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**The Diagnostic Validity of the DSM-III/III-R Criteria
for Post Traumatic Stress Disorder:
The Case of the Head Injured**

Doreen C. Gough

**A thesis submitted to the School of Graduate Studies of the University of
Ottawa as partial fulfillment of the requirements for the degree of Doctor of
Philosophy.**



Doreen C. Gough, Ottawa, Canada, 1991



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**This thesis is dedicated to
Mike and Lauren,
for their patience and
continuing love and support.**

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The Diagnostic Validity of the DSM-III/III-R Criteria for Post Traumatic Stress Disorder: The Case of the Head Injured

Abstract

Sixty head injured patients participated in this research, an evaluation of the validity of the DSM-III/III-R criteria to diagnose cases of Post Traumatic Stress Disorder among the head injured. Data was collected from a battery of tests, including a self-report checklist of symptoms, the Diagnostic Interview Schedule, Life Events Inventory, Novaco Anger Inventory, MMPI, WAIS-R, and the Halstead-Reitan Battery, at three times within the first year of recovery. In order for a psychodiagnostic system to be valid, its psychometric adequacy must be demonstrated. In this research, the meaningfulness of the DSM-III/III-R criteria was examined through (a) its concordance with alternative criteria for PTSD (i.e., convergent validity), (b) the application of multivariate statistical techniques (i.e., MANOVA, Discriminant Analysis) to determine whether PTSD and non-PTSD groups could be discriminated on the basis of external predictor variables, including those of distress, cognitive impairment, and demographic/ psychosocial variables; and (c) its association with neurological variables, which estimate degree and location of brain damage. Furthermore, the validity of the alternative criteria was also examined through the same procedures. One set of alternative criteria was representative of the criteria used to diagnose Post-Concussional Syndrome, a disorder most recently considered to be equivalent to PTSD. Lack of association between PTSD status and neurological variables would constitute a form of discriminant validity.

Results indicated that concordance rates between DSM-III/III-R criteria and alternative criteria were low, while concordance rates between alternative sets of criteria were acceptable. Assessment of the convergent validity of PTSD criteria with external measures of distress and impairment indicated that the largest multivariate group separation and highest discrimination rates were achieved for alternative PTSD criteria. Individuals who met DSM-III criteria at the initial assessment appeared less distressed and more healthy than corresponding non-PTSD groups; this pattern was less obvious at follow-up. In contrast, those who met alternative criteria for PTSD at all assessments appeared more distressed and impaired than corresponding non-PTSD groups at all assessments. The DSM-III-R criteria fell somewhere between DSM-III and alternative criteria in

terms of univariate group scores but the multivariate separation between PTSD and non-PTSD groups were not as great as when alternative criteria were used. Of the external predictor variables, anger or irritability had the highest association with PTSD, regardless of how diagnosed. Anger may be the sine qua non of PTSD and as such needs further research; DSM-III/III-R's inclusion of anger is commendable. The PTSD and non-PTSD groups could not be discriminated on the basis of medical/neurological variables even though all subjects had some evidence of impairment; thus, all sets of PTSD criteria had discriminant validity when compared to brain damage. The PTSD groups formed on the basis of "post-concussional" symptoms were generally less seriously injured than either corresponding non-PTSD groups or PTSD groups formed from DSM-III/III-R criteria. This finding makes questionable DSM-III/III-R's dismissal of such symptoms as Organic Mental Disorder. The implications of this research for DSM-IV are that PTSD criteria may need to be less restrictive by (a) including somatic symptoms and those symptoms used in operational definitions of Post-Concussional Syndrome, such as headache, vertigo, and attention/memory impairment; (b) removing the requirement that both intrusion and avoidance-numbness must be present for a diagnosis; (c) recognizing that global symptoms of maladjustment that occur or re-occur after a trauma may indicate PTSD and not comorbidity; and (d) recognizing that the presence of intrusion and/or avoidance-numbness may indicate an adaptive response to the trauma and not a disorder, especially in the absence of associated distress or impairment.

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A REVIEW OF THE LITERATURE

Introduction

The concept of Post-Traumatic Stress Disorder (PTSD) has existed under various labels and operational definitions for a long time as has speculation on its etiology. Interest in PTSD has waxed and waned over the years, influenced by crises and their aftermath. Despite periods of intense investigation, there is still no widely accepted operational definition of PTSD that is endorsed by all interest groups that study this phenomena. Until the last decade, diagnoses of PTSD were loosely based on constellations of symptoms that exist among trauma survivors. These sets of symptoms may be said to be experiential or phenomenologically-based because they were observed in studies that had no bias toward clinical theory. Subsets of these symptoms that have been used to operationally define PTSD following various traumas are similar to each other but not identical.

With the publication of the third edition of the Diagnostic and Statistical Manual (DSM-III) in 1980, the American Psychiatric Association (APA) gave its official recognition to PTSD and tried to tighten up the diagnostic criteria. In essence, the model of PTSD outlined in DSM-III is that of a unitary syndrome with known etiology (i.e., recognizable traumatic stressor outside the range of usual human experience) and composed of three symptom clusters: symptoms of intrusive thought and affect leading to a psychic reliving of the trauma, symptoms related to numbing of responsiveness or reduced involvement in social relations, and symptoms in a miscellaneous category (referred to as hyperarousal symptoms by DSM-III-R). The DSM-III formulation assumes that the syndrome is a pervasive one and suggests that contact with any traumatic experience will lead to reexperiencing and numbing as well as to some symptoms of hyperarousal, guilt, avoidance behaviour, generalized sleep disturbance, or cognitive disruption.

This literature review is divided into five sections. In the first section, the subject and purpose of this dissertation are introduced. The topics covered include the hypotheses of this study, criticisms of the present psychiatric classification of PTSD, and the history of PTSD, including etiological speculation and past attempts to establish diagnostic criteria for PTSD. The second section examines and compares various sets of criteria used to diagnose PTSD, including DSM-III/III-R and alternative criteria. Also discussed in the second section are the parameters (e.g., reliability, sensitivity/specificity, coverage, homogeneity, and comorbidity) and methods (e.g.,

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laboratory studies, cross-catastrophe comparisons, concordance with other diagnostic criteria, multivariate statistical analysis) used in research to establish the construct validity of a classification scheme.

Issues related to the validity of DSM-III/III-R are addressed in the third section. The first criterion in DSM-III/III-R's conceptualization of PTSD is the occurrence of a traumatic event. The influence of different aspects of the event on this disorder are examined. In addition to the discussion of the situational influences on PTSD, the personal attributes that contribute to a stress reaction are also examined. A summary is made of the symptomatology of PTSD in this section, specifically DSM-III/III-R's criteria B, C, and D. Also included are symptoms referred to as associated features by DSM-III/III-R but used by alternative criteria to define PTSD. Other issues dealt with under Signs and Symptoms of PTSD are the indications of an adaptive response to trauma, the temporal aspects of PTSD, the predisposition for individuals to display differential forms of maladjustment following trauma, and the overlap of PTSD criteria with other DSM-III/III-R diagnoses.

The fourth section examines the extent to which DSM-III/III-R criteria for PTSD may be valid in the case of the head-injured by discussing the situational factors and secondary stressors associated with head trauma, and the methods used in the assessment of brain damage. The concordance between PTSD and the so-called Post-Concussional Syndrome is detailed because of its importance to this research, as well as the controversy over neurogenic and psychogenic explanations of Post-Concussional Syndrome. Lastly, the psychometric methods used to assess distress and impairment in the head-injured, as well as other trauma survivors (i.e., the MMPI, WAIS-R, and Halstead-Reitan). Difficulties inherent in isolating impairment due to neurogenic causes from impairment due to psychogenic causes are highlighted.

Purpose of the Dissertation

Hypotheses

The present research was undertaken to investigate the validity and utility of the DSM-III criteria to operationally define and diagnose Post Traumatic Stress Disorder among trauma survivors who received a concomitant head injury. The DSM-III/III-R criteria for PTSD will be compared to alternative diagnostic criteria, such as used by Braverman (1980) who investigated sequelae of industrial, motor, and sporting accidents; and by Lidvall, Linderöth, and Norlin (1974) who studied post-traumatic symptomatology of accidental head injury. In the first hypothesis, the diagnostic agreement (i.e., Cohen's kappa) among DSM-III/III-R, Braverman, and Lidvall et al. criteria

for PTSD will be examined (convergent validity). Despite the call for research comparing DSM-III criteria with alternative diagnostic criteria for PTSD (e.g., Malt, 1986), little research of this nature could be found relating to civilian trauma. The review suggests that some researchers believed that PTSD was an entirely new disorder, not diagnosed before the publication of DSM-III in 1980. Fortunately, there are some exceptions. As diagnostic criteria for PTSD, the investigators of the "Legacies of Vietnam" study (e.g. Kadushin, Boulanger, & Martin, 1981) assembled a set of symptoms that have been observed in at least five of seven major studies of both civilian and war trauma. Not all symptoms reported in the clinical literature found their way into DSM-III/III-R; the question arises whether there are other symptoms that could be usefully included. It will become apparent (in the literature review) that DSM-III departed from the symptom-based criteria that was used prior to its publication. Furthermore, the phenomena selected in DSM-III/III-R as indicative of PTSD is both theory-driven, and possibly more indicative of adaptational processes than of distress.

This study is based on the concept that a mental disorder is as defined in DSM-III/III-R: "a clinically significant behavioural or psychological syndrome or pattern that occurs in a person and that is associated with distress (a painful symptom) or disability (impairment in one or more important areas of functioning) or with a significantly increased risk of suffering death, pain, disability, or an important loss of freedom" (American Psychiatric Association, 1987, p. xxii). Therefore, in order for a set of diagnostic criteria to be valid there must be psychometric evidence of distress and/or impairment among individuals diagnosed with the disorder. Although individuals described as having the same mental disorder can not be expected to be alike in all ways, there should be homogeneity with respect to distress and/or impairment. In the second hypothesis, this research attempts to obtain psychometric evidence of distress and impairment associated with PTSD. Such evidence will provide the basis for assessing the validity of DSM-III/III-R criteria, as well as of alternative criteria.

Despite extending the concept of PTSD to include head-injured survivors of trauma, DSM-III and DSM-III-R have ignored the constellation of symptoms observed in numerous studies of this population (e.g., Lishman, 1968, 1973, 1978). These symptoms, derived from phenomenological studies, are dismissed as associated features that are possibly suggestive of an Organic Brain Syndrome. The collective opinion of neurological investigators, however, is that these symptoms are attributable to a psychological stress reaction consequent to the head injury regardless of possible brain damage. In addition, these symptoms (the so-called Post-Concussional Syndrome)

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bear closer resemblance to those found among neurotic and other traumatized populations (e.g., rape victims, Dahl, 1989) than those directly resulting from localized brain damage (e.g., to the frontal or temporal lobes [Lishman, 1968]).

The third hypothesis will examine the association between a diagnosis of PTSD and medical and neuropsychological indices of brain damage. If diagnoses of PTSD based on Lidvall et al. criteria (originally used to diagnose Post-Concussional Syndrome) are more clearly associated with medical indices and impairment suggestive of brain damage than those of DSM-III or Braverman, this will suggest that DSM-III is valid in its concern about the comorbidity with brain damage. If diagnoses of PTSD are not related to indices of brain damage, or less so than PTSD-diagnoses according to DSM-III/III-R or Braverman criteria, the validity of dismissing this constellation of symptoms as definitive of PTSD will be compromised. If post-traumatic symptomatology is caused by specific brain damage to a particular part of the brain and not simply associated with it, then DSM-III/III-R is correct to classify the disorder as Organic Mental Disorder.

There is no "gold standard" for the diagnosis and measurement of PTSD. Zwick (1983) suggested that when there is no gold standard on which to measure new criteria, the measurement of diagnostic validity requires that alternative sets of criteria be compared for their diagnostic agreement (e.g., Hypothesis One), and thus providing information on the individuals who meet one or another sets of criteria. In the fourth hypothesis, the characteristics of individuals diagnosed as having PTSD will be determined according to each set of criteria and the types of cases for which the various sets of criteria agree and disagree will be examined. All of the information obtained on the predictor variables used in the previous hypotheses, as well on a set of demographic/psychosocial variables, will provide information on the individuals who are PTSD-positive. Furthermore, there may be certain personal attributes or characteristics that moderate the influence of a stressor, either predisposing to or providing protection from dysfunction.

Criticisms of the DSM-III/III-R Diagnostic Criteria for PTSD

The American Psychiatric Association assembled for the PTSD diagnostic criteria a very restrictive and narrow set of criteria that are a collection of intrapsychic and psychophysiological phenomena. This was to improve psychiatric classification by making it more specific and addressing the issue of comorbidity. Yet, in DSM-III/III-R, APA states that it rejects the assumption that each mental disorder is a discrete entity with sharp boundaries between the disorder and other mental disorders or no mental disorder. This relates to several conceptual issues of validation that

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will be discussed in the literature review. These include (a) whether mental illness is a disease or a reaction, (b) whether mental disorders are independent entities or arbitrary concepts, (c) whether disorders should be classified on the basis of symptomatology, etiology, or pathogenesis, and (d) whether a mental disorder should be portrayed by typology or by dimensions (Kendell, 1976).

Restrictiveness. The DSM-III definition of PTSD has been criticized for being too restrictive, thus leading to estimates of the prevalence of PTSD that are thought to be too low in comparison to alternative criteria for PTSD. For example, an individual may be considerably distressed and impaired as indicated by psychometric instruments such as the Symptom Checklist-90 (Derogatis, 1977) and the General Health Questionnaire (Goldberg, 1978), yet be diagnosed as non-PTSD by DSM-III because they did not meet all three criteria (e.g. Creamer, 1990; Malt, 1986; McFarlane, 1988a, 1988b). An alternative bidimensional view of PTSD suggests that intrusive recall alternates with avoidance-numbness in a cyclical relationship (Horowitz, 1986a). Even among combat veterans, research suggests that the coexistence of all three phenomena may be the exception. For example, ex-combatants who witnessed but did not participate in abusive violence were less likely to meet the full DSM-III requirements for PTSD than were those who did participate (Laufer, Brett, & Gallops, 1984, 1985b). Meanwhile, individuals who participated in abusive violence have higher levels of avoiding/numbing symptoms than reexperiencing symptoms, possibly because of guilt over their transgressions. Both groups of veterans may be underdiagnosed by DSM-III. The restrictiveness of DSM-III criteria has been interpreted by some to be politically motivated, possibly an attempt to lower the number of potential claims against the U.S. Veteran's Administration. (e.g., Jones & Riley, 1987; Laufer et al., 1984, 1985b; Solomon, 1987).

Comprehensiveness. DSM-III has also been criticized for being too comprehensive, trying to force all forms of trauma into one definition regardless of personal or situational variables. Neither DSM-III nor DSM-III-R recognizes that there may be subtypes of PTSD. Cross-catastrophe studies of accidents (e.g., Braverman, 1980; Burstein, 1985; Modlin, 1983); disasters (e.g., Davidson & Baum, 1985; McFarlane, 1988a, 1988b; Titchener & Kapp, 1976; Wilkinson, 1983); burns (e.g., Andreason, Norris, & Hartford, 1971; Stoddard, Norman, & Murphy, 1989); rape (e.g., Atkeson, Calhoun, Resick, & Ellis, 1982; Burgess & Holmstrom, 1974); prisoner-of-war and concentration camp imprisonment (e.g., Chodoff, 1963; Goldstein, van Kammen, Shelly, Miller, & van Kammen, 1987); and combat (e.g., Atkinson, Sparr, Sheff, White, & Fitzsimmons, 1984; Wilson, Smith, &

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Johnson, 1985) show that while there is diagnostic overlap among sets of criteria used following various traumas, there is also considerable variation. Arguments have ensued among different interest groups over necessary and sufficient diagnostic criteria. While there is no doubt that phenomena such as intrusive recall, avoidance-numbness, and hypervigilance appear in traumatized survivors, the question addressed in this study is whether it is appropriate to use these phenomena as markers of a mental disorder. The theoretical and experimental literature on coping behaviour lists these phenomena as coping or adaptive measures to deal with stress (see Lazarus & Folkman, 1984).

Theoretical. DSM-III/III-R also claims to be generally atheoretical with regard to etiology (APA, 1980, see p.7). According to Penk et al. (1988) however, both the DSM-III and DSM-III-R criteria of PTSD are strongly theory-driven, drawing on a consensus among dynamic theories of PTSD (e.g., Freud, Ferenczi, Abraham, Simmel, & Jones, 1921; Brett & Ostroff, 1985; Lifton, 1976), cognitive theories (e.g., Horowitz, 1986a), learning theories (e.g., Dollard & Miller, 1950; Foy, Carroll, & Donahoe, 1987; Keane, Zimering, & Caddell, 1985; Mowrer, 1960), and biologic theories or mechanisms (e.g., Kardiner & Spiegel, 1947; Kolb, 1984; van der Kolk, 1987). Furthermore, Klerman (1989) suggested that the attempt to account for how the disorder came about (i.e., traumatic stressor) was unfortunate from a scientific standpoint because it contaminated description and cause. According to Solomon and Canino (1990), the stressor criterion should be removed from the diagnosis and reserved for axis IV.

Pathologizing an adaptive process. The work of Kardiner (1941, 1959) is considered a precursor to DSM-III. Based on experiences with WWI and WWII veterans, he contended that the chronic phase of the traumatic syndrome entails fixation on the trauma, catastrophic dreams, irritability and startle pattern, proclivity to explosive aggression, and a lowering of general level of functioning that affects emotion, interest in things, and intellectual ability. He also suggested that the presenting symptoms are largely concerned with the autonomic system, prompting him to relabel traumatic neuroses as "physioneuroses" (Kardiner listed several examples of somatic symptoms as indicative of PTSD but DSM-III failed to include them). Kardiner dismissed the importance of symptoms per se, and suggested instead that restitutive processes be identified to infer damage. Thus, the concept of distress/disorder was confounded with natural adaptive processes used to "work through" or reappraise the situation. It is possible that DSM-III/III-R

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pathologize a healthy adaptive process. Even if the individual is distressed and/or impaired during or after attempts to cope, it is important that the adaptive processes not be labelled dysfunctional. The work of R.S. Lazarus and others (Klinger, 1977; Shontz, 1975; Wortmand & Brehn, 1975) bears particularly on this issue and will be discussed.

Methodological issues. In the last ten years, attempts to validate the diagnostic criteria have been almost entirely based on Vietnam combat veterans seeking treatment from a war that ended over 15 years ago. Furthermore, most of these studies either rely on the subjects' retrospective recall of PTSD symptomatology or investigate delayed or chronic cases of PTSD. Less effort has been made to assess the diagnostic validity of DSM-III/III-R PTSD criteria in prospective studies of survivors of disaster, assault, rape, and accidents. Issues of methodology will be discussed in this literature review, as well as methods to evaluate diagnostic criteria. These include the sensitivity and specificity of the criteria to identify cases and the degree of homogeneity among individuals diagnosed with the disorder.

Several important questions have been raised about the investigation into the validity of DSM-III/III-R criteria for PTSD (by Boulanger, 1990; Egendorf, 1982; Laufer et al., 1984; Malt, 1988; McFarlane, 1988a): (a) little examination has been made of whether different types of traumatic events lead to a similar pattern of phenomenon; (b) a large number of PTSD patients have concurrent psychiatric diagnoses, perhaps indicating a lack of specificity of the criteria; (c) most studies of PTSD have been conducted with treatment-seeking survivors; (d) most studies rely on retrospective recall, few have been prospective; (e) there is little understanding of whether, or how, the phenomenology of PTSD changes as the traumatic event recedes into the past; (f) there is a dearth of psychometric studies on what significant differences there are between individuals diagnosed with and without PTSD; (g) few studies have compared DSM-III/III-R with alternative diagnostic criteria for PTSD. Despite burgeoning research in the last decade, there has been a reluctance to build on previous research and to make cross-catastrophe comparisons. Different researchers and ideological factions propose different sets of symptoms as primary or definitive of the disorder, while acknowledging other PTSD symptoms as secondary. So, while DSM-III/III-R attends to the intrusive, avoiding, and vigilant aspects of PTSD, depression and somatization are acknowledged as associated features only. At the same time, alternative criteria use the presence of somatic symptoms (e.g., headaches, dizziness, fatigue), depression, and anxiety to signal a post-traumatic stress disorder, barely acknowledging intrusive recall, avoidance, and withdrawal.

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Yet, the collection of all these symptoms has turned up for years in experiential or phenomenological research on trauma survivors (Etteedgui & Bridges, 1985).

Summary. This research was designed to assess the validity of DSM-III criteria to assess PTSD among head-injured survivors. It will proceed by comparing DSM-III/III-R criteria for PTSD with alternative criteria for concordance and by using multivariate statistical techniques to assess homogeneity, especially in terms of distress and/or impairment, among individuals diagnosed with the disorder. These individuals will also be assessed for the contribution that possible brain damage makes to their diagnosis of PTSD. It is possible that diagnoses of PTSD made according to alternative criteria may have a neurological etiology. Conceptual and methodological issues concerning the diagnosis of PTSD among head-injured and other traumatized groups will be discussed in the literature review.

The general question of validation of DSM-III, according to Silver and Iacono (1985), is whether or not it truly reflects the clinical research literature. More specifically, does the DSM-III diagnosis for PTSD reflect an underlying and identifiable symptom structure, or is it simply an arbitrary grouping of symptoms? Since the validation process begins with a thorough review of the literature, the present literature review is intended to be comprehensive. It will attempt to summarize and synthesize experimental and observational studies on PTSD with (a) cross-catastrophe and historical comparisons, (b) the use of alternative diagnostic criteria, and (c) application of multivariate statistical techniques. Different aspects of the disorder will be discussed as they pertain to construct validity. These include signs and symptoms, etiology, personal differences, and situational aspects of different trauma. In general, PTSD research has been characterized by confusion and a failure to generalize from or build on earlier findings and clinical experience.

History of PTSD

Known through the years by different names, PTSD has been described or referred to by writers, philosophers, and scientists, including Shakespeare, Dickens, and Freud. Historical descriptions of PTSD have come from wars and catastrophes such as the Great Fire of England in 1666 (e.g., Samuel Pepys's diary [Daly, 1983]). Shakespeare's King Henry IV suffered PTSD as a consequence of war. Charles Dickens wrote to a friend of the symptoms he experienced following

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a railway accident. These and other examples of PTSD occurring after accidents, recorded by physicians as early as the 18th and 19th century, have been provided by Trimble (1981). In a whimsical article on PTSD, Sonnenberg (1982) made a case study of Hamlet's stress reaction to his father's murder.

Various labels have been applied to the constellation of signs and symptoms that sometimes appear following a traumatic occurrence. These labels include "traumatic neurosis", "post-traumatic syndrome", "post-traumatic stress", "accident neurosis", "traumatic neurasthenia", "shell shock", "war neurosis", "post-accident syndrome", "Da Costa's syndrome", "combat fatigue", "chronic stress syndrome", "survivor syndrome" and "concentration camp syndrome". Despite the various labels and vague diagnostic definitions, diagnoses of PTSD have been given frequently. According to Keiser (1968), most clinicians and researchers have been in agreement on what the syndrome entails, at least at a conceptual level.

The clinical features that have been associated with the historical nosology of post-traumatic stress disorder following both civilian and war experiences are presented in Tables 1 and 2. As can be seen in these tables, symptoms common to this syndrome are: (a) anxiety and depression and their physiological and psychological correlates, (b) conversion and somatization reactions, (c) intrusive imagery and recall of the trauma, (d) sleep and dream disturbances, (e) denial and withdrawal, (f) irritability and explosive or aggressive behaviour, (g) cognitive impairment, (h) constricted or labile affect, (i) phobic and panic responses, and (j) guilt. There had been little change in the symptoms that are generally recognized as comprising this disorder. Foa, Steketee, and Rothbaum (1989) observed that in early descriptions of this syndrome there was a generalization that different traumas produced the same symptoms. Between the 1940's and the 1980's, the post-traumatic syndromes were labeled according to the type of trauma. In DSM-III, similarity of symptoms across trauma was again assumed, without any acknowledgement of subtypes of PTSD.

Etiological Speculation

The range of etiological speculation has not changed much in the last century. The study of trauma has taken several separate but related theoretical directions over the years, including concepts of "anxiety neurosis" from psychoanalytic theory, "fight or flight alarm reaction" from explosive or aggressive behaviour biology and "learned helplessness" from behaviourism. By the late 19th century it was known that railway and industrial accidents causing personal injury could

Table 1

Symptoms Most Frequently Reported by Individuals Affected by Accidents and Disasters

Adler (1943), Cucoanut Grove Nightclub Fire

- Anxiety
- Fatigue
- Fearfulness
- Insomnia
- Irritability

Andreassen, Norris, & Hartford (1971), Reactions to Severe Burns

• Excessive sensitivity	• Anxiety
• Emotional lability	• Fearfulness
• Crying spells	• Phobias
• Insomnia	• Depression

Bloch(1978), Reactions to Classroom Assault

• Fatigue	• Somatic complaints	
• Weakness	– gastrointestinal	(45%)
• Blurred vision	– musculoskeletal	(13%)
• Tinnitus	– respiratory	(12%)
• Irritability	– headaches	(11%)
• Sensitivity to weather	– cardiovascular	(8%)
• Dizziness	– skin	(6%)
• Malaise	– miscellaneous	(5%)

Boman (1979), Psychological Reactions to a Train Wreck

• Anxiety	• Poor concentration
• Irritability	• Headaches
• Nightmares	• Gastro-intestinal disturbance
• Depression	• Fear of train travel
• Guilt about not helping others	• Excessive drinking
• Anger	• Sexual impotence
• Absenteeism from work	• Conversion symptoms

Disaster Research Centre (cited in Quarantelli, 1985), Xenio, Ohio Tomado^R

• Depression	(56%)
• Anxiety or Excitability	(50%)
• Insomnia	(27%)
• Headaches	(25%)
• Anorexia	(19%)

Jones & Riley (1987), Reactions to Civil Accidents^R

• Pain	(87%)	• Abnormal preoccupation with self	(47%)
• Anxiety	(87%)	• Resentment	(44%)
• Irritability	(75%)	• Memory Disturbance	(37%)
• Insomnia	(73%)	• Dizziness	(22%)
• Headache	(72%)	• Phobias	(22%)
• Depression	(67%)	• Nightmares	(18%)
• Sexual problems	(61%)	• Hysteria	(9%)
• Fatigue	(56%)	• Weakness	(7%)

Note. R - Studies so noted list symptoms in ranked order.

Table 1 (continued)

Mahan & Elger (1989), Reactions to Accidents Causing Mild Head Injury ^R (3 to 6 months post-trauma)

- Headache (59%)
- Dizziness (28%)
- Fatigue (27%)
- Memory impairment (15%)
- Short attention span (13%)
- Insomnia (13%)
- Slow thought processes (7%)
- Hypersensitivity to sound (4%)

Marks, Fritz, Bucher, & Earle (cited in Quarantelli, 1985), Series of Tornadoes ^R

- Anxiety or Excitability (49%)
- Hypersensitivity (49%)
- Insomnia (46%)
- Concentration impairment (37%)
- Anorexia (29%)
- Headaches (19%)
- Anxiety dreams or Nightmares (18%)

White (1982), Psychological Reactions to Bums ^R

- Reduced social activity (38%)
- Worry about appearance (38%)
- Unhappiness or depression (37%)
- Reduced interest in everyday activities (30%)
- Impaired concentration (29%)
- Increased irritability (29%)
- Fear or panic (25%)
- Fear of going out (21%)
- Reduced sexual activity or satisfaction (18%)
- Loss of interest in personal appearance (16%)
- Wishing to be dead (11%)

Wilkinson (1983), Hyatt Regency Skywalks Collapse

• Repeated recollections of disaster (88%)	• Impaired concentration (44%)
• Sadness (83%)	• Guilt (44%)
• Fatigue (57%)	• Avoidance of situations that cause recall (40%)
• Recurrent feelings of anxiety and depression (54%)	• Reminders of event make things worse (37%)
• Dreams of the disaster (52%)	• Inability to feel deeply about anything (36%)
• Insomnia (50%)	• Anger (35%)
• Anorexia (46%)	• Loss of interest (34%)
• Loss of enthusiasm (45%)	• Feelings of detachment (29%)
• Startle reaction (45%)	• Memory difficulties (27%)
	• Psychosomatic complaints (18%)
	• Diminished sexual interest (17%)

Note. ^R - Studies so noted list symptoms in ranked order.

Table 2.
Symptoms Most Frequently Reported by Survivors of War Trauma

Archibald & Tuddenham (1965), Combat Personnel in WWII R

• Depression	(89%)	• Momentary blackouts	(61%)
• Restlessness	(84%)	• Dizziness	(61%)
• Irritability	(82%)	• Excess smoking	(61%)
• Excessive jumpiness	(76%)	• Abdominal discomfort	(61%)
• Fatigue	(76%)	• Pounding heart	(56%)
• Waking during night	(75%)	• Combat dreams	(53%)
• Impaired concentration	(75%)	• Pervasive disgust	(52%)
• Sweaty hands or feet	(73%)	• Shortness of breath	(50%)
• Severe headache	(69%)	• Sighing and yawning	(48%)
• Insomnia	(69%)	• Diarrhea	(36%)
• Impaired memory	(66%)	• Difficulty swallowing	(29%)

Chodoff (1963), Concentration Camp Survivors (15 years after liberation)

- Irritability
- Restlessness
- Startle reaction or hypersensitivity to noise
- Insomnia
- Nightmares
- Anxiety and tension
- Psychosomatic complaints
- Phobias
- Obsessive ruminations
- Depression
- Seclusiveness
- Apathy
- Dependency
- Feelings of inadequacy
- Suspiciousness, hostility or paranoia

DeFazio, Rustin, & Diamond (1975), Combat Personnel in Vietnam

• Diarrhea	• Feeling that life is a strain
• Insomnia	• Irritability and anger
• Depression	• Inability to relax
• Worry that something wrong with mind	• Feelings of detachment from others
• Substance abuse	• Anxiety
• Frequent nightmares	• Fatigue
• Fears	• Nausea and vomiting
• Impaired concentration	

Note. R - Studies so noted list symptoms in ranked order.

Table 2 (continued)

Eitinger (1969), Norwegian Survivors of Nazi Concentration Camps ^R

- Memory impairment (87%)
- Concentration impairment (87%)
- Anxiety (85%)
- Irritability (85%)
- Insomnia (60%)
- Nightmares (52%)

Grinker & Spiegel (1945), Combat Personnel in WWII ^R

• Restlessness	• Tremor
• Irritability or aggression	• Impaired concentration , Confusion
• Fatigue upon rising, Lethargy	• Alcoholism
• Insomnia	• Preoccupation with combat
• Anxiety	• Anorexia
• Fatigue	• Nightmares
• Startle reaction	• Psychosomatic symptoms
• Tension	(e.g., vomiting, diarrhea)
• Depression	• Suspiciousness
• Personality change	
• Memory Impairment	

Hocking (1970), Prisoners of War in WWII

• Depression	• Impaired memory and concentration
• Insomnia	• Obsession with thoughts of wartime experiences
• Nightmares	• Apathy and lack of initiative
• Anxiety	• Hypersensitivity to noise
• Tension	• Guilt
• Irritability	
• Startle reaction	

Kardiner (1941), Combat Personnel in WWI and WWII

• Somatic concerns, (e.g. gastrointestinal, heart, headaches)	• Hyperalertness
• Hypochondriasis	• Apprehension
• Irritability or aggression	• Repetition phenomena
• Depression	• Depression
• Hypersensitivity to noise	• Autonomic disturbances
• Vertigo	• Insomnia
• Phobias	• Fatigue
• Distressing dreams	• Sensory motor disorders

Note: R - Studies so noted list symptoms in ranked order.

Table 2 (continued)

Krystal (1968), Jewish Survivors of Nazi Concentration Camps

- Insomnia (100%)
- Dreams and nightmares (71%)
- Anxiety (97%)
 - vigilance and multiple phobias (77%)
 - chronic tendency to worry (39%)
 - diffuse fears about renewed persecutions (31%)
 - expectation of catastrophe (24%)
- Impaired concentration and memory
 - amnesia (19%)
 - hyperamnesia (8%)
 - confusion of past and present (8%)
 - disorientation (7%)
 - hallucinations (4%)
 - dreamlike experiences during waking (3%)
- Survivor guilt (92%)
- Masochistic character trait (79%)
- Depression (80%)
- Withdrawal from interpersonal relationships (79%)
- Impaired reality testing
 - overwhelming of the patient with hallucinations or dreaded events
 - fantasies of revenge, reunion, or identification with dead relatives
 - projection
- Hyperarousal (49%)
- Psychosomatic diseases (45%)
 - muscular tension
 - headaches
 - fatigue
 - allergies
 - stomach problems, including ulcers

Langer (1987), Prisoners of War in WWII and Korea

• Anger and irritability	• Anxiety
• Depresssion	• Social withdrawal
• Fear of losing control	• Feeling of being misunderstood by non-POWs
• Guilt	• Distrustful of non-POWs
• Overstimulation	• Disorders of self-esteem
• Nightmares	(inappropriately low or high)
• Acute psychoses	

Reid (1944), Bomber Crews in WWII

• Anxiety	• Preoccupation
• Insecurity	• Mental sluggishness
• Nightmares	• Confusion
• Startle reaction	• Headache
• Apathy	• Gastrointestinal distress
• Poor memory	• Backache

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lead to a variety of symptoms indicative of maladjustment, despite an absence of neurological signs.

Early speculation on an "organic" cause of "railway spine" or "railway brain", and championed by a physician called Erichsen, centered around disturbance of the "molecular condition" or micro-structural lesions in the central nervous system. There were notable discrepancies, however, between the apparent severity of the accident and the intensity of the traumatic reaction, as there still are.

Increasingly, neurologists of the day came to accept a psychological approach to both etiology and treatment of PTSD. Herbert Page, a surgeon to the London and North West Railway, contended that many cases of "railway spine" did not result from nervous lesions but from functional disturbances, a concept that he helped to introduce. He found in these cases of railway spine the occurrence of hemianesthesia and other symptoms that were generally considered stigmata of hysteria. While Charcot and Freud concurred, two of Germany's leading neurologists of the day (Thomsen and Oppenheimer) objected to an hysteria classification. The German physicians found in these cases that hemianesthesia was much more severe, depression was deeper and that there was little response to therapy, so they ascribed the condition to something distinct from hysteria (Ellenberger, 1970). Oppenheimer called the disorder "traumatic neurosis" and attributed the symptoms of concussion to functional disturbances. He also noted that post-traumatic neurosis could develop after any injury or surgical operation (Trimble, 1981).

The concepts of malingering, compensation and secondary gain have also been associated with post-traumatic disorder, both because there can be such gain and because the symptoms are hard to objectify (Binder, 1986). The champion of this view, Miller (1961, 1966), has suggested that this disorder is an outcome of the setting in which it occurs, and is related to a "lack of social responsibility". He believes that severity is inversely proportional to the severity of the trauma and attendant injury and that the majority of people with this disorder lose their symptoms upon settlement of litigation. This belief is important to the issue of diagnostic validity. It may adversely affect the willingness of mental health professionals to make a diagnosis of PTSD and may cause policy-makers to establish diagnostic criteria that is overly restrictive. Because payment of compensation often depends on the designation of the PTSD label there is one set of rigid diagnostic criteria for the courts, while a more liberal set of criteria is frequently used in the clinician's office.

The Establishment of Diagnostic Criteria

The psychiatric codification of PTSD began during WWII. Kardiner (1941) described five principal features of the response to combat trauma in words that are similar to DSM-III: (a) a persistence of startle response, (b) irritability or a proclivity to explosive outbursts of aggression, (c) fixation on the trauma, (d) constriction of the general level of personality functioning, and (e) an atypical dream life. Then Lindemann (1944), working with close relatives of people who had died under catastrophic circumstances (either the Cocoanut Grove nightclub fire or WWII combat), noted that somatic complaints were primary, followed by sensations of unreality, emotional distancing, inability to carry on normal patterns of activity, preoccupation with images of the deceased, and feelings of guilt, irritability, anger, and restlessness. Lindemann realized that such distress could be brought on by reminiscences of the recent bereavement. The bereaved individual attempted to avoid this intense distress, as well as the expression of emotions, by psychic avoidance of the tragedy.

The impetus behind official recognition of PTSD by the American Psychiatric Association and its inclusion in DSM-III came from veterans groups and mental health professionals engaged in caring for Vietnam veterans. Inclusion of the category was in part a compromise to recognize a so-called "post-Vietnam syndrome" and relate it to the stress reactions or traumatic neuroses that had been witnessed through the years in survivors of both civilian and military catastrophes. Themes of the "post-Vietnam syndrome", identified by Shatan (1973), include guilt feelings and self-punishment, feelings of being made a scapegoat, rage and other violent impulses against indiscriminate targets, brutalization and its attendant "psychic numbing", alienation from one's own feelings and from other people, and doubt about the continued ability to love and trust others. Characterization of the "post-Vietnam syndrome" also included hyperalertness, sudden reliving of the combat experience, emotional numbing, alienation, and guilt (Helzer, Robins, & McEvoy, 1987; Panzerella, Mantell, & Bridenbaugh, 1983; Silver & Iacono, 1985). Many of these themes do not appear to have face validity when applied to survivors of civilian accidents or natural disasters. Yet, these experiences are assumed to be general regardless of trauma and individual differences and they have become the cardinal symptoms in DSM-III. It is a diagnostic classification system based on the clinical knowledge, judgment and experience of selected members of a committee, and not on empirical research.

In summary, PTSD is not new, nor is the range of speculation on its etiology. Although there has been controversy over how best to operationally define PTSD, most health professionals

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and lay persons alike have a conceptual understanding of it. Currently, the most widely known diagnostic criteria for PTSD is that presented by the American Psychiatric Association in DSM-III/III-R.

Classification of PTSD

Similarities and Differences Between DSM-III and DSM-III-R

The American Psychiatric Association recognized the post-traumatic stress disorder and included it in the two previous Diagnostic and Statistical Manuals (DSM), as well as the current and revised editions of DSM-III (APA, 1980, 1987). It was referred to as Gross Stress Reaction in the 1952 DSM-I edition (APA, 1952), and Transient Situational Disturbance in the 1968 DSM-II edition (APA, 1968). The essential feature of the diagnostic criteria, contained in DSM-III (see Table 3), is the "development of characteristic symptoms following a psychologically traumatic event that is generally outside the range of usual human experience [but which] would evoke significant symptoms of distress in almost anyone" (APA, 1980, p. 236). DSM-III-R (see Table 4) elucidates the types of traumata that are considered to lead to PTSD. Stressors producing this disorder include accidental disasters (e.g., car accidents with serious physical injury, airplane crashes, large fires, collapse of physical structures), natural disasters (earthquakes, floods, tornadoes), and deliberately caused disasters (wars, pogroms). Sometimes there is a concomitant physical component of the trauma, which may involve direct damage to the central nervous system (e.g., head injury, malnutrition). DSM-III-R suggests that the disorder is more severe and lasting when the stressor is of human design. The emphasis has shifted over the years from when the diagnosis of "psychoneurotic reaction" assumed underlying personality problems that were merely exacerbated by the trauma to a recognition that extreme stress evokes symptoms in most people.

The basic tenets for diagnosing PTSD remained the same in DSM-III-R as in DSM-III (i.e., occurrence of both intrusive/reexperiencing elements of the trauma and avoidance/numbness to the external world and to stimuli associated with the trauma). According to DSM-III, the traumatic event is persistently reexperienced in at least one of the following ways: recurrent and intrusive distressing recollections of the event, recurrent distressing dreams of the event, or sudden acting or feeling as if the traumatic event were recurring. DSM-III-R added a fourth way: intense psychological distress at exposure to events that symbolize or resemble an aspect of the traumatic event, including anniversaries of the trauma.

Numbing of responsiveness or reduced involvement with the external world, beginning some time after the trauma, is shown (according to DSM-III) by (a) markedly diminished interest in one or more significant activities, or (b) feeling of detachment or estrangement from others, or (c) constricted affect. DSM-III-R added avoidance behaviour to this category in the form of: efforts

Table 3

DSM-III Diagnostic Criteria for Post-Traumatic Stress Disorder

- A. Existence of a recognizable stressor that would evoke significant symptoms of distress in almost everyone.**
- B. Reexperiencing of the trauma as evidenced by at least one of the following:**
 - (1) recurrent and intrusive recollections of the event
 - (2) recurrent dreams of the event
 - (3) sudden acting or feeling as if the traumatic event were reoccurring, because of an association with an environmental or ideational stimulus
- C. Numbing of responsiveness to or reduced involvement with the external world, beginning some time after the trauma, as shown by at least one of the following:**
 - (1) markedly diminished interest in one or more significant activities
 - (2) feeling of detachment or estrangement from others
 - (3) constricted affect
- D. At least two of the following symptoms that were not present before the trauma:**
 - (1) hyperalertness or exaggerated startle response
 - (2) sleep disturbance
 - (3) guilt about surviving when others have not, or about behaviour required for survival
 - (4) memory impairment or trouble concentrating
 - (5) avoidance of activities that arouse recollection of the traumatic event
 - (6) intensification of symptoms by exposure to events that symbolize or resemble the traumatic event

Note. From the Diagnostic and Statistical Manual of Mental Disorders, Third Edition, by The American Psychiatric Association, 1980, Washington, DC: APA.

Table 4

DSM-III-R Diagnostic Criteria for Post-Traumatic Stress Disorder

- A. The person has experienced an event that is outside the range of usual human experience and that would be markedly distressing to almost anyone, e.g., serious threat to one's life or physical integrity; serious threat or harm to one's children, spouse, or other close relatives and friends; sudden destruction of one's home or community; or seeing another person who has recently been, or is being, seriously injured or killed as the result of an accident or physical violence.
- B. The traumatic event is persistently reexperienced in at least one of the following ways:
 - (1) recurrent and intrusive distressing recollections of the event (in young children, repetitive play in which themes or aspects of the trauma are expressed)
 - (2) recurrent distressing dreams of the event
 - (3) sudden acting or feeling as if the traumatic event were recurring (includes a sense of reliving the experience, illusions, hallucinations, and dissociative [flashback] episodes, even those that occur upon awakening or when intoxicated)
 - (4) intense psychological distress at exposure to events that symbolize or resemble an aspect of the traumatic event, including anniversaries of the trauma
- C. Persistent avoidance of stimuli associated with the trauma or numbing of general responsiveness (not present before the trauma), as indicated by at least three of the following:
 - (1) efforts to avoid thoughts or feelings associated with the trauma
 - (2) efforts to avoid activities or situations that arouse recollections of the trauma
 - (3) inability to recall an important aspect of the trauma (psychogenic amnesia)
 - (4) markedly diminished interest in significant activities (in young children, loss of recently acquired developmental skills such as toilet training or language skills)
 - (5) feeling of detachment or estrangement from others
 - (6) restricted range of affect, e.g., unable to have loving feelings
 - (7) sense of a foreshortened future, e.g., does not expect to have a career, marriage, or children, or a long life
- D. Persistent symptoms of increased arousal (not present before the trauma), as indicated by at least two of the following:
 - (1) difficulty falling or staying asleep
 - (2) irritability or outbursts of anger
 - (3) difficulty concentrating
 - (4) hypervigilance
 - (5) exaggerated startle response
 - (6) physiologic reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event (e.g., a woman who was raped in an elevator breaks out in a sweat when entering any elevator)
- E. Duration of the disturbance (symptoms B, C, and D) of at least one month. Specify delayed onset if the onset of symptoms was at least six months after the trauma.

Note. From the Diagnostic and Statistical Manual of Mental Disorders; Third Edition Revised, by the American Psychiatric Association, 1987, Washington, DC: APA.

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to avoid thoughts or feelings associated with the trauma, efforts to avoid activities or situations that arouse recollections of the trauma, inability to recall an important aspect of the trauma (psychogenic amnesia), and sense of foreshortened future (e.g., does not expect to have a career, marriage, children, or a long life). DSM-III-R requires the presence of at least three of the above seven items to meet criteria, rather than just one (as in DSM-III).

DSM-III also requires at least two miscellaneous symptoms to be present that were not present before the trauma. They include: hyperalertness or exaggerated startle response, sleep disturbance, guilt about surviving when others have not or about behaviour required for survival, memory impairment or trouble concentrating, avoidance of activities that arouse recollection of the traumatic event, and intensification of symptoms by exposure to events that symbolize or resemble the traumatic event. These symptoms were renamed "hyperarousal" symptoms in DSM-III-R and modified slightly (see Table 4). The changes entailed movement of some of the miscellaneous symptoms to other categories, as well as the deletion of survivor guilt and the addition of irritability or anger.

Both DSM-III and DSM-III-R list a variety of autonomic, dysphoric, or cognitive symptoms as characteristic of PTSD, but consider them as associated features only. These include symptoms of depression, anxiety, irritability (became part of the operational definition in DSM-III-R), impulsivity, and Organic Mental Disorder, such as failing memory, difficulty in concentrating, emotional and autonomic lability, headache, and vertigo. According to Brett, Spitzer, and Williams (1988), this was an attempt (in DSM-III-R) to recognize somatic symptoms as either reexperiencing phenomena or increased arousal. The final miscellaneous symptom in DSM-III was reworded in DSM-III-R to: physiological reactivity upon exposure to events that symbolize or resemble an aspect of the traumatic event. But, there is no specification of what symptoms are allowable or consistent with this view. For example, are the symptoms of headache and dizziness following head injury a form of reexperiencing phenomena, of increased arousal, or only of associated features?

Symptoms characteristic of PTSD are considered by DSM-III to usually begin immediately, or soon after the trauma. A diagnosis of PTSD is not made, according to the 1987 revision, if the disturbance lasts less than one month. According to DSM-III-R, the intrusive/reexperiencing symptoms may develop after a latency period of months or years, though avoidance is usually present during this period. There is no specification of whether these avoidance symptoms warrant a diagnosis of PTSD, so presumably not. DSM-III-R adds that while PTSD can occur at any age,

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including during childhood, the symptoms that appear in children may not be identical to adult symptoms.

Psychosocial stressors, such as divorce, business or marital difficulties, chronic illness, persecution, or stressors associated with specific developmental stages are excluded as traumatic stressors. Difficulties associated with such stressors would fall under the rubric of "Adjustment Disorders". Bereavement is usually considered by DSM-III to be a psychosocial stressor because it is within the range of usual human experience. Exceptionally, the catastrophic death of a loved one, such as the massacre of female engineering students in Montreal, would be considered a traumatic stressor.

In summary, the basic tenets of what constitutes a diagnosis of PTSD are the same in DSM-III and DSM-III-R. They include: (a) intrusive recall or psychic reexperiencing of the original trauma, (b) avoidance or numbing phenomena associated with either the traumatic event or with the outside world, and (c) hyperarousal or cognitive dysfunction. There must be evidence of all three sets of symptoms to warrant a diagnosis of PTSD. The disorder only occurs following traumatic stressors and may occur in anyone.

Alternative Diagnostic Criteria

Two alternative sets of criteria that have been used to diagnose PTSD and are based on years of observational studies are those used by Braverman (1980), in his study of 202 accident survivors, and by Lidvall et al. (1974), in their study of 70 head-injured patients. Braverman (1980) noted the presence of at least 7 of 10 PTSD symptoms in over 50% of his subjects. He proposed that to meet partial criteria for PTSD an individual had to display at least two primary symptoms of irritability, posttraumatic nightmares, and hypersensitivity to sound; and five secondary symptoms. These include impaired concentration, difficulties in recall, absentmindedness, social withdrawal, anxiety with or without phobia for the injuring object or associated circumstance, depression, and sexual dysfunction. The diagnosis of full PTSD required the endorsement of all 10 symptoms. Lidvall et al. (1974) used the presence of at least five of nine PTSD symptoms in a less restrictive set of diagnostic criteria (at the time called Post-Concussional Syndrome). The symptoms are headache, hypersensitivity to light, hypersensitivity to sound, dizziness, fatigue, difficulty concentrating, memory impairment, anxiety, and irritability.

There is a 50% overlap between the Braverman and the Lidvall et al. criteria, which together account for 14 of the historically-recognized symptoms of PTSD presented in Tables 1 and 2.

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These 14 symptoms overlap closely with those identified (a) at the Menninger Clinic as operationally defining PTSD (Modlin, 1960, 1983, 1986), (b) by Lishman (1978) as central to most definitions of PTSD following head injury, (c) in the Langer-22 Index, a symptom checklist of physical and mental health items that has been used to separate holocaust survivors from matched control subjects (Eaton, Sigal, & Weinfeld, 1982), (d) in a 24-item symptom checklist being developed in Norway to assess the effects of traumatic injuries (Malt, Blikra, & Hoivik, 1989a), and (e) in the 21-item Stress Scale administered to Vietnam veterans in the large "Legacies of Vietnam" study. The Stress Scale (see Table 5) was constructed of symptoms that had appeared in at least 75% of seven notable observational studies by Erikson (1976, survivors of a dam collapse), Grinker and Spiegel (1945, WWII combat veterans), Horowitz (1976, Vietnam veterans), Krystal (1968, concentration camp survivors), Lifton (1973, Vietnam veterans), Segal (1973, Korean war POWs), and Shatan (1973, Vietnam veterans). In the Legacies of Vietnam study, veteran and non-veteran respondents ($N = 1001$) were interviewed and asked about symptoms they might have experienced in their lifetime. Information was also obtained on onset and chronicity. The cut-off for diagnosis of PTSD was 5 out of a possible 21 symptoms. Boulanger, Kadushin, Rindskopf, and Carey (1986) applied a latent class analysis to the data and derived seven clusters that appeared at face value to correspond loosely to DSM-III criteria, but did not fit into the three rigid categories of symptoms used by the DSM-III. There were other contradictory findings. Cluster analysis revealed that distinct patterns of symptoms changed over time, and that there were three classes of subjects: those who were stressed (17%), those who were not stressed (42%), and those who had a number of stress symptoms but not enough or in the right combination to be considered PTSD-positive (39%). Some symptoms, such as loss of interest and depression, were most frequently reported to occur during the initial reaction. As the stress reaction became chronic, symptoms of irritability, startle reactions, and intrusive recollections emerged.

In summary, subsets of symptoms known for years to follow traumatic events have been used to diagnose PTSD. There is tremendous overlap among these phenomenologically-based sets of diagnostic criteria. A comparison of these alternative sets of criteria with those symptoms used by DSM-III to diagnose PTSD does not indicate a high overlap of symptoms.

Table 5

Comparison of Frequency of PTSD Symptoms Endorsed by Stressed Vietnam Veterans and Non-Veterans in the Legacies of Vietnam Research

	Veterans	Non-veterans	DSM-III-R Criteria
• Feeling anxious or tense ^R	53%	48%	Generalized Anxiety
• Feeling irritable or short tempered ^R	48%	37%	Generalized Anxiety
• Trouble trusting others ^R	38%	31%	Detachment
• Feeling sad, depressed or blue ^R	31%	31%	Constriction
• Trouble staying asleep or oversleeping ^R	30%	24%	Intrusiveness
• Feeling jumpy or easily startled	29%	12%	Hyperalert
• Feeling the impulse to lash out ^R	27%	21%	Hyperalert
• Feeling easily tired	25%	22%	Generalized Anxiety
• Losing interest in usual activities	24%	18%	Diminished Interest
• Headaches or pains in the head ^R	22%	19%	Generalized Anxiety
• Thoughts of how you might die	22%	21%	Constriction
• Feeling what other people care about doesn't make sense	21%	18%	Detachment
• Stomach troubles	19%	20%	Generalized Anxiety
• Trouble remembering things	19%	20%	Cognitive Dysfunction
• Frightening dreams or nightmares	18%	8%	Intrusiveness
• Flashbacks	17%	–	Intrusiveness
• Feeling confused or having trouble thinking	17%	15%	Cognitive Dysfunction
• Feeling that life was not meaningful	16%	19%	Diminished Interest
• Feeling dizzy	15%	10%	Generalized Anxiety
• Occasional feeling of losing control	13%	8%	Hyperalert
• Feeling numb ^R	9%	6%	Constriction
• Attacks of sudden fear or panic ^R	8%	3%	Hyperalert

Note. R - Rank order for that symptom was identical in both groups.
 From Legacies of Vietnam (p. 657) by A. Egendorf, C. Kadushin, R. Laufer, G. Rothbart, and L. Sloan (Eds.), 1981, New York: Centre for Policy Research; and The Vietnam Veteran Redefined: Fact and Fiction (p. 29) by G. Boulanger and C. Kadushin (Eds.), 1986, Hillsdale, NJ: Lawrence Erlbaum.

The Validity of Classification

Psychiatric classification involves the classification of abnormal behaviour that a person may manifest at some point. It facilitates understanding by providing conceptual simplification and encouraging explanatory theories. According to Blasfield and Draguns (1976), the two primary purposes of psychiatric classification, communication and prediction, are in conflict with each other. Communication is best served by a simple scheme in which the diagnostic rules are easy to apply and are based on characteristics most frequently encountered in clinical practice. In contrast, prediction is best served by a highly complex system which, in addition to predicting response to different forms of therapy, also furnishes a basis for the understanding of etiology. The final judgment rests with the clinician. If for various clinical, theoretical, social, political, or other reasons he/she is dissatisfied with the scheme, it will not be used. Evaluation of the classification will be slow and lacking in continuity.

Validation of a particular classification schema is important for treatment and medico-legal issues (e.g., compensation). For example, poor or non-existent diagnostic validity obscures important relationships between types of psychopathology and response to treatment (Strauss, Bartko, & Carpenter, 1973). Although the issues of face, descriptive, predictive, and construct validity are usually applied to diagnostic criteria, Breslau and Davis (1987) argue that "The validity of a diagnostic category should be judged in terms of its utility in clinical practice: (a) Does it distinguish patients with the disorder from those without the disorder, and (b) is it associated with factors related to etiology, prognosis or treatment?" (p. 256). Blasfield and Draguns (1976) outline several features by which psychiatric classification may be evaluated. They include (a) the sensitivity and specificity of the operational definition, (b) the reliability of the symptoms used in the operational definition, (c) the coverage of the classification (i.e., the applicability of a classification scheme to the domain of patients for which it is intended), and (d) descriptive validity or the homogeneity of the category.

Sensitivity, Specificity, and Reliability

Sensitivity is defined as the proportion of cases with the disorder that are correctly identified by a particular set of diagnostic criteria. *Specificity* refers to the proportion of subjects not demonstrating the criteria who are correctly classified (as not having the disorder). Diagnostic categories have been created that specify the characteristics that an individual must possess in

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order to be classified into that category according to specific and explicit rules (e.g., the DSM-III definition of PTSD). This is an attempt to increase both the efficiency and the usefulness of diagnostic activity. Specificity of these characteristics presumably reduces the likelihood of disagreement among clinicians, thereby increasing the reliability of the diagnosis. At the same time, however, sensitivity is usually decreased. Furthermore, some symptoms will be easy to operationalize (e.g., reliable) while others will rest primarily on the subjective judgment of the clinician. With respect to PTSD, there may be general agreement concerning the presence of intrusive phenomena but little agreement over what constitutes intrusive phenomena. Some may define them narrowly as specific cognitive and affective recollections of the event, while others extend the meaning to include sleep disturbances, somatization, and hypervigilance (Horowitz, 1979, 1983, 1986a), or chronic pain at the site of a previous wound that has long since healed (Benedikt & Kolb, 1986). An apparent paradox exists: precisely defined criteria, while reliable, reduce coverage, and vaguely defined criteria, while increasing coverage, reduce reliability.

DSM-III asserts that everyone who has PTSD should experience intrusive thoughts of some kind while displaying numbing behaviour and/or avoidance, as well as hyperalertness or cognitive dysfunction. Among veterans, considered by Boulanger et al. (1986) to be chronically stressed according to the Stress Scale, only 84% had intrusive phenomena (sensitivity = .84). While the chronically stressed were more likely to have constricted affect (89%) and hyperalertness (90%), they were less likely to claim detachment (70%), diminished interest (70%), or cognitive dysfunction (75%). While these results partially validated DSM-III criteria for PTSD, they raised questions about the sensitivity of some symptoms.

Coverage

Blashfield and Draguns (1976) used the term *coverage* to refer to whether or not a category is defined so as to be applicable to the patients for which it is intended. Coverage can be mathematically defined as the ratio of the number of patients who can be diagnosed using the classification to the total number of patients for whom a classification is relevant. For example, the number of head injured survivors who meet all of DSM-III criteria for PTSD is small although many complain of alternative symptoms of PTSD (e.g., Malt, 1989). This suggests that DSM-III criteria for PTSD has poor coverage of head-injured trauma survivors. The symptoms most frequently seen following even mild head injury (e.g., Lidvall et al., 1974) are only accorded associative status by DSM-III; yet, DSM-III claims that its criteria are applicable to head-injured survivors.

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Results from cross-catastrophe studies also bear on the issue of coverage. For example, Solomon and Canino (1990) found that some common stressful events (e.g., moving, money problems, household illness, breaking-up with a best friend) related more closely to DSM-III criteria for PTSD than did events outside the range of normal human experience (e.g., floods, mudslides, dioxin exposure, being mugged/beaten). Wilson et al. (1985) also reported that individuals who were experiencing the loss of a loved one, through death or divorce, showed greater DSM-III PTSD symptomatology than individuals who had their lives threatened (in combat, accidents or assault). Yet, DSM-III specifically excludes common events, such as bereavement and divorce, as PTSD stressors. They are considered to be within the range of usual human experience and thus psychosocial stressors, falling under the rubric of Adjustment Disorders.

Clinicians respond to poor coverage by bending or broadening the diagnostic criteria of a category, thus decreasing reliability. For example, Atkinson, Henderson, Sparr, and Deale (1982) reported that one form of professional resistance to DSM-III criteria for PTSD takes the form of the following question: "If in essence the veteran seems to suffer from the disorder, what difference does absence of one or another detail make?" (p. 1119).

Homogeneity and Comorbidity

Descriptive validity, according to Blasfield and Draguns (1976), refers to the degree of homogeneity among persons assigned to a psychiatric category in terms of the behaviours, symptoms, personality characteristics, social history data, and other kinds of information used to make a diagnosis. Problems arise, however, in the selection of characteristics that should demonstrate homogeneity, as well as with the relative degree of homogeneity required. Not all individuals described as having a particular mental disorder can be expected to be alike in all ways.

According to Greene (1988), the issue of whether monothetic or polythetic criteria are more appropriate for classifying mental disorders has not been resolved in DSM-III and DSM-III-R. *Monothetic* criteria, such as used by DSM-III for PTSD, refers to the specification of necessary and sufficient features for making a diagnosis. *Polythetic* criteria refers to the requirement that only a minimal number of features need be present for a diagnosis, (e.g., DSM-III criteria for the schizophrenic disorders, Lidvall et al. criteria for PTSD). Sets of criteria that are polythetic recognize a number of diverse features that are thought to overlap in the disorder and that are not mutually exclusive of other disorders. Thus, it is possible that two patients who are diagnosed with the

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disorder may share few, if any, symptoms. Polythetic criteria reflect the overlap among various diagnostic categories where few firm boundaries are seen clinically.

With respect to homogeneity, persons diagnosed according to monothetic criteria should have greater similarity on psychometric measures than patients meeting polythetic criteria (Greene, 1988).

However, this was not the case in a study by Overall and Zisook (1980) of 161 outpatients who were diagnosed as depressed according to both clinical and psychometric criteria. A comparison of five sets of diagnostic criteria for depression was made. The percentages of patients for whom the diagnosis of depression was confirmed by any one of the five diagnostic systems ranged from 34% to 93%. Results indicated that very restrictive criteria did not provide more valid diagnoses nor yield more homogeneous groups than less restrictive criteria. Furthermore, not all of the depressed persons displayed identical phenomena. A cluster analysis of symptoms identified four homogeneous subtypes of depression. Each set of diagnostic criteria was biased toward a different subtype of depression when assigning a diagnosis.

Considerable controversy may occur over both the subtyping of a category and its overlap with other categories (comorbidity) and normality. For example, Andreasen, Grove, and Maurer (1980) wrote that disagreement occurs as to whether depressive disorders are a single phenomena with varying degrees of severity; or, a group of two or more discrete illnesses with differing courses, prognoses, responses to treatment, familial backgrounds, etiologies, and clinical picture. Paykel (1971) suggests that the well known difficulty in making clear boundaries between diagnostic groups in psychiatry is "not surprising in view of the multifactorial etiology and multiplicity of pathoplastic factors determining symptomatic picture" (p. 286). Many patients are near the boundaries and it is difficult to know on what side they belong. In research such assignment may come from a discriminant function, but in clinical practice Paykel suggests the procedure will continue to be that of making the "best guess". Operational definitions, or formal diagnostic criteria, will only provide approximations. He presents a convincing argument against using simple logical definitions based on key features for psychiatric syndromes, which unlike syndromes in general medicine have no clear-cut and specific underlying features such as etiology and pathology. Rather, psychiatric syndromes can only be defined loosely in terms of clusters of features, and class assignment is based on the degree of resemblance of various features.

Two-Dimensional Approach

Kendell (1976) and others (e.g., Akiskal, Bitar, Puzantian, Rosenthal, & Walker, 1978) argue for the abandonment of most diagnostic subcategories (at least in the field of depression). The categorical approach would be replaced by a biaxial approach to which factors are more likely to correspond, for example, along the dimension of mild-severe or primary-secondary. Such analysis allows more precise description than occurs in forced categorical assignment. For while it may be possible in any one study to show that human phenomena may be arranged in discrete clusters the fact that we have so many competing classification schemata is, according to Kendell, "itself cogent evidence that natural boundaries, if they exist at all, are not obvious" (p. 20). Dimensional distinction, on the other hand, is more flexible.

In a 29-month prospective study of the stress reaction of 50 firefighters to devastating bushfires, McFarlane (1988a) concluded that some DSM-III criteria could be considered as a continuum and others as categorical. In particular, both intrusive recall and avoidance seemed to be dimensional, ranging between two extremes. Intrusive thoughts or images did not have a one-to-one association with the disorder but rather they seemed to reflect a working-through process. In contrast, disturbed attention, impaired concentration, and heightened arousal appeared to discriminate more precisely between the firefighters with and those without PTSD. This suggests that disturbance of attention was the central abnormality in PTSD. Conversely, Van Kampen, Watson, Tilleskjor, Kucala, and Vassar (1986) found disturbance of concentration to be a poor marker of PTSD in veterans admitted for alcohol abuse, but it is possible that alcohol withdrawal confounded their results.

A Bidimensional View of PTSD

Horowitz (1976, 1983, 1986) offers a bidimensional view of PTSD that contains both temporal and phenomenological aspects. Accordingly, involuntary repetition (in thought, emotion, and behaviour) occurs in phases and alternates with periods of "warding off" of intrusive recall (by ideational denial and emotional numbness). There may also be intrusive repetitions of one aspect of a stress event with simultaneous denial and numbing of another implication of the event. Only one of the two dimensions may be dominant at a particular time. Certain responses to trauma tend to be established early and persist over time in one or the other mode and patterns of oscillations are different in each person. For example, Dahl (1989) identified four groups of response rates among rape victims: 47% had high levels of both intrusion and avoidance, 32% had high intrusion

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but medium to low avoidance, 15% had medium to low intrusion but high avoidance, and 6% had low to medium levels of both. Furthermore, Horowitz (1986) and other researchers (Benedikt & Kolb, 1986; Dobbs & Wilson, 1960; Keane & Kalousek, 1982; Kolb, 1984; Schottenfeld & Cullen, 1985) maintain that reexperiencing of the traumatic event is manifested in a wider variety of ways than elucidated by DSM-III. In addition to intrusive thoughts and images, repetitive reliving of the traumatic event is signalled by symptoms of hypervigilance and intense emotionality, sleep and dream disturbances, impaired concentration, hypersensitivity to sensory stimulation, certain somatic complaints (tremor, diarrhea, nausea, weakness, sweating and pounding heart), unexplainable somatic pain at the site of a since-healed injury, and reexperiencing of the bodily state (e.g., somatic symptoms) that were evoked at the time of the trauma. Avoidance or denial is manifested, according to Horowitz (1986) and Kardiner (1941), by sleep disturbances, memory impairment, numbing, withdrawal, excessive alcohol or drug use, vertigo, lack of interest or inaptitude to work, amnesia, sexual impotence, and somatic symptoms including fatigue, headaches, bowel symptoms, and muscular pain.

Applying the two-dimensional model of PTSD (i.e., the presence of either intrusion or avoidance), researchers have produced estimates of PTSD among civilian and military survivors that are two or three times as high as those provided by the DSM-III model (Creamer, 1990; Laufer et al., 1984, 1985b). Speed, Engdahl, Schwartz, and Eberly (1989) found that many former WWII POWs experienced severe PTSD symptoms without actually meeting DSM-III criteria for the diagnosis, primarily because of the absence of symptoms of numbness. Using Likert-type scaling, it was possible to have an intensity level of 36 (out of a possible 48) and still not meet DSM-III criteria for the diagnosis of PTSD. Solomon (1987) obtained data from soldiers who had sought treatment in the field for combat stress reactions. If reexperiencing phenomena were used as the sole criteria, 77% of these soldiers would be diagnosed as PTSD, whereas reexperiencing in combination with avoidance or both avoidance and hyperarousal yielded lower figures of 59% and 56%, respectively. Among the soldiers who did not seek treatment, 38% reported reexperiencing phenomena and 22% reported reexperiencing and avoiding symptoms. Only 18% would have met full DSM-III criteria. In another sample of Vietnam veterans, Egendorf et al. (1986) found that while 50% of the group showed signs of unresolved and troubling war experiences, only 25% met DSM-III criteria for PTSD.

Summary.

Psychiatric classification involves the application of simple or complex rules to determine whether an individual's behaviour or symptoms place him or her within a category to which the label of disorder has been applied. The validity of a set of diagnostic criteria may be evaluated in terms of the hit-rate with which it correctly classifies individuals who have been previously diagnosed with or without the disorder according to an independent diagnostic source (sensitivity and specificity). The application of specific and explicit criteria presumably increases the reliability of the criteria to consistently make the correct diagnoses. Diagnostic criteria may also be judged in terms of whether it is applicable to the domain of patients for which it is intended (coverage). For example, it is not clear that DSM-III criteria for PTSD is sensitive to the identification of PTSD among head-injured survivors of trauma, even though the domain of survivors for which DSM-III is intended includes the head injured. The validity of diagnostic criteria also depends on the degree of homogeneity that may be demonstrated among persons assigned to a particular psychiatric category. It is not clear whether the use of tight, restrictive criteria increases or decreases the degree of homogeneity. Much effort has been made to create psychiatric categories that are separate and distinct from other categories, in terms of symptoms, etiology, prognosis, and treatment; however, forced categorical assignment may not correspond to the phenomena seen in either clinical practice or empirical research. Psychiatric classification based on a dimensional approach, such as Horowitz's bidimensional view of PTSD, may allow for more precise description of psychic phenomena. Patients with atypical symptoms are not neglected and phenomena are not attributed to patients who do not experience such phenomena.

Methods of Validation

Researchers assess the validity of diagnostic criteria by trying to verify utility and meaningfulness through independent sources of information. As noted by Zwick (1983), these sources include laboratory studies, cross-catastrophe and historical comparisons, comparisons with alternative diagnostic criteria, and application of multivariate statistical techniques.

Laboratory Studies

Advancement in the validation of PTSD as a distinct and definable disorder has come from psycho-physiological studies. During a playback of taped combat sounds, Blanchard, Kolb, and associates (Blanchard, Kolb, Gerardi, Ryan, & Pallmeyer, 1986; Blanchard, Kolb, Pallmeyer, & Gerardi, 1983) have monitored veterans with and without PTSD (according to DSM-III) and various control groups for several physiological responses. Compared with the control groups, veterans with PTSD showed significantly greater arousal to the recorded sounds in heart rate and blood pressure. They also reported greater psychological distress, including depression, anxiety, and hostility. These and additional significant differences in psychophysiological responsivity have been verified by Dobbs and Wilson (1960), Lavie and Hertz (1979), Malloy, Fairbank, and Keane (1983), and van der Kolk, Blitz, Burr, Sherry, and Hartmann (1984). Kolb (1987) has postulated that trauma survivors with PTSD have a persisting conditioned emotional response to any stimuli reminiscent of the trauma. This results in excessive autonomic arousal of the central adrenergic system. Kolb, Burris, and Griffiths (1984) administered two drugs containing adrenergic blocking agents to PTSD combat veterans and produced significant changes in intrusive phenomena and hyperarousal. Improvements were also noted on various indices of psychosocial functioning, including performance and interest in work and school, and reduced drinking. Complaints of pain were reported less frequently in half of the participants. These results suggest that intrusion and hyperarousal belong in the same category, as Horowitz (1986) contends. Furthermore, such phenomena is evident in a wider range of symptoms than so indicated by DSM-III.

Davidson, Fleming, and Baum (1985) compared DSM-III intrusion and avoidance with the general symptoms of stress measured by the Symptom Checklist-90 (SCL-90) in subjects threatened with exposure to nuclear and toxic environmental contaminants. Subjects who reported the most intrusive thinking had significantly higher catecholamine levels than those who did not report intrusive recall. No similar relationships were found for other physiological measures nor did avoidance have any relationship with physiological measures. There were significant correlations between DSM-III criteria and scores from the SCL-90, including total symptom distress, somatic distress, difficulty concentrating, interpersonal problems, depression, anxiety, anger, fear, suspiciousness, and alienation.

Psychometric studies. The second source of laboratory data that examines the validity for PTSD diagnostic criteria involves psychometric studies. For example, Stretch (1985) made a study

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of Vietnam combat veterans and nurse veterans and obtained highly significant correlations between PTSD symptoms and self-reports of respiratory, cardiovascular, gastrointestinal, and nervous system problems, as well as overall health. Fairbank, Keane, and Malloy (1983) found that a combination of the MMPI and questionnaires on anxiety, depression, and fear correctly classified 83% of the subjects who had received DSM-III diagnoses of PTSD. The PTSD group could be discriminated from groups of either well-adjusted or maladjusted veterans without PTSD. Foy, Sippelle, Rueger, and Carroll (1984) found that the MMPI had moderate ability to correctly classify subjects on the basis of the DSM-III PTSD diagnoses, while a problem checklist of generalized anxiety correctly classified almost all of the subjects. Roberts et al. (1982) determined that PTSD veterans had significantly higher scores than non-PTSD veterans on measures of problems with intimacy and sociability: MMPI clinical scales Pa(Paranoia), Pd (Psychopathic Deviate), and Si (Social Introversion), and content scales Social Maladjustment, Family Problems, and Manifest Hostility.

Cross-Catastrophe Comparison

Evaluation of diagnostic criteria may be made by comparing the distribution of diagnoses across presumably equivalent samples of survivors. A comparison of PTSD across civilian catastrophes, experienced either individually or collectively, and war-related stressors is presented in Appendix A. From this research it may be seen that there are subtypes of PTSD with systematic and temporal variation in the types of stress symptoms occurring in different populations (e.g., Horowitz, 1986a). There is also accumulating evidence that different aspects within a particular stressor (e.g., combat exposure versus exposure to war atrocities) are associated with distinct symptom patterns (e.g., high reexperiencing, low avoidance), from Grinker and Spiegel (1945), Krystal (1968), Laufer and his colleagues (1984, 1985a, 1985b), Segal (1973), and Shatan (1973).

Pearce, Schauer, Garfield, Ohlde, and Patterson (1985) reported that veterans who had experienced a traumatic event, either war or non-war-related, reported significantly more symptoms on a psychological problem checklist than did non-traumatized veterans. The checklist was factor analyzed into nine factors, several of which resembled DSM-III primary criteria. Symptom homogeneity among all traumatized veterans was only modest, however. The war-trauma group reported experiencing significantly more problems with anger, depression, emotional numbness, withdrawal, and schizoid tendencies than did the non-war trauma group. Both traumatized groups

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reported similar levels of anxiety, cognitive problems, interpersonal difficulties, job problems, substance abuse, money problems, and criminal behaviour.

Wilson et al. (1985) compared survivors of various civilian traumas with veterans of Vietnam combat. While all stressors produced significant intrusion, some stressors produced significantly more intrusion than others. Intrusive phenomena occurred more frequently following Vietnam combat, rape, and divorce than following multiple trauma, death of a loved one, serious illness, other family trauma, and life-threat (all listed in decreasing order). Scores on the avoiding/numbing symptoms were very similar to the intrusion scores; scores for the various stressors appeared in the same order of frequency as they had for intrusive recall. While scores on intrusion and avoidance were equivalent among Vietnam veterans, rape victims, and divorcing persons, the veterans reported approximately twice as much other distress. It was possible to separate Vietnam combat from all other stressors on the basis of the occurrence of depression, somatization, rage/anger, sensation seeking, stigmatization, and intimacy conflict. Conversely, Silver and Iacono (1985) found that Vietnam veterans displayed more intrusive phenomena than traumatized non-Vietnam veterans did, while both groups (who had sought counselling) reported similar levels of depression. Changes in intrusive recall in the Vietnam veterans were also associated with changes in aggression, detachment, and apprehension.

No recent studies could be found that directly compared head injured survivors with other survivors. Adler (1943) found that while 54% of a group of survivors of the Cocoanut Grove nightclub fire developed PTSD, only 32% of a group of head injured patients developed such complications. The first appearance of post-traumatic nightmares occurred immediately after the disaster in the majority of the fire victims, but only after hospital discharge in individuals with head injuries. Headaches and dizziness persisted in almost all the patients with PTSD following head injury, but were practically absent in the traumatized survivors of the fire.

Historical and Cross-Cultural Comparison. Historical comparisons may be made of samples from the same population, selected and assessed at different periods, but similar in methodology, assessment, and subject pool. Such a comparison may be made from studies by DeFazio, Rustin, and Diamond (1975) and Grinker, Willerman, Bradley, and Fastovsky (1946) of flying personnel from WWII and from Vietnam. Individuals from both wars were identical in terms of mean number of symptoms and prevalent symptoms of PTSD, including nightmares, restlessness, irritability, sleep difficulties, various signs of depression, and psychosomatic difficulties. Validation of DSM-III criteria

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also comes from cross-cultural comparison. Kinzie, Fredrickson, Ben, Fleck, and Karls (1984) assessed a group of 13 Cambodian refugees who had survived several years of concentration camp experience. Symptoms of avoidance, hyperactive startle reactions, emotional numbness, intrusive thoughts, and nightmares predominated and lasted at least three years following release.

Comparison Across Different Population Samples. Psychometric studies have identified MMPI scales that discriminate between PTSD patients and control groups. However, the scales that provide maximum discrimination change depending on the sample of patients used and the types of trauma. For example, research by Foy et al. (1984) in a sample of veterans who applied for psychiatric services and were screened for primary substance abuse yielded a different set of optimal MMPI predictors than obtained by Roberts et al. (1982) in substance abusing veterans (who were seeking treatment for their addictions). Attempted validation of an MMPI content scale for PTSD (Keane, Malloy, & Fairbank, 1984) has revealed that the cutoff score for maximum separation of PTSD and non-PTSD patients varies according to age, region, and stressor. Based on research with Vietnam veterans, Keane et al. (1984) suggested a cutoff score of 30; assessment of older veterans from WWII suggested a lower cutoff of 17 (Query, Megran, & McDonald, 1986). Regional differences also suggest that local norms be used to determine an optimal cutoff score. For example, Watson, Kucala, and Manifold (1986) studied mostly white U.S. Northerners and found that a lower score was required for maximum discrimination of PTSD from non-PTSD veterans than that advocated by Keane et al. (1984), who studied Southerners (i.e., more Blacks). Consistent with this regional disparity are results from the "Legacies of Vietnam" study (Boulanger, 1981), in which differences in frequency of symptom endorsement depended on geographic area.

Concordance with Other Diagnostic Criteria

Diagnostic systems are often evaluated by determining the degree to which they agree with alternative systems. Controversy arises over how much status one gives to other standards, as it is often unclear that any one system can be accorded the status of a gold standard. According to Zwick (1983), assessment of the agreement among diagnostic criteria with Cohen's kappa (Cohen, 1960) can provide useful data even if it is not clear that any one set has preferred status: The proportion of individuals diagnosed as having a given disorder can be determined according to each set of criteria. Furthermore, the types of cases for which the various criteria are likely to disagree can be noted. For example, Zwick (1983) reviewed several studies in which groups of

patients who had received differential diagnoses according to one of several sets of psychiatric criteria (e.g., Feighner Criteria, Research Diagnostic Criteria, Schedule for Affective Disorders and Schizophrenia) were compared. While it was possible for some of these studies to differentiate among different groups of patients, differences were minimal on several independent variables, including psychosocial adjustment, neuromotor and cognitive functioning, family and childhood history, age, demographic variables, and response to drugs or psychotherapy.

In a study of the diagnostic reliability of DSM-III criteria for PTSD, diagnostic agreement among clinicians was examined by Atkinson et al. (1984). While two independent psychiatrists specifically trained to elicit diagnoses of PTSD from psychiatric records of disability claimants agreed with each other fairly well (in 77% of the cases), agreement with the original clinical examiner occurred in only 61% of the cases. There was better agreement concerning the absence of PTSD than its presence.

Multivariate Statistical Analyses

When multivariate techniques such as discriminant analysis or factor analysis are used to confirm an already existent diagnostic system "they can legitimately be viewed as constituting a part of the validation process" (Zwick, 1983, p. 120). Klerman (1989) calls the correlational analysis of a syndrome with one or more external validators (e.g., life events, demographics) the second stage of validation. Kendell (1976) warns, however, that while discriminant analysis can be used to prove the presence of certain boundaries it cannot prove their absence. Blanchard et al. (1983) used discriminant analysis to determine (a) whether combat veterans experiencing PTSD (as defined by DSM-III) were homogeneous on certain physiological indices and (b) if they could be differentiated from non-PTSD non-veterans on the basis of these indices. It was heart rate and systolic blood pressure that very significantly discriminated between the groups during the playing of combat sounds, trials of mental arithmetic, and periods of music or silence. Discriminant analysis has also been used to identify situational variables that discriminate between those with PTSD and those without PTSD (based on either DSM-III criteria or alternate diagnostic criteria), but so far these studies have been conducted only with veterans. A number of the studies that claim to have provided validation of DSM-III criteria do so simply on the basis that degree of combat predicts PTSD (e.g., Atkinson et al., 1984; Foy et al., 1984; Frye & Stockton, 1982).

Silver and Iacono (1984) administered a symptom checklist of PTSD symptoms to 406 Vietnam veterans who had requested counselling. Factor analysis revealed four factors —

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dysthymia, survivor guilt, reexperiencing, and numbed responsiveness with attendant anger and hostility. While some of these factors are represented in DSM-III criteria, dysthymia and anger are not. Although DSM-III-R officially recognizes anger as a primary symptom, it is only one of six hyperarousal symptoms. Meanwhile, DSM-III's three avoidant symptoms — (a) avoiding places or activities which remind me of the war, (b) problems talking about the war, and (c) feeling blamed or scapegoated — were excluded from the factor analysis because they failed to meet the minimum factor loading criteria. The symptom checklist was next administered to 63 non-Vietnam veterans who had requested counselling for traumatic stress. When the two subject samples were combined, anger and detachment were split into two separate factors. Dysthymia and reexperiencing remained as factors but survivor guilt did not appear. Neither DSM-III nor DSM-III-R recognize depression as a primary symptom of PTSD, only an associated feature. On the basis of these results, the authors of the study and others (e.g., Kormos, 1978; Nace, Meyers, O'Brien, Ream, & Mintz, 1977) have suggested that the importance of depression is greater than that accorded by DSM-III.

Summary

Several independent sources of information have been used to validate diagnostic criteria for PTSD. Laboratory studies indicate that while criterion symptoms of intrusion and hyperarousal are related to psychophysiological responsivity to stimuli reminiscent of the trauma, avoidance does not appear to have physiological correlates. Furthermore, there are indications that intrusion and hyperarousal belong in the same category, thus supporting Horowitz's bidimensional view of PTSD. Psychometric studies indicate significant correlations between criterion symptoms of PTSD and other measures of distress. Comparison of groups of traumatized survivors across various catastrophes, cultures, ages, and regions suggest that while there are similarities in response to trauma, there are situational and personal variations in the traumatic stress response. Diagnostic validity may be assessed by evaluating the degree to which a diagnostic system agrees with alternative criteria (Cohen's kappa). As part of the validation process, multivariate statistical techniques may be used to assess homogeneity on certain external predictor variables among individuals diagnosed with a particular disorder.

Issues Related to the Validity of DSM-III/III-R

Conceptualization of PTSD

The first and foremost criterion in DSM-III/III-R for a diagnosis of PTSD is the occurrence of a traumatic event. Therefore, the issue of what constitutes a traumatic event will be addressed in this section and how this issue relates to the validity of DSM-III among head injured. DSM-III assumes that PTSD phenomena are identical in each and every trauma. Incidence rates and symptoms of PTSD following various types of trauma in cross-catastrophe studies will be examined as they apply to this generalization. The appraisal of a situation as traumatic involves personal factors as well as situational factors. The perception of threat and the personal meaning of the threat to the individual may be more important than the magnitude of the event, per se. This may explain why some mildly injured persons are at the same or greater risk for PTSD than the severely injured. Yet, DSM-III takes account of neither personal nor situational factors. These factors will also be addressed as they apply to the validity of DSM-III criteria. Few studies have examined the validity of DSM-III criteria for PTSD in traumatized populations other than ex-combatants. The present research had to draw mainly on those done on veterans. Combat stress reaction has taken over from "railway brain" as the paradigm for PTSD. To familiarize the reader with situational aspects of civilian and combat trauma, they are discussed in Appendix A.

The Traumatic Event: DSM-III's Criterion A

Since 1900, when it was realized that railway and industrial accidents causing personal injury could lead to PTSD, the diagnosis has been applied to survivors of motor vehicle accidents, work-related accidents, assaults and falls, either with or without concomitant physical injury. Civilian and military survivors of wartime trauma such as combat, bombings, and incarceration in concentration or prisoner-of-war camps are also likely to suffer PTSD. Survivors of natural and manmade disasters such as floods, landslides, tornadoes, explosions and fires, nuclear station accidents, airplane crashes and collisions at sea, together with their rescuers, may also develop PTSD.

There seldom exists a single recognizable stressor in traumatic situations, contrary to that suggested in DSM-III. While it may be theoretically possible to distinguish between a single massive experience comparable to the acute disaster (shock trauma), and the accumulation of difficult experiences comparable to chronic disaster (strain trauma), all trauma happen within a

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psychosocial context and all involve secondary stressors (Kinston & Rosser, 1974). These include injuries and hospitalization, loss of home, community, family members or friends, personal or familial disruption, continual exposure to war, or coming home from an unpopular war to an unsympathetic society. In the case of accident victims, with attendant injuries, there is an interaction among several factors: the traumatic accident, the surgical-medical problem, any crisis or conflict occurring at the time of the accident or culminating in the accident, and distress or dysfunction caused by the accident.

Do the Traumas That Usually Produce Head Injury Quality as Traumatic Stressors According to DSM-III?

In ordinary clinical practice, PTSD is most often seen in patients who have had a single unexpected accident, at work, home, or on the highway. According to DSM-III, car accidents that produce serious physical injury warrant inclusion as PTSD stressors, yet, there is no objective standard to apply to the term "serious". Is any injury that leads the survivor to require medical attention a serious enough injury? And serious to whom – the emergency room physician or to the patient? Feder (1985) suggests that an accident of non-catastrophic proportions cannot reasonably be grouped along with earthquakes, combat, and death camps as a PTSD stressor and that a diagnosis of PTSD is not warranted in these circumstances, regardless of symptoms. Horowitz (1983) suggests, however, that "Some life events are common when their inclusion among a population is considered, but are shocking and uncommon experiences for the individual who has for the first time experienced such an episode" (p. 19); Scrignar (1984) and Trimble (1985) share his opinion. Furthermore, Mineka and Kihlstrom (1978) argue, on the basis of results from experimentally-inducing neuroses in animals, that it is precisely the unpredictability and uncontrollability of a traumatic event that causes distress and not the aversiveness, longevity, or frequency of the noxious stimulus, per se.

Malt, Blikra, and Hoivik (1989b) concluded, after studying 551 adults three years after accidental injuries, that accidental injuries are an important source of morbidity and reduced life quality in society. Burstein (1985) reports that of 120 patients he saw who met the DSM-III definition of PTSD, in consultations anywhere from 2 days to 2 years following traumatic stressors, 41% were from motor vehicle accidents; not all of the accidents produced substantial injury to the victim. Watson (1987) reports that 30% of the injured survivors of motor vehicle accidents referred to him for assessment in relation to litigation met DSM-III criteria for PTSD. Others (Lidvall et al.

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1974; Lishman, 1968, 1978; Malt, 1988) also report incidence rates of PTSD following head injury that range from 10% to 30% among random samples of patients.

Assumption of Generalizability. The assumption made by DSM-III is that there are general response tendencies to stressful events. Accordingly, the stress reaction occurs independently of the framework in which the injuring event took place: the same symptoms appear following a variety of traumatic stressors that differ in quantity and quality. However, this view is only partially supported by research. For example, validation of a scale to assess traumatic stress, called the Impact of Event Scale and developed by Horowitz, Wilner, and Alvarez (1979), has found that the endorsement pattern of intrusive and avoiding/numbing phenomena is similar across some types of traumatic events and populations, including bereavement (Zilberg, Weiss, & Horowitz, 1982), combat (Schwargwald, Solomon, Weisenberg & Mikulincer, 1987) and stressful films (Horowitz et al., 1979). At the same time there are variations in symptoms depending on the trauma and the individual. For example, Zilberg et al. (1982) found that while intrusion and avoidance were positively correlated following some traumatic instances, after others they are inversely related.

Horowitz (1986) compared scores on the Impact of Event Scale between individuals who had been exposed to personal violence and individuals who had lost a loved one. While there were no significant differences in the group mean scores on the general categories of intrusion and avoidance, there were differences on specific items. The group exposed to personal violence reported more efforts to remove the event from conscious remembrance and to keep their thoughts from returning to the event. They appeared more vigilant, easily startled and to have more nightmares than bereaved subjects. The bereaved group seemed to be numb, often reporting that they felt as if the death had not been real or, at least, not completely real. Similarly, Wilkinson (1983) reported that victims and observers of the falling skywalk at the Hyatt Regency Hotel in Kansas City suffered more from intrusion and being easily startled than did persons who served as rescuers or who retrieved and identified bodies. Themes of survivor guilt were prominent in the bereaved.

Incidence of PTSD Across Various Traumas. Different kinds of stress events may also result in different incidence rates. In a survey of 2,493 randomly selected individuals, Helzer et al. (1987) estimated the prevalence of PTSD (according to DSM-III) to be 1% of the general population. Traumatized civilians and unwounded Vietnam veterans met full criteria at an incidence

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rate of 3.5% and Vietnam veterans wounded in action, 20%. Although meeting the full diagnostic criteria was unusual in this sample of the general population, experiencing some of the symptoms was not. Sixteen percent of the respondents endorsed some symptoms (mean of 2.5 symptoms), suggesting that at least 8% of them might have warranted a partial diagnosis of PTSD (meeting criteria on two of the three cardinal sets of symptoms).

Abbott, Cousineau, Cheitlin, Thomas, and Lim (1978) observed that PTSD (diagnosed on the basis of generally recognized symptoms culled from MMPI responses) occurred in three-quarters of a group of patients who had received assaultive penetrating cardiac or abdominal wounds. Bordow and Porritt (1979) assessed patients injured in road accidents for PTSD on the basis of emotional lability, sleep disturbance, and cognitive confusion). The incidence rate of these symptoms was 30% in patients who had received up to 10 hours of supportive therapy and as high as 87% in patients not treated. Braverman (1980) made the diagnosis of PTSD in 58 of 92 industrially injured patients (incidence rate of 63%) and in 52 of 110 patients injured in moving vehicles (incidence rate of 47%), using as criteria the presence of at least 7 of 10 generally recognized symptoms. Variability in incidence rates for PTSD can be explained by situational circumstances and by the lack of a standard set of diagnostic criteria. Methodological issues and differences in sample populations also affect incidence rates. These issues are discussed in Appendix A also.

What makes these events traumatic? Kardiner (1941) wrote that trauma is an external factor that initiates an abrupt change in previous adaptation to the outer world. Based on reports of victims from a wide variety of catastrophes, the characteristics that make these events so upsetting is the extent to which they are unpredictable, uncontrollable, dangerous, and overwhelming (Braverman & Hacker, 1966; Figley, 1985; Mineka & Kihlstrom, 1978; Titchener, 1985). Shaw (1987) writes that trauma unmasks the illusion of safety and personal invincibility. The individual is threatened with his or her own death or the destruction of an important part of his body, or to such humiliation and manipulation that personal identity may be lost. Accordingly, PTSD is the response to the fear of annihilation of life, or loss of limb or identity (Walker & Cavenar, 1982).

There emerges a sense of helplessness and an inability to control or cope with the fear of injury and death. According to the reactance theory of Wortman and Brehm (1975), when there is an actual or threatened loss of controllability of outcome, there will be increased energization of the organism. This may lead to a state of helplessness if the sense of controllability is not regained.

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This state of helplessness, characterized by dejection, apathy, depression and an apparent unwillingness to respond may be an essential factor in the formation of PTSD.

In summary, the trauma literature partially validates DSM-III's contention that almost everyone is at risk of experiencing significant symptoms following a traumatic stressor of unspecified magnitude. Any accident or environmental stressor, whether or not it is common, if perceived by the individual as dangerous can lead to PTSD with its attendant symptoms and subsequent morbidity. But it does not appear that all survivors display exactly the same set of symptoms. In short, the literature does not seem to support DSM-III's assumption of generalizability.

Personal Attributes Contributing to PTSD

Studies on experimental neuroses (reviewed in Mineka & Kihlstrom, 1978) show that unpredictability and uncontrollability can produce stress even if the stressor is of short duration and is neither intense nor frequent. According to the animal model of coping, survival hinges on discovering what is predictable or controllable in the environment (Lazarus & Folkman, 1984). The literature also tells us that some animals break down under what appears to be relatively moderate stress while others endure extraordinary treatment before breakdown. Still other animals do not become neurotic at all (Mineka & Kihlstrom, 1978). In humans, personal factors are used to help explain these discrepancies. Lazarus and Folkman (1984) consider that what is important about the stressfulness of an event is its "psychological situation". First, a person must appraise or evaluate the situation as harmful or threatening rather than, say, challenging or exhilarating. Second, individuals who feel that their adaptive resources are over-taxed or exceeded become unable to cope with situations that others might find less catastrophic. Moreover, the relationship between threat and challenge appraisals can shift as an event unfolds, through changes in the environment and through cognitive coping efforts. The appraisal of what can be done about the event is also important. Lazarus and Folkman call this "secondary appraisal" and suggest that it "takes into account which coping options are available, the likelihood that a given coping option will accomplish what it is supposed to, and the likelihood that one can apply a particular strategy or set of strategies effectively" (1984, p. 35). While initial appraisals may be modified upon later reflection that influences the emotional response, reactions to stress often remain distressingly persistent despite efforts to control them rationally (Shontz, 1975).

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Evidence that the development of stress reactions is integrally related to the individual's appreciation of the experience comes from studies of war-related stressors. Following extensive investigation of WWI and WWII combat veterans and survivors of the Holocaust, Krystal (1968) concluded that it was not the intensity of the experience but the meaning of the experience to the individual that made the largest contribution to the stress response. Examination of 40 case studies of PTSD in Vietnam veterans lead Hendin, Pollinger, Singer, and Ulman (1981) to also conclude that it is (a) the individuals' perception of realistic dangers, together with (b) the subjective distortions of these dangers, and (c) the threat to protective/adaptive/coping mechanisms that were influential factors in the traumatic reaction and post-traumatic adaptation.

The interaction between personal attributes, or predisposition, and situational factors has been known for years to determine the degree and type of stress reaction. The clinical influence of certain moderating variables on stress and, in particular, on PTSD include demographic variables (age, sex) and psychosocial variables (socioeconomic status, recent life events) as well as previous adjustment and psychiatric history. For example, McFarlane (1988a) examined the effect of these variables on temporal patterns of PTSD at 4, 11, and 29 months post disaster among firefighters who had been exposed to devastating bushfires. Outcome was predicted by several factors, including previous adverse life events, prior history of and treatment for psychiatric disorders, and a coping mechanism of avoidance of thoughts about problems. Age did not affect outcome.

Age and Sex. While little conclusive evidence has been found to establish the general effect of age on traumatic stress reaction, some studies have found a significant relationship. For example, Leopold and Dillon (1963) reported that following a marine collision and explosion men who were older than 36 years at the time of the accident were the most affected psychologically. Levav, Greenfeld, & Baruch (1978) found age to have a U shape relationship with combat stress reaction. The very young soldiers (<18 years old) and those 25 to 29 years old were most highly stressed by the battle. While age was found not to relate significantly to distress following the Beverly Hills Supper Club fire (Green, Lindy, & Grace, 1985), there was a trend for the younger survivors to show more distress on some measures, such as the SCL-90.

Malt (1988) reported that among survivors of traumatic injuries, females report more negative psychiatric consequences than males, but concedes that this difference may reflect an increased symptom awareness among women. A further clinical analysis seemed to indicate that persons with "histrionic" personality traits (mostly females) reported several diffuse symptoms of

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distress while compulsive persons (mostly males), who obtained a similar numerical score on the symptom checklist, were clinically more distressed.

In an interview of 142 burn patients within a week, on average, of the incident, White (1982) found no significant effect on depressive and anxious sequelae from variables such as sex, industrial versus non-industrial accidents and, in the case of women, social class. Men from the lower classes were highly likely to experience distress up to one year later. Predictive factors for poor emotional reactions included age, living arrangements, family size, severity of injury, duration of hospitalization, and pretraumatic incidence of depression, anxiety, or personality disorders.

Socioeconomic Status. Green, Grace, and Gleser (1985) found that survivors of the Beverly Hills Supper Club fire who had the lowest levels of education and social assets were at significantly greater risk to suffer distress, as measured by both the SCL-90-R and the Psychiatric Evaluation Form. Among veterans, Levav et al. (1979) concluded that rank, age, and socioeconomic factors played as important a role in development of and recovery from PTSD as did intensity of combat. Soldiers with lower rank and socioeconomic status were most vulnerable to war stress.

It is often assumed (e.g., Boulanger, 1986; Grinker & Spiegel, 1945; Helzer, 1983; Hocking, 1970; Jenkins, 1979) that people with the highest level of psychosocial assets and personal resources are the least likely to develop a stress reaction, unless the stressor is severe enough to cause almost everyone to break down. Helzer (1983) examined this assumption. He looked at predisposing factors such as drug use, education, parental psychiatric history, parental arrest and juvenile delinquency, including school truancy or dropout, drunkenness at a young age, arrests and fighting that came to the attention of the authorities. Using depression as a dependent variable, Helzer determined that superior social assets and premilitary adjustment interacted with intensity of combat in the following way: At low levels of combat, veterans with personal or familial maladjustment had no greater probability of suffering depression than their well-adjusted comrades. Following intense combat individuals with superior assets and premilitary adjustment were significantly less likely to experience depression.

Recent Life Changes. Although conceptual and methodological criticisms can be made of life event studies and life event checklists (Cohen, Kamarck, & Mermelstein, 1983; Johnson & Sarason, 1979; Rabkin & Struening, 1976) the consistency of effect shown by the research

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suggests that the likelihood of a stress response or illness is increased by numerous recent life events, even when other factors such as socioeconomic status are partialled out (e.g., Boman, 1979; Christensen, 1981; Horowitz, 1986; Johnson & Sarason, 1979; Paykel, 1974; Totman, Kiff, Reed, & Craig, 1980). Typical correlations in the literature between life change and illness range between .12 and .30 (Christensen, 1981; Rabkin & Struening, 1976). An important consideration in the association of recent life events to illness is the time period from which events are selected. The highest correlations between life change and either somatization or physical illness are obtained when events occur within the year prior to the illness (Christensen, 1980; Johnson & Sarason, 1979). The highest correlations between life change and psychiatric illness are obtained when psychiatric problems are contemporaneous with changes.

Recent life events have been shown to contribute significantly to the variance (a) in PTSD among veterans of Vietnam, second only to intensity of combat (Green & Berlin, 1987), (b) in distress experienced by survivors of the Beverly Hills Supper Club fire (Green, Grace, & Gleser, 1985), (c) in psychological disturbance on the MMPI in patients with chronic low back pain (Smith, Follick, & Ahern 1985), and (d) in the traumatic reaction to rape, but in a curvilinear relationship (Ruch & Chandler, 1983). Previous life changes of moderate magnitude facilitated coping with the crisis of rape, whereas no change and/or severe pretraumatic change were quite detrimental. Weisaeth (1989) also reported that a previous experience of having survived a life threatening situation contributed to optimal impact behaviour, at the time of an industrial disaster.

Psychiatric History. Experimental work on learned helplessness suggests that previous uncontrollable aversive situations or insoluble problems can lead to impaired problem solving, inadequate coping behaviour, and a perception of the self as helpless, incompetent and weak (Wortman & Brehm, 1975). Such personality configurations, together with increased self-expectations in the face of crisis and reduced support and approval from others are, according to Hirschfeld and Behan (1963), essential to the "disability process". Ruch and Chandler (1983) studied rape victims and found a highly significant effect between PTSD and mental health at the time of the attack. Problems such as general anxiety, depression, suicidal ideation, and alcohol or substance abuse, which reduced the victim's ability to emotionally deal with the crisis, accounted for almost 20% of the variance while assault factors accounted for less than 2% of the variance.

Davidson et al. (1985) found that 24 of 36 chronic PTSD patients had at least one pretraumatic psychiatric illness, usually alcohol abuse or depression and a history of familial

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psychopathology, most commonly alcoholism, depression, or an anxiety disorders. Brill (1967) observed that soldiers of WWII with preexisting neuroses had a seven-to-eight times greater chance of psychiatric reactions than did those with more normal predispositional characteristics. Conversely, Watson, Kucala, Manifold, Vassar and Juba (1988) compared three groups of veterans including (a) those who were hospitalized for PTSD, (b) those who were hospitalized for other psychiatric problems, and (c) "normal" veterans, and found no significant differences in self-report incidences of legal problems, drinking, employment, and church attendance during adolescence. Furthermore, Card (1983, 1987) found that of 14 measures of sociodemographic variables, academic variables and personality traits, which had been measured during adolescence in a massive longitudinal study of American youth, only "low self confidence" at age 15 was associated with chronic PTSD in Vietnam veterans. Helzer et al. (1987) did find an association between PTSD and childhood behavioural problems in both Vietnam combat veterans and victims of criminal assault. However, it is not clear whether early behavioural problems predispose one to suffer PTSD or make an individual more likely to experience combat or assault.

There is also not clear and consistent relationship between manifest psychopathology and susceptibility to breakdown from stress. At least two studies of POWs (Ford & Spaulding, 1973; Wolf & Ripley, 1947) have found that while some prisoners with preexisting disorders such as passive-dependency or limited ego defenses may have handled the camp stressors poorly, those diagnosed with preservice history of impaired object relations, either schizoid or psychopathic personality, handled stress as well or better than those who were better adjusted. In summary, predisposition or character pathology may relate to PTSD in four ways. Character pathology may be relatively independent from PTSD so that there is virtually no prediction from one to the other. Alternatively, maladjustment may predispose individuals to develop PTSD and to maintain symptoms over time. Character pathology may also function as a selector so that certain individuals seek high risk and thus are predisposed to experience a traumatic event. Finally, character pathology may develop as a consequence of the trauma.

Summary. Stress reactions to traumatic events can be influenced by demographic variables, and by pretraumatic adjustment and psychosocial functioning. Age and sex seldom account for main effects alone, but usually have some interactional effect with other moderating variables. The likelihood of a stress reaction (or mental or physical disorder) is also increased following an excess of recent stressful events. Higher education and socioeconomic status

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generally have an ameliorative effect on PTSD. Some studies report that they have isolated certain psychological problems or psychiatric disorders that seem to be more prevalent in the history of persons who develop PTSD. Other studies report that if such differences can be found they are usually insignificant. Traumatic events can lead to stress reactions in which symptom presentation varies according to both situational characteristics and personal appraisal. Not only is there a threat to one's safety and integrity but the myth that one can control and predict events may be lost. A traumatic event also leads to secondary stressors which may be even more traumatic to an individual than the initial event. Failure to deal with these stressors leads to development of a post-traumatic stress disorder.

Signs and Symptoms of PTSD

A vast number of observational and quasi-experimental studies have been published on the occurrence and intensity of psychological symptoms that follow and persist after specific traumatic events. The symptoms observed in some of these studies were presented in Table 1 (civilian trauma) and Table 2 (war trauma). The appearance of any subset of these PTSD symptoms (usually four or more) following a traumatic stressor and not present before the trauma has been used for years by clinicians and researchers as diagnosis criteria for PTSD, both before and after the publication of DSM-III (e.g., Legacies of Vietnam study).

Recent nosological attempts by the American Psychiatric Association to define post-traumatic stress disorder are based on both clinical theories of response to trauma and phenomena observed primarily in help-seeking Vietnam veterans, up to 25 years after service. Not all of the symptoms observed in the myriad of other trauma studies have been included in DSM-III. While symptoms of depression, somatization, substance abuse, and antisocial behaviour that occur following trauma have been interpreted by some (e.g., Horowitz, 1986) as examples of intrusion, avoidance, or hyperarousal phenomena, DSM-III dismisses most of them as associated features. Furthermore, DSM-III suggests that they may indicate coexistent psychiatric disorders. While it is true that few of the symptoms displayed in Tables 1 and 2, are unique to PTSD, constellations of these symptoms, when manifested after a traumatic event, have come to be accepted as definitive of PTSD (e.g., Boulanger, Kadushin, & Martin, 1981).

The concern that the DSM-III PTSD criteria is more theoretical than criteria for other DSM-III disorders (Penk et al. 1988) and that health-seeking survivors are so often used as research subjects (e.g., Creamer, 1990; Kuhne, Baraga, and Czekala, 1988; McFall, Smith, Roszell, Tarver,

& Malas, 1990) leads to questions about the validity of DSM-III symptoms as markers of PTSD. According to Kardiner (1941), "the real damage does not possibly always occur in the form of a symptom, ... but by inference we can understand the damage by examining the restitutive processes, particularly those common to all the traumatic neuroses" (p. 85) — namely, intrusive recall, and avoidance/numbing. The criteria used by DSM-III may be markers of an adaptive or coping response. If so, such behaviour alone hardly warrants a *disorder* label. The term disorder should be applied to survivors who experience distress and/or impairment, regardless of adaptive behaviour. Other methodological issues may also obscure the distinction between the process of adaptation and the markers of a disorder. Clinical research data that is acquired in a therapeutic context, such as an intake interview, may be confounded by the therapeutic process. The extent to which thoughts or observed behaviour results from therapeutic intervention must be considered. Furthermore, the reliance on retrospective recall of PTSD symptoms among traumatized populations, in particular ex-combatants, may obscure the temporal unfolding of PTSD. Malt (1986) also warns that the emphasis on health-seeking behaviour may cause social, racial, and sexual biases in DSM-III diagnoses. For these reasons, intrusive recall and avoidance behaviour may not be good markers for PTSD.

Indications of an Adaptive Response

Theoretical suppositions. The ability of humans to deal with stress is in large part a function of the initial psychological reactions it produces. According to Freud (1920/1962, 1926/1959, 1939/1964), Horowitz (1976, 1986), and Lindemann (1943), the repetition of traumatic events in thought, emotion, and behaviour is a dynamic process by which survivors attempt to integrate the trauma into their self-structure. Titchener (1985) suggests that the repetition seen in dreams and symbolic reenactments of the trauma undo or master the traumatic experience by attempting to revise history and act as though the actual trauma had not occurred. The trauma recreated in the dream is one from which the traumatized person may awaken and thus escape the danger, in effect, restoring the pretraumatic sense of invincibility. Intrusive recall may also be viewed as progressive desensitization, where the painful affect is gradually removed from the experience (Lazarus & Folkman, 1984). As a paradigm of Piaget's theory of assimilation and accommodation, psychological elements of a traumatic event will remain in active memory until the trauma can be

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assimilated and successfully integrated. Until accommodation has occurred, the individual can be viewed as experiencing psychic overload.

To counter trauma-induced anxiety, repression may occur. Attempts at defense include trying not to think about the trauma, psychological numbing of affect, and avoidance of stimuli that would reawaken disturbing memories. This intrapsychic mechanism is counterpoint to the behavioural response of flight from dangerous or painful external situations. Denial, through damping the significance of the experience and reducing the affects aroused by the trauma, prevents stimulation and allows for the control and management of traumatic intrusions. Emotional difficulties may be channelled into psychosomatic symptoms, amnesia, or constriction in interpersonal relationships (Titchener, 1970). Psychic numbing is a desensitization of the mind to all stimuli (Lifton, 1967, 1976), thus redirecting concern to the self and the body. Janis (1971) has postulated that after trauma a conflict occurs between the need for calming reassurances and the need for vigilance. Touching on the issue of hypervigilance in Moses and Monotheism, Freud (1939/1964) described how posttraumatic anxiety or hyperarousal becomes the source of the continuation of the emergency response. In this state of hyperarousal there is a mode of anticipation such that when any associated stimuli or situation reminiscent of the original trauma occurs the individual may act as if it had already occurred and not become surprised or overwhelmed by it again. Hyperarousal is, then, a state of preparedness.

Green, Wilson, and Lindy (1985), Horowitz (1986), Walker (1981) and Williams (1982), suggest that what DSM-III considers to be symptoms of an illness are often healthy and adaptive responses to unhealthy life experiences. The affected person, according to Zilberg et al. (1982):

'doses' himself or herself with tolerable levels of intrusive content so that effective processing of the personal meanings of the event can proceed. The pattern observed then is oscillations between intrusive and avoidant states – the magnitude of these oscillations decreasing over time as the implications of the event are worked through, leading to relative completion of the stress response. (p. 413)

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Evidence that the symptoms chosen by DSM-III as criteria for PTSD are part of an adaptive process. Evidence that the process of intrusive recall is an adaptive mechanism may be found following many and varied traumatic experiences, even innocuous stressors such as films or movies (Horowitz, Becker, & Moskowitz, 1971). Other common examples include:

1. Compulsive reworking through play and dreams is evident in children following trauma that includes abuse and family breakdown (Freud, 1939/1964; Terr, 1983).
2. During the four days following the murder of J. F. Kennedy, the average U.S. adult spent 8 hours per day at his T.V. or radio tuned to news broadcasts (Janis, 1971).
3. Israel has special museums, periodicals, and occasions of public mourning, as well as other remembrances, dedicated to the memory of the Holocaust (Kinston & Rosser, 1974).
4. Symbolic transformations of traumatic experiences are made into works of art.
5. Considerable attention is now given in the U.S. to the Vietnam war and its veterans, in research, visual arts, literature, and the media. The Vietnam experience is now being relived after years of repression and avoidance of such topics at the national level (Penk & Robinowitz, 1987).
6. The essence of psychotherapy is in the cathartic reliving and therapeutic reexposure to the memories of trauma (Cohen, 1980; Fairbank & Nicholson, 1987, Horowitz, 1986).

Pennebaker and Susman (1988) reported on the curative benefits of reexperiencing traumatic phenomena. For 15 minutes on four consecutive days, 23 introductory psychology students were asked to write about the most upsetting and traumatic experience of their entire lives. The traumas that the students wrote about were indeed horrifying and qualified for inclusion under DSM-III. One third of the students were asked to recount only facts about the experience (trauma-facts), one third to recount only emotions felt about the experience (trauma-emotion), and the remainder to write about both facts and feelings (trauma-combination). A control group, also of 23 students, was asked to write about trivial topics. Each day, before and after writing, subjects completed a brief questionnaire pertaining to their health and moods. Four months later they completed a follow-up questionnaire. Finally, information about health centre visits for illness, injury and checkups was collected. Frequency of health centre visits for the three months prior to the experiment were compared with those in the six months after.

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The results indicated that people in the trauma-combination and trauma-emotion conditions reported the greatest anxiety and depression after writing each day, however, at the 4-month follow-up, these two groups reported being the happiest, healthiest, and least anxious. The trauma-facts and control subjects appeared unaffected by the experiment. A significant drop in visits to the health centre occurred in the trauma-combination group, with other groups showing little or no change in illness behaviour. This study was repeated with blood samples taken at the beginning and end of the experiment, as well as at six week follow-up. Not only were the previous results replicated, the subjects in the trauma-combination group showed a significant improvement in immune system functioning at the end of the study and at six weeks follow-up.

According to Andreasen and Norris (1977), aspects of intrusion, avoidance, and numbing phenomena are used by severely burned patients as coping mechanisms, including the reworking or rumination over events, the constriction or repression of feelings, denial, regression, religiosity, rationalization, and withdrawal. Not only important during hospitalization, such coping is considered essential to long-term readjustment of burn patients. Equally good recovery resulted from the primary use of either dissociation or reworking.

Blank and Perry (1984) studied burn patients, 11 of whom experienced intrusive recall during delirium while the remaining 23 displayed avoidance-denial during delirium. The two groups did not differ in etiology of burns; nor onset, duration, severity, or treatment of the delirium. The patients who displayed reexperiencing phenomena (e.g., illusions, hallucinations, symbols, delusions, and disorientation) were younger, more severely burnt, less likely to survive, and had more PTSD symptoms including somatic concern. Of these patients who survived, all met DSM-III criteria for either PTSD ($N = 6$) or a major depressive disorder ($N = 1$). Of the patients who had displayed greater denial during delirium (e.g., minimization of injuries, repression, displacement, and projection) only one out of 23 received a DSM-III diagnosis (i.e., adjustment disorder with depressed mood).

Lazarus and Folkman (1984) consider that denial-like processes may be constructive or adaptive (a) in situations in which there is no direct action that the individual can take to overcome a harm or threat, or (b) when individuals deny certain facets of a situation or its implications but not the whole experience. Avoidance and numbness may be most effective in the early stages following a traumatic event, potentially alleviating distress without altering functioning or producing additional harm. Emotional numbing or alexithymia may also be highly adaptive during the stressor. Shipko, Alvarez, and Novcello (1983) suggest that appropriate emotionality may preclude

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purposeful behaviour. Support for this idea has come from research with recovering burn patients (Blank & Perry, 1984), their relatives (Calla, Perry, Kulchycky, & Goodwin, 1988), and from the Buffalo Creek dam collapse (Titchener & Kapp, 1976).

Following work with victims of rape, Kilpatrick et al. (1985) found that avoidance could become negatively reinforced, however, by the resultant reduction in anxiety and be quite hard to change. Moreover, the number of cues precipitating avoiding behaviour can become so numerous that there is tremendous restriction in the survivors' behaviour and movements. While avoidance and numbness serve a useful purpose as long as a threat persists, the traumatic experience must again reach consciousness to be put into perspective. Abnormal denial, according to Horowitz (1986), is "characterized by such extreme avoidance that the person does not cope with stressors and may resort to extreme countermeasures such as excessive drugs or thrill seeking" (p. 243).

Summary. Psychoanalytic theories of the "repetition compulsion" together with cognitive models of information processing suggest that reexperiencing phenomena are adaptive. The benefits of intrusive recall may be seen in research and examples of everyday life. Denial and increased arousal also have beneficial effects. The natural process should not be labelled as pathological (i.e. as a disorder) unless it is prolonged, blocked or interferes with regular functioning to a significant extent.

Temporal Aspects of PTSD

Prospective studies of survivors of civilian trauma show that survivors infrequently report simultaneous occurrence of all three primary DSM-III symptoms. Horowitz et al. (1979) carried out a cluster analysis of the responses to a self-report measure of PTSD that they called the "Impact of Event Scale". Results from 66 out-patients admitted to a treatment program following a traumatic event supported the existence of two homogeneous clusters of items, namely, intrusion and avoidance (Cronbach's alpha for intrusion = .79, for avoidance = .82). A correlation of .42 between the two dimensions indicated both some degree of independence and some degree of covariation. In a second validation study of the Impact of Event Scale, Zilberg et al. (1982) obtained data from bereaved subjects who were seeking therapy for their grief. Correlation between intrusion and avoidance was lowest ($r = .15, p \geq .05$) before therapy, moderate and significant ($r = .57, p < .01$) during therapy, and highest ($r = .79, p < .01$) one year after therapy was concluded. Shortly after bereavement and before therapy, patients were stuck in either a "frozen"

state (low intrusion/high avoidance) or an "overwhelmed" state (high intrusion/low avoidance) such as Horowitz's bidimensional view of PTSD. Maximum concordance between intrusion and avoidance appeared when bereaved subjects were judged to have adapted to their loss. Laufer, Brett, and Gallops (1985a, 1985b) also reported that while correlations between any two of the three primary DSM-III symptoms were significant in Vietnam veterans, the correlation between intrusion and avoidance/numbness was the lowest at $r = .22$ ($p < .05$). The correlation between intrusion and hyperarousal was the highest at $r = .52$ ($p < .01$). This supports a temporal theory of stress response.

Among survivors of civilian accidents, Scrignar (1984) found that the trauma initially led to a state of numbness or shock, resulting in insomnia, phobias, hyperalertness, and intrusive recall. He suggested that increases in autonomic activity and motor tension then produced somatic and pain complaints. As the anxiety diminished over time, preoccupation with the actual trauma changed to an obsessive concern with any physical disability attributable to the trauma. Lewis, Gottesman, and Guistein (1979), working with cancer surgery patients, found that initial feelings of anxiety and helplessness gave way to depression and lowered self-esteem several weeks later. Among the relatives of burn patients, Cella et al. (1988) found that over time intrusive thinking decreased more dramatically than did avoidance.

Few, if any, studies on PTSD were conducted during or immediately after the major wars of this century. Most studies of veterans give a retrospective accounting of symptoms that have dissipated by the time of the investigation, or they report on chronic or delayed PTSD. In contrast, most studies of civilian trauma are prospective accounts of the more immediate reaction. While it may be possible to look back and ascertain whether certain symptoms occurred, how is it possible to determine objectively whether or not they occurred simultaneously? McFarlane (1988a) found a major difference in the retrospective recall of an event between persons experiencing PTSD and those not experiencing PTSD. The non-PTSD group in his study were less likely at 11 months to recall having been previously injured, while the PTSD group recalled the same number of injuries at the 11 month follow-up as they had at 4 months. The occurrence of this significant fall-off in the reporting of aspects of the disaster in only 7 months by those without PTSD suggests that quantitative data about an event must be collected soon after the event. Otherwise, the association between stressor and reaction may be obscured because of differential rates of recall.

Unlike the Vietnam war, prospective investigations of PTSD have been made in combatants of Middle East conflicts during the 1980's. Schwarzwald et al. (1987) reported that

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among combat-stressed soldiers, intrusive items were endorsed significantly more frequently than avoidance items (71% versus 47%). Less than half of the subjects exhibited coexistent intrusion and avoidance; 25% displayed high intrusion/low avoidance. Another study of combat-stressed soldiers, including those who sought and received on-site treatment and those who did not seek treatment, also revealed prospective differences in endorsement of intrusive or avoiding symptoms over time. While Solomon (1987) initially reported a higher frequency of avoidance among these soldiers, the same soldiers later experienced more intrusion (Solomon, Weisenberg, Schwarzwald, & Mikulincer, 1988).

Predisposition to display certain symptoms. Studies into individual differences in adaptation also support the contention that intrusive recall and avoiding/numbing phenomena seldom appear together. Accordingly, there is a predisposition to display certain symptoms only. Based on his work, Byrne (1964) has suggested that "repressors" are people who deny personal impulses and are overly defensive in their personality structures; "sensitizers" are people who have weaker psychological defenses and, therefore, are likely to be overwhelmed by impulses. This suggests that repressors are more likely to display avoiding/numbing symptoms while sensitizers are more susceptible to intrusive recall. Weinstein (1978) investigated this concept and observed that repressors (e.g., denial of anxiety) did show a relatively greater autonomic response than self-report response to a stressor (e.g., threatening film). The reverse was true for sensitizers (e.g., able to express anxiety). There is also some evidence that individuals who report many PTSD symptoms are more susceptible to hypnosis (Stutman & Bliss, 1985).

The literature on experimental neurosis (reviewed in Mineka & Kihlstrom, 1978) indicates that experimentally-neurotic animals also show affective and somatic changes in one of two directions. They either became very agitated with increased activity and autonomic arousal or became passive and withdrawn with decreased activity levels. Some animals pass through one stage and then another.

More support for a temporal model of PTSD. Klinger (1977), Shontz (1975), and Wortman and Brehm (1975) are also sensitive to the temporal aspects of reacting to tragedy. On the basis of research into coping, Klinger (1977) asserts that there is an observable sequence of reacting to loss that he calls an incentive-disengagement cycle, that is normal and adaptive. It consists of "a phase of activity, disbelief or invigoration, followed by a second phase of protest, blame, or

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aggression, leading then to grief, apathy, despair, or depression, ending finally by detachment or recovery. The end result is disengagement (p. 171)". He also suggests that disengagement develops in spurts with intrusive recall or pangs, as he calls them, re-occurring over each and every facet of the loss. This helps the loss fade from present concern. Shontz (1975) proposes that the first stage in coping is shock. There is a feeling of detachment, perhaps with remarkable clarity and efficiency of thought and action. The second stage, encounter, is an extremely intense period in which the person is apt to experience helplessness, panic and disorganization. This is when intrusive recall or reliving of the trauma occurs frequently. This is followed by the third stage of "retreat", corresponding to avoidance/numbness.

Patterns of therapeutic change that follow treatment for PTSD also indicate bidimensionality. Burstein (1984) reported that medication (imipramine) significantly decreased intrusive activity in 10 survivors of either auto accidents or assault, but did not noticeably decrease avoidance. A group of 12 Cambodian refugees who had survived atrocities in concentration camps were assessed before, during, and after one year of psychotropic medication and monthly supportive appointments (Boehnlein, Kinzie, Ben, & Fleck, 1985; Kinzie et al. 1984). Prior to treatment most of the patients displayed only avoiding behaviours. Intrusive phenomena appeared only after interviews began. At the end of one year, there was marked improvement in the intrusive and hypervigilant symptoms but avoidance was not affected. Further studies into pharmacological treatment of PTSD (Kolb et al. 1984) and self-medication with alcohol (Lacoursiere, Godfrey, & Ruby, 1980) also show avoiding phenomena to be resilient to agents that are affective at treating intrusive and hyperarousal symptoms.

In summary, variations in presentation of symptoms according to time of observation, as well as predominance of one dimension over the other, have been recorded following civilian trauma and war-related trauma. Support for a temporal, bidimensional approach to the definition of PTSD comes from many sources.

Phenomenological Aspects of PTSD

While DSM-III contends that PTSD is a comprehensive disorder with the same symptoms appearing universally following various trauma, research suggests that stress symptoms vary across different types of trauma. This calls for changes to be made to DSM-III and DSM-III-R to take these differences into account. These trauma studies are listed in Table 6. As discussed in Appendix A, it is important to be aware of the methodological differences among studies. Besides different

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stressors (individual accident or assault, disaster or war), studies differ in the sample populations (e.g., general psychiatric patients, general population, substance-abusing veterans, those seeking treatment, counsel or disability insurance) and how they were selected (e.g., patients, random population, or outreach program). Studies also vary in the criteria used to diagnose PTSD (e.g., DSM-III, alternative criteria or MMPI criteria), how the diagnosis was made (e.g., self-report symptom checklist, structured or unstructured interview, multi-test psychometric battery) and how long after the trauma the assessment was made. The results of these studies are summarized in the following discussion, categorized by symptom complex. The discussion is intentionally comprehensive to impress on the reader the tremendous variation in the post-traumatic reaction from person to person and tragedy to tragedy, unlike the neat, orderly package of symptoms presented by DSM-III.

Intrusive recall or reexperiencing of the trauma: DSM-III's criterion B. To review DSM-III, certain stimuli associated with the trauma may at any time cause the trauma to be relived in dissociated form, in nightmares, in overwhelming affect states, or in reenactments. Many studies of survivors of civilian disasters (Braverman, 1980; Burstein, 1985; Davidson & Baum, 1985; McFarlane, 1988b; Modlin, 1983, 1986; Titchener & Kapp, 1976; Wilkinson, 1983; Wilson et al., 1985), of veterans (Atkinson et al., 1984; Birkhimer, DeVane, & Muniz, 1985; Boulanger, 1981; Brett & Mangine, 1985; Escobar et al., 1983; Penk et al., 1981; Silver & Iacono, 1984; Van Kampen et al., 1986; Wilson et al., 1985), and of survivors of POW and concentration camps (Chodoff, 1963; Goldstein et al., 1987; Kinzie et al., 1984) have found evidence of intrusive recall in anywhere from 40% to 100% of the subjects. Boulanger et al., (1986) compared DSM-III criteria with alternate criteria for PTSD and found that of veterans diagnosed as having acute PTSD (on the basis of a latent class analysis of generally recognized symptoms of PTSD), only 75% of them had experienced intrusive thoughts. The percentage was slightly higher for those with chronic PTSD: 84% claimed intrusive recall.

In a study by Davidson et al. (1985), intrusive thinking and avoidance were both reported by persons threatened with exposure to nuclear or toxic contaminants and both symptoms correlated with distress on the Symptom Checklist-90 (SCL-90). When symptom reporting for the threatened persons was compared to that of non-threatened control subjects, only the results for intrusive thinking were significant. Furthermore, intrusive thinking was tied to increased serum catecholamine levels, but avoidance phenomena was not.

Table 6.
Research Methodology in PTSD Studies

Study	Trauma	Selection	Number of Subjects	PTSD Criteria	Type of Assessment	Time since trauma
1. Adams & Adams 1984	Mt. St. Helens' eruption	all survivors	many	stress reaction	hospital and agency records of illness, family problems, alcohol abuse, aggression, violence, and mental health (compared with pre-trauma)	≤ 7 months
2. Adler 1945	Nightclub fire or head injury	serial admissions	246	alternative criteria	neuropsychiatric interviews	≤ 6 months
3. Atkinson, Sparr, Sheff, White, & Fitzsimmons 1984	Vietnam	disability claimants	40	DSM-III	evaluation of mental health records	≥ 6 years
4. Baum, Gatchel, & Schaeffer 1983	Three Mile Island radiation accident	random selection	38 survivors 56 controls	alternative criteria	SCL-90, BDI, cognitive and physiological tests	17 months
5. Benedikt & Kolb 1986	WWII or Vietnam combat injuries	referrals to pain clinic	22	DSM-III	evaluation of case history files	10 - 40 years
6. Birkhimer, Devane, & Muniz 1985	Vietnam, combat	patients	15	DSM-III and alternative criteria	diagnostic interviews	≥ 11 years
7. Boulanger 1981, 1986	Vietnam or civilian trauma	random selection	549 veterans 452 non-veterans	alternative criteria	Stress Scale	≥ 6 years
8. Braverman 1980	industrial or non-industrial accidents (injured)	consecutive hospital admissions	202	alternative criteria	intake interview	≤ 1 year
9. Burstein 1985	accidents, assault or sudden losses	patient consultation	53	DSM-III	Impact of Event Scale, diagnostic interview	≤ 2 years
10. Chaney, Cohn, Williams, & Vincent 1984	accidents or assault (with injuries)	randomly-selected patients	26 trauma, 26 illness, 26 pain patients	alternative criteria	symptom endorsement	6 - 12 months
11. Chodoff 1963, 1969	Holocaust	treatment-seeking survivors	many	alternative criteria	diagnostic interviews	≤ 20 years

(Table 6 continued)

Study	Trauma	Selection	Number of Subjects	PTSD Criteria	Type of Assessment	Time since trauma
13. Davidson, Kudler, Saunders, & Smith, 1985	Three Mile Island (TMI) or toxic waste dump	random selection	53 TMI residents, 27 living near toxic waste dump, 35 controls	clinically acceptable	SCL-90, BDI, physiological tests	≤5 years, TMI, ≤ 14 month, toxic waste discovery
14. Eaton, Sigel, & Weinfeld, 1982	Holocaust	random selection	657	alternative criteria	diagnostic interview, Langer 22-item questionnaire	35 years
15. Erikson 1976	Buffalo Creek dam collapse	litigants	654	alternative criteria	diagnostic interviews	≤ 2 years
16. Escobar, Randolph, Puente, Spiwak, Asamen, Gill, & Hough, 1983	Vietnam, combat	PTSD patients	41	DSM-III	symptom questionnaire	≥ 4 years
17. Fairbank, Keane, & Malloy, 1983	Vietnam, combat	PTSD patients	12 veterans 24 controls	DSM-III	structured interview	≥ 6 years
18. Faustman & White, 1989	combat in WWII, Korea, or Vietnam	hospitalized psychiatric, substance abuse, or PTSD patients	536	DSM-III	evaluation of discharge summary	≤ 40 years
19. Feinstein 1989	combat in Namibia	all survivors of an ambush	14	DSM-III	symptom checklist	1, 2, 3, and 4 weeks
20. Foy & Card 1987	Vietnam	random selection	298	DSM-III (crudely)	evaluation of mental health records	≥ 7 years
21. Foy, Carroll, & Donahoe, 1984	Vietnam	treatment-seeking	43	DSM-III	symptom checklist	≤ 18 years
22. Goldstein, van Kammen, Shelly, Miller, & van Kammen, 1987	Japanese WWII POW camps	treatment-seeking	41	DSM-III	semistructured diagnostic interview	40 years
23. Green, Lindy & Grace, 1985	Vietnam	volunteers	20	DSM-III	questionnaires	≥ 10 years

(Table 6 continued)

Study	Trauma	Selection	Number of Subjects	PTSD criteria	Type of Assessment	Time since trauma
24. Gringer & Spiegel, 1945	WWII air combat	random selection	many	alternative criteria	evaluation of psychiatric/medical reports	≤ 6 months
25. Helzer, Robins, & McEvoy, 1987	combat or civilian	random selection	2,493 (general population survey)	DSM-III	Diagnostic Interview Schedule	≤ 15 years
26. Helzer, Robins, Wish, & Hesselbrock, 1979	Vietnam	random selection	571 veterans, 284 controls	depression	diagnostic interview	8-12 months, 3 year followup
27. Jones & Riley 1987	industrial or motor vehicle accidents	litigants	327	DSM-III and alternative criteria	semistructured interview	≤ 1 year
28. Kardiner 1941	WWI combat	random selection	many	alternative criteria	evaluation of service records	≤ 25 years
29. Kinzie, Fredrickson, Ben, Fleck, & Karis, 1984	Cambodian concentration camps	treatment-seeking survivors	13	DSM-III	diagnostic interview	10-15 years
30. Kuhne, Baraga, & Czekala, 1988	Vietnam	seeking treatment for chemical dependency	69	DSM-III and alternative criteria	symptom checklists	≥ 10 years
31. Laufer, Brett, & Gallops, 1984, 1985a, b	Vietnam	randomly selected	251	alternative criteria	Stress Scale	6-15 years
32. Laufer, Yager, Frey-Wouter, Donnellan, Gallops, & Stenback, 1981	Vietnam or civilian trauma	randomly selected	387 Vietnam veterans 274 other veterans, 452 non-veterans	alternative criteria	Stress Scale, other indices	6-15 years
33. Lidvall, Linderroth, & Norlin, 1974	accidents producing minor head injuries	consecutive hospital admissions	83	alternative criteria	questionnaires, diagnostic interviews, medical examinations	2, 6, 14, 30, and 90 days
34. Malloy, Fairbank, & Keane 1983	Vietnam	treatment-seeking patients and non-patients	30	DSM-III	structured interview	≥ 5 years

(Table 6 continued)

Study	Trauma	Selection	Number of Subjects	PTSD criteria	Type of Assessment	Time since trauma
35. McFarlane 1988	extensive bush fires	firefighters	50	diagnostic interview	diagnostic interviews	8, 11, 29 and 42 months
36. Modlin 1983, 1986	accidents or assault	consultations for PTSD	several hundred	DSM-III and alternative criteria	diagnostic interviews	≥ 2 years
37. Murphy 1985	losses incurred from Mt. St. Helens eruption	random selection	155	alternative criteria	questionnaires	3 years
38. Nace, Meyers, O'Brien, Ream, & Mintz, 1977	Vietnam	patients, mostly drug abusive	202	depression	BDI	28 months, on average
39. Panzarella, Mantell, & Bridenbaugh, 1983	military service	treatment-seeking	143	psychological adjustment	questionnaire	≤ 1 year
40. Pearce, Schauer, Garfield, Ohlde, & Patterson, 1985	combat or civilian trauma	random selection	90	alternative criteria	questionnaires	≤ 15 years
41. Penk, Robinowitz, Roberts, Patterson, Dolan, & Atkins, 1981	military service	substance abusers seeking treatment	87 combatants 120 non-combatants	DSM-III	symptom checklists	≥ 5 years
42. Pitman, Altman, & Macklin, 1989	Vietnam combat (with injuries)	treatment-seeking	156	DSM-III	questionnaire, diagnostic interview	≥ 10 years
43. Roberts, Penk, Robinowitz, Dolan, Gearing, & Patterson, 1982	military service	substance abusers seeking treatment	274	DSM-III	symptom checklists	≥ 5 years
44. Schottenfeld & Cullen, 1985	occupational exposure to toxic substances	treatment-seeking	21	DSM-III	diagnostic interview	≤ 6 months
45. Sierles, Chen, McFarland, & Taylor, 1983	combat	randomly selected PTSD patients	25	DSM-III	diagnostic interview	≥ 5 years

(Table 6 continued)

Study	Trauma	Selection	Number of Subjects	Criteria	Type of Assessment	Time since trauma
46. Sierles, Chen, Messing, Besymer, & Taylor, 1986	combat	treatment-seeking	25	DSM-III	diagnostic interview	≥ 10 years
47. Silver & Iacono 1984, 1985	Vietnam	treatment-seeking	405	alternative criteria	symptom checklist	11 years, on average
48. Sims, White, & Murphy, 1979	IRA bombing	treatment-seeking patients	20	alternative criteria	semistructured interview	2 years
49. Titchener & Kapp, 1976	Buffalo Creek dam collapse	litigants	654	alternative criteria	diagnostic interviews	≤ 6 months
50. Van Kampen, Watson, Tilleskjor, Kucala, & Vassar, 1986	Vietnam	alcohol treatment patients	75	DSM-III	structured interview	≥ 8 years
51. Wilkinson 1983	Hyatt Regency skywalk collapse	randomly selected	102	DSM-III	structured interview	≤ 5 months
52. Wilson, Smith, & Johnson, 1985	Vietnam combat or civilian trauma	volunteers	74 veterans 242 civilians 93 controls	DSM-III and alternative criteria	questionnaires	≤ 10 years

Note. SCL-90 = Symptom Checklist-90;
BDI = Beck Depression Inventory

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McFarlane (1988b) examined the sensitivity and specificity of various DSM-III diagnostic criteria in a study of traumatized firefighters. The symptom labelled "intrusive thoughts of the disaster" was very sensitive (this symptom occurred in 89% of the cases diagnosed for PTSD) but less specific (this symptom also occurred in 65% of the cases where PTSD was not diagnosed). In contrast, the item "intensification of symptoms or psychological distress by exposure to events that stimulate recall" was highly specific (97% of those without PTSD did not experience this symptom) but had low sensitivity (only 33% of those diagnosed with PTSD experienced this symptom). In other words, intrusion was frequently endorsed by both those with and those without PTSD, while intensification of symptoms was infrequently endorsed by either group. Kulka and Schlenger (1986) reported on the sensitivity and specificity of these symptoms to diagnose cases of PTSD among combat veterans that had already been identified by experts as meeting DSM-III criteria for PTSD. The sensitivity and specificity for intrusive thoughts was 80% and 77%, respectively, for recurrent dreams, 84% and 83%, for sudden acting or feeling as if the traumatic event were recurring, 76% and 80%, and for intensification of symptoms, 75% and 76%.

In a study of 251 randomly selected Vietnam veterans, Laufer et al. (1985b) divided war stressor into 3 categories: primarily combat, witnessing abusive violence, and participation in abusive violence. In combat, with its attendant threat to life, intrusive recall correlated significantly with hyperarousal but not with avoidance-numbness, cognitive impairment, or a DSM-III diagnosis of PTSD. The witnessing of abusive violence strongly lead to intrusive recall but other DSM-III symptoms of PTSD were infrequently reported. Participation in abusive violence was associated primarily with avoidance or numbing symptoms, as well as with hyperarousal and cognitive impairment. The authors suggested that the men who participated in abusive violence were less able to tolerate thinking about their actions because of guilt, and thus experienced less intrusive recall. They used numbness/avoidance (e.g., denial) to defend against their thoughts. Wilson and Krauss (1982) found with Vietnam veterans that exposure to death and dying best predicted the occurrence of intrusive recall but did not predict other PTSD symptoms. Degree of psychological isolation upon homecoming related to all PTSD symptoms.

Pearce et al. (1985) compared Vietnam-combat veterans with non-combatant veterans from the same era, who had experienced some form of trauma not related to combat. The two groups differed on intrusive phenomena and other DSM-III symptoms (e.g., avoidance/numbness, withdrawal, guilt, and being easily startled), but were similar on measures of global anxiety, cognitive impairment, and interpersonal behaviour.

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Recurrent dreams of trauma are prevalent among PTSD patients but incidence rates vary from study to study. Troubled dreams have been reported in from 35% (Chaney, Cohn, Williams, & Vincent, 1984) to 80% (Burstein, 1985) of survivors of civilian accidents, while Malt et al. (1989b) found nightmares to be seldom reported. When they were reported they were most often not associated with the accident. Creamer (1990) reported that "recurrent dreams of the event" occurred in 57% of a treatment-seeking group of people who were both threatened and exposed to multiple homicide by a crazed gunman. Berger (1977) considered frightening dreams or nightmares to be one of the core symptoms of the Concentration Camp Survivor Syndrome and Goldstein et al. (1987) reported that 94% of their ex-POWs from WWII still had bad dreams 40 years after the war. A high incidence rate for traumatic dreams has been found in some studies of veterans with PTSD (Birkhimer et al., 1985; Helzer et al. 1987), yet Boulanger (1981) in the "Legacies of Vietnam" found this symptom to be endorsed infrequently by both veterans and non-veterans (18% and 8%, respectively). Adler (1945) compared survivors of the Cocoanut Grove nightclub fire with head-injured patients and found a later onset of trauma-related dreams in the head injured. He also determined that in later-onset nightmares the real aspects of the trauma tend to be more obscure, making their connection to the trauma more difficult to ascertain.

Symptoms of avoidance/numbness: DSM-III's criterion C. For these symptoms, it appears that there is little consistency among various stressors and that the internal consistency of this symptom in DSM-III criteria is variable. For example, McFarlane (1988b) reported that avoidance or numbness were infrequently endorsed by traumatized firefighters, both with and without PTSD. Furthermore, each of these avoiding items related poorly to DSM-III diagnoses of full or partial PTSD. Madakasira and O'Brien (1987) found that less than half of a group of tornado survivors reported avoidance/numbness, recurrent dreams, or survivor guilt; in comparison, intrusive recall and hyperarousal were reported in over 80% of the survivors.

Wilson et al. (1985) found that rape victims, persons undergoing divorce and combat veterans experienced avoidance/numbness about equally, and significantly more than did survivors of other civilian stressors. Individuals involved in family trauma (e.g., alcoholism, divorce, mental illness, serious legal problems) reported significantly more avoidance than intrusive recall. In contrast, most of the other traumatized groups experienced intrusion and avoidance equally. The stressor that produced the significantly least avoidance/numbness was life-threat (i.e., automobile accidents and assault). This finding was echoed by Creamer (1990) who reported on survivors of

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an incident of mass homicide, like the massacre of female engineering students in Montreal. While 98% of the survivors experienced some form of intrusive recall and 71% had diminished interest in significant activities, less than half experienced avoidance or estrangement; only 21% had restricted affect.

Avoidance/numbness was never considered an essential or core symptom in survivors of Nazi concentration camps (Berger, 1977) nor did Rynearson (1984) even mention finding avoiding/numbing or repressive phenomena in persons who had lost a loved one through murder. The bereaved subjects experienced intrusive and repetitive images of the homicide, as well as symptoms of hypervigilance and cognitive disruption. According to Solomon and Canino (1990), disaster victims with apparently high levels of distress following exposure also report symptoms of avoidance-numbness infrequently.

Malt et al. (1989) administered to accidentally injured adults a 24-item checklist of PTSD symptoms. High avoidance was not necessarily associated with diagnoses of PTSD (assessed with Horowitz's Impact of Event Scale), but social isolation was the single best predictor of psychopathology at follow-up. Of patients who reported avoidance/numbness and received a diagnosis of some DSM-III disorder, less than half were diagnosed with PTSD. Boulanger et al. (1986) found that veterans with *acute* PTSD (diagnosed on the basis on a latent class analysis of generally recognized symptoms of PTSD) were equally likely to experience constricted affect, diminished interest, and detachment (85%, 85% and 78%, respectively). During the *chronic* phase, constriction was more likely to be experienced than diminished interest or detachment (89%, 70% and 70%, respectively). While Shatan (1973) identified avoiding/numbing themes as part of the "post-Vietnam syndromes", Laufer et al. (1985) found avoidance/numbness to be pervasive only in those combat veterans who had participated in atrocities.

Investigation of the individual items of avoidance/numbness suggests that while the symptom *diminished interest in previously enjoyed activities* is present in some survivors of disasters and war (Birkhimer et al., 1985; Boulanger, 1981; Goldstein et al., 1987; Titchener & Kapp, 1976; Van Kampen et al., 1986; Wilkinson, 1983), the incidence rates can range between 10% (Goldstein et al., 1987, POW) and 71% (Creamer, 1990, homicide threat). Atkinson et al. (1984) found this symptom did not discriminate between groups of PTSD and non-PTSD combat veterans (diagnosed on the basis of DSM-III). Kulka and Schlenger (1986) reported that the sensitivity and specificity of this item to diagnose PTSD in combat veterans was 76% and 68%, respectively; McFarlane (1988b) reported figures of 33% and 100% with traumatized firefighters. Diminished interest in sex or sexual

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dysfunction has also been reported in survivors of accidents (Braverman, 1980; Chaney et al., 1984; Jones & Riley, 1987; Modlin, 1986), combat (Laufer et al., 1981), and disasters (Wilkinson, 1983) to varying degrees.

The symptom *constricted affect* has been reported in combat veterans (Kuhne et al., 1988; Penk et al., 1981; Silver & Iacono, 1984), Cambodian refugees (Kinzie et al., 1984), and Holocaust survivors (Chodoff, 1963); but not in WWII POWs (Goldstein et al., 1987), nor following civilian disasters (Wilkinson, 1983). Helzer et al. (1987) found emotional numbing to be rare, even among combat veterans, with less than 5% of the symptomatic respondents in their survey reporting this symptom. Atkinson et al. (1984) also found this symptom to be endorsed only marginally in combat veterans and to not discriminate between those diagnosed with PTSD (according to DSM-III criteria) and those not. Kulka and Schlenger (1986) reported the sensitivity and specificity of this item with veterans to be 75% and 69%, respectively, while McFarlane reports the figures to be 44% and 94% with firefighters.

Van Kampen et al. (1986) separated *expression of affect* from *numbing of affect*. In combat veterans, the former item correlated moderately with DSM-III diagnoses of PTSD and other symptoms but not with degree of combat exposure. The reverse was true for the latter item; the greater the combat exposure, the greater the emotional numbing. Roberts et al. (1982) reported that Vietnam veterans with PTSD have more problems in areas of intimacy and sociability than veterans without PTSD. Likewise, Wilson et al. (1985) noted almost twice as much conflict over intimacy among Vietnam veterans than among survivors of civilian trauma.

Feelings of alienation or detachment from others can occur following all types of trauma but incidence rates in PTSD patients may be as low as 20% (Baum et al. 1983; Birkhimer et al., 1985; Boulanger, 1981). The sensitivity and specificity of this symptom is, according to Kulka and Schlenger (1986), 81% and 73%, in PTSD veterans. Survivors of automobile accidents or assault have been reported to frequently experience social withdrawal (Braverman, 1980; Burstein, 1985; Modlin, 1983, 1986), and resentment (Jones & Riley, 1987). Withdrawal and feelings of detachment occurred in survivors of the Holocaust (Chodoff, 1963), but were not considered core symptoms of the Concentration Camp Survivor Syndrome (Berger, 1977). Survivors of the Buffalo Creek dam collapse experienced a loss of connection to others and a breakdown in community cohesiveness (Erikson, 1976), but remained close to their families and significant others (Titchener & Kapp, 1976). Difficulties in relationships with significant others have been observed in victims of rape (Burgess & Holstrom, 1974; DiVasto, 1985). These symptoms are reported to be related to

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other PTSD criteria and to intensity of combat in some studies of veterans (Atkinson et al., 1984; Goldstein et al., 1987; Kuhne et al., 1988; Panzarello et al., 1983; Penk et al., 1981; Silver & Iacono, 1984; Van Kampen et al., 1986), but not in others (Foy et al., 1984; Roberts et al., 1982).

DSM-III-R removed the symptom *avoidance of stimuli reminiscent of the trauma* from the miscellaneous category of symptoms and included it with numbness. Avoidance has been found to relate to trauma, presence of other PTSD symptoms, and DSM-III diagnosis of PTSD by Escobar et al. (1983), Kuhne et al. (1988), Penk et al. (1981), Van Kampen et al. (1986), and Wilkinson (1983), but not by Atkinson et al. (1984). Goldstein et al. (1987) found this symptom to be reported by less than a quarter of ex-POWs. Phobias and fears are sometimes reported in rape victims (DiVasto, 1985) and survivors of various civilian traumas (Burstein, 1985). The sensitivity and specificity of avoidance was reported by Kulka and Schlenger (1986) as 59% and 79%, respectively, in combat veterans. McFarlane (1988b) reported these figures to be 25% and 95% in traumatized firefighters.

Miscellaneous or hyperarousal symptoms: DSM-III's criterion D. In general, the literature supports the inclusion of most of the miscellaneous or hyperarousal symptoms in diagnostic criteria for PTSD. According to Boulanger et al. (1986), 81% of acutely stressed veterans and 90% of chronically stressed veterans report symptoms of *hyperalertness*, including feeling like lashing out, getting out of control, being easily startled, and having attacks of sudden fear or panic. *Cognitive dysfunction* was experienced by 70% of acutely distressed veterans and 75% of chronically stressed veterans. Kulka and Schlenger (1986) and McFarlane (1988b) reported the sensitivity and specificity of various hyperarousal or miscellaneous items to be: sleep disturbance, 84% and 72% (combat veterans), 56% and 68% (firefighters); hypervigilance or easily startled, 73% and 80% (combat veterans), 50% and 84% (firefighters); and irritability/anger, 68% and 82% (combat veterans).

The symptoms *hyperalertness* and *exaggerated startle response* were noted by Burstein (1985) to be present in 60% of survivors of various civil trauma and have been consistently found in studies of combat and disasters (Atkinson et al., 1984; Birkhimer et al., 1985; Boulanger, 1981; Escobar et al., 1983; Helzer et al., 1987; McFarlane, 1988b; Penk et al., 1981; Van Kampen et al., 1981; Wilkinson, 1983). These same studies also report *sleep disturbance* to be common. It was also found to occur in between 40% and 93% of survivors of civil trauma or accidents (Burstein, 1985; Chaney et al., 1984; Jones & Riley, 1987) and is considered a core symptom in survivors of

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concentration camps (Berger, 1977) and in victims of rape (Di Vasto, 1985). *Sleep disorder* was the fifth most frequently endorsed symptom on the Stress Scale (Boulanger, 1981) with 30% of the veteran respondents and 24% of non-veterans reporting this symptom. Mikulincer, Glaubman, Wasserman, Porat, and Birger (1989) compared PTSD and matched non-PTSD subjects on laboratory sleep patterns. The PTSD subjects evidenced significantly less normal sleep, more awakenings, longer REM latency, and shorter slow wave and REM periods than non-PTSD subjects.

Guilt seldom occurs in response to accidents and disasters. Helzer et al. (1987) found *survival guilt* to be reported by less than 5% of symptomatic respondents, even among combat veterans, although others have estimated as many as 30% of ex-combatants experience guilt (e.g., Birkhimer et al., 1985). The separation of *guilt over behaviour required for survival* from *guilt over having survived a trauma* is useful. Guilt has been dropped entirely as a symptom from DSM-III-R, a change not endorsed by everyone (e.g., Creamer, 1990; Hodgkinson, 1989). According to Brett, Spitzer, and Williams (1988), this symptom was dropped because it was not clear to the Task Force that guilt was present in all cases of PTSD. Another explanation offered by Creamer (1990) is that it did not fit neatly (i.e., theoretically) in with the other three categories.

Impairment of memory and/or concentration has been reported to occur following accidents, combat, and disasters (Atkinson et al., 1984; Birkhimer et al., 1985; Boulanger, 1981; Braverman, 1980; Burstein, 1985; Chaney et al., 1984; Escobar et al., 1983; Jones & Riley, 1987; McFarlane, 1988b; Modlin, 1983, 1986; Panzarello et al., 1983; Pearce et al., 1985; Silver & Iacono, 1984; Van Kampen et al., 1981; Wilkinson, 1983). Estimates of incidence rates of impairment range from 15% to 98%, depending on the stressor. Cognitive dysfunction including disorganization, sluggish thinking, and difficulty making decisions have also been reported (Erikson, 1976; Titchener & Kapp, 1976). According to studies by Boulanger (1981) and Pearce et al. (1985) cognitive dysfunction is equally endorsed by both traumatized combatants and non-combatants.

Everly and Horton (1989) conducted a pilot study on memory impairment in 14 patients diagnosed as having PTSD according to DSM-III-R (in which memory impairment is excluded as a definable symptom). They found short-term memory to be impaired in 12 of 14 patients. In contrast, Zimering, Caddell, Fairbank, and Keane (1984) reported that PTSD veterans, in comparison to non-PTSD veterans, were not impaired on memory tests but were on tests of attention and concentration. McFarlane (1988b) found that disturbance of attention and

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concentration appeared to be the best predictor of chronic PTSD in firefighters who had fought devastating bushfires. It had the best combination of sensitivity (75%) and specificity (81%) of any other DSM-III symptom (in both acute and chronic cases). Among combat veterans, Kulka and Schlenger (1986) reported the sensitivity and specificity of *trouble concentrating* to be 72% and 72%.

Kuhne et al. (1988) spoke out against inclusion of disturbed sleep, concentration problems and memory disturbance as diagnostic criteria because they found these symptoms to have low discriminating power in separating PTSD from non-PTSD subjects. But, their results may have been influenced by the fact that all their subjects were recovering from substance abuse. These symptoms are frequently observed in early remission from drug use anyway and therefore may have had less discriminating power in this particular subgroup. These results support the contention that a wider scope of definable symptoms is needed to define PTSD. Diagnostic criteria must be broad enough to include responses to various trauma by a wide range of the population.

To DSM-III-R was added *irritability or outbursts of anger* as part of the definition of PTSD. The consensus from research is that this is a move towards greater diagnostic validity (e.g., Weisaeth, 1989) and it makes DSM-III more consistent with alternative diagnostic criteria for PTSD. Adams and Adams (1984) found evidence from police and court records of increased aggression and violence in residents of Mount St. Helen following the eruption. Jones and Riley (1987) reported this symptom in 75% of a sample of litigants following accidents. Wilkinson (1983) reported that 55% of the victims of the skywalk collapse (survivors, observers, rescuers) had an angry reaction, which was directed at a variety of targets. Increased irritability is evident following other disasters (Adler, 1945; Titchener & Kapp, 1976) and accidents (Braverman, 1980; Jones & Riley, 1987; Modlin, 1983, 1986). Berger (1977) reports irritability to be a core symptom in survivors of concentration camps. According to Weisaeth (1989), it was the only PTSD symptom that increased in frequency and intensity in the seven months after an industrial factory explosion.

In her comparison of traumatized veterans and traumatized non-veterans, Boulanger (1981) reported that *irritability* was the second ranked item in the Stress Scale for both groups. Veterans endorsed this item slightly more often than did the non-veterans, at 48% and 37% respectively. These results are supported by Pearce et al. (1985) who assessed veterans traumatized from either combat or from non-war-related stressors. While both trauma groups displayed significantly more irritability than did non-trauma veterans, the ex-combatants more often experienced feelings of irritability than did the other traumatized group. Other research (e.g., Foy &

Card, 1987; Laufer et al., 1981; Pearce et al., 1985; Penk et al., 1981; Silver & Iacono, 1984; Wilson et al., 1985) has also found combat veterans have significantly greater difficulties with anger, temper control, frustration tolerance, and expression of hostility. However, Atkinson et al. (1984), Roberts et al. (1982), and Van Kampen et al. (1986) did not find a relationship in ex-combatants between measures of aggression, irritability, hostility, rage, or frustration tolerance and diagnosis of PTSD according to DSM-III.

Somatization, Psychasthenia and Other Dissociative Behaviour. There is a high incidence of somatic complaints from survivors following most trauma. *Somatization* occurs in conjunction with other recognized symptoms of PTSD and has been reported by 50% to 90% of the survivors of (a) accidents, both with attendant head injuries (Adler, 1945; Lidvall et al., 1974; Lishman, 1971) and without head injury (Jones & Riley, 1987; Tarsh & Royston, 1985), (b) rape (Burgess & Holmstrom, 1974; Dahl, 1989; Di Vasto, 1985; Evans, 1978), (c) exposure to radioactive or toxic contaminants (Baum et al., 1983; Davidson et al., 1985; Schottenfeld & Cullen, 1985), (d) community disasters (Adams & Adams, 1984; Murphy, 1985; Titchener & Kapp, 1976), (e) combat (Goldstein et al., 1987; Kuhne et al., 1988; Penk et al., 1981), and (f) death camps (Berger, 1977; Chodoff, 1963; Eaton et al., 1982). Often the severity of the somatic complaints outweighs the severity of the original trauma or of attendant injuries.

Symptoms of *psychasthenia* have also been noted extensively in survivors (Adler, 1945, Berger, 1973a; Kardiner, 1941; Lidvall et al., 1974; Lifton, 1963; Lishman, 1968). The dictionary defines *psychasthenia* or *neurasthenia* as a neurosis marked by chronic and abnormal fatigue, lack of energy, feelings of inadequacy, moderate depression, inability to concentrate, loss of appetite, and insomnia. Also included as part of this syndrome are symptoms of irritability, multiple somatic complaints, diminished tolerance for stress, and heightened perception of the environment as stressful. According to Berger (1973a), "clinically neurasthenia may be regarded as a stress-intolerance syndrome" (p. 560). Kardiner (1941) also suggested it was interchangeable with the term traumatic neurosis (Kardiner, 1941). Today the term is used sparingly, probably because it has been associated with outmoded psychiatric concepts.

Studies suggest a relationship between DSM-III criteria and somatization (Benedikt & Kolb, 1986; Feinstein, 1989; Goldstein et al., 1987; Kolb, 1987; Madakasira & O'Brien, 1987; Modlin, 1986; Sierles et al., 1983; Wilkinson, 1983) although there have been exceptions (e.g., Atkinson et al., 1984). A direct relationship was found between combat exposure and somatic complaints

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among substance abusing veterans (Kuhne et al., 1988; Penk et al., 1981), but Foy et al. (1984) did not find such a relationship in a mixed psychiatric group of veterans. Wilson et al. (1985) found that somatic complaints occurred significantly more often (at least by 50%) in Vietnam combat veterans than in survivors of civilian trauma; civilians who experienced the death of a loved one reported significantly less somatization than civilians who experienced any other stressor. Murphy (1985) reported less somatic complaints among those who lost family members than those who lost property as a result of the Mount St. Helens eruption. The bereaved subjects reported a higher frequency of other PTSD symptoms.

While there are frequently no known physiological or medical explanation for these symptoms, there are several psychological explanations. The overwhelming nature of trauma makes psychological integration or adaptation difficult. When there has been a failure to integrate or "work through" the original trauma, both dissociative and conversion reactions can be mobilized as defenses against overwhelming experiences (van der Kolk, 1987). The original distress is walled off, leaving the patient to react to subsequent stress as if it were a recurrence of the original trauma. Thus, "The patient experiences the emotional intensity of the original trauma without conscious awareness of the historical reference" (van der Kolk, 1987, pg. 7). There was considerable discussion within the DSM-III-R Nomenclature Advisory Committee, between the Task Force on PTSD and the Advisory Committee on Dissociative Disorders, on whether PTSD belongs with the anxiety disorders or with the dissociative disorders (Brett et al., 1988; Penk et al., 1988; Wilson et al., 1987). While an agreement was reached that reexperiencing and numbing are mild dissociative symptoms, the disorder remained with the anxiety disorders.

Numerous researchers, including Adams and Adams (1984), Berger (1977b), Gringer and Spiegel (1945), Hocking (1970), Horowitz and Soloman (1975), Kardiner (1941), Leopold and Dillon (1963), Modlin (1983, 1986), and Titchener (1985), have suggested that traumatized survivors repress or avoid thinking about the trauma by transforming their stress into psychosomatic symptoms, psychasthenia, depression, and anxiety. As an example, Titchener (1985) tells of a patient who received a concussion with moderate brain damage from which his physician assured him he would recover. The patient subsequently developed head and back aches. Titchener believes that the patient substituted this pain as a more acceptable symptom to deal with subjective fear of brain damage and possible loss of cognitive ability. Accordingly, somatization allows anxiety to be attributed to something concrete: a physical disorder. In psychoanalytic terms, it becomes "the unconscious focus of psychological decompensation with ego-syntonic secondary gain"

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(Bloch, 1978, p. 1190). Behaviourally, survivors become more concerned about their health than normal and more responsive to small pains and bodily sensations (Klinger, 1977; Scrignar, 1984). Because of diminished responsiveness to outside stimulation, they cease to care about most of the incentives to which they had earlier been committed.

Benedikt and Kolb (1986) have suggested that chronic pain at the site of a former injury is a form of intrusive recall, a reexperiencing of the acute physical pain. The study of 22 patients diagnosed as having PTSD (according to DSM-III) who suffered chronic pain at the site of a former injury incurred in combat 10 to 45 years earlier revealed no evidence of a physiological cause. In four of the cases pain had been in remission for an average of 18 years. This finding is consistent with various reports of chronic pain in Holocaust survivors, more than 25 years after liberation (Eitinger, 1969), and in accident survivors, long after injuries were presumed to have healed (Melzack, 1973). Schottenfeld and Cullen (1985) also presented as an example of intrusive recall: the reexperiencing of the bodily state and symptoms that had been caused by the exposure to toxins in the workplace. Mental associations to the original trauma may cause anxiety that leads to anticipation of the recurrence of pain, subjectively augmenting pain perception. The body state that occurred because of the trauma is reexperienced, rather than images or dreams of the trauma itself.

Pennebaker and Susman (1988) present a theory of psychosomatics and inhibition that may explain somatization after trauma. They propose that the inhibition or avoidance of thoughts, feelings, or behaviour requires a physiological response that results in increased autonomic nervous system activity. Over time, this inhibition serves as a cumulative stressor that increases the probability of somatization, as well as stress-related illnesses. As an alternative explanation, Kolb (1988) suggested that exposure to stimuli reminiscent of the trauma leads the patient with PTSD to respond with immediate and excessive physiological arousal, particularly in their cardiovascular and neuromuscular systems. This conditioned emotional response is expressed subjectively as palpitations, panic attacks and other pains, including headache, nausea, vomiting, and diarrhea. Furthermore, this somatic arousal may still be observed even when other clinical symptoms such as avoidance, withdrawal, or intrusive recall seem to have remitted.

Anxiety and Depression: DSM-III's "associated features". Grinker and Spiegel (1945) emphasized that anxiety and depression are cardinal symptoms of combat-related stress disorder, as are sleep disruption, nightmares of combat events, guilt, and anger. Yet, DSM-III fails to include

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anxiety and depression as definable features of PTSD. Symptoms of anxiety or depression have been reported frequently following accidents, by up to 87% of the victims (Braverman, 1980; Jones & Riley, 1987; Modlin, 1986), by survivors of disasters (Baum et al., 1983; Davidson & Baum, 1985; Erikson, 1976; Titchener & Kapp, 1976), the Holocaust (Chodoff, 1963; Eaton et al., 1982), rape (Alkeson et al., 1982; DiVasto, 1985), bombings (Sims, White, & Murphy, 1979), fire (Adler, 1945), and combat (Boulanger, 1981; Pearce et al., 1985). McFarlane (1988) has reported both anxiety and depression to be highly sensitive (75%) and specific (83%) when diagnosing chronic PTSD in firefighters.

Several studies of veterans have found a relationship between the presence of a PTSD diagnosis and the symptom of anxiety (Fairbank et al., 1983; Foy et al., 1984; Green et al., 1985; Malloy et al., 1983; Pearce et al., 1985; Stampler & Sipprelle, 1981; Zimering et al., 1984), although others have not, especially when PTSD is strictly diagnosed according to DSM-III criteria (Atkinson et al., 1984; Penk et al., 1981; Van Kampen et al., 1986). In cross-catastrophe comparison, Pearce et al. (1985) detected no difference between the level of anxiety experienced by traumatized Vietnam combat veterans and survivors of other trauma. Both groups experienced significantly more anxiety than controls. In the "Legacies of Vietnam" study (Boulanger, 1981), the item *feeling anxious and tense* was the most frequently endorsed item on the Stress Scale by both veterans (53%) and non-veterans (48%). Boulanger et al. (1986) grouped somatic symptoms of dizziness, headaches, stomach troubles, fatigue, and tension together with anxiety and irritability as indicative of generalized anxiety, and reported that 97% of acutely stressed veterans and 100% of chronically stressed veterans experienced these symptoms. In fact, this subset of symptoms was experienced more (by 30%) than any other subset of PTSD symptoms. Somatic/anxiety symptoms were also endorsed 2 to 3 times more frequently than other PTSD symptoms by veterans who experienced symptoms, but not in the right combination to meet DSM-III criteria. While the non-stressed group also endorsed these somatic symptoms more frequently than any other of the PTSD symptoms, the stressed veterans were 5 to 8 times more likely than the controls to report them.

Foy et al. (1984) constructed a problem checklist of adjustment problems and psychological symptoms of which 14 were characteristic of PTSD according to DSM-III, but not necessarily phrased in the same way as DSM-III. The checklist was administered to 43 troubled veterans, of whom 21 were classified on the basis of DSM-III criteria as suffering from PTSD while 22 were classified as non-PTSD. Discriminant function analysis revealed that items not included in

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DSM-III criteria for PTSD but indicative of anxiety, correctly classified more than 90% of the study subjects.

Numerous studies show a concurrent relationship between depression and PTSD, according to either DSM-III or alternative diagnostic criteria (Benedikt & Kolb, 1986; Braverman, 1980; Davidson et al., 1985; Escobar et al., 1983; Fairbank et al., 1983; Faustman & White, 1989; Foy & Card, 1987; Foy et al., 1984; Goldstein et al., 1987; Green et al., 1985; Pearce et al., 1985; Pitman, Altman, & Macklin, 1989; Sierles, Chen, McFarland, & Taylor, 1983; Silver & Iacono, 1984; Stampfer & Sippelle, 1981; Van Kampen et al., 1986). Madakasira and O'Brien (1987) found that the depression factor from the SCL-90 was significantly associated with diagnoses of PTSD. Depression yielded a sensitivity of 84% and a specificity of 77%. These figures rose to 86% and 82%, respectively, when depression and somatization factors were combined. Other factors from the SCL-90 — obsessive-compulsion, interpersonal sensitivity and anxiety — did not significantly contribute to the classification. Penk et al. (1981) reported depression to be associated with combat but not with intensity of combat. Using the Beck Depression Inventory, Nace et al. (1977) found that the incidence of depression in Vietnam veterans was approximately 33% more than two years after return from duty. Some studies have found combat trauma significantly more likely to produce depression than any other trauma (Pearce et al., 1985; Wilson et al., 1985), however Boulanger (1981) reported veterans and traumatized civilians to endorse depression equally. Endorsed by 31% of both veterans and non-veterans, it was the fourth ranked item on the Stress Scale out of 21 symptoms.

Other Symptoms and the Predisposition to Display Differential Forms of Maladjustment Following Trauma. Research suggests that consequences of trauma may include thoughts or attempts to commit suicide, marital or family discord, divorce, substance abuse, increased susceptibility to physical illness, aggression, violence, sociopathy, criminality, and general maladjustment or psychiatric problems (e.g., Adams & Adams, 1984; Chaney et al., 1984; Davidson et al., 1985; Foy & Card, 1987; Langley, 1982). Using several of these symptoms as discriminating variables in an attempt to separate those diagnosed as having PTSD from those diagnosed as not having PTSD (according to DSM-III), Foy and Card (1987) obtained an overall classification rate of 88% of cases. Kadushin and Boulanger (1986) also suggested that PTSD veterans can be separated from non-PTSD veterans on the basis of their greater tendencies toward violent behaviour.

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Increased alcohol and drug abuse has been reported in survivors of accidents and assaults (Chaney et al., 1984), the Mount St. Helens eruption (Adams & Adams, 1984), the Three Mile Island radiation accident (Davidson et al., 1985), IRA bombings (Sims et al., 1979), and combat (Atkinson et al., 1984; Birkhimer et al., 1985; Lacoursiere et al., 1980; Nace et al., 1983). Foy and Card (1987) reported alcohol abuse to be a discriminating variable in separating PTSD veterans (diagnosed according to DSM-III) from non-PTSD veterans. Other studies have also found substance abuse to be concordant with DSM-III diagnoses of PTSD (Escobar et al., 1983; Faustman & White, 1989; Green et al., 1985; Pitman et al., 1989; Sierles et al., 1983; Van Kampen et al., 1986). Several researchers (Kadushin & Boulanger, 1986; Lacoursiere et al., 1980) have suggested alcohol and drug abuse are a form of self-medication for PTSD symptoms. After chronic use, attempts to stop using substances may lead to exacerbation of the original PTSD symptoms.

According to Roy (1983), self-medication with alcohol may have more to do with an individual's style of handling stress than it does with the nature of the stressor itself. Other researchers have also suggested that a person's predisposition (or what may be called his coping style) can incline the individual to a particular response, which may have pathological overtones, given that the stressor is traumatic enough. Jones and Riley (1987) performed a cluster analysis of symptoms that were reported by accident survivors. They derived four groups based on these symptoms. The most easily identified group, called "stoics", reported headache, irritability, and pain but complained the least. They also reported anxiety less frequently than pain. The second group, called "depressives", was the largest group. Affective symptoms were reported but little pain or anxiety. The third group, called "multiple claimants", contained subjects who had made previous claims because of previous injury. They complained of depressive symptoms, though rarely enough to warrant a clinical diagnosis of depression. The fourth group, called "phobics" and predominantly women, had notable clinical anxiety and *neurotic* symptoms that were more prevalent than pain. Symptoms of hysteria, phobias and dizziness were common in this group and they came closest to fulfilling the DSM-III criteria for a PTSD diagnosis.

According to Horowitz (1986), "general response tendencies to trauma vary among persons according to cognitive, emotional and regulatory styles" (p. 2). He suggested that repression (avoidance/numbness) is frequently associated with an hysterical personality predisposed to the development of conversion reactions, anxiety attacks, and dissociative episodes (Shapiro, 1965). Conversely, the obsessional personality allows for the appearance of control through avoidance of emotional threats, according to Shapiro (1965), by sliding from one

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aspect of a theme to the opposite and back again. Here, intrusion of words, images or feelings are common responses to traumatic events, as are difficulties in decision making. According to Horowitz (1986) both obsessionals and hysterics may exhibit similar stress responses, including denial and intrusion but they differ in their stability in any given phase. The narcissistic personality interprets events in such a way as to place the "self" in better light, that is internalizing the good and excluding the bad through denial, disavowal, externalization and negation (Horowitz, 1986). Paranoid states, self-destructive acts, episodes of panic, shame or depersonalization may occur. To obtain sympathy or secondary gain, the enactment of a "wounded hero" role may be played.

Thompson (1965) investigated 500 cases of civilian PTSD following litigation and concluded that PTSD is a neurosis due to and caused by situational factors. It is manifested in seven observable subtypes, each one characterized by a predominance of anxiety, phobia, hysteria, obsessive-compulsion, hypochondriasis, depression, or a mixture of anxiety and hysteria. Such categorization is similar to that of Grinker and Spiegel (1945) who identified five psychotraumatic syndromes that followed combat, labelled free anxiety, phobic, conversion, psychosomatic, and depressive. Anxiety syndrome was the most commonly encountered subtype, but it was by no means the only one.

Overlap with Other Diagnostic Criteria. Symptoms that have been frequently observed to follow trauma and used in numerous studies as alternative criteria for PTSD are considered by DSM-III as associated features, therefore not part of the operational definition of PTSD. Thus, post-traumatic stress disorder diagnosed by DSM-III is rarely a discrete entity but appears instead with symptoms that cut across various DSM-III diagnoses (Benedikt & Kolb, 1986; Escobar et al., 1983; Faustman & White, 1989; Helzer et al., 1987; Jones & Riley, 1987; Pitman et al., 1989; Sierles et al., 1983, 1986). According to DSM-III, the presence of these other symptoms may lead to additional diagnoses, regardless of whether the symptoms originated after the trauma. Therefore, signs of depression might lead to a diagnosis of Affective Disorder, physical complaints to Somatization Disorder and the cluster of headache, vertigo, and memory or concentration difficulties might be diagnosed as Organic Mental Disorder. The purpose of this delimitation is to exclude patients with other illnesses from the PTSD category (Robins & Guze, 1970). This exclusion may be artificial because it results in a high overlap of PTSD with other diagnoses. Several studies that reveal the extent of this overlap are tabulated in Table 7. Most of the research was done with veterans.

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These studies indicate that over two thirds of all PTSD subjects (diagnosed according to DSM-III) received at least one other DSM-III diagnosis. The average being from 3.5 (Escobar et al., 1983) to 4.3 (Birkhimer et al. 1985). As shown in Table 7, (a) 8% to 70% of all persons with PTSD also received a DSM-III diagnosis of affective disorder, (b) 30% to 67% received a diagnosis of alcohol abuse, (c) 16% to 40% received a diagnosis of drug abuse, (d) 12% to 100% received a diagnosis of somatization disorder, and (e) up to 75% received a diagnosis of anxiety disorder. Further evidence against the validity of exclusive criteria used for PTSD by DSM-III comes from Helzer et al. (1987). They reported that people with PTSD (diagnosed according to DSM-III) are more likely to receive an additional DSM-III diagnosis of a mental disorder than any other troubled persons are: Individuals diagnosed as having PTSD are (a) 10 times more likely than other individuals to receive an additional diagnosis of an obsessive-compulsive disorder, (b) six to eight times more likely to receive a diagnosis of an affective disorder, (c) up to four times more likely to be diagnosed with another anxiety disorder, and (d) approximately twice as likely to receive a diagnosis of substance abuse or other core diagnosis. Jones and Riley (1987) examined 327 survivors involved in civil accident litigation. They reported that a precise psychiatric diagnosis according to DSM-III was applicable in only a few subjects although symptoms, including pain, anxiety, and depression, were present in most. A diagnosis of any DSM-III anxiety disorder was present in only 6% of subjects. A diagnosis of affective disorder was more common at 13.5%.

Delayed onset of PTSD. It has been suggested by some (e.g., Burstein, 1985; Nichols & Czirr, 1986; Scrignar, 1984; Watson et al., 1988) that the diagnosis of a delayed onset of PTSD may occur only because of earlier failure to make a diagnosis. The symptoms of PTSD may have been misdiagnosed as something else. As has been shown throughout this literature review, individuals may differ widely in their clinical presentation of PTSD, with different symptoms either receding or intensifying over time. This is particularly true in those who use avoidance and suppression, rather than acknowledging the frightening and painful memories and feelings (Burstein, 1989; Egendorf, 1982; Kadushin & Boulanger, 1986; Nichols & Czirr, 1986; Pilowsky, 1985; Walker & Cavenar, 1982). It may also be difficult to make a diagnosis in individuals who are distrustful because of previous victimization (Westermeyer & Wahmenholm, 1989).

Table 7.
Overlap of PTSD with other DSM-III Diagnoses

	Affective Disorders	Alcohol Abuse	Drug Abuse	Somatization	Anxiety Disorders	Organic Mental Disorder	Personality Disorder	Schizophrenia	Obsessive-Compulsive	Dissociative or Conversion Disorder	Other
Behar, 1984 (N=20)	16%	45%	23%	—	—	—	13%	—	—	—	15%
Benedikt & Kolb, 1986 (N=22)	41%	38%	13%	100%	—	—	—	—	—	—	—
Birkhimer, De Vane, & Muniz 1985 (N=15)	67%	30%	30%	—	—	—	50%	—	—	—	—
Davidson, Fleming, & Baum 1985 (N=36)	55%	41%	16%	—	19%	—	3%	7%	3%	—	—
Escobar, Randolph, Puente, Spiwak, Asamen, Hill, & Hough, 1983 (N=25)	49%	61%	40%	15%	50%	—	—	—	—	—	—
Faustman & White, 1989 (N=536)	25%	40%	27%	—	2%	2%	—	5%	—	—	—
Jones & Riley, 1987 (N=327)	13.5%	—	—	—	6%	—	—	—	—	9%	—
Pitman, Altman, & Macklin, 1989 (N=156)	70%	67%	30%	—	75%	—	—	—	19%	—	19%
Sierles, Chen, Messing, Besyner, & Taylor, 1983, 1986 (N=25)	8%	64%	20%	12%	—	—	12%	—	—	—	—

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Kramer and Kinney (1988) compared Vietnam combat veterans who met full criteria for DSM-III PTSD and had disturbed dreams with combat veterans who displayed partial criteria for PTSD and did not have disturbed dreams. Both groups were investigated in a sleep laboratory and clearly deviated from normal sleep parameters, including lighter sleep, a diminished amount of REM, and an increase in awakenings during REM. The non-dream-disturbed group suffered from insomnia while the dream-disturbed group had delayed REM onset and more awakenings and arousals during NREM. These results suggested the possibility of a latent form of PTSD in the non-dream-disturbed veterans who had some PTSD symptoms but did not meet all of the cardinal requirements of DSM-III.

Summary

While there is theoretical and phenomenological evidence that the symptoms used by DSM-III to define PTSD do exist, the criteria has been criticized as being too restrictive. Furthermore, it is not clear that these symptoms identify a disorder (e.g., distress and/or impairment). DSM-III may be considering as pathological a process that is natural and adaptive. Psychoanalytical and cognitive theories suggest that after a trauma there is a natural and cyclical oscillation between intrusive recall and repression of emotions/thoughts surrounding the trauma. With or without conscious awareness, the traumatized individual repeatedly doses himself or herself with tolerable levels of traumatic content in an attempt to reappraise or *work through* the event and to integrate and assimilate it into his or her personality. It is only when the process is prolonged, blocked, or interferes with regular functioning to a significant extent that a disorder may be present.

Controversy also surrounds DSM-III's requirement that there must be evidence of all three sets of the symptoms they consider primary – reexperiencing, avoidance/numbness and hyperarousal – according to very restrictive and circumscribed criteria. There is a call to relax these restrictions so that the presence of either reexperiencing or avoiding/numbing phenomena (and defined by more variable criteria) would also warrant a diagnosis of PTSD (e.g., Horowitz, 1976, 1983, 1986a; Laufer et al., 1984, 1985b). Relaxed restrictions and the incorporation of various phenomenologically-observed symptoms as part of the definition, rather than as associated features, would also make DSM-III more compatible with alternative criteria for PTSD. Research that investigates symptomatology following various traumatic stressors suggests that the presentation of symptoms does vary somewhat from event to event and from individual to individual.

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Post-traumatic stress disorders are manifested in specific psychological symptoms that fall roughly into several categories. As an example, Lipkin, Blank, Parson, and Smith (1982) have proposed eight subtypes: (a) classical traumatic neurosis with symptoms such as anxiety, insomnia, depression, irritability, spells of rage, flashbacks or numbing of affect or both, and nightmares; (b) impacted grief, with the appearance of a simple depression; (c) psychosomatic complaints, including tension syndrome of headache or low back pain; (d) violence, paranoia, suspicion, irritability, hostility, and phobia about crowds; (e) addiction to alcohol, drugs, gambling or thrills and risk-taking; (f) intense exacerbation of minor character problems like impulsiveness or sociopathy; (g) suicides and homicides; (h) chronic or intermittent psychosis-like symptoms and severe life impairment.

When researchers and clinicians assume a narrow view of PTSD, as defined by DSM-III, they are apt to misdiagnose the persistent somatization, anxiety, and depression that are reactions to the trauma. This underdiagnoses PTSD and provides a conclusion that victims have integrated the traumatic experience into their psyche. Considering trauma-induced symptoms as indicative of other disorders renders little insight into the phenomenology of PTSD and failure to discern the very important relationship between events and their impact. It implies that the clinical outcome of the disorder (e.g., functional impairment) is its cause. This formulation serves only to place the onus on the patient and leads possibly to the wrong therapeutic intervention (Schottenfeld & Cullen, 1985).

An alternative approach has been proposed by Modlin (1983, 1986), Scrignar (1984), and Thompson (1965). They have suggested that certain neurotic disorders should not be diagnosed as such if careful analysis of the patients' history reveals that symptoms began only after the frightening event. According to Scrignar (1984), misdiagnoses often occur in the chronic stages when clinicians tend toward diagnoses of somatization, generalized anxiety, depression, addiction, or personality disorder.

Validity of DSM-III/III-R Criteria to Diagnose PTSD Following Head Injury

The validity of DSM-III-R criteria to diagnose PTSD in head injured survivors is examined in this research. Therefore, the primary trauma and secondary traumas (e.g., medical techniques, disruption to normal life), and the behavioural and neuropsychological consequences of the head injury are examined in this literature review. An attempt has been made to be comprehensive in

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order to convey the difficulty and complexity of making differential diagnoses between neurologic and "pseudoneurologic" conditions. *Pseudoneurologic* refers to the presentation of symptoms that are suggestive of a possible brain disorder and CNS dysfunction (e.g., headaches, dizziness) but for which no neurological cause can be found. Neuroradiologic techniques, such as CT scans, can locate brain damage but they cannot reveal the functioning of the brain nor can they tell if brain damage causes certain symptoms. The use of evoked potential studies to assess brain damage and symptoms of PTSD are also inconclusive, because evoked potentials can also be affected by non-neurological conditions. This illustrates the difficulty that even the most advanced technology has in locating and assessing brain damage, let alone contributing to the controversy over whether PTSD following head injury is neurogenic or psychogenic.

Traumatic Stressor: The Accident with Attendant Head Injury

Accidents that cause injuries, especially to the head, are a major health problem. It has been estimated that from 175 to 430 people per 100,000 of the population will be involved in trauma leading to head injuries (Kraus, 1987) caused primarily from motor vehicle accidents (i.e. passenger or pedestrian), but also from falls, sports, criminal assault, and industrial accidents. In a study by Kalsbeck, McLaurin, Harris, & Miller (1980) of head injuries resulting in coma, motor vehicle accidents accounted for 70% while falls and other causes accounted for 30%. The highest risk group is that of young adults aged 15-24 with children and the elderly also at risk. Young children and older persons are more likely to have received their injuries from falls or being hit by a car, while adolescents and young adults are more often injured as occupants of motor vehicles. The ratio of male to female rates of head injury is between 2 to 1 and 4 to 1. Of the people who are admitted to hospital and survive their injuries, about 70% have mild injuries with or without any neurological damage and less than 10% have severe brain injury. Studies (cited in Levin, Benton, & Grossman, 1982) estimate that about 80% of severely head-injured patients make a moderate to good recovery with the length of the recovery period directly related to neurological indices. This suggests that as many as 98% of all surviving head injured persons will have made a sufficient mental recovery to be at risk of a psychological stress reaction.

Mattsson (1975) suggested that characteristics of the injury itself, its nature, location, severity, extent, and reversibility, as well as the emotional, social, and occupational significance of the injury to the victim determine the psychological reaction to physical injury. For example, injuries to the head and upper body are generally more threatening than injuries to the lower anatomy.

While fractures and lacerations usually heal, brain damage following a head injury may be irreversible, and because of the great psychic value attached to the head, an injury to it may be more likely to lead to a stress reaction than an orthopaedic injury (Auerbach, Scheffen, Reinhart, & Scholz, 1960; Lipowski, 1975). For example, the majority of the mildly concussed patients in Lidvall et al. (1974) told the researchers that they believed their brain concussion to be a very serious matter. According to Lishman (1978), "The head holds an especially important place in the body image, and is widely regarded as the seat of the soul or of sanity. The lay attitude to 'concussion' is one of unusual alarm, and unconsciousness and confusion are always deeply impressive symptoms" (p. 210).

Headache, dizziness, hypersensitivity to sensory phenomena, cognitive impairment, and other symptoms that may have originally been caused by brain trauma may be sustained by psychic mechanisms and serve as a nucleus for a traumatic reaction. This may lead the patient with even a minor concussion to make an appraisal that he or she is suffering from physical after-effects of the accident, including brain damage (Scrignar, 1984; Titchener, 1985). Further traumatization may also occur from a secondary appraisal that damage to the brain can only become worse. According to Auerbach (1987), many mildly to moderately injured persons make more of their prognosis than was intended by the physician. They begin to fulfill the expectations of a brain-damaged patient, believing that they will always be disabled. Of course, head injuries that initially seem to be minor sometimes develop life-threatening complications. Cases of patients who walked and talked after the accident but lapsed into coma within 24 hours have been presented by Dacey, Alves, Rimel, Winn, and Jane (1986) and by Jennett (1978). Some of the patients even died from secondary damage, such as raised intracranial pressure, intracranial hematoma, and hypoxic/ischemic brain damage. Not all accidents need be spectacular for significant damage to occur. One study by Kalsbeek et al. (1980) reported that falls and industrial accidents are more likely to produce an intracranial hematoma than are motor vehicle accidents.

Situational factors prevailing throughout the course of events, such as the need for medical treatment as well as the procedures themselves, the reactions of others, and the need to trust rescuers and medical staff are stressful. Even the person who had a minor injury, but needs medical intervention, has had his normal everyday routine interrupted. Other appraisal factors that can adversely affect recovery include the degree of responsibility the patient has or feels for his predicament (e.g., can he blame others or himself), how preventable the accident was, and whether it was a repeat occurrence.

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In summary, the consequences of head trauma increase stress that, combined with reduced cognitive functioning, may produce an increased number of PTSD symptoms (Long, Gouvier, & Cole, 1984). Patients who repeatedly fail to cope with stressors effectively during their recovery can easily develop a belief in their own personal disability leading to unnecessarily prolonged invalidism. Stress sustained from head trauma in combination with inadequate coping ability during the chronic phase of recovery further contribute to psychological complications.

Diffuse and Concussional Injuries. The term "diffuse axonal injury" is usually associated with coma longer than 6 hours that is not due to mass lesions or ischemia. Diffuse brain damage without a mass lesion occurs in almost one-half of severely head-injured patients and is the cause of 35% of all deaths from head injuries. The damage is caused by the shaking of the brain within the skull leading to inertial or acceleration effects (Gennarelli, 1987). Strich (1969) attributed the primary mechanism of diffuse brain damage to mechanical shearing/stretching of nerve fibres immediately on impact. This may produce asymmetric damage to the cerebral hemispheres and fibre tracts. Several studies (reviewed in Cooper, 1987 and Levin et al., 1981) have shown that shear strain (pulling apart of axons and disruption of cell bodies) produced by rotational acceleration is greater in the corpus callosum and those parts of the brain with structural irregularity, such as areas of bony protrusion and rough surfaces (e.g., the temporal and frontal lobes). Depending on the mechanics of the injury, bundles of nerve fibres running in one direction may be damaged, whereas those running in another direction may be spared. It is further contended that mechanically induced strain occurs at the surface of the brain in mild injuries and extends inward to affect the diencephalic core in the most severe injuries. This demonstrates the complexity of trying to relate behavioural, emotional, and cognitive consequences of head injury to brain damage for differentiation between neurological and psychological causes of the consequences.

Although there have been some challenges to Strich's axonal damage theory, results from two sources support her views. Microscopic damage following even minor head injury has been demonstrated in histological studies of people who died soon after injury from non-neurological complications (Oppenheimer, 1968, Peerless & Rewcastle, 1967). Gennarelli and his associates (Adams, Graham, & Gennarelli, 1983; Gennarelli et al., 1982) have produced in non-human primates prolonged traumatic coma without any intracranial mass lesion, using experimental devices to replicate human accidents. Quantitative grading of the axonal injury correlated significantly with length of coma.

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At the lowest end of the continuum of diffuse injury is the concept of concussion. The term *concussion* refers to a temporary and reversible disturbance or deficiency of neurological function for which there is no known isolable damage to the brain. There may also be some post-traumatic and/or retrograde amnesia. Loss of consciousness, if any, is 6 hours or less. Concussive injuries are the most frequent of all head injuries. The mildest form of head injury is that in which there is confusion and disorientation but without amnesia or loss of consciousness. The confusion usually lasts only momentarily, is completely reversible, and is associated with no other sequelae. The injury is not sufficient to disrupt the influence of the brainstem-activating system on the cerebral hemispheres. Systemic changes or neurological signs, if they occur, do not last long.

Assessment of Brain Damage

Motor and neuropsychological deficits following head injury may arise from primary brain damage, including contusions, hemorrhages, lesions, lacerations, and diffuse axonal injury; or from secondary damage (i.e., not present clinically for some period of time), including extradural or intradural hematomas, localized or generalized brain swelling, raised intracranial pressure, and hypoxic brain damage. Computerized tomography scanning (CT-scans), the primary diagnostic procedure used to characterize brain damage, can reveal contusions, swelling, hematomas, severe bleeding into the cerebrospinal fluid spaces, and other injuries to the soft tissue but cannot evaluate brain function. Plain skull films and cerebral angiography can also be used to identify linear and depressed fractures, vascular injuries, or other lesions not shown on CT-scans. Efforts to relate the location of brain injury to neurological signs, including prolonged coma, and neuropsychological deficits are complicated by diffuse damage and attendant microscopic damage to nerve fibres that cannot be disclosed by neuroradiological imaging.

Impaired consciousness. The depth and duration of impaired consciousness has long been viewed as one of the most useful indicators of the extent of brain damage. Unconsciousness can be produced either by dysfunction of the diencephalon and brainstem or by dysfunction of both cerebral hemispheres. There is some suggestion from evoked potential studies that prolonged coma is most dependent on hemispheric dysfunction (Greenberg, Becker, Miller & Mayer, 1977). To characterize the continuum of consciousness and coma, Teasdale and Jennett (1974) developed the Glasgow Coma Scale (GCS) which evaluates three components of wakefulness independently of each other: eye opening, motor response, and verbal response.

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Bricolo, Turazzi, and Feriotti (1980) found that restoration of spontaneous or stimulated eye opening occurs in the majority of severely injured patients from one to four weeks after injury (i.e., 75% of the patients by one month). The return of the capacity to obey simple commands, an accomplishment considered to represent return to consciousness, came for most patients within three months. Speech was reestablished only over the next three to six months. Restoration of the sleep-wake cycle was observed in most patients by six months.

Post-traumatic amnesia. Head-injured patients can have protracted periods of disorientation and confusion despite very brief loss of consciousness. In these cases, post-traumatic amnesia is frequently used to assess the severity of the injury. In some patients the change from complete amnesia to complete clarity is rapid so that the duration of amnesia can be calculated with certainty. However, the return of continuous memory for ongoing events does not always coincide with a return to normal orientation. Many patients have periods of increasing clarity alternating with periods of confusion, the end-point of which is not always clear (Rutherford, Merrett, & McDonald, 1977). This makes it difficult to measure and rank the severity of certain head injuries such as mild or concussive injuries. As well, there is often uncertainty of the exact time of the accident and difficulty in relating the patient's return of memory to known events. Wrightson and Gronwall (1979) found it was only possible to categorize amnesia of short duration within quite wide limits. Sisler and Penner (1975) found that the estimated duration of post-traumatic amnesia varied on repeated assessment. Also, retrospective measurements of post-traumatic amnesia do not necessarily agree with prospective serial assessments of amnesia (Gronwall & Wrightson, 1980). Symptoms and duration of post-traumatic syndromes have been found to be related to amnesia by some (Guthkelch, 1979; Minderhoud, Boelens, Huizenga, & Saan, 1980) but not by others (Russell & Smith, 1961; Rutherford et al., 1977; Wrightson & Gronwall, 1979).

Computer techniques. Electroencephalograms (EEG) and recently developed computer techniques, including evoked potentials, provide information concerning the functional integrity of the brain. Serial EEG recordings taken during early recovery from severe head injury show slowing of spontaneous electrical activity; there appears a relatively uniform rhythm throughout the brain, rather than a normal spatial distribution of rhythms of different frequencies. Various cortical and subcortical neurogenerator sites are affected differentially by head injury, causing variable influence on arousal, awareness or cognition. Evoked potential technology has been used to

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assess the functional integrity of the brain. Sensory-evoked potentials are sensitive to brain damage because such damage causes alterations in the neuroelectrical responses of specific receptor organs, some ascending sensory pathways, specific sensory cortices, and non-specific cortical areas (Rappaport, Hall, Hopkins, & Belleza, 1981).

Any changes or delays in normal wave patterns known to be generated at specific neuroanatomical sites might suggest brain pathology, including the secondary effects of brain injury, like abnormalities in cerebral blood flow, hypoxemia, and extremes in intracranial pressure. Extreme caution must be taken in interpretation of evoked responses because normal or non-neurologically injured subjects are also known to produce abnormal evoked potentials. For example, Rappaport et al. (1981) found mild to moderate abnormalities, representing presumed neuroanatomical differences, in up to 22% of normal subjects. Differences in brainstem auditory responses have also been shown to occur between males and females and among different age groups (Rowe, 1978). It is known that high levels of blood alcohol concentrations, selective attention, and female menstrual cycles (basal body temperature changes) affect various facets of the responses (Picton, Stapells, & Campbell, 1981).

Greenberg, Mayer, Becker, and Miller (1977) obtained repeated visual, auditory, and somatosensory evoked potentials during the acute and chronic recovery period from 51 patients with severe head injury. Almost half of the recordings showed little or no differences between the patients and 20 uninjured control subjects. Of the patients with minimal evoked potential impairment at the initial assessment, 80% became responsive within 30 days of injury. The initial somatosensory potentials appeared to be the most powerful of all the modalities at prognosticating final outcome. Conversely, initial brainstem auditory potentials failed to relate to either prolonged coma or motor response. Those recorded after 6 months, however, did correlate significantly with outcome. Several studies have since provided confirmation or support for the Greenberg et al. results (Karnaze, Marshall, McCarthy, Klauber & Bickford, 1982; Lindsay, Carlin, Kennedy, Fry, McInnes & Teasdale, 1981; Newlon, Greenberg, Hall, Engs, & Becker, 1982; Rappaport et al., 1981). In general, they suggest that while cortical evoked potentials relate to initial coma scores and final outcome, it is not clear that assessment of the quality of the initial brainstem evoked response provides prognostic information. The most accurate prognoses are obtained from responses that are either normal/mildly abnormal or severely abnormal. Patients who have moderate initial abnormalities are relatively labile in prognosis and subsequent evoked potentials (Newlon et al. 1982).

Neuropsychological examination. Neuropsychological test batteries have become important tools in the analysis of the cognitive impairment of the brain-damaged person and have proven to be exceedingly sensitive to the assessment and localization of brain damage from head trauma or neuropathological processes.

Filskov and Goldstein (1974) summarized results from studies that assessed different medical/neuropsychological techniques for their ability (a) to identify cerebral impairment, (b) to localize the damage to the left or right hemisphere, and (c) to attribute impairment to a specific neuropathological process. The neuropsychological battery ranked at the top of all techniques, including brain scan, blood flow, EEG, angiogram, pneumoencephalogram, and X-ray: identifying all cases of cerebral impairment ($N = 89$), localizing lesions in 89% ($N = 84$), and identifying a neuropathological process in 85% of the cases ($N = 78$). In contrast, brain scans identify the presence of approximately 80% of all brain tumours and 50-60% of all vascular problems at optimal times; and EEG's identify the presence of brain damage approximately 70% of the time, and correctly localize lesions approximately 35% of the time.

Summary. Brain damage following head injury may arise from the primary effects of mass lesions or diffuse axonal strain or from secondary effects. Brain damage may be quantified and categorized by means of neurological signs, including impairment of consciousness, presence of neuroanatomical reflexes, amnesia, by neuroradiologic and neuroelectrophysiologic techniques, and by neuropsychological assessment. Even the most advanced technology cannot provide definite answers on what if any brain damage has occurred following a head injury, especially a mild injury, nor what effect it will have on arousal, awareness, cognition, and subjective complaints of distress.

Post-Concussional Syndrome

Post-concussional syndrome (PCS) is a specific cluster of symptoms that can appear during recovery from traumatic head injury and persist long after recovery is thought to be complete. The syndrome is generally recognized to include headache, dizziness, vertigo, irritability, restlessness, depression, insomnia, fatigue, anxiety, impaired memory and concentration, and hypersensitivity to sensory stimuli (e.g., Auerbach et al., 1960; Binder, 1986; Dikmen, McLean, & Temkin, 1986; Jonsson, Lidvall, & Malhammar, 1967; Kay, Kerr, & Lassman,

1971; Kelly, 1975, 1981; Keshavan, Channabasavanna, & Reddy, 1981; Kosteljanetz, Jensen, Norgard, Lunde, Jensen, & Johnsen, 1981; Lidvall et al., 1974; Lishman, 1968, 1978; McLean, Temkin, Dikmen, & Wyler, 1983; Merksey & Woodforde, 1972, Minderhond et al., 1980; Rutherford, Merrett, & McDonald, 1977, 1979). The frequencies with which each of these symptoms occur in various samples of head-injured patients and control subjects are displayed in Table 8. As the table shows, each of these symptoms occurs quite frequently in most head-injured samples, although there are exceptions (e.g., Oddy, Humphrey, & Uttley, 1978b). Where a control group has been included, these symptoms usually occur significantly more often among the head-injured subjects (e.g., McMillan & Glucksman, 1987). The following discussion reports on these studies in more detail.

The course of PCS over time. Lidvall et al. (1974) and Rutherford et al. (1977, 1979) plotted the course of PCS symptom development over the first year following a minor head injury, including minor concussion. Of the 83 patients in Lidvall et al., 73% reported one or more symptoms on the second day. By the end of the first week, this number declined to less than 50% and by 90 days, only 24% of patients complained of symptoms. Of 145 patients in Rutherford et al. (1977, 1979), 35% were reported to have two or more symptoms at six weeks. At one year, approximately the same number of patients still complained of symptoms. Using 5 symptoms as a lower limit, approximately 12% of the patients in both samples met criteria for PCS. This percentage did not decline over the observation period, instead, more cases of PCS were identified at the last assessment than at the first one. The number of symptoms reported at six weeks in Rutherford et al. followed a U-shaped distribution: there was a decline in number of patients reporting from one to four symptoms as the number of symptoms increased, but at five symptoms the number of patients increased (i.e., 9.7% endorsed 3 symptoms, 2.8% endorsed 4 symptoms, 6.9% endorsed 5 symptoms and 3.4% endorsed 6 symptoms).

Lidvall et al. (1974) compared patients who developed PCS with patients who did not develop PCS. No differences were found on a neurological examination that included assessment of post-traumatic amnesia (none exceeded 90 min.), EEG recordings, skull fractures, and other neurological signs and symptoms, however, there was some suggestion that late-developing dizziness may have been related to traumatic vestibular dysfunction.

Table 8.
Frequency of Post-Concussional Syndrome Symptoms
Reported by Patients

	Headaches	Anxiety	Insomnia	Dizziness	Irritability	Fatigue	Imp. Concentration	Memory Difficulty	Depression	Sensitivity to Light	Sensitivity to Sound	Characteristics of Subject Group
Auerbach, Schefflen, Reinhart, & Scholz, 1960 (N=50)	52%	20%	36%	40%	36%	28%	22%	—	—	—	—	varying severity, 6 month PT
Dikman, McLean, & Temkin, 1986 (N=20)	52% 37%	50% 40%	42%* 6%	42% 12%	68% 43%	68% 41%	42% 22%	53%* 6%	—	32% 27%	54%* 10%	minor HI, 1 month PT non-injured controls
Kay, Kerr, & Lassman, 1971 (N=94)	47% 42% 82% 64%	11% 11% 33% 30%	— — — —	15% 26% 47% 49%	12% 20% 22% 34%	4% 5% 19% 16%	3% 16% 15% 41%	— — — —	14% 11% 39% 38%	— — — —	— — — —	concussed, DISCH brain damaged, DISCH concussed, 3-6 month PT brain damaged, PT
Keshavan, Channabasavanna, & Reddy, 1981 (N=60)	78% 47%	58% 28%	70% 37%	47% 30%	30% 17%	47% 37%	8% 8%	10% 8%	— —	— —	45% 30%	varying severity, 6 week PT varying severity, 13 week PT
McKinlay, Brooks, Bond, Martinage, & Marshall, 1981	54% 46% 53%	57% 66% 58%	— — —	— — —	63% 69% 71%	82% 69% 69%	— — —	73% 59% 69%	57% 52% 57%	— — —	— — —	severe, 3 mo. PT, reported by relatives severe, 6 mo. PT, reported by relatives severe, 12 mo. PT, reported by relatives
McLean, Temkin, Dikmen, & Wylie, 1983, (N=20)	65%* 35% 23%	35% 35% 31%	32% 30% 12%	45%* 35% 14%	30% 35% 21%	70%* 65%* 23%	40% 45%* 14%	35%* 40% 6%	— — —	15% 25% 15%	25% 30% 15%	concussed, 3 days concussed, 1 month non-injured controls
McMillan & Glucksman, 1987	71%* 10%	— —	— —	46%* 5%	64%* 16%	75%* 25%	— —	— —	— —	33%* 0%	38%* 0%	28 concussed, >4 years PT 20 orthopaedic injured, >4 yr PT
Mertsey & Woodforde 1972, (N=27)	90% 94%	50% 53%	— —	40% 59%	— —	0% 53%	— —	20% 59%	70% 71%	— —	— —	minor HI, no compensation minor HI, compensation paid
Minderhuid, Boelens, Huizenga, & Saan, 1980 (N=725)	30%* 18% 19% 10%	— — — —	— — — —	22%* 12% 13% 8%	22%* 12% 17% 9%	28%* 15% 21% 11%	19%* 9% 14% 7%	17%* 6% 13% 4%	— — — —	— — — —	— — — —	concussed, 4 week PT non-concussed, 4 week PT concussed, 6 month PT non-concussed, 6 month PT
Oddy, Humphrey, & Uttley, 1978b	10%	10%	10%	10%	17%	16%	14%	18%	10%	10%	10%	48 moderate-severe, 6 month PT
Rutherford, Merrett, & McDonald, 1977, 1979 (N=145)	25% 8%	19% 4%	15% 2%	15% 5%	9% 5%	9% 2%	8% 3%	8% 4%	6% 2%	— —	— —	concussed, 6 week PT concussed, 1 year PT

Note. PT = postinjury
DISCH = at time of hospital discharge
HI = head injured
* symptom frequency reported by patient group is significantly different, at $p < .05$, from that reported by the control group in the study.

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Psychometric testing at one month follow-up revealed that patients most severely afflicted with PCS had significantly lower performance on some tests of visual perception and memory than did those with few or no symptoms. There were no other discernible differences.

Different PCS symptoms seem to have different courses. One group of researchers (Dikmen et al., 1986; McLean et al., 1983) compared small samples ($N = 20$) of mildly concussed patients with control subjects. Soon after injury, the patient group had a significantly higher occurrence of headaches, dizziness, fatigue, and memory difficulties than the control group. By one month, the head-injured group complained significantly more often of fatigue, impaired concentration, insomnia, sensitivity to light, and memory difficulties; the control subjects also endorsed symptoms with some regularity. The PCS symptom that seemed to most clearly and consistently separate injured from non-injured subjects at both times was that of memory difficulties. Kay et al. (1971) compared 94 concussed patients with 61 more-severely head-injured patients who had evidence of residual brain damage. There was little difference between the two groups on incidence and frequency of PCS symptoms at discharge: Both groups complained most of headaches. At a three-to-six month follow-up, headaches were most frequently endorsed by the mildly injured group while the more severely injured group complained most of impaired concentration.

Latent class analysis of Lidvall et al. (1974) results revealed three symptom profiles. Profile 1 (11% of the patients) contained the most severe cases of PCS with patients reporting several symptoms at each assessment; most reported a gradually increasing number of symptoms during the observation period. Profile 2 (12% of the patients) was characterized by acute reports of headache, dizziness, and chronic fatigue during the first 90 days only. Profile 3 (77%) consisted of patients who had few or no symptoms, except perhaps, acute headaches and dizziness. Some of the symptoms, especially anxiety and fatigue, were reported to have also been present before the accident; however, they were reported in retrospect to have occurred only about half as frequently before as after the trauma. Headache was least often reported to have occurred before the accident.

Cross-cultural and historical comparisons. To compare across cultures, headache was also reported to have occurred frequently in patients who had received head injuries of various severity from a study in India by Keshavan et al. (1981). Also occurring frequently within 13 weeks of injury

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were anxiety, insomnia, dizziness, fatigue and sensitivity to sound. These symptoms were reported gradually less frequently over the period of assessment. Using a cut-off of three out of five symptoms as diagnostic criteria, it was estimated that 43% of these patients had PCS. In a historical comparison, headache and anxiety were also endorsed most frequently of all symptoms by head-injured patients in a study by Auerbach et al. (1960). Using a rating scale of "symptomatology-incapacity", it was observed that (a) 24% of the patients recovered promptly without being incapacitated by PCS symptoms, (b) 18% were reported to be mildly to moderately incapacitated, (c) 18% were moderately incapacitated or more, (d) 34% suffered moderately severe symptoms for an "appreciable length of time", and (e) 6% were incapacitated with severe symptoms.

Comparison between subjective and objective reports of symptoms. To assess differences between subjective symptom reporting and a more objective assessment, Oddy, Humphrey, and Uttley (1978b) quizzed 48 moderate to severely head-injured patients together with their closest relatives at six months post-injury. Reports (of symptoms experienced by the patient) from the patient and closest relative were remarkably consistent. The symptoms most frequently reported by head-injured patients were also the symptoms that their relatives noticed most about them. Poor memory, loss of temper, and fatigue were the predominate symptoms. While 23% of the patients were found to be symptom-free at six months, as many as 35% experienced 6 or more symptoms. The number of reported symptoms showed a significant but moderate relationship to length of post-traumatic amnesia ($r = 0.30, p < 0.02$) and to time before return to work ($r = 0.27, p < .04$). While there was a slight quantitative difference in symptom reporting between those least severely and those most severely injured, there was no qualitative difference. Symptom reporting did not relate to sex, social class, or pursuit of compensation.

Secondary gain and symptom pattern. To address the issue of secondary gain, Merskey and Woodforde (1972) compared PCS patients who had not sought compensation with PCS patients to whom compensation had already been paid. While both groups reported headaches to be most common (90%, 94%), followed by depression (70%, 71%), and anxiety (50%, 53%), those patients in receipt of compensation had significantly greater reporting of fatigue and memory difficulties. There was a trend for reports of dizziness to occur more frequently in patients who had not sought compensation.

The frequency of PCS in children with head injuries. Rutter, Chadwick, Shaffer, and Brown (1981) suggested that PCS is seen infrequently in children who have received head injuries. They reviewed several studies that indicate that head injury leads to behavioural disturbance, including symptoms of headache, eating problems, hyperactivity, impaired attention, fatigue, learning difficulties, poor concentration, and irritability (Black, Jeffries, Blumer, Wellmer, & Walker, 1969; Klonoff, Low, & Clark, 1977). In comparison to children with milder head injuries or orthopaedic injuries, Rutter and associates (Brown, Chadwick, Shaffer, Rutter, & Traub, 1981) determined that psychiatric referrals for problems were much more frequent in children with severe head injuries, especially children with either transient or persistent intellectual impairment. Problems that could be attributed to brain injury included socially inappropriate behaviour, over-talkativeness, enuresis, slowness, over-eating, and stuttering. Problems that could not be attributed to brain injury, because they occurred in children both before and after head injury and in children with orthopaedic injuries, were restlessness, gross motor activity, fidgetiness, hyperactivity, difficulties with relationships, tantrums, disobedience, stealing, truancy, and under-eating. Post-concussional symptoms, such as headache, aches and pains, relationship problems, eating problems, and ruminations/compulsions were more likely not attributable to brain injury. Sleeping problems and fatigue may have been caused by the brain injury, however.

Possible Neurogenic Explanations for Post-Concussional Syndrome

One of the continuing puzzles of head injury is the pathological basis for the phenomenon of concussion, in general, and specifically of Post-Concussional Syndrome. Although it has often been considered that concussion involves no pathological damage to the brain, this assumption is not universally accepted. Some researchers, such as Trimble (1981), assert that there is conclusive evidence that changes in brain function occur even after mild head injury, regardless of whether there is loss of consciousness or other neurological signs; and that this change is frequently accompanied by neuronal damage and cell loss in certain areas of the brain. Support for this contention comes from work reported earlier in this review on experimental concussion in animals (e.g., Adams et al., 1983; Gennarelli, 1987; Gennarelli et al., 1982) and on histological analysis of the brains of mildly head-injured persons who died from other causes (Oppenheimer, 1968). There have also been studies that show mild alterations to brain functioning following mild head injury as the following discussion will indicate. These changes have been detected by CT-scans,

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electroencephalograms, evoked potentials, cerebral blood flow investigations, electronystagmograms, and ophthalmological and otological examination.

CT-Scans and EEG Recordings. Abnormal CT scans have been obtained from mildly injured patients who were alert and neurologically normal (Dacey et al., 1987; French & Dublin, 1977) and on patients experiencing PCS (Kosteljanetz et al., 1981). In the latter study 13 of 19 men, who reported at least three PCS symptoms occurring for at least six months after mild injuries, appeared to have a moderate degree of cerebral atrophy. Cognitive impairment, endocrinological abnormalities (i.e., increased FSH), and sexual dysfunction were also noted frequently in this group of men. Electroencephalogram readings were mildly abnormal in seven of the patients and there was suggestion of a possible association between temporal lobe abnormality and sexual dysfunction in a few patients. These results are quite astonishing and not indicative of other studies of similar patients. There was little explanation for the results other than three of the men developed secondary symptoms of brain damage. Although the subjects were screened for certain pretraumatic disorders there was no control group. Perhaps there was some other underlying pretraumatic condition that could have explained these unusual results, other than brain damage.

Abnormal EEGs have also been detected in cases of mild concussion and whiplash injuries, despite the absence of other neurological signs (Levin & Grossman, 1978; MacFlynn, Montgomery, Fenton, & Rutherford, 1984). Most EEG recordings are normal, however, following mild and even severe injuries; and patients with EEG abnormalities do not necessarily develop symptoms of PCS. Caution is necessary when interpreting EEG abnormalities because there is no conclusive evidence that they have been caused by the head injury. For example, Dencker (1960) found focal EEG abnormalities that were identical in each twin of three sets of monozygotic twins, of whom one person in each set had received a closed head injury about 10 years previously. Without data from the matching twin, such EEG abnormalities might have been ascribed to the head injury. Similarly, in seven sets of dizygotic twins EEG abnormalities occurred just as often among the non-injured group as among the injured group.

Abnormalities in critical and brainstem evoked potentials have been reported in some mildly head injured patients (Montgomery, Fenton, & McClelland, 1984; Rowe & Carlson, 1980) and in some patients displaying either PCS (Noseworthy, Miller, Murray, & Regan, 1981; Rizzo, Piereeli, Pozzessere, Floris & Morocutti, 1983) or isolated symptoms of PCS such as vertigo or dizziness

(Rowe, 1977; Rowe & Carlson, 1980). As previously mentioned, recordings can also be affected by non-neurological phenomena such as age or changes in basal body temperature, such as occur during menstrual cycles. Cortical evoked potentials have also been used to record anomalies of brain functioning in depressed and psychiatric populations (e.g., Levit, Sutton, & Zubin, 1973; Shagass, Roemer, Straumanis, & Amadeo, 1980). According to Shubert (1982), evoked potential determination is promising in this area but its utility has not been proven. Other scientists (e.g., Jones, 1982; Williams, 1982) have also expressed the need for caution and they criticize the methodology used in some evoked potential studies. These criticisms include: not ruling out neurotic influences and exceeding the reliability limits of evoked potentials.

Neurological Signs. Subtle cerebral dysfunction has also been implicated in the pathogenesis of PCS. Taylor and Bell (1966) investigated cerebral circulation in 70 concussed patients who had varying degrees of injury and duration of unconsciousness but few of whom had persisting neurological deficits. The time of assessment varied from 1 week to 3 years after injury but was, on average, 4 to 8 weeks post-injury. Most of the patients also had some or all of the symptoms generally recognized as defining PCS. Compared to control subjects, the patients displayed a reduction in the volume and a delay in the flow of cerebral blood that were not accounted for by cardiac output. Although no causal relationship could be established between PCS and increased cerebral circulation time they were related. The authors suggested that while it is common for patients to have normal cerebral blood flow and no PCS symptoms 12 to 24 hours following concussion, both symptoms and increased cerebral circulation may develop a short time later. Taylor and Bell (1966) also noted that both conditions remained for weeks or months in some patients; then disappeared within a short time of each other.

Several studies mentioned in the previous section on PCS (e.g., Jonsson et al., 1967) reported that PCS patients are less able to tolerate high levels of sound and light, compared with what neurotic or healthy people can tolerate. Waddell and Gronwall (1984) investigated nine mildly injured patients who, compared with controls, obtained results on objective measures that suggested they were moderately hypersensitive to light and mildly hypersensitive to sound at approximately 12 days after injury. Objective evidence of increased sensory sensitivity was not related to subjective reports, however. This led the authors to suggest there was a possible physiological basis for the sensory intolerance. Abnormalities on tests of vestibular functioning that

have been reported among patients experiencing PCS symptoms have also led to speculation that there is a physiological basis for dizziness, a symptom of PCS (Houdart et al. 1966; Toglia, 1976)

Summary. Studies suggest that the entire phenomena of concussion is based on brain dysfunction, rather than observable pathological lesions. According to Gennarelli (1987), concussion may be viewed on a continuum of physiological neurological dysfunction, without substantial underlying anatomical disruption. Classical cerebral concussion often occurs in conjunction with other types of brain injury. More complex are injuries where focal lesions occur together with diffuse injury. This interaction may lead to a completely different set of neurological deficiencies and psychological dysfunction than occur with either concussion or focal lesions alone. Speculation on neurogenic causes of PCS include neuronal damage and cell loss, and brain dysfunction. Evidence of such changes in the brain come from histological analysis of brain tissue of mildly concussed patients who died from other causes and experimental animals. Results from some studies also indicate changes on neuroradiological assessment, EEG and evoked potential recording, and cerebral blood flow following even mild injuries. Although research has detected changes in neurological functioning in association with PCS, results are correlational and not causal. Even hard evidence of axonal damage does not preclude a psychological reaction to the traumatic circumstances.

Possible Psychogenic Explanation for Post-Concussional Syndrome

Support for the belief that PCS is caused, or at least propagated, by primarily psychological factors comes from several sources: (a) the failure to find an association between PCS and extent or location of head wounds, (b) the presence of psychosocial predisposing factors to PCS, (c) incidence rates of PCS that are independent of severity, (d) evidence of pretraumatic neuroticism, (e) treatment and iatrogenic influences, (f) the issue of compensation, and (g) the delayed appearance of symptoms (e.g., after resumption of work).

While some disabilities relate closely to brain damage there is a lack of association between PCS and brain damage. Attempts have been made to relate the location of brain damage to different neuropsychological and psychiatric disabilities. For example, frontal lobe damage is reported to give rise to symptoms of euphoria, facetiousness, irritability, apathy, defects of attention, inability to plan ahead, and changes of character, including heightened and inappropriate

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sexual behaviour, and/or criminality. Wounds to the lateral convex surfaces of the brain produce mainly intellectual and motor changes. Patients with left parieto-temporal lesions may show significant impairment on tests of general intelligence, both verbal and non-verbal. Right hemisphere wounds raise the possibility of a marked visuospatial impairment. Left unilateral wounds are associated with more psychiatric disturbance than are right unilateral wounds, while bilateral wounds appear to cause dementia. Temporal lobe injuries have been associated with atypical psychoses. Injury to the basal area of the brain have been reported to produce marked sluggishness, apathy, irritability, mood changes, and disturbance of appetite, thirst and sleep. Parietal, occipital and cerebellar lesions do not seem to be implicated in gross psychiatric disturbance (Lishman, 1978). It has not been possible to isolate an area of the brain to which brain damage to it causes post-concussional syndrome.

The extent to which disability or impairment is dependent upon brain damage is difficult to assess, primarily due to the inability to accurately determine the severity, extent, and location of the damage. To address this, Lishman (1968) obtained detailed information on the extent and location of known brain damage in 670 WWII combatants who had sustained penetrating injuries. He acknowledged that there may have been diffuse damage superimposed over the localized damage; but presented evidence from other studies that suggested diffuse damage is much less prevalent after penetrating injuries (when the head is static) than in closed head injuries from falls and traffic accidents (when the head is moving). As well, post-traumatic amnesia does not correlate as highly with severity of damage from penetrating wounds as it does in the case of closed head injuries. Of patients in Lishman's study with evidence of mental disability, (a) 81% had some form of intellectual disorder, mostly impaired memory, attention, and concentration, (b) 78% had affective disorders, most notably irritability, (c) 28% had behavioural disorders, and (d) 49% had somatic complaints but without a demonstrable physical basis. Many people suffered from more than one disorder: 22% displayed frontal lobe syndrome and 70% complained of post-traumatic syndrome.

As Lishman expected, disability was shown to correlate significantly with both depth of penetration and total amount of brain tissue destroyed, when intellectual impairment, rank, age, and physical integrity were controlled for, but the correlation was rather small ($r = .25$). The greater part of the variance was left unaccounted for. Other medical indices, including duration of amnesia and epilepsy also made a minimal contribution. Most closely related to the severity of brain damage were behavioural disorders, frontal lobe syndrome, and intellectual disorders, except for difficulty in

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concentrating. Affective disorders and somatization showed no such association with extent of damage, however, affective disorders, behavioural disorders, and somatic complaints were most frequent after right hemisphere damage and frontal lobe damage. Intellectual disorders, as a group, occurred more commonly after damage to the left parietal and temporal lobes. The symptoms generally recognized as comprising the post-traumatic syndromes did not demonstrate any association with either extent or location of brain damage.

Levin and Grossman (1978) compared patients with mild, moderate, or severe closed head injuries on behavioural sequelae. Mildly injured patients generally provided no evidence of behavioural disturbance, other than somatic concern and anxiety. Severely injured patients had significantly higher scores on emotional withdrawal, conceptual disorganization, motor retardation, unusual thought content, blunted affect, excitement, and disorientation. Moderately injured patients, in general, followed the pattern of the severely injured but were less disturbed. The moderately injured, who did not have the unusual thought content shown by the severely injured, were much less cooperative than the other patients. Investigation of the relationship between intracerebral location of injury and behavioural sequelae failed to disclose any significant findings, although the number of patients who could be subdivided according to any specific location of brain damage was quite small. There was a sufficient number of midbrain injuries to make a comparison with hemispheric injuries: There was less anxiety and depression in the mesencephalic patients, but a trend toward greater thinking disturbance. There were no behavioural differences between those with and those without a nondepressed skull fracture, nor between those with and those without a hematoma. Analysis of the EEG and CT findings revealed that there was significantly greater thinking disturbance, withdrawal or social retardation, and other behavioural sequelae in patients with abnormal EEG tracings and CT scans than in patients who had normal neurological results. Disinhibited or agitated behaviour during the acute stage of recovery was also significantly related to outcome, including excessive anxiety and depression, greater thinking disturbance, and increased psychopathology; but not to physical signs, including hemiparesis, hematoma, mesencephalic brain stem involvement, or focal injury to the frontal-temporal area. In summary, although it is possible to associate many neuropsychological and psychiatric disabilities to known brain damage, PCS shows no such relationship with extent and location of brain damage.

Psychosocial Predisposing Factors to PCS. Certain psychosocial factors have been shown to predispose an individual to develop PCS. Rutherford et al. (1977) found evidence that age, sex, type of accident, place of accident, and assignment of blame affected the incidence of PCS soon after injury. Individuals who blamed their employer or a large organization for their accidents were significantly more likely to report PCS symptoms. There was a trend for persons who were older, female, or had sustained their injury from a fall to experience PCS. This pattern remained somewhat the same at the one year follow-up, although the incidence rate of PCS symptoms was reduced (Rutherford et al., 1979). Conversely, the duration of retrograde or post-traumatic amnesia did not significantly affect the proportion of patients with symptoms, at either 6 weeks or one year, although there was a trend in a positive direction at 6 weeks. Lidvall et al. (1974) also isolated sex and occupation as possible factors contributing to PCS. He determined that homemakers and unskilled workers were significantly overrepresented in the PCS group, while other psychosocial factors were not related to the formation of PCS.

Incidence Rates of PCS That are Independent of Severity. It has been suggested by some (e.g., Miller, 1966; Modlin, 1983, 1986) that the occurrence of PCS is inversely proportional to the severity of the injuries. According to Miller (1961) the more trifling the injury, the longer and more vehement are the complaints of PCS. Explanations for this paradox include: (a) fraudulent gain (Miller, 1961, 1966), (b) the legitimacy of socially condoned invalidism, and (c) length of convalescence provided by severe injuries (Modlin, 1983). Of Miller's patients who had a post-traumatic amnesia of less than 15 minutes, 47% were determined to have "gross unequivocal psychoneurotic complaints", while only 6% of patients with amnesia over 72 hours had such complaints. While some studies have suggested a higher incidence of PCS among mildly injured patients (e.g., Ruesch & Bowman, 1945), there is also evidence that frequency and severity of PCS symptoms is unrelated to severity of head injury and that it may actually increase with severity, especially if observation is made during the latter recovery period (Adler, 1943; Auerbach et al., 1960; Bond, 1975; Guthkelch, 1979; Kay et al., 1971; Keshavan et al., 1981; Lishman, 1968; McKinlay, Brooks, & Bond, 1983; McLean, Dikmen, Temkin, Wyler, & Gale, 1984; McLean et al., 1983; Minderhoud et al., 1980; Oddy et al., 1978). In an historical comparison, Adler (1943) found only negligible differences in symptom reporting between those with mild head injuries and those with more serious injuries (measured by duration of retrograde amnesia) and between those with

and those without additional complicating injuries. More recently, Kelly (1981) presented figures that almost 50% of his severely head injured patients developed PCS.

The severely-injured person may derive some protection against developing PCS during the early stages of recovery because of medical and social support, or because he/she has not yet tried to resume normal activities (Long et al., 1984). Post-concussional symptoms may also be overlooked in the early stages because of the severity of other deficits (Adler, 1943; Long & Novack, 1986). Levin, Grossman, Rose, and Teasdale (1979) reported that PCS symptoms are common in severely head-injured patients (coma score of 8 or less) six months to three years after the accident. Of four clusters of post-injury behavioural disturbances (i.e., thinking disturbance, hostile-suspiciousness, social withdrawal-retardation, and anxiety-depression) moderately and severely disabled patients were predominantly affected by thinking disturbance and withdrawal-retardation. Within the first six months of injury, these patients characteristically failed to appreciate the severity of their cognitive deficit and either focused on relatively minor residual symptoms or denied any sequelae.

Denial of mental, emotional, and behavioural sequelae by severely head-injured patients during early convalescence (i.e. 3, 6 and 12 months post-injury) was circumvented by McKinlay, Brooks, Bond, Martinage, and Marshall (1981) with interviews of patients' close relatives. The most frequently reported changes in patients, according to relatives, were mental rather than physical and included slowness, tiredness, irritability, poor memory, and emotional changes. These were viewed by the relatives as quite serious. Whereas physical and language disabilities declined in frequency over time, at least half of the emotional symptoms were reported with increasing frequency. Irritability was the most frequently reported symptom at each assessment (over 63% of the cases). Relatives reported that impatience, tension, anxiety, and depression occurred in over 50% of the patients at three months. At 6 and 12 months, impatience, bad temper, tension, anxiety, depression, and personality change were frequently reported. Throughout the course of the study, there was also a direct relationship between the levels of stress reported by the relatives while coping with the injured patient and the emotional and subjective changes in the patient. In contrast, the relationship between severity of the patient's injury (as assessed by post-traumatic amnesia) and stress on the relatives weakened over time. The stress that occurs in the relatives because of the emotional and subjective changes in severely head-injured patients is further documented in several studies, including Brooks (1983), Lezak (1978), Oddy, Humphrey, and

Uttley (1978a), Panting and Merry (1972), Romano (1974), and Rosenbaum and Nazenson (1976). These studies have been summarized by Bond (1983) and Brooks (1984).

Evidence of Pretraumatic Neuroticism. The PCS symptoms that head-injured patients complain about have been equated, in the literature, to those experienced by all traumatized persons regardless of injury (presented in Tables 1, 2, and 5), and by persons with certain neuroses (e.g., somatization, anxiety). They are not the same as symptoms known to have a definite and isolable neurological etiology (Levin & Grossman, 1978; Lishman, 1968). Furthermore, some of the PCS symptoms that develop (e.g., anxiety and depression) are hard to conceptualize as being caused directly by brain damage.

Jonsson et al., (1967) compared a group of PCS patients with a group of neurotic patients and observed no significant differences between the groups on manifest anxiety, obsessive-compulsive reactions, headache, dizziness, and impaired concentration. There was a trend, however, for the neurotic group to score higher than the PCS patients on all those symptoms, except dizziness. Furthermore, the neurotic subjects had significantly higher scores on interpersonal difficulties, neurasthenic symptoms, and memory impairment. A control group of healthy subjects reported fewer symptoms than either of these two groups. Attentional impairment was also examined. On a tone counting task there was no significant difference between PCS patients, psychiatric patients, and healthy controls, however, when distraction was added PCS patients and psychiatric patients performed equally poorly, compared with healthy normal subjects.

Lidvall et al. (1974) found no indication of a higher frequency of pretraumatic neurosis among patients who displayed PCS symptoms at 90 days than among those who either recovered rapidly or never experienced PCS symptoms. Mental strain at the time of the accident was reported significantly more often by the PCS patients, however. Also, patients who developed delayed PCS symptoms reported more frequently that they had (in the acute recovery phase) worried about and feared serious consequences of the accident. Keshavan et al. (1981) attempted to measure pretraumatic neuroticism by asking a close relative to rate the head-injured patient on neurotic symptoms that were evident before the accident. In contrast to Lidvall et al., scores on pretraumatic neurotic symptoms were significantly related to the number of PCS symptoms reported by the patient after the accident. In summary, although there have been suggestions of a higher incidence of premorbid neuroticism among patients with PCS, this has not been verified.

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Furthermore, self-reports of pretraumatic functioning are inevitably distorted by emotional and amnesic factors, and it is not possible to estimate the distortion in order to correct for it.

Issues of Secondary Gain, Treatment, and Delayed Onset of PCS. Also adding to speculation that PCS is of psychological origin is that time of onset and persistence of PCS are both extremely variable, and can be affected by issues of secondary gain and treatment. The development and exacerbation of symptoms weeks or months after mild to moderate head injury, is difficult to explain on a neurological basis. Miller (1968) and Cook (1972) have contended that PCS symptoms persist longer in those patients who claim compensation for their injuries but others have found no such association (Kelly, 1975, 1981; Merskey & Woodforde, 1972; McKinlay et al., 1981; Steadman & Graham, 1970; Taylor, 1967). Besides, post-concussion symptoms also develop and persist in cases not being litigated (Kelly, 1981; Merskey & Woodforde, 1972; Rimel, Giordani, Barth, Boll, & Jane, 1981).

Kelly (1975) compared PCS patients who had received treatment for PCS with those who had not. A satisfactory recovery was made in 83% of the treated patients but in only 14% of the untreated patients. Treatment that consisted of offering information, explanation, and encouragement by medical personnel, as well as advocacy of bed rest was found also by Minderhoud et al. (1980) to markedly reduce the number and frequency of PCS sequelae. According to Long et al. (1984), patients who are forewarned of the relationship between stressors and symptoms and instructed to gradually increase their attempts at recovery are better prepared to prevent further debilitation. Attempts to recover faster than the body is able will result in fatigue and irritability. This puts the patient at greater risk of a stress reaction, including symptoms of headache and dizziness.

Do the Post Traumatic Symptoms Warrant a Label? There are debates on whether the symptoms associated with PCS actually comprise a syndrome. Cook (1972) writes that "there might be some reason to refer to headache, dizziness, irritability and failure of concentration as post-concussional symptoms but there is no justification for the use of the term 'post-concussional syndrome' in which symptoms are of long duration and generally disabling" (p. 29). According to Long and Novack (1986), this debate has been frequent and yet to be resolved. Some researchers have found it difficult to categorize patients as having PCS because most patients develop some, but not all, of the characteristic symptoms. There can be a large scattering of

symptoms among subjects, but with no obvious clustering that would allow division into groups. For example, Auerbach et al. (1960) used headache, cognitive impairment (memory or concentration), and emotional symptoms (anxiety or irritability) as criteria; but this excluded many subjects who had significant symptoms but not that particular constellation. Rutherford et al. (1977) also failed to find a pattern of interrelated symptoms. While a clear relationship between impaired memory and concentration was established, no other symptom cluster emerged. This issue of whether monothetic criteria (i.e., certain key symptoms only) or polythetic criteria (i.e., any subset of characteristic symptoms) is preferable for diagnostic purposes was discussed in an earlier section.

Lewin (1970) also objects to the lumping together of PCS symptoms and labeling them as a syndrome. He believes that symptoms have various and differing explanations and do not always occur together. The close analysis of each presenting symptom as to its probable cause are more likely to lead to appropriate treatment and subsequent relief. For the majority of patients, Lewin believes that neurological causes may be found for acute symptoms such as headache and vertigo. He suggests that the so-called "psychoneurotic" symptoms are part of a natural recovery process and that an appropriate convalescence, together with explanations and reassurances from health professionals, will go a long way to relieve these symptoms. Specific memory and intellectual deficits will respond to special rehabilitation training programs.

Summary

Post-concussional syndrome is a term applied to an individual who, following a traumatic head injury, complains of a constellation of somatic, dysphoric, anxious, and cognitive symptoms for which no neurological pathology can be ascertained. Although there is some evidence of neurological dysfunction, the symptoms seem to be propagated mostly by psychological factors. While the symptoms may appear in an identifiable pattern, there is considerable variation in the number of symptoms and combinations of symptoms reported by different patients. The extent to which these symptoms disrupt the resumption of normal activities also varies. As the name implies, PCS is reputed to most often follow concussive injuries, however research shows that it is as likely to follow more serious diffuse or focal head injuries, as well as injuries to other parts of the body. The six principal etiological factors contributing to post-concussional syndrome are brain injury, brain dysfunction, post-traumatic emotional stress, pretraumatic functioning, iatrogenic inferences, and secondary stressors. Because of the ambiguity about cause, it is preferable to exclude any reference to etiology and to refer to this syndrome as PTSD. For example, the Medical Subject

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Headings of the National Library of Medicine (used by Index Medicus) subsumes the Post-Concussional Syndrome under Post-Traumatic Stress Disorder.

The diagnostic picture that unfolds among survivors of traumatic head injuries according to the neurological literature is slightly different than that suggested by the current psychiatric literature (e.g., in survivors of Vietnam combat) although there is overlap. The emphasis in the neurological literature is not on intrusive recall and avoidance/numbness (so prevalent in the psychiatric literature that has been influenced since 1980 by DSM-III) but on symptoms of fatigue, irritability, impaired cognitive performance, headaches, dizziness, and hypersensitivity to sensory stimuli. These are symptoms that have been observed and generally considered as indicative of PTSD in innumerable studies of survivors of various trauma over the last 200 years (refer to Tables 1, 2, and 5). Most of these symptoms are considered by DSM-III to be either associated features or to warrant a diagnosis of Organic Mental Disorder. Yet, these symptoms cannot be clearly attributed to neurological damage, as shown in this literature review. For example, researchers and clinicians have noted that head-injured patients with these symptoms resemble individuals with either other injuries or neuroses, rather than those known to have neurological lesions.

Psychometric Assessment of Distress and Impairment Secondary to Trauma and Head Injury: Results from the MMPI, WAIS-R, and Halstead-Reitan in Head Injured Trauma Survivors

This research investigates the validity of DSM-III criteria for PTSD in accident survivors who received head injuries. Therefore, it is necessary to explore the use of psychometric measures that assess distress and impairment and provide differential assessment of neurological and non-neurological impairment. These instruments include the MMPI, the WAIS-R, and the Halstead Reitan Battery. The results of studies that have used these test batteries in traumatized survivors and in neurological and non-neurological subjects are presented in this section.

Assessment of Neuropsychological Impairment after Head Injury **Cognitive Functioning**

Research on the neuropsychological consequences of head injury has shown that differences among patients with head injuries of differing severity (for all but the most severely

injured), and in comparison to matched control subjects, are seldom significant on most measures of cognitive function after several years. This is especially so if the patient has made a good recovery. From these studies it can be seen that there is rapid improvement within six months of injury when the amnesic period (PTA) is short or the coma score is 8 or better; verbal skills improve quicker than non-verbal skills. If PTA lasts a long time or the initial score is less than 5, cognitive function may never be restored to normal limits (Alexandre, Colombe, Nertempi, Benedetti, 1983; Bennett-Levy, 1984; Bond, 1975; Chadwick, Rutter, Brown, Shaffer, & Traub, 1981). Several studies have found that residual deficits are also strongly related to acute neurological signs, including hemiparesis, aphasia, oculovestibular functioning, pupil reactivity, and EEG activity; and secondary complications, possibly caused by delayed surgical intervention (Alexandre et al., 1983; Levin et al., 1979). Individuals who sustain injuries to areas of the brain below the cerebral cortex have a much poorer prognosis than those with hemispheric damage (Levin & Grossman, 1978). Bilateral or left hemisphere damage has been shown to be more disruptive to cognitive functioning than right hemisphere lesions (Chadwick et al., 1981; Grafman et al., 1988). Attempts to find associations between focal brain damage and neuropsychological deficits may be somewhat successful in the case of the severely injured or if the data is collected within the first year of injury. The tests most frequently used are the Wechsler Adult Intelligence Scale (WAIS or WAIS-R) and the Halstead-Reitan Battery (summarized in Method). See Table 9 for a comprehensive list of these studies, their methodology, and results.

In general, patients with lesions in the right hemisphere do poorly on the nonverbal subtests including non-verbal memory retention (Alexandre et al., 1983). Individuals with left hemisphere damage, especially in the left temporal area, may have impaired verbal skills. Patients with extensive diffuse or bilateral damage often have impairment in all areas of functioning, or else, very inconsistent test results. This makes differential diagnosis difficult. Other evidence suggests that diffuse lesions produce lower non-verbal scores than verbal scores. A difference of more than 10 points between verbal and performance IQ is considered significant. Mandleberg and Brooks (1975) reported an initial mean difference between those scores of 19 in severely injured patients. Low verbal IQ is very rare and, according to Kolb and Whishaw (1980), its appearance should never be ignored.

Table 9.
Review of Head Injury Studies

Researchers	Severity of Head Injury	Sample Size and ages of subjects at time of injury	Matched or Screened for pre-traumatic variables	Control Group	Time of Assessment Post Trauma	Tests	Results
Alexandre, Colombo, Nertempi, & Benedetti (1983)	mild to severe ¹	100, various ages with 61 subjects under 30 years of age	no	no	recovery from PTA and at 12 and 24 months	WAIS, memory tests	Long-term recovery of cognitive/memory skills was related to location of damage and neurological indices: 80% of hemispheric-injured group, 35% of diencephalic-injured group and 9% of mesencephalic-injured group had an IQ in the normal range with minimal or no deficits at 2 years.
Bennett-Levy (1984)	severe	39, under 35 years of age	yes	32 orthopaedic-injured subjects	2 to 5 years	various memory tests; Speed of Information Processing	Long-PTA (i.e., > 3 weeks) group reported poor memory and were impaired on long-term retention of complex materials or tasks involving time constraints, as well as speed of information processing; short-PTA group reported good memory with no objective evidence of impairment on any memory task, but speed of processing information fell between that of control group and long-PTA group.
Bond (1975)	severe	56, ages 15 to 64 years (mean age = 30 yrs.)	no	no	3 to 24 months	WAIS	Long-PTA group (i.e., >11 weeks) had little or no restoration of verbal or performance skills; short-PTA group had rapid improvement within six months, especially on verbal subtests.
Chadwick, Rutter, Brown, Schaffer, & Traub (1981)	mild to severe (55%)	60 children, 5 to 14 years of age	yes	28 orthopaedic-injured children	recovery from PTA, and at 4, 12 and 27 months	WISC, various tests of cognitive functions and reading ability	Long-PTA (i.e., >1 week) group had short and long term residual memory and cognitive deficits still evident at 27 months, especially on timed tasks; short-PTA group had no long term deficits.
Dancker (1960)	mild to severe	117, ages not given	yes	mono- or dizygotic twin	3 to 25 years (mean=10 years)	25 various tests of cognitive performance	Injured group had inferior performance of 21 tests, that reached significance on abstraction, figure-ground discrimination, ability to shift attention, and speed and attention in manual coordination.

(Table 9 continued)

Researchers	Severity of Head Injury	Sample Size and ages of Ss at time of injury	Matched or Screened for pre-traumatic variables	Control Group	Time of Assessment Post-Trauma	Tests	Results
Dikmen, Reitan, & Temkin (1983)	mild (50% of subjects) to severe	45, ages 15 to 44 years	somewhat	35 non-injured friends of another group of head-injured subjects	recovery from PTA, and at 12 and 18 months	Halstead-Reitan	Initial impairment on Category, TPT Time, Finger Tapping, and Trail Making with significant improvements at 12 and 18 months; results were less consistent on Rhythm, Speech Perception, TPT Memory and Localization, and measures of attention, concentration, and incidental memory.
Dikmen, McLean, & Temkin (1986)	mild	20, ages 15 to 60 years	somewhat	19 non-injured friends of another group of head-injured subjects	1 and 12 months	Halstead-Reitan	Significant differences between patient and control groups were apparent at 1 month on Rhythm test only; no significant differences on any test at 12 months.
Dye, Saxon, & Milby (1981)	mild to severe	48, ages 16 to 37 years	somewhat	16 orthopaedic-injured subjects	50% of subjects with- in 18 months PT and 50% between 18 to 36 months	WAIS, Halstead-Reitan	Significant differences between head injured and control groups on all measures except Verbal IQ; long-coma group were more impaired than short-coma group on most measures but not on Performance and Full-Scale IQ, TPT Memory, Finger Tapping and Trail Making; short-coma group was most impaired on measures of attention and concentration.
Gentilini, Nichelli, Schoenhuber, Bortolotti, Tonelli, Fulasca et al. (1985)	mild	50, ages 13 to 75 years (mean=35 years).	yes	50 relatives or friends of the head injured	1 month	6 tests measuring attention, concentration and intelligence	Significant univariate differences between groups was found only on selective attention; multivariate difference was not significant.
Gronwall & Wrightson (1974)	mild	100, ages 10 to 55	no	no	5 to 54 days	PASAT	Temporary slowing of information processing with return to normal in the majority of patients by 35 days, the remainder by 54 days; PCS symptomatology was related to test scores.
Jonsson, Lidvall, & Malthammar (1967)	mild	17, ages 17 to 53	somewhat	16 patients with neurotic disorders,	1 to 3 months	Thurstone's Identical Forms Test, tone counting	No differences except under conditions of distraction when the healthy subjects received significantly better scores than both patient groups.

(Table 9 continued)

Researchers	Severity of Head Injury	Sample Size and ages of Ss at time of injury	Matched or Screened for pre-traumatic variables	Control Group	Time of Assessment Post-Trauma	Tests	Results
Levin, Grossman, Rose & Teasdale (1979)	severe	27, ages 18 to 50	yes	no	6 to 36 months	WAIS and tests for memory and aphasia	Patients with good to moderate global recovery made progressive gains in test scores, good outcome could be distinguished from moderate to poor outcome on the basis of memory retrieval from long term storage, although there was marked variability in each group; acute neurological signs were also related to neuro-psychological outcome.
Mandleberg & Brooks (1975)	severe	40, over 15 years of age (mean = 28)	no	27 patients with neurotic disorders, 13 healthy subjects	0-3, 4-6, 7-12 months and approx. 3 years	WAIS	Verbal subtests were less impaired and faster to recover (by 1 year) than performance subtests (by 3 years); Digit Span scores differentiated between head injured and control groups at 13 months and improved the least of all Verbal subtests; Digit Symbol was the most impaired Performance subtest.
McLean, Temkin, Dikmen, & Wyler (1983)	mild to moderate	20, ages 15 to 60 (mean age = 23)	yes	52 non-injured friends of head-injured subjects from another study	3 and 30 days	STROOP, test of memory and of orientation (i.e., GOAT)	Differences on some aspects of the Stroop and most of the memory test were significant at 3 days but not at 1 month; the more severely injured Ss accounted for most of the early difference.
McMillan & Glucksman (1987)	mild to moderate	24, ages 15 to 60 years	somewhat	20 orthopaedic injured subjects	1 to 7 days	WAIS-R (shortened), memory tests, PASAT	Subtle deficits in rate of information processing under the "fast" administration of PASAT but not on the "slow" version, head-injured subjects rated their memory as lower than the control subjects but differences in objective memory and intelligence tests were non-significant.
Rimel, Giordani, Barth, Boll, & Jane (1981)	mild	69, ages 15 to 55 years	somewhat	no	3 months	WAIS, Halstead-Reitan, WRAT and a memory test	Memory problems among the head-injured frequently reported by patient and relatives, but objective evidence of memory impairment (in comparison to standardized norms) was not significant; most patients scored lower than their expected norms however, especially in areas of attention, concentration, memory, and judgment.

(Table 9 continued)

Researchers	Severity of Head Injury	Sample Size and ages of Ss at time of injury	Matched or Screened for pre-traumatic variables	Control Group	Time of Assessment Post-Trauma	Tests	Results
Solomon, Greene, Farr, & Kelly (1986)	mild to severe	126, ages 16 to 50	yes	no	2 to 30 years	WAIS, memory test	Test scores were lower than expected, especially on the memory scale; correlation between IQ and memory quotient scores was $r = .76$.
Stuss, Ely, Hugenholtz, Richard, La Rochelle, Poirier, & Bell (1985)	mild to severe	20, mean age at testing was 29 years	yes	20 healthy subjects	0.5 to 23 years (mean = 2.6 years)	WAIS, Stroop, Trail Making, card sorting, generation of word lists, and memory	No significant univariate differences between groups on majority of measures, except those considered as sensitive to decreased attention, concentration, speed, endurance in problem solving, and subtle memory deficits.

Note. PTA = post-traumatic amnesia.

1. severe injuries refer to PTA > 1 week or Glasgow Coma Scale scores at admission of ≤ 8 .

PASAT = Paced Auditory Serial Addition Test.

GOAT = Galveston Orientation and Amnesia Test.

WAIS = Wechsler Adult Intelligence Scale.

WRAT = Wide Range Achievement Test.

While subtle cognitive deficits on selected measures may be present in the first few days or weeks after mild head injury, neurological factors are not necessarily the cause. For example, Barth et al. (1983) determined that mild neuropsychological impairment in a group of mildly concussed patients could be significantly accounted for by factors other than brain damage, such as age or education. Measures of the duration of post-traumatic amnesia and loss of consciousness did not significantly contribute to the variance obtained on the neuropsychological examination. There were tremendous variations in the various neuropsychological tests. For example, sensory-motor functioning on the Halstead-Reitan did not relate to cognitive impairment on the WAIS-R whereas integrity of memory and visuo-motor problem solving skills did.

Comparison of neurological and neurotic patients. Differential diagnosis between neurotic and brain-damaged patients on the basis of WAIS subtest scores has been addressed (e.g., Matarazzo, 1972; Rapaport, Gill, & Schafer, 1968; Zimmerman and Woo-Sam, 1973). The following are some of the results from these studies: In general, both groups show similar intratest scatter but intratest scatter on some verbal subtests is more pronounced in certain neurotic disorders. Neurotic subjects have been shown to score lower than their overall mean on Picture Completion while the brain damaged subjects do not. Brain-damaged patients typically score 1.5 to 2.5 points lower than their overall mean on Similarities and neurotic patients score 1.5 to 2.5 points higher than the mean on Similarities. While deviations from the mean of up to 2.5 points on the remainder of the subtests can be made by either brain damaged or neurotic points, deviations over 2.5 should alert one to the possibility of brain-damage. Ladd (1964) differentiated between patients with neurotic (especially somatization) disorders and patients with brain disease. He found a significant IQ difference between the brain damaged group and the neurotic group, largely attributable to a low performance IQ among the brain-damaged. The brain damaged patients were also significantly more variable on the performance subtests than the neurotic group.

Attentional and Memory Deficits

Stuss et al. (1985) further postulated that the basic cognitive disorder secondary to closed head injury is that of an attention deficit. Information processing capacity is limited either in terms of speed of processing or the amount of information that can be handled simultaneously. Their sample of 20 patients, who received head injuries of varying severity anywhere from half a year to 23 years before (average = 2.6 years) and made a good recovery could be significantly

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discriminated from matched controls on the basis of: sensitive measures of decreased attention and concentration, rapidity of processing information, memory disturbance, decreased cognitive endurance, and impaired problem solving. While there was impairment on divided attention, no deficit could be found on selective attention. And, differences could not be found on less subtle measures of cognitive performance.

Dencker (1960) administered a battery of 25 neuropsychology tests to 36 sets of monozygotic twins. One individual of each set of twins had received a closed head injury from 3 to 25 years previously. The injured group performed more poorly than the uninjured identical twins on 21 of the 25 tests. The differences were significant on ability to abstract, figure-ground discrimination, ability to shift attention, and speed and attention in manual coordination ability. Yet, these differences were not enough to clinically discriminate between those who had received a head injury and those who had not.

Subtle deficits in information processing and memory among mildly injured patients have been detected, but only if assessments are made within days or weeks of injury (Dikmen et al., 1986; Gronwall & Wrightson, 1974; Jonsson et al., 1967; McLean et al., 1983; McMillan & Glucksman, 1987). Furthermore, the detection of mild impairment later than 30 days post-injury in patients with minimal injuries (e.g., Rimel et al., 1981) may arise from the failure to compare test results with those of non-injured controls who are similar in premorbid characteristics and personality to the injured persons (e.g. friends). Individuals who receive head injuries may, as a group, be different from the general population. They may have been more maladjusted before the accident or are risk takers (Fahy, Irving, & Millac, 1967). A temporary slowing of information processing lasting longer than 30 days in mildly-injured persons may also be related to complaints of PCS symptoms (Gronwall & Wrightson, 1974).

Studies of mild to severely injured patients that were conducted within 3 years of injury have revealed the following patterns of neuropsychological recovery, on the WAIS and Halstead-Reitan batteries (Dikmen et al., 1983, 1986; Dye, Saxon, & Milby, 1981; Mandelberg & Brooks, 1975). In general, impaired performances may be found soon after the injury on (a) reasoning and concept formation, (b) quickness and flexibility of thought processes, (c) adaptation to tasks with unique requirements, and (d) psychomotor problem-solving speed and skills. The tests most affected would be TPT Time, Finger Tapping, Trail Making, and all the WAIS subtests, except Similarities. Improvements would usually be significant by 12 and 18 months, however. Persons who are initially the most impaired make the greatest improvement, but may still have relatively

greater residual deficits at follow-up. The results seem less consistent on measures of attention, concentration, and incidental memory (i.e., Category, Rhythm, Speech Perception, Digit Span). The less-severely injured patients may be more impaired on these measures than the severely injured (e.g., Dye et al., 1981).

The Digit Span (DS) test measures immediate auditory memory, attention, concentration, and freedom from distraction. Results from this test are inconsistent among various studies of the head injured. While Fodor (1972) suggested that DS is relatively unaffected by mild to moderate injuries, Becker (1975) has found scores to improve during recovery. Among severely head-injured patients, Mandleberg and Brooks (1975) determined that DS scores differentiated between control subjects and patients at 13 months. Digit Span scores improved over time but, of all the WAIS subtests, they improved the least. Russell (1972) reported that DS scores may be differentially more sensitive to left hemisphere damage. Brooks (1972) postulated that it may only be the backward span that is significantly impaired by brain damage because he found that duration of post-traumatic amnesia related only to the backward span task. The task of reversing digits demands a strategy of auditory or visual rehearsal and more persistent retention, thus presumably activating longer term memory and sustained attention. Scores on DS may also be impaired by anxiety and stress.

The Effects of Stress and Anxiety on Cognitive Function

Experimental investigation of the effect of anxiety and stress on attention, concentration, and memory has generally relied on the use of arousal as the major theoretical construct. Arousal refers to changes in brain activity resulting from stimulation and can be measured objectively by changes in the output of hormones, such as adrenalin, noradrenalin, and prolactin. In general, research suggests that mild forms of stress, such as heat and noise, can increase performance on some tasks, like vigilance, while decreasing performance on others (e.g., serial reaction). Fatigue and sleep deprivation generally impairs cognitive performance, although there are some tasks that show no depreciation, and noise has been shown to actually improve performance in sleep-deprived subjects (Hockey, 1979).

A variety of studies (listed in Johnson & Sarason, 1979) have suggested that increased levels of anxiety and arousal are negatively related to performance on complex cognitive tasks, ability to utilize semantic cues in memory recall, and degree of cue utilization. Higher states of arousal are usually associated with better long-term memory recall, however. For shorter-term

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recall, the reverse may be true. Hyperaroused individuals display a restricted range of attention. Research on cognitive efficiency in dangerous environments (summarized by Baddeley, 1972) suggests that there is a narrowing of attention and a tendency to engage in task-irrelevant behaviour, or worse, behaviour that works against problem solving.

Despite some inconclusive results from studies to correlate WAIS IQ scores with measures of anxiety (Dana, 1957; Matarazzo, Ulett, Guze, & Saslow, 1954), others have found significant negative correlations between anxiety scores and several WAIS subtests (Calvin, Koons, Bingham, & Fink, 1955; Hodges & Spielberger, 1968; Knox & Grippaldi, 1970; Siegman, 1956). Calvin et al. (1955) reported that they did not find a significant correlation between scores on the Manifest Anxiety Scale and WAIS IQ in normal undergraduate students, but scores on Digit Span and Block Design did decrease significantly as anxiety scores increased. When these students were combined with another group of students who were experiencing scholastic difficulty for unknown reasons, the relationships between anxiety level and WAIS scores reached significance for Full and Verbal IQ and for four more of the 11 subtests.

Morris and Liebert (1968) divided test items on the Manifest Anxiety Scale (MAS) into those measuring cognitive concern (i.e., worry) and those measuring autonomic reactions (i.e., emotionality) to investigate the effects of both on timed WAIS subtests. Only half of the subjects knew they were being timed. Knowledge of being timed helped low-worry subjects perform better but hindered high-worry subjects. Significant negative correlations were also found between MAS scores and both Raven's Progressive Matrices, a test measuring abstraction ability ($r = -.41, p < .01$), and the Bender-Gestalt Recall Test, which involves recalling and drawing complex geometric patterns ($r = -.44, p < .01$).

Anxious-normal or neurotic subjects may produce lower scores on Digit Span than on Arithmetic, indicating that Digit Span is the WAIS-R subtest most affected by stress and anxiety. Callens and Meltzer (1969) studied the interactive effect of intelligence, anxiety, and psychiatric diagnosis on Arithmetic and Digit Span. As expected, Digit Span was more impaired than Arithmetic among the high-anxiety, high-IQ, neurotic subjects but less impaired among low-anxiety and low-IQ subjects, regardless of psychiatric diagnosis. No direct relationships were found between WAIS subtest scores and either anxiety or diagnosis alone. Hodges and Spielberger (1968) reported that subjects experiencing high levels of *state* anxiety showed a significant decrease in Digit Span performance under experimental conditions (e.g., they were told they were failing). There was no difference on Digit Span performance between high and low *trait* anxiety

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subjects (measured by the Manifest Anxiety Scale). The results were somewhat confounded, however, by the fact that individuals with high trait anxiety were particularly disposed to high state anxiety under the experimental conditions of "failure" stress.

Knox and Grippaldi (1970) obtained significant interactions between several WAIS subtests and both state and trait anxiety. High state and high trait anxiety subjects had, relative to their scores on Similarities, lower scores on both Arithmetic and Digit Span. The two groups were also very similar in their WAIS profiles. Low state anxiety subjects received the lowest scores of all groups on each of the three subtests just mentioned, while low trait anxiety subjects received low scores on Similarities and Digit Span, but their scores on Arithmetic were superior. Medium anxiety subjects (state or trait) had the highest subtest scores relative to other subjects on the Digit Span, while their scores on other tests fell around the median. High anxiety subjects produced superior scores on Similarities (i.e., concept formation) while doing quite poorly on Arithmetic and Digit Span, suggesting impaired attention and concentration relative to other cognitive skills. Low anxiety subjects did not show such a pattern. In summary, excessive anxiety seems to have a disruptive effect on abstraction, incidental learning, and timed visuospatial/visuomotor performance, but mild anxiety may have a facilitating effect. There appears to be a curvilinear relationship between anxiety and Digit Span such that both high and low anxiety subjects perform poorly on Digit Span.

The MMPI in Differential Diagnostic Assessment

There have been few studies to date that have provided MMPI data on persons suffering from PTSD following head injury, but the MMPI has been used frequently in attempts to differentiate between brain-damaged and psychiatric patients (reviewed in Farr & Martin, 1988). Researchers and clinicians typically use the MMPI to assess emotional problems as part of neuropsychological investigation, even though the interpretation of these profiles in differential assessment is not altogether clear. Diagnostic separation between brain-damaged and psychiatric patients is improved when a test battery is used, often including the MMPI, the WAIS, and the Halstead-Reitan. It appears that scores on all of these tests can be affected by both brain damage and neurotic processes. While some studies show brain damaged patients to score lower on most clinical scales on the MMPI than neurotic patients (e.g., Holland & Watson, 1980), others indicate a direct relationship between severity of brain damage and severity of emotional problems (e.g.,

Dikmen & Reitan, 1977). Mean MMPI profiles have been plotted for some of these studies and included as Figure 1.

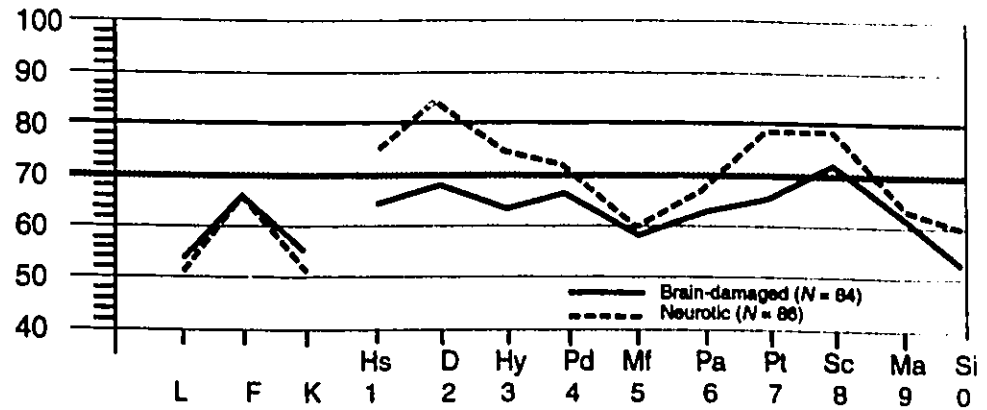
The MMPI has been used extensively to discriminate between individuals with and those without a known physiological cause for a somatic or pain disorder. There is a paucity of information on MMPI responses from civilian PTSD patients, however. Some of this work will be discussed in this section. Many of the symptoms that chronic pain patients complain about resemble those observed in phenomenological studies of PTSD (e.g., somatization). Furthermore, as previously mentioned one research team has suggested that chronic pain at the site of a previous, since-healed wound is a manifestation of intrusive recall (Benedikt & Kolb, 1986). The subcategorization of chronic pain sufferers indicates that there is a subgroup of pain patients who resemble PTSD patients on the MMPI. It is also obvious, from MMPI protocols, that persons with a physiological basis for their illness or pain experience emotional distress, presumably as a consequence of their medical problem.

Research has been ongoing to determine ways of diagnosing PTSD from MMPI profiles and to validate them with DSM-III criteria. This work has centered on the scales F (Validity), D (Depression), and Sc (Schizophrenia), with suitable cutoffs being established. A PTSD content scale has also been developed (Keane et al., 1984). The research in this area looks promising, but at the present time it does not seem possible to obtain differential diagnoses of PTSD on the basis of MMPI scores. There are many similarities on the MMPI among groups of mixed psychiatric patients, including PTSD patients. Furthermore, all the work of establishing the validity of MMPI diagnostic criteria for PTSD has been conducted on veteran populations. The remainder of this literature review is devoted to the use of the MMPI to provide differential diagnoses and to indicate the forms of distress experienced by various patient groups, including PTSD patients.

Comparison of Neurological and Non-Neurological Patients

Efforts to differentiate brain damaged individuals with CNS compromise from either normal, psychiatric, or "pseudoneurologic" populations has, according to Farr and Martin (1988), "met with enough success to keep interest in the endeavour alive and with enough frustration to discourage primary adoption of any specific MMPI scale or index" (pg. 214). Unfortunately, investigations into the differential diagnoses of brain damage from psychiatric disorders typically use unspecified or mixed diagnoses, of either CNS dysfunction or psychiatric disorder. The former group often

Holland &
Watson,
1980



Wooton,
1983

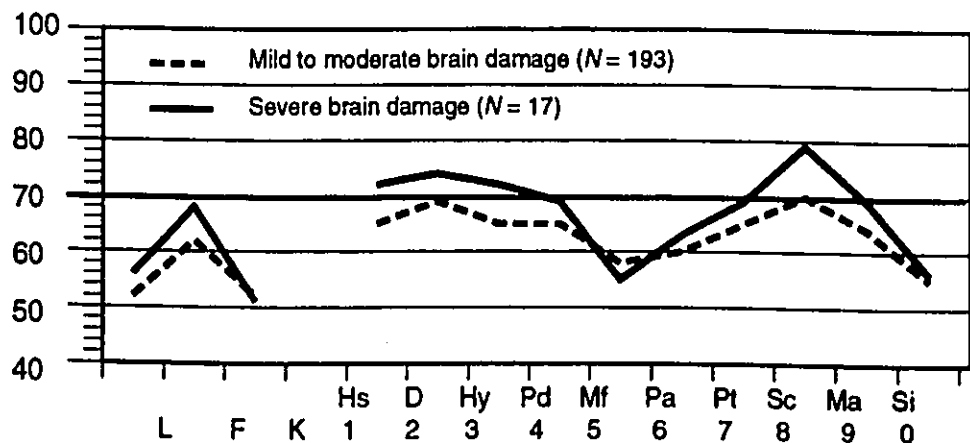
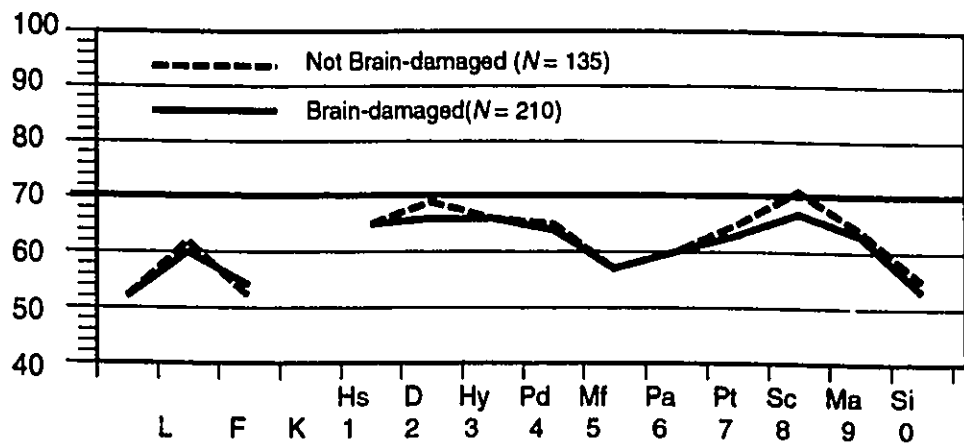


Figure 1.
Comparison of MMPI profiles of brain-damaged patients and other subjects.

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includes individuals with chronic brain disorder or disease, while the latter group is often heavily loaded with schizophrenics.

Ruesch and Bowman (1945) examined MMPI profiles obtained from four groups of neurological patients. The lowest scores were obtained by the acute head injured, who scored slightly above normal only on the *D* scale. The chronic head injured, with or without neurological signs, scored high on the so-called neurotic scales (*Hs* [Hypochondriasis] + *D* [Depression] + *Hy* [Hysteria] = 201) and, to a lesser extent, on the so-called psychotic scales (*Pa* [Paranoia] + *Pt* [Psychasthenia] + *Sc* [Schizophrenia] = 170). Their profiles resembled those of the neurotic group who scored highest on the neurotic scales (sum = 182). Brain disease patients were equally abnormal on both the neurotic scales (sum = 191) and the psychotic scales (sum = 184).

Dikmen and Reitan (1977) divided a large sample of traumatic head injured patients into three groups on the basis of impairment on the WAIS and the Halstead-Reitan batteries. Mean MMPI profiles for all groups revealed primary elevations on neurotic scales and secondary elevations on psychotic scales. The patients with residual neuropsychological deficit, besides being older, had higher scores on MMPI scales *L*, *F*, *Hs*, *D*, *Sc* and the Goldberg Psychotic Index but lower scores on *Ma* (Mania) than did the patients who performed normally on the neuropsychology tests. Patients with verbal-intellectual impairment tended to show greater maladjustment on the MMPI than did other patients, although MMPI elevations were also associated with impairment in other cognitive functions. The severity of brain damage related to the severity of emotional problems. Elevations on MMPI clinical scales also occurred in as many as a third of 71 mildly head injured patients three months after injury in a study by Barth et al. (1983). The Halstead-Reitan Impairment Index correlated with the MMPI *D* scale ($r = 0.22, p < 0.01$), as well as with reports of psychological symptoms obtained from the SCL-90 ($r = 0.27, p < 0.01$). Calsyn, Louks, and Johnson (1982) found that the optimal linear regression of all 13 MMPI clinical scales and the Ego Strength scale explained 31% of the total variance in cognitive deficit on the Halstead-Reitan battery, in a mixed group of neurological patients. The scales Ego Strength and *Mf* (Masculinity-Femininity) contributed most strongly.

Several studies have attempted to either develop an MMPI subscale for detecting "organicity" or to find certain profiles that suggest neuropathology. To this avail, Wooten (1983) obtained MMPI profiles of a large group ($N = 345$) of patients who were referred for neuropsychological evaluation. Scores were coded into one-, two-, and three-scale high-point code types and the referred patients were compared with general mental-health outpatients. The

neuropsychology patients, approximately 40% of whom had head trauma, were equally likely to have one, two, or several MMPI scales elevated. These patients were more likely than the psychiatric outpatient group to have elevations on scales *Hs*, *Ma*, and *Si* (Social Introversion), while the psychiatric group had high points on scales *Pd* (Psychopathic Deviate), *Mf*, and *Pt*. When the patients considered to be brain-damaged were compared to those considered to be not brain-damaged, mean scores were similar on all scales, except *D* and *Sc* (see Figure 1). Both the brain-damaged and the psychiatric groups had similar elevations on scales *D* and *Sc*. Seven of 14 two-point code types were more frequent among neuropsychology patients (i.e., 89/98, 12/21, 13/31, 23/32, 68/86, 29/92, and 39/93); two were more frequent among the psychiatric outpatient group (i.e., 27/72, 48/84). Six three-point code types that were more frequent in the neuropsychology group differentiated significantly between the two groups (i.e., 123, 789, 128, 138, 349, 249). The 278 code was relatively frequent in both groups. Code types that have been thought to be associated with brain damage, such as 29/92 and 139 (e.g., Webb, McNamara, & Rodgers, 1981): (a) were low in their frequency of occurrence, (b) did not differentiate between categories of brain dysfunction, and (c) were no more indicative of brain damage than any other code. The *Ma* scale was prominent among the neuropsychology group, yet it has received little attention in previous studies. The *Ma* elevations may have been either a consequence of the head trauma or pretraumatic factors. When patients in different categories of brain dysfunction were compared for number of elevated MMPI scales, there were no significant differences. There was, however, a trend for the severely dysfunctional group to have a slightly higher percentage of patients with elevated scores, mostly on scales *Hy* and *Sc*. In comparison to Dikmen and Reitan (1977) who believed they had found a direct and significant relationship between MMPI elevations and severity of brain damage, Wooten concluded that neuropsychology referrals have significant emotional difficulties, regardless of degree of brain damage (see Figure 1).

Several studies have investigated to see whether indices of WAIS intertest scatter correlate with MMPI scale scores and if, in combination, they could differentiate among different groups of patients (Bloom & Entin, 1975; Gaines & Morris, 1978; Holland & Watson, 1980; L'Abate, 1962). For example, the combination of certain MMPI scales, especially the K-score, and several of the WAIS indices of scatter provided differentiation among different patient groups and predicted degree of psychopathology in a study by L'Abate (1962). Furthermore, Gaines and Morris (1978) found a significant negative correlation between full scale IQ and MMPI elevations, suggesting that IQ is inversely related to psychopathology.

Holland and Watson (1980) determined that overall intellectual impairment on the WAIS is associated with naive defensiveness, thought confusion, and the absence of intellectual and cultural interests on the MMPI. Groups of neurotic, schizophrenic, alcoholic, and brain-damaged patients exhibited statistically significant univariate differences on all WAIS subtests, except Vocabulary. The brain damaged group, of which almost a third were from traumatic head injuries of unspecified severity, were the most deficient on the WAIS. They gave the poorest performance of all the groups on three verbal tests and four performance tests. In contrast, the neurotic group was least impaired with scores comparatively high on almost all the subtests. The remaining groups were relatively nondescript in their pattern of intellectual functioning. On the MMPI, there were significant univariate differences among the groups on all clinical scales, except *Ma* (see Figure 1 for mean profiles of brain-damaged and neurotic groups). The brain-damaged patients were characterized by their relatively low scale scores, especially on *Hs*, *D*, *Hy*, *Pd*, *Mf*, *Pt*, and *Si*, while neurotics had elevated scores on *Hs*, *D*, *Hy*, *Pd*, *Pt*, *Sc*, and *Si* that were higher than the schizophrenic group on all but *Sc*. Multiple discriminant analyses on the basis of either the WAIS or the MMPI differentiated significantly among the groups. When WAIS and MMPI scores were combined in a multiple discriminant analysis, there was a significant increase in group discrimination compared to either measure alone.

Shaw and Matthews (1965) and Matthews, Shaw, and Kløve (1966) administered the WAIS, Halstead-Reitan battery, and MMPI to a group of 32 patients with unequivocal evidence of chronic brain damage (e.g., seizure disorder, Parkinson's disease, Huntington's chorea). The tests were also administered to a group of 32 "pseudoneurologic" patients. There were striking differences between the two groups on all tests, with the brain-damaged patients showing inferior performance on the WAIS and Halstead-Reitan tests and more pathology on the MMPI *Hs*, *Hy*, and *Ma* scales than the pseudoneurologic patients. Despite significant group differences, useful cutoff points for differential diagnosis could not be established. Even the composite measure, the Impairment Index, was relatively inefficient as a dichotomous measure: Raising the cutoff increased specificity (44% to 94%) but decreased sensitivity (91% to 72%) of identifying patients who were impaired due to a neurological disorder.

Comparison of Patients with and Without a Known Physiological Cause of Their Somatic Disorder

The MMPI has been used to discriminate between individuals with and without known physiological causes for chronic pain and somatic disorders, but the conclusion is that no single scale or pattern of the MMPI is likely to give such discrimination (Adams, Heilbronn, & Blumer, 1986). Kurland and Hammer (1968) evaluated 148 medical patients with various physical disorders and found a high percentage of abnormal MMPI profiles among them. Significant elevations (T score over 70) on one or more scales were produced by 66% of the sample (35% had three or more elevated scales). The *Hs* and *D* scales were most frequently elevated, followed in order by *Hy*, *Pd*, *Pt*, *Sc*, and *Ma*. A correlational relationship between MMPI scores on the neurotic scales and seriousness of illness was found. Furthermore, patient ratings of pain/discomfort correlated significantly with the neurotic scales (especially *Hs*), as well as the psychotic scales (*Pd*, *Pt*, & *Sc*). Further evidence of the effect of serious physical illness on emotional state was revealed in a comparison between those who rated their illness as more serious than it was (overconcerned) and those who rated their illness as less serious than it was (underconcerned). Despite overconcern for their illness, the former group had lower scores on *Hs*, *D*, and *Hy* than did the underconcerned group. It was the actual seriousness of the illness and not the perception of seriousness that was directly related to scores on *Hs*, *D*, and *Hy*. These results are confirmed by Skenazy and Bigler (1985) who studied the influence of chronic illness, including diabetes, on MMPI scores. Mean scores on almost all clinical scales (i.e., *Hs*, *D*, *Hy*, *Pd*, *Pt*, and *Sc*) were higher for the ill patients compared with normals, but the difference was only significant on the first three clinical scales - *Hs*, *D*, and *Hy*.

Questions have been raised about the validity of using the MMPI for somatic-related conditions of known physiological origin, because MMPI profile interpretation is usually biased toward psychopathology. If patients answer affirmatively to pain-related questions, this presumably elevates scores and leads possibly to a neurotic diagnosis. In response to this concern, Leavitt and Katz (1989) compared MMPI protocols of rheumatoid arthritis patients with individuals given a diagnosis of *fibromyalgia*, defined as three or more months of diffuse musculoskeletal pain and tenderness but with no detectable abnormality on medical tests. A total of 32 items on the *Hs*, *D*, *Hy*, and *Sc* scales statistically discriminated between the two groups of patients with the arthritic group having lowest scores on 29 of the statements. Thus, physical illness alone was not sufficient to elevate MMPI scale scores. In medical checkups, the arthritic patients seemed appropriately

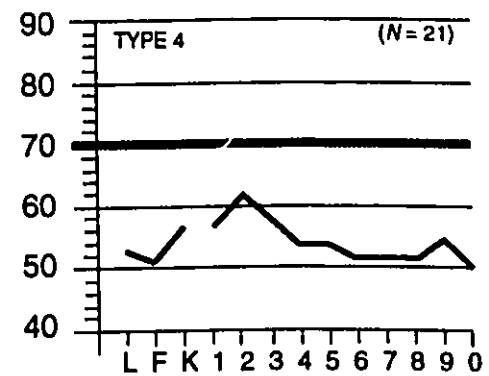
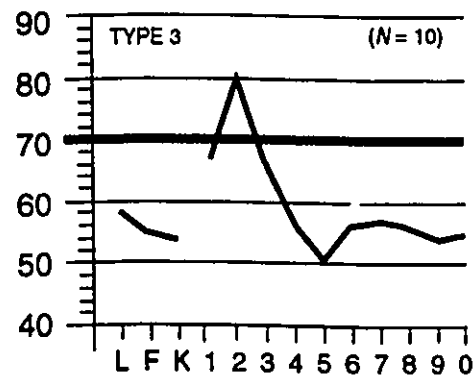
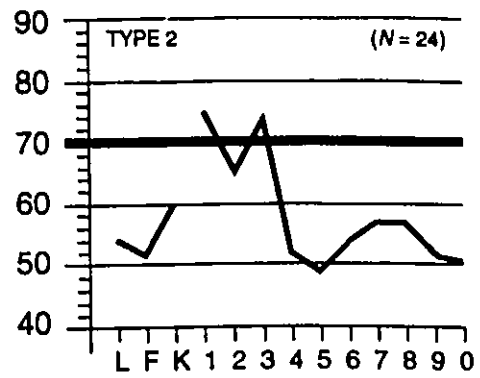
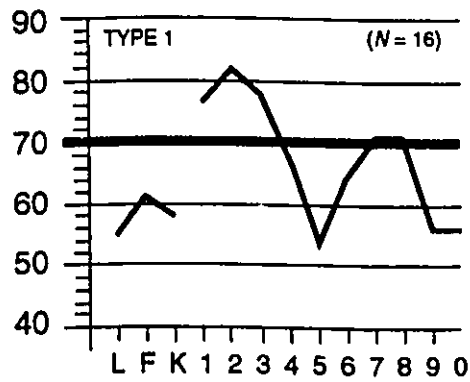
concerned about their health and prognosis; patients with fibromyalgia were more symptomatic and displayed greater psychological disturbance during consultation. While the two groups of patients had equivalent scores on an analogue scale of pain intensity (60 on a scale of 100), the patients with fibromyalgia had significantly more abnormal MMPI scales and significantly higher scores on items dealing with specific physical symptoms, personal distress, social withdrawal, peculiar behavioural dysfunction, and abnormal/unconventional experiences. This suggests a possible somatoform disorder. The arthritic group worried more about their physical health and catching diseases. They also made more claims for work disability payments.

Studies on MMPI and chronic pain have found MMPI profiles to be affected by how extensive the pain is, how long it has lasted, and where it is located (Sternbach, Wolf, Murphy, & Akeson, 1973; Strassberg, Reimherr, Ward, Russell, & Cole, 1981), and by other variables, including gender (Maruta, Swanson, & Swenson, 1976; Sternbach et al., 1973; Strassberg et al., 1981), negative life events (Smith et al., 1985), and litigation (Sternbach et al., 1973). Outcome studies have shown that physically-ill persons with high scores on the neurotic scales have generally poorer prognosis and poorer response to treatment than equally ill persons with lower scores. For example, Wiltse and Rocchio (1975) found that scores on the *Hs* and *Hy* scales predicted 36% of the variance in symptomatic relief of low back pain after medical treatment, compared with medical indices that only predicted 0.2% of the variance; Gore, Sepic, Gardner, and Murray (1987) found that amount of pain relief following medical/surgical treatment for neck pain was also unrelated to various medical indices that included radiology findings.

Subcategories of pain sufferers. Costello, Hulse, Schonfeld, and Ramamurthy (1987) used cluster analysis to identify four MMPI patterns that chronic pain sufferers tend to present. Support for subtyping of pain sufferers on the basis of MMPI profiles comes from Adams et al. (1986) who also found evidence of four subtypes of pain sufferers; MMPI protocols were blind-sorted by two experienced clinicians who obtained a 93% agreement. The MMPI profiles of these four groups of patients (displayed in Figure 2) related to certain clinical and demographic variables.

One profile (Type 1) had elevations on nearly all the clinical scales and the *F* scale and persons who produced this profile resembled those of PTSD patients. The studies by Fairbank et al. (1983), Keane et al. (1984), and Vanderploeg, Sison, and Hickling (1987) of veterans with PTSD (displayed in Figure 3) will be discussed in the next section. Patients with this profile reported very poor health, emotional lability, and intense, constant, pervasive pain. Numerous drugs were used

Adams,
Heilbronn,
& Blumer,
1986



Costello,
Hulsey,
Schoenfeld,
&
Ramamurthy,
1987

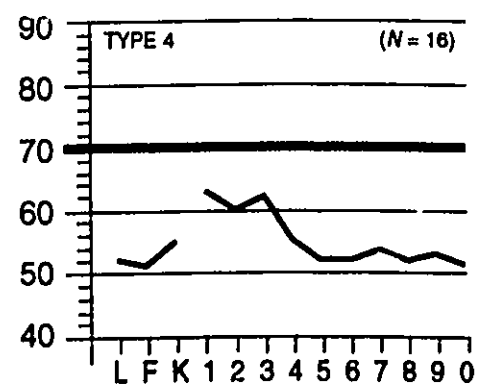
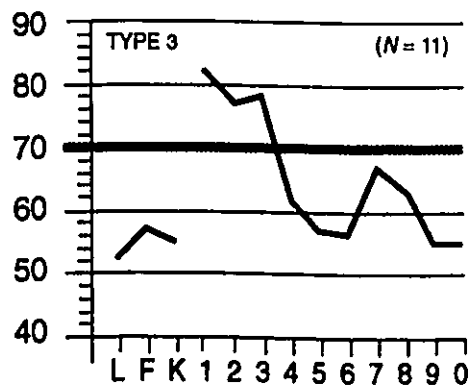
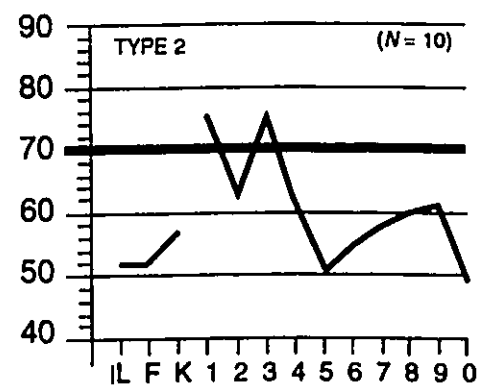
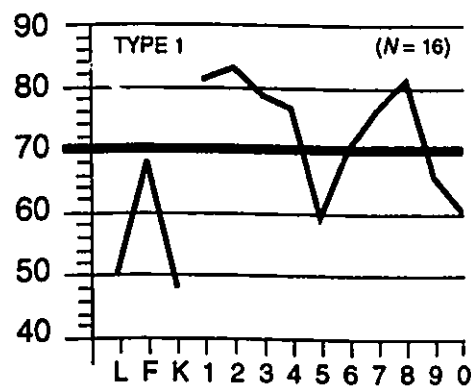


Figure 2.
Comparison of MMPI profiles of subcategories of chronic pain patients.

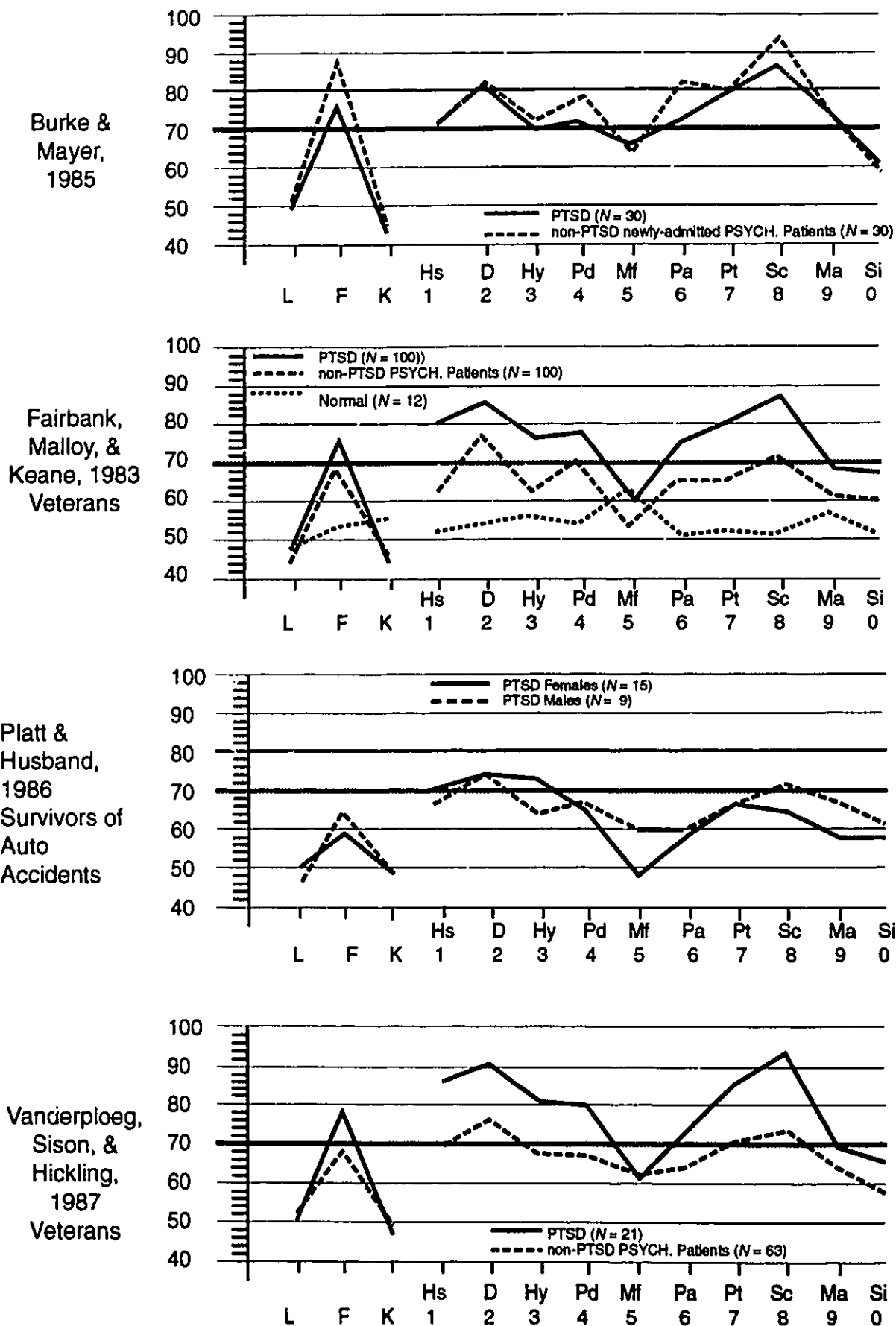


Figure 3.
Comparison of MMPI profiles of PTSD and Non-PTSD groups.

to control the pain. Patients were often found to have a lower IQ, less education, lower monthly income, and more frequent unemployment, than other pain sufferers. Despite more frequent searching for health care, they were the least likely to show improvement from treatment.

A second profile (Type 2) was defined by a 13/31 code with a low *D*. No unique demographic or clinical correlates could be found. The third profile (Type 3) had elevations on three of the neurotic scales but not on the others. Although there are variations between the studies, the third group appeared to be the most physically ill having had multiple surgeries and frequent hospitalization. While they made the least physical improvement in response to treatment, the third group of patients did improve psychologically, trying hard to adapt to the affliction. Patients who were grouped into the fourth category were directly contrastable to those who obtained the first profile. They made only moderate claims of poor health, emotional lability, and intensity or impact of pain. The MMPI profiles were in the normal range with no scales above a T score of 70. The demographic picture was one of good education, high literacy, and good pay. In the fourth group, pain was responsive to treatment and disability was usually of short duration. The base rates of chronic pain patients in each of these profiles was estimated at 15% for the first type, 20% for the second type, 30% for the third type, and 25% for the last type.

MMPI Results from Trauma Survivors

Civilian Trauma. The ability of the MMPI to diagnose PTSD, in conjunction with DSM-III and alternative sets of diagnostic criteria, has been extensively analyzed. In general, subjects diagnosed with PTSD show high mean elevations on all clinical scales. Their profiles are very similar to those produced by randomly selected psychiatric patients, even with a possible diagnosis of schizophrenia (Archibald & Tuddenham, 1965; Burke & Mayer, 1985; Fairbank et al., 1983; Foy et al., 1984; Keane et al., 1984; Vanderploeg et al., 1987). The mean MMPI profiles from some of these studies for groups of PTSD patients and groups of psychiatric patients are presented in Figure 3. It is not always clear what significant differences there are between MMPI profiles of PTSD patients and those of non-PTSD psychiatric patients.

Abbot et al. (1978) obtained MMPI results from 20 recovered victims of penetrating cardiac wounds sustained during criminal assault. The wounded patients showed higher scores on *Hs*, *D*, *Hy*, *Pd*, *Pt*, and *Sc* than did matched non-wounded subjects, but only *Hs* and *D* reached $T > 70$ and reached significance on *Hs* and *Pt*, only. Mean MMPI scores for cardiac wounded patients were

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very similar to those of another group of 17 patients who sustained penetrating abdominal wounds during assault. MMPI protocols of inner city teachers who had been physically assaulted by their students were examined by Bloch (1978). Elevated scores were found on MMPI *Hs* and *Pt*.

Chaney et al. (1984) compared MMPI results among normal subjects, civilian-trauma victims who were injured, psychogenic pain patients, and patients who were physically ill. Not all of the trauma victims displayed PTSD symptoms; as a group, their MMPI scores did not differ significantly from the two groups of patients. Mean scale scores for the trauma group were slightly elevated over normal profiles and often fell somewhere between those of psychogenic pain patients and those of physically ill patients. An elevated score above 70 on either the *Sc* or *Ma* scale was obtained by 46% of the trauma patients, compared with 54% of the physically ill, and 8% of the psychogenic pain patients. A 1-3 profile was obtained by 15% of the trauma patients, 42% of the psychogenic pain patients, and 8% of the physically ill patients. A 138 or 139 pattern was obtained by 58% of the trauma patients, 65% of the physically ill, and 23% of the pain patients. This study suggests that civilian trauma does not elevate MMPI scales over those of non-traumatized patients, although it may cause slight elevations over "normal profiles".

Platt and Husband (1986) presented mean MMPI profiles from 24 accident survivors who were diagnosed with PTSD, according to DSM-III criteria. The results, displayed in Figure 3, indicated that most clinical scales were elevated. There were also gender differences. The women had higher neurotic scale scores and the men had higher psychotic scale scores. The study compared PTSD females with depressed females and found that both groups produced similar mean MMPI profiles.

War Trauma. Two studies of WWII veterans, conducted 15 and 20 years after military service, revealed that a group of veterans with generally recognized symptoms of PTSD scored slightly higher means on the clinical scales of the MMPI than did the noncombat general psychiatric patients, about one-third of whom were diagnosed as schizophrenic (Archibald, Long, Miller, & Tuddenham, 1962; Archibald & Tuddenham, 1965). The differences were significant on the *Hs* scale. Head-injured patients who developed chronic invalidism were also reported by Archibald et al. (1962) to have higher elevations on *Hs* and *Hy*. Recent studies of prisoners-of-war from WWII (Miller, Martine, & Spiro, 1989) and Vietnam (Ursano, Boydston, & Wheatley, 1981) have determined that POWs who received the worst treatment have significantly higher elevations on the MMPI clinical scales than other POWs, especially on *Hs* and *Pa*.

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Several studies (Burke & Mayer, 1985; Fairbank et al. 1983; Keane et al. 1984; Vanderploeg et al., 1987) compared MMPI mean scores from different groups of veterans, including PTSD, normal, and psychiatric inpatients. The results are displayed in Figure 3. The PTSD groups have elevated mean scores (above T scores of 70) on the validity scale *F* and clinical scales, *Hs*, *D*, *Hy*, *Pd*, *Pa*, *Pt*, and *Sc*. The mixed psychiatric groups have lower scores on all scales than the PTSD groups, suggesting greater overall distress among PTSD patients. These results were further substantiated by data from other questionnaires that showed PTSD patients scored higher on depression, anxiety, and some fear items than either the normal or psychiatric groups. Using all of the psychometric data to discriminate between PTSD and non-PTSD subjects, Fairbank et al. (1983) obtained a correct classification rate of 83%.

A similar classification rate was obtained by Foy et al. (1984) who found that MMPI scales *Pt*, *Mf*, *F*, *L*, and *Pa* (in stepwise order) provided a sensitivity of 88.2% and a specificity of 76.5%. Univariate differences on *D* ($p < 0.5$), and *Sc* ($p < .05$) were also significant. In a study of combat veterans who were seeking treatment for substance abuse, Roberts et al. (1982) also detected differences between PTSD and non-PTSD veterans on MMPI *Pd*, *Pa*, *Si*, and content scales Social Maladjustment, Family Problems, and Manifest Hostility. Further analysis revealed that such MMPI differences could not be attributed to differences in premilitary adjustment, demographic variables, or combat exposure (Penk et al., 1981). Koretzky and Resenoer (1987) used MMPI data to diagnose PTSD and found that veterans who had experienced combat were significantly more likely than non-combatants to meet MMPI criteria for PTSD (28% of the combat veterans vs. 10% of the non-combatants). These veterans, hospitalized for alcoholism treatment, were assessed for PTSD on the basis of MMPI criteria developed by Keane et al. (1984).

MMPI Diagnostic Criteria for PTSD

Keane et al. (1984) developed both a clinical scale decision rule and a content scale for diagnosing PTSD from MMPI data that was obtained from 200 Vietnam combat veterans. The veterans had been referred for differential psychiatric diagnostic assessment and were classified as PTSD or non-PTSD on the basis of structured interviews, psychophysiological assessment of heart rate, skin resistance, and subjective experience of anxiety caused by Vietnam combat pictures and sounds. The non-PTSD patients received diagnoses of either affective or psychotic disorders. The MMPI decision rule was constructed from the following results. Comparison of a subgroup of the PTSD subjects with a subgroup of the non-PTSD subjects revealed that the PTSD group had

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its highest elevations on scales *F*, *D*, and *Sc*. Cutoff scores were calculated that were one standard deviation below the PTSD group mean for these scales. Thus, the cutoff for the *F* scale was a T score of 66, for scale *D*, 78, and for scale *Sc*, 79. Subjects with scores above these cutoff points were classified as PTSD, and those with scores below this point were classified as non-PTSD. Discriminant analysis conducted on all subjects revealed that subjects diagnosed as PTSD on the basis of DSM-III criteria were correctly classified by the MMPI clinical scale decision rule 74% of the time.

Slightly higher diagnostic hit rates (of 82%) were obtained with the MMPI content scale for PTSD, also developed by Keane et al. (1984). This scale has received official recognition as a valuable diagnostic tool by the U.S. Veterans Administration (Blanchard, Wittrock, Kolb, & Gerardi, 1988). To construct the 49-item scale, MMPI items were submitted to chi-square analyses to determine which items were endorsed differentially by subgroups of PTSD and control subjects, at a significance level of $p < .001$. Inspection of the frequency distributions of PTSD content scale scores indicated that a score of 30 was the optimal cutting score for maximum separation. Another MMPI PTSD content scale was developed by Penk and his associates (e.g., Penk, Robinowitz, Black, Dolan, & Bell, 1989) for use with substance abusers. They have suggested, however, that the Keane et al. scale is preferable for use with most neurotic, psychiatric, and non-psychiatric populations.

Cross-validation studies comparing the Keane et al. decision rules and PTSD scale with other diagnostic criteria for PTSD have produced variable classification rates. Blanchard et al. (1988) examined the Keane decision rule and compared the MMPI results to those obtained from a structured interview called the Anxiety Disorders Interview Schedule (DiNardo, O'Brien, Barlow, Waddell, & Blanchard, 1983). It solicits very detailed information from patients that leads to differential diagnoses made among the anxiety disorders. Blanchard, Gerardi, Kolb, and Barlow (1986) obtained 93% agreement between PTSD diagnoses obtained from this instrument and a criterion diagnosis of PTSD given by an expert (i.e., L. C. Kolb). These PTSD patients were then administered the MMPI. Using the Keane *F-D-Sc* decision rule, 69% of the cases were correctly identified, compared with 74% identified in Keane et al. (1984). A cut-off score of 30 on the PTSD content scale correctly identified 66% of the PTSD patients. This compares to 82% correctly classified in Keane et al., 73% in a study by Hyer et al. (1986) and 57% in a study by Gayton, Burchstead, and Matthews (1986). Utilization of a higher cutoff of 35 in the last study led to the

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correct identification of 42% of the PTSD group and 82% of the non-PTSD group (high specificity but low sensitivity).

Query et al. (1986) examined former WWII POWs and revised the cutoff score for the PTSD content scale to 17 and correctly classified 67% of the PTSD patients and 88% of the non-PTSD patients. Watson et al. (1986) also re-calculated optimal cutoff points. To separate PTSD patients from normal subjects the optimal cutoff was 8.5. This correctly identified 74% of the normal and 87% of the PTSD group. The optimal cutoff for separation between PTSD and non-PTSD patients was 14.5, correctly identifying 73% and 53%, respectively. In comparison, the mean values that had been obtained on the PTSD scale by Keane et al. (1984) for comparable groups of PTSD/non-PTSD patients were 37 and 20 respectively. Some of the variability among these studies may be accounted for by (a) differences in the population samples, in terms of geographic area and ethnicity, (b) whether or not the subjects were hospitalized and (c) the rigor with which the diagnoses were made.

Cannon, Bell, Andrews, and Finkelstein (1987) used both the MMPI PTSD content scale and the Keane et al. decision rules in a study of 595 veteran psychiatric inpatients, of whom 14% had received a DSM-III diagnosis of PTSD following a standard psychiatric interview. Sensitivity and selectivity of both measures were moderate, but the false-positive rate was high. Sensitivity was .76 using the PTSD content scale and .81 using the decision rule (cutoffs of 66, 78, and 79 on scales *F*, *D* and *Sc*, respectively). Selectivity was .69 using the PTSD content scale and .41 using the decision rule. The probability of a false positive (i.e., not being diagnosed as having PTSD by the MMPI but meeting MMPI criteria for PTSD) was .74 using the PTSD content scale and .77 using the clinical scale cutoffs. The probability of a false negative (i.e., being diagnosed with PTSD by the MMPI but not meeting the MMPI criteria for PTSD) was .06 using both the PTSD content scale and the decision rule. Agreement between diagnoses given according DSM-III criteria and according to MMPI criteria was assessed using Cohen's kappa (Cohen, 1960). Agreement between DSM-III diagnosis of PTSD and (a) the MMPI PTSD content scale criteria was $k = .41$, ($p < .01$), and (b) the clinical scale decision rule was ($k = .36$, $p < .01$).

Vanderploeg et al. (1987) tried to discriminate between four groups of veteran patients — PTSD, psychotic, depressed, and chronic pain — on the basis of MMPI data. The Keane et al. decision rule yielded a correct discrimination between PTSD and non-PTSD patients of 81%, while the PTSD content scale resulted in a correct classification rate of 77%. Not only are these rates similar to those obtained by Keane et al. (1984) but blind sorting of the MMPI profiles by clinical

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psychologists also resulted in a similar classification rate. Significantly different scores among the four groups were detectable for all subscales except the *L* and *K* scores. The PTSD group was similar to the depressed group on scale *D* but scored a higher mean. On scales *Hs* and *Hy*, the PTSD group was most similar to the chronic pain group but scored higher. On several of the remaining scales the PTSD group was most similar to the psychotic group: (a) scoring higher on scales *Pd* and *Pt*, (b) the same on scale *Sc*, and (c) lower on scales *F*, *Pa*, and *Ma*. The PTSD group did not score differently from other groups on scales *L*, *K*, *Mf*, and *Si*. The mean profile for the PTSD group and for the combined profile of other three groups is presented in Figure 3. The PTSD group produced a "278" profile while the other three groups produced a "278" profile when they were combined into one group.

Summary. It may be difficult to give differential diagnoses of PTSD on the basis of MMPI scores because of the similarities between PTSD patients and other patients. However, the results suggest that PTSD patients may experience distress on a wide range of symptoms and more intensely than other individuals (e.g., more depression than the depressives, more somatization and hysteria symptoms than the chronic pain group, and as much or more psychopathology as psychotic patients).

Summary

Attempts to relate the degree or location of brain damage to behavioural and neuropsychological deficits are confounded by several factors, as well as methodological inconsistencies between studies. Diffuse brain damage may occur in conjunction with focal damage and it is highly unlikely that the multiple effect from two or more forms of damage can be subdivided according to etiology. It is also possible that the consequences from one type of injury will be altered when a second type of damage is superimposed on it. From what Lishman (1968, 1978) and others (e.g., Grafman et al., 1988) can infer from the psychometric examination of servicemen who incurred penetrating wounds to the head, psychiatric disability and intellectual impairment relate to total loss of brain tissue, yet symptoms of post-concussional syndrome do not show such a relationship. Studies of closed head injury also indicate that while behaviour disturbances are likely to occur only after severe head injuries, affective disturbances such as somatic concern, anxiety, and post-concussional syndrome are equally probable after minor injury.

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In general, cognitive impairment increases with severity of brain damage,. It may be detectable at subtle levels in mildly head injured patients but only on certain tests. This does not prove neurological damage, only that impairment is secondary to head injury. Subtle deficits may also be detected following stressful events or traumatic circumstances in which there was no head injury. Cognitive performance is most impaired in severe injuries or when the injury involves either the left or both hemispheres. Duration of post-traumatic amnesia and period of coma have been found to correlate with later cognitive performance in more severely injured patients, but results may only be significant in the early stages of recovery (Kløve & Cleeland, 1972; Mandleberg & Brooks, 1975). Studies indicate that patients with no hematoma and brief periods of coma and/or confusion recover markedly within one to three months of injury, both with respect to matched controls and to estimates of preinjury functioning. For more severely injured patients, there is no guarantee of complete restitution of intellectual functioning. Intellectual recovery occurs first on verbal subtests, with performance scores attaining maximum recovery between one and two years after injury.

While global measures of intelligence often fail to detect cognitive impairment in mildly injured patients, more specialized tests such as the Halstead-Reitan Neuropsychological Test Battery and WAIS-R subtests may reveal subtle attentional and memory deficits in the early stages of recovery. One study (Dye et al., 1981) found that short-coma patients performed more poorly on measures of attention and concentration than either matched controls or long-coma patients. The more severe the head injury, the more memory is disrupted (especially for delayed recall of newly-acquired material). However, subjective assessment of memory does not necessarily relate to objective assessment of memory. In other words, subjective complaints of memory impairment from patients who may also be experiencing other PCS symptoms does not necessarily imply a corresponding degree of brain damage.

The effectiveness of the research literature to provide definitive answers on memory and intellectual functioning are obscured by several methodological issues: (a) lack of information on preinjury cognitive performance, (b) absence of an appropriate control group, (c) failure to screen for preinjury conditions (e.g.. alcoholism), (d) inadequate documentation of severity and location of head injury, (e) lack of consistency in the injury-test interval, and (f) lack of serial testing to depict the course of recovery.

A number of studies that have attempted to separate brain-damaged patients from other clinical populations on the basis of neuropsychology assessment have been reviewed. Further

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reviews may be found in Farr and Martin (1988), Heaton and Crowley (1981), and Wooten (1983). These studies have concluded that brain dysfunction has more impact on the Halstead-Reitan battery and some other neuropsychology tests than emotional factors. Despite the robustness of the tests, however, test performance is not independent of emotional problems. Emotional problems that frequently accompany brain disorders may overshadow the nature and severity of the brain dysfunction itself (Wooten, 1983).

The MMPI measures the multidimensional interaction of personality and illness factors that are reflected in various aspects of the respondents' behaviour, thoughts, and emotions. Summary of research into the use of the MMPI among trauma survivors shows that persons with PTSD have, on average, elevations on validity scale *F* and most of the clinical scales. It is important to note that the T scores given in these studies for the different groups of patients and non-patients are means and do not necessarily represent individual T-scores. The scale means for PTSD patients are similar to or higher than most mixed psychiatric groups, however, the majority of studies have been conducted with veteran patient groups. The one study that provided scale means for survivors of automobile accidents obtained a mean profile for the men that resembled those of male veterans but the scores for the accident survivors were substantially lower (Platt & Husband, 1986). There also appears to be some evidence that males and females who have PTSD may differ slightly in their mean MMPI profiles.

There is no consensus as to a specific code type for PTSD. Individuals with the disorder endorse a considerable range of symptoms. Elevations on the so-called neurotic scales (i.e., *Hs*, *D*, *Hy*) are often as high as on the so-called psychotic scales (i.e., *Pa*, *Sc*, *Ma*). Post-traumatic stress disorder seems to consist of a mixture of psychiatric symptoms. To some extent, patients with PTSD resemble in their endorsement of MMPI items neurotic patients, chronic pain sufferers, and individuals diagnosed as schizophrenic.

Hypotheses of the Present Study

Construct validation of the concept of post-traumatic stress disorder refers to the establishment of the syndrome as a distinct and isolable disorder within which characteristic symptoms have assessable cognitive, emotional, behavioural, and physiological components. This may be distinguished from validation of an arbitrary set of diagnostic criteria considered necessary and sufficient to define the disorder. The issue addressed in the present research is that of the operational or diagnostic validity of DSM-III/III-R criteria for PTSD examined from a psychometric

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perspective. The presumption is made that PTSD is conceptually different from other diagnostic disorders in terms of etiology, behavioural manifestations, and prognosis. This research examines whether the criteria used by DSM-III/III-R to classify individuals are defined in such a way as to permit valid classification of those with or without the disorder.

This research was designed to assess the validity of the diagnostic criteria used by DSM-III/III-R to operationally define PTSD by verifying the meaningfulness of the DSM-III/III-R criteria through independent sources of information. This was done first by comparison of diagnoses made according to DSM-III/III-R with alternative diagnostic criteria. Next, multivariate statistical techniques were used to identify distress and impairment, as well as psychosocial/demographic and medical factors, that differentiate between those diagnosed with PTSD and those diagnosed without PTSD according to the various sets of diagnostic criteria.

Hypothesis One. It is hypothesized that there is poor concordance between DSM-III/III-R and alternative diagnostic criteria for PTSD with a head injured population. Despite a thorough review of the literature, it was not possible to accord the status of gold standard to any one set of diagnostic criteria in this study of PTSD. Different factions have chosen to operationally define PTSD with different subsets of symptoms that have been observed in countless studies of traumatic events. New criteria, such as DSM-III/III-R, are intended to improve diagnostic practices and some (e.g., Spitzer, Endicott, & Williams, 1979) contend that these new criteria should not be evaluated by comparison with diagnostic methods intended to simulate prevailing practices. However, there was no evidence in the literature that the DSM-III/III-R diagnostic definition of PTSD has superior validity, at least not among the head injured. Assessment of the agreement among alternative sets of diagnostic criteria, using Cohen's kappa, can provide useful data even if it is not clear that any one set has preferred status (Zwick, 1983). The proportion of individuals diagnosed as having a given disorder can be determined according to each set of criteria, thus providing information on the coverage of the diagnostic criteria. In this research, the DSM-III/III-R criteria are compared with two sets of alternative criteria used in research before the publication of DSM-III, namely by Braverman (1980) and by Lidvall et al. (1974) and the following results obtained: (a) the proportion of individuals diagnosed as having PTSD according to each set of criteria (i.e., coverage), (b) the concordance of diagnosis of PTSD among the various sets of criteria, including overlap of subjects and Cohen's kappa (convergent validity), and, (c) examination of coverage and concordance of the actual symptoms used as criteria. Extreme rates of PTSD (either high or low) for

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a given set of criteria would suggest poor coverage and thus reflect on the validity of the criteria. The validity of a diagnostic criteria is only as good as the symptoms used as criteria. Therefore, the descriptive validity of the criterion symptoms will also be examined for their sensitivity and specificity, in as well as correlational analyses to determine their association with external predictor variables.

Hypothesis Two. It is hypothesized that multivariate separation between PTSD and non-PTSD groups on the basis of distress or impairment will be less satisfactory when the groups are formed on the basis of DSM-III/III-R criteria than on the basis of alternative criteria. If the diagnostic criteria that are used to operationally define the syndrome are valid, it should be possible to discriminate between those diagnosed with the disorder according to this operational definition and those without the disorder, at least in terms of distress and/or impairment. As discussed in the literature review, one might expect to find homogeneity among PTSD patients on symptoms of distress and impairment in one or more important areas of functioning. Some or all of these variables should distinguish between PTSD and non-PTSD patients. If the classification based on an operational definition of PTSD is less than adequate, the assignees to a specific group will not typify the categories in which they are placed. This research assesses whether it is possible to statistically discriminate on the basis of optimal subsets of predictor variables including symptoms of distress and cognitive impairment between head-injured patients diagnosed according to DSM-III/III-R with PTSD and those without PTSD. For comparison, discriminant analyses are also performed on the basis of optimal subsets of predictor variables using both Braverman and Lidvall et al. criteria to diagnose PTSD. Finally, it may be possible that no one set of the diagnostic criteria examined in this research is preferable to another. From an understanding of the phenomenological research into PTSD, it is possible that PTSD may be best diagnosed when an individual meets any set of diagnostic criteria. Perhaps the combination of all sets of diagnostic criteria (i.e., least restrictive criteria) provides the best coverage of PTSD, as suggested by Paykel (1971). Therefore, within-group homogeneity and between-group heterogeneity will also be examined for groups formed on the basis of whether an individual met any set of diagnostic criteria for PTSD. It is only possible to prove the diagnostic validity of a set of criteria on the basis of discriminant analyses using independent predictor variables and not to disprove validity; however, the meaningfulness of a DSM-III/III-R diagnoses of PTSD is questionable if it is not possible to find a greater level of distress or impairment among the PTSD patients. If PTSD patients are not more distressed or impaired than non-PTSD patients they hardly warrant the label of a "disorder". If it is

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found that one or both of the alternative sets of criteria (i.e., Braverman or Lidvall) produce groups of PTSD patients that are more distressed and/or more impaired than either the corresponding non-PTSD group or the PTSD group formed from DSM-III/III-R criteria, it may be concluded that DSM-III/III-R is not the optimal diagnostic criteria for operationally defining PTSD in a head-injured population.

Hypothesis Three. It is hypothesized that the likelihood of discriminating on the basis of neurological and neuropsychological variables between PTSD patients diagnosed according to Lidvall criteria and those diagnosed without PTSD is no more likely than it is when the two groups are formed on the basis of DSM-III/III-R or Braverman criteria. As previously reviewed, the Lidvall et al. (1974) set of diagnostic criteria used to research Post-Concussional Syndrome (PCS) is representative of similar subsets of symptoms used in neurological circles to diagnose PCS. The popular consensus, supported by the majority of studies, is that PCS is sustained by psychogenic forces and, therefore, the label PCS has been subsumed under PTSD; however, DSM-III/III-R dismisses the majority of PCS symptoms as associated features that are possibly due to an Organic Mental Disorder. If DSM-III/III-R is valid, there should be a strong positive relationship between the diagnostic criteria of Lidvall et al. and neurological/neuropsychological indices of brain damage. This search for brain damage correlates of PTSD diagnoses will also address the issues of (a) whether PCS and PTSD are equivalent, (b) whether subsets of symptoms traditionally used to define PCS may be used to diagnose PTSD, and (c) whether the Lidvall et al. criteria may be used to assess the diagnostic validity of DSM-III/III-R criteria. Little association is expected between PTSD diagnoses according to any criteria and indices of brain damage.

Hypothesis Four. When all sets of predictor variables in this research are combined, it is also hypothesized that maximum discrimination between PTSD and non-PTSD groups will be achieved when alternative criteria are used rather than DSM-III/III-R. Also, as noted in the literature, differential diagnosis of mental disorders is significantly increased when psychometric information from several sources is combined; including personal attributes or characteristics that moderate the influence of a stressor. The combination of a wider set of predictors will increase the power of the statistical analyses in this research to determine which set of diagnostic criteria for PTSD is optimal for use with head-injured survivors. To be valid a set of diagnostic criteria should demonstrate some degree of group homogeneity across a broad range of psychometric data. This final analysis

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will also provide information on the types of cases for which the various sets of criteria agree or disagree, thus furthering the validation process. Lastly, given the paucity of psychometric data on PTSD (in general) and following head injury (more specifically) this research also provides valuable, if secondary, information on the personality, neuropsychological, cognitive, demographic, and psychosocial characteristics of those suffering PTSD following head injury.

METHOD

Subjects

Sixty subjects voluntarily agreed to participate in this research. They were patients over the age of 15 who were treated in hospital for head injuries received as a result of trauma that met the first of DSM-III's primary criteria. The trauma they experienced may generally be considered outside the range of usual human experience. Motor vehicle accidents accounted for most of the trauma: 43 patients were occupants of a vehicle involved in an accident and four patients were pedestrians hit by a car. Falls accounted for injuries to ten patients while two patients were assaulted. One patient received a moderate head injury when she hit a tree in a sporting accident.

Inclusion/exclusion criteria. The subjects in this study represented, as close as possible, serial admissions to the hospital. The head injuries, received under various traumatic circumstances, represented a wide range of neurological injury, from probably none to severe brain damage (i.e., Galveston Orientation and Amnesia Test score of 75 out of 100, see Appendix B). Excluded from this study were patients under the age of 15 and patients who did not make at least a moderate recovery because they would not be able to give informed consent. Also excluded were individuals who did not have a working knowledge of English, and individuals who lived more than 200 kms. from Ottawa. There was no selection of patients on the basis of any other variables and these patients represented a wide range of socioeconomic status (i.e., from unskilled labourer to professor), intelligence (i.e., a post-trauma IQ of between 66 and 116) and educational achievement (i.e., from some primary education to a Ph. D.). All subjects were at least functionally literate in English, although English was not the primary language of 13 patients.

Participation rate. Following acceptance of the research proposal by the respective hospitals, patients who presented themselves to the Ottawa Civic Hospital and to St. Vincent Hospital, Ottawa, over the 18-month period from November 1985 to June 1987 were approached for recruitment as volunteers. Of the patients who were initially approached, 88% agreed to participate. Those who refused consent cited a variety of reasons for refusal, including not feeling up to it, experiencing too much stress to participate, and being from out-of-town. Others were involved in litigation and worried that insurance companies or third parties could get access to

individual assessment results. After giving consent, a further ten persons dropped out of the study before completing the initial battery. Thus, 74% of those individuals originally approached completed the requirements of the initial assessment.

Demographical information. The 60 subjects who completed the initial requirements included 40 males and 20 females. Of these subjects, 30 (50%) were 15-25 years old, 19 (32%) were 26-35 years old, 6 (10%) were 44-60 years old and 5 (8%) were over 60 years old. There were no subjects in the age group 36 to 43 years old and this reflects the fact that this age group has the lowest probability of sustaining a head injury (Bond, 1986; Cooper, 1987; et al., 1982). With respect to severity of head injury, 26 (43%) received diagnoses of mild injury, 19 (32%) received moderate injuries and 15 (25%) received severe injuries. The criteria used to assess severity is presented in the next section under Medical/Neurological Variables.

Assessment Procedure

Patients were approached when they were fully conscious and no longer confused, disoriented or amnesic, according to the Galveston Orientation and Amnesia Test (see Appendix B). They were contacted either in the hospital or over the phone at their home. Following introductions (see Appendix C) the patient was asked to read the consent form (see Appendix C) or, if there were reading difficulties, it was read out loud by the examiner. Once the patient was fully informed of the study and what was required of him or her and consent was given, the consent form was signed. The patient was given a copy and told contact would be made to arrange an appointment.

Initial testing sessions took 4 to 6 hours to complete. They were scheduled as close to hospital discharge as possible, depending on the severity of the injury and recovery from it. Patients were only tested when they were physically well enough to tolerate extensive testing. Over 70% of the subjects were tested within one month of discharge and 95% within four months. Two severely injured subjects were tested at seven and eight months after discharge, by which time they had made moderate to good recovery from the brain injury. Testing was done in a neuropsychology laboratory at the hospital and/or in a quiet room in the patient's home. The primary criterion for testing in the home was the distance the patient lived from the hospital and his or her ability and willingness to find transportation to and from the hospital.

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As there was considerable variation in the severity of the injuries, recovery rate, stamina and endurance, testing was done in one to four sessions, depending on the subject. Sessions ranged in duration from 90 minutes to 5 hours. Young persons with minor injuries often completed the assessment battery in one session whereas elderly patients and those with extensive injuries required more time. Some patients were unable or unwilling to schedule more than two hours at a time.

Training and inter-observer reliability. Psychometric assessment was done by the author and three highly-trained psychometrists. All four examiners were trained in the neuropsychological department at the Royal Ottawa Hospital where there is a continuing process of peer review. Training was provided by senior psychometrists in the Neuropsychological Laboratory at the Royal Ottawa Hospital, under the supervision of the chief neuropsychologist, Dr. R. Trites. The author was also trained in the use of the Diagnostic Interview Schedule (DIS) at a one-week training course at the Washington University of Medicine, St. Louis, MO, following which she was qualified to train others in the use of DIS.

It was decided to forego making an assessment of interrater reliability because of the ongoing assessment process at the hospital and to do so again with even a few of these injured patients would have put a further strain on them during their recovery. Also, the ethics of submitting some patients to this extensive neuropsychological test battery twice was questionable. Moreover, the test batteries employed in this research were tightly structured and many required minimal subjective judgement. The scoring of the WAIS-R and the coding of the Diagnostic Interview Schedule (to be discussed later in "Measures to Assess PTSD") for computer scoring were always checked by the author and discrepancies were resolved. Many of the measures were also simple to administer; (a) in the form of questionnaires, (b) administer with tape recordings, slides, or a mechanical key tapper, or (c) paper and pencil tests.

Test Administration at Initial Assessment

The questionnaires, the MMPI, and the Diagnostic Interview Schedule (discussed in the next section) were always administered together. They were given to 1/3 of the patients before neuropsychology testing began, 1/3 of the patients half-way through initial neuropsychology testing, and 1/3 of the patients upon completion of neuropsychology testing. The

neuropsychology tests (see Variables and Measures) were presented in randomized order. All questionnaires including the MMPI were self-administered unless the patient's reading ability was not adequate to allow him or her to complete the questionnaires alone. This happened in seven cases. Some subjects were reluctant to complete the entire battery of tests and questionnaires. It was realized that for such subjects it would not be possible to administer both the Halstead-Reitan battery and the WAIS-R, because of the length of time and amount of rapport needed to complete each of them. Preference was given to retaining the Halstead-Reitan battery because of its reputation as one of the more reliable psychological means of identifying patients with brain damage (Dye et al., 1981; Goldstein, Deysach & Kleinknecht, 1973; Kane, Parsons, & Goldstein, 1985; Lezak, 1976) and without it Hypothesis 3 could not have been tested. Furthermore, it also has individual subtests that are sensitive to cognitive function and thus was used to assess cognitive impairment for Hypothesis 2. The reason for including both the Halstead-Reitan and the WAIS-R is that a neuropsychological examination requires assessment of cognitive, perceptual, sensory, and motor functions. While both batteries are sensitive to brain damage and have high correlations, they vary somewhat as to areas assessed, and no battery covers all areas completely. While Kane et al. (1985) determined that scores derived from both batteries produced comparable hit rates at discriminating between brain-damaged and psychiatric groups, on an individual-case basis, these measures showed a differing sensitivity to the presence or absence of brain damage. The use of only one or a few subtests, or a composite score, such as the Impairment Index or WAIS-R Full Scale IQ, is not recommended for classification of a head-injured population (Lezak, 1976; Matthews et al., 1966; Franzen, 1989). A comparison of mean scores on predictor variables shows that the group who completed the entire battery had slightly higher SES scores, less recent events and a lower mean MMPI *Ma* (Mania) score (see Attrition Analysis in the Results). If the research had been restricted to those who completed the entire battery there would have been a bias towards subjects who were more compliant, probably because they were not under as much stress; and who were slightly more seriously injured, as reflected in duration of hospitalization, impaired consciousness, and likelihood of having received a hematoma. As will be shown, these variables also had some effect on PTSD diagnoses. The subjects who completed the entire battery may have been more motivated to do so because the severity of their injuries gave personal relevancy to the diagnostic tests or, they may have been more accessible because of their longer stay in hospital (i.e., a captive audience).

Midway Assessment

Following the completion of the initial testing, patients were contacted by telephone, from three to six months later and asked about PTSD symptoms they might be experiencing (the DIS and the Symptom Checklist). The telephone call lasted about 15 minutes. This was done to assess whether they were experiencing PTSD symptoms at the time. There had been concern that PTSD symptoms could occur after the initial assessment and be resolved by the follow-up session; and not be recalled by the subject at follow-up. This was the case with six subjects or 10% of the sample. Without the midway survey, little would have been known about the temporal pattern of PTSD among these subjects. Patients were randomly selected for this assessment at 3, 4, 5, or 6 months. Of the original 60 patients, 46 were available for this mid-way assessment. Ten subjects had moved and could not be located and four were unavailable (out-of-town on holiday or business). A comparison of group means on all variables showed that there were no significant differences between the initial 60 subjects and the 46 midway subjects (see Attrition Analysis in Results).

Follow-up Assessment

Follow-up assessment was conducted at 7 to 10 months after initial testing was completed. Again, subjects were randomly selected to be assessed at 7, 8, 9, or 10 months. The assessment battery at this time included the PTSD portion of the DIS, the Symptom Checklist, the MMPI, and the Halstead-Reitan battery. The assessment battery required 3 to 4 hours and was concluded in one or two sessions, depending on the patient's preference and endurance. Thirty-one patients (52%) agreed to participate in the complete follow-up battery. A further nine subjects were only willing to respond over the telephone to the PTSD portion of the DIS and the Symptom Checklist. Of the 20 patients who were not followed up, 10 had moved and could not be located and 10 refused to participate, citing a variety of reasons for refusal. This follow-up rate was approximately the same as experienced by Dikmen et al. (1983) who studied a similar group of head injured patients. A comparison of mean scores on all predictor variables showed that there were no significant differences between the original 60 subjects and the 38 follow-up patients (see Attrition Analysis in Results).

Variables and Measures

Criterion Variable

The criterion variable in this research was the presence or absence of a diagnosis of PTSD, as determined according to three major sets of diagnostic criteria. Each set of criteria was scored in various ways. Furthermore, a diagnosis of PTSD are also made if the subject meets any set of criteria. This brought a total of nine of ways to diagnose PTSD in this research. The primary set of diagnostic criteria was DSM-III criteria, as assessed by the National Institute of Mental Health (NIMH) Diagnostic Interview Schedule (DIS, Robins, 1985). In addition, the criterion variable was evaluated by two alternate sets of diagnostic criteria, composed of subsets of experiential-based criteria used in research by Braverman (1980) and Lidvall et al. (1974). These symptoms were assessed by a symptom checklist (see Appendix D). In addition, modifications were made to the scoring of these sets of diagnostic criteria as follows.

1. The DSM-III criteria were modified to include cases of partial PTSD in the event that few or no patients would meet full DSM-III criteria for PTSD, as has occurred in other studies of PTSD among accident survivors (e.g., Malt, 1988). A diagnosis of partial PTSD was given if subjects endorsed either intrusive or avoiding-numbing symptoms, as well as the miscellaneous symptoms generally acknowledged to represent hyperarousal. This is in accordance with the bidimensional model of PTSD put forward by Horowitz (1986), and used in PTSD research by Laufer et al. (1985a). The criteria will be referred to as DSM-III (1).
2. DSM-III allows for the retrospective diagnosis of a case and the Diagnostic Interview Schedule is worded in such a way as to establish temporality. In this research, cases of PTSD diagnosed in retrospect (at a later assessment) were included with the PTSD cases diagnosed at an earlier time. This modification increased the number of PTSD cases but considerably reduced the number of non-PTSD cases because only those subjects who denied PTSD-symptoms at all three assessments can be deemed to be completely free of PTSD during the first year following injury. This modification will be referred to in this research as DSM-III (2).
3. This research was conducted prior to the publication of DSM-III-R but because the 1987 revisions were minor (discussed in the literature review) answers to the DIS could be regrouped to approximate, as close as possible, most of the changes in DSM-III-R. Others have also done this (e.g. Solomon & Canino, 1990). The presence of anger or irritability could be established from the Symptom Checklist of Braverman-Lidvall symptoms (see Appendix D). Of the remaining additions,

"psychogenic amnesia" and "sense of foreshortened future" have been shown to be endorsed minimally in at least one study: Creamer (1990) reported these symptoms to be endorsed by only 5% of a traumatized population. Furthermore, the symptom of psychogenic amnesia may not be appropriate to use with head injured patients because it cannot be separated from that of post-traumatic amnesia following brain trauma and thus, due to neurogenic causes. Almost all head-injured patients reported some period of amnesia in this study. Under this third modification to DSM-III criteria, full and partial diagnoses of PTSD were made according to these discussed approximations to the criteria in DSM-III-R. This modification will be referred to in this study as DSM-III (3).

4. The fourth modification to DSM-III criteria involved the inclusion of retrospectively diagnosed cases of PTSD (according to DSM-III (3) criteria) to the PTSD cases that were previously identified. This modification will be referred to as DSM-III (4).

5. Braverman (1980) used the presence of 10 symptoms as diagnostic criteria for a full diagnosis of PTSD. A diagnosis of partial PTSD was given if at least two of the symptoms of irritability, hypersensitivity to sound, and posttraumatic nightmares were present, together with at least five of the remaining symptoms: impairment of concentration, difficulties in recall, absentmindedness, social withdrawal, anxiety with or without phobia for the injuring object or associated circumstance, depression, and sexual dysfunction. Because the full criteria seemed overly restrictive and likely to lead to very few diagnoses it was decided that a subject would be diagnosed PTSD-positive if either full or partial Braverman criteria was met. The Braverman PTSD symptoms had to be endorsed at the level of "moderately" or more on the Symptom Checklist (Appendix D) to meet criteria for inclusion. Others who have used Likert-type checklists have also considered "moderately" as the lower limit for item endorsement (e.g., Frye & Stockton, 1982; Keane et al., 1986). The scoring variation of this criteria will be referred to as Braverman (1).

6. The scoring modification to Braverman criteria involved obtaining an intensity of distress score for the symptoms that are endorsed at least "moderately" (according to the Likert score). A score of 2, 3, or 4 was given if a symptom was endorsed respectively, as "moderately", "quite a bit", or "extremely". The intensity score is the sum of the Braverman symptom scores. An arbitrary cut-off score of 11 was used to separate non-PTSD from PTSD cases. The cut-off was determined after the frequency counts of symptom endorsement by the subjects were reviewed (see Appendix E). The value of 11 was the lowest intensity score obtained by anyone who met the Braverman (1) criteria. It also seemed to be a value that separated those with many symptoms from

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those with few or no symptoms, as is shown in Appendix F. It also turned out to be a value that diagnosed approximately 20% of the subjects as suffering from PTSD. This figure is similar to those obtained in studies of PTSD among veterans and following civilian accidents with or without attendant head injury, including Boulanger et al. (1986), Lidvall et al. (1974), Mahan and Elgar (1989), and Malt (1988). This modification of Braverman criteria will be referred to as Braverman (2) in this research.

7. Lidvall et al. (1974) diagnosed Post-Concussional Syndrome on the endorsement of at least five out of nine symptoms, including headache, hypersensitivity to light, hypersensitivity to sound, dizziness, fatigue, difficulty concentrating, memory impairment, anxiety, and irritability. The Lidvall et al. criteria must be endorsed at least "moderately" in this study to meet item criteria. This set of criteria is referred to as Lidvall (1).

8. The scoring modification to Lidvall et al. criteria involves obtaining an intensity of distress score for the symptoms that are endorsed at the moderate level or greater. As in the modification of Braverman criteria, an intensity score is obtained by summing the scores for each item. An arbitrary cut-off of 11 is used to diagnose PTSD cases (see Appendix E). The value of 11 was the lowest intensity score obtained by anyone who met Lidvall criteria. Approximately 20% of the subjects received a diagnosis of PTSD according to this criteria. This modification of Lidvall criteria will be referred to as Lidvall (2).

9. Finally, PTSD diagnoses were made for individuals who met any of the previous eight sets of criteria. This criteria is referred to as Any Criteria.

Measures to Assess PTSD

Diagnostic Interview Schedule (DIS). The Diagnostic Interview Schedule was developed at Washington University by Robins, Helzer, and colleagues (Robins, 1985; Robins, Helzer, Croughan, & Ratcliff, 1981; Robins, Helzer, Ratcliff, & Seyfried, 1982) for the National Institute of Mental Health. The measure is a fully structured interview schedule that enables professionals and non-professionals, following training on the administration of the interview, to make consistent and accurate diagnoses of DSM-III mental disorders through the computer scoring of coded answers to specific questions. The presence of DSM-III psychiatric disorders is ascertained by asking respondents whether they have experienced each of the criterion symptoms in their lifetime and whether that symptom met at least one of three severity criteria. Also ascertained is the age at which the first symptom associated with the diagnosis occurred, and when the subject last had any

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symptom associated with that diagnosis. Recency of symptom occurrence is categorized within two weeks, one month, six months, one year, three years, or over three years. A diagnosis is scored as positive if the criteria has ever been met in the subject's lifetime. Each diagnosis that has ever occurred is assessed for recency. For disorders that were non-current, age at last symptom is obtained.

Structured diagnostic interviews, such as the DIS, have several advantages over both self-report symptom checklists and unstructured diagnostic interviews. They are more detailed and can cover more criteria than self-report questionnaires can, as well as being conducted in an interpersonal situation. Examiners are trained, yet need not be clinically experienced in order to administer the interview or make diagnoses. Structured interviews are self-contained, reliable and objective, coming closer to actuarial methods of assessment than unstructured interviews. In this research, the DIS was used to diagnose PTSD according to DSM-III, as well as pretraumatic psychiatric disorders, for Hypothesis Four.

The Diagnostic Interview Schedule has been used in a variety of clinical, research, and epidemiological applications to diagnose PTSD (e.g., Breslau & Davis, 1987; Boehnlein et al., 1985; Kulka & Schlenger, 1986; Helzer et al., 1987; Solomon & Canino, 1990), and other DSM-III disorders in psychiatric (Ganguli & Saul, 1982) and non-psychiatric patients (Clouse & Lustman, 1983). The DIS is designed to be used with both traumatized and neurologically disordered individuals, and has a section for both PTSD and Organic Brain Syndrome. It is considered to be the best completely structured interview currently available (e.g., Ganguli & Saul, 1982). Weller et al. (1985) compared the Diagnostic Interview Schedule with another structured, diagnostic interview called the Psychiatric Diagnostic Interview. A kappa value of 0.72 was found between the two interviews, significant at $p < 0.001$, thus indicating good diagnostic compatibility. The majority of validity studies of the DIS have focused on concordance in computer-scored diagnosis between trained lay interviewers and psychiatrists, either making DSM-III diagnoses on the basis of psychiatric training or the DIS. Robins et al. (1981) established that the concordance between lay interviewers and psychiatrists on all DSM-III disorders, except PTSD, ranged between $k = .40$ for Panic disorder to $k = 1.00$ for Anorexia nervosa, with a mean of $k = .69$ for all disorders (sample size, $N = 216$). The kappa for Organic Brain Syndrome was .73. The sensitivity ranged from 44% for Panic disorder to 100% for Anorexia nervosa (mean = 75%) and the specificity from 84% for Psychosexual dysfunction to 100% for Anorexia nervosa (mean = 94%). The sensitivity and specificity for Organic Brain Disorder was 80% and 96%, respectively. Breslau and Davis

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(1987) reported on the administration of the DIS to both survivors of Vietnam combat and civilian trauma and provided concordance rates between lay and psychiatric interviewers for PTSD. Kappa values between the two sources of diagnoses for PTSD following combat were 0.65 and following civilian trauma, $k = 0.67$. The sensitivity for PTSD was 82% (combat) and 86% (civilian), while specificity was 87% (combat) and 82% (civilian).

Robins et al. (1982) reported that lay interviewers diagnoses of DSM-III disorders were confirmed by the psychiatrists DIS evaluation from 53% to 95% of the time, depending on the disorder; the mean was 76%. None of the variables of sex, age, or in/out-patient status of the subject affected concordance between lay and psychiatric interviewers. A disorder was more accurately reported by the lay interviewer when, according to the psychiatrists interview, there had been symptoms within the current year than when the symptoms were in remission, however Kappas were still greater than .50 for disorders in remission. Duration of the disorder showed no effect on accuracy. Both extreme positives and extreme negatives were more accurately identified than borderline cases. The concordance between lay and psychiatric interviewers for borderline positives was, on average, $k = .54$ and sensitivity = 61%, down from .69 and 77% respectively, when cases were clear-cut. For borderline negatives, the average kappa was reduced from .66 (for clear-cut cases) to .38, while the average specificity was reduced from 97% to 80%. The agreement between the psychiatrist's and lay interviewer's DIS diagnoses and the patient's medical chart was such that an average of 63% of all diagnoses in the chart were identified by the psychiatrist's DIS and 55% by the lay interviewer's DIS. The lower success of the lay interviewer's DIS was largely explained by missed cases of somatization disorder, which has been found to be underdiagnosed by lay interviewers, probably as a result of the instructions to lay interviewers to not question a respondent's claim that symptoms had a medical explanation. Without somatization disorder, the lay interviewers identified an average of 60% of the chart diagnoses, almost the same proportion as the psychiatrist's.

To answer the question of whether the DIS was insensitive to clinically important disorders, the results of the Robins et al. (1982) study indicated that omissions of DIS diagnoses in the medical chart were considerably more common than were omissions of chart diagnoses by the DIS, whether the DIS was administered by a psychiatrist or a lay interviewer.

The following amendments were made to the pre-1987 DIS to assess DSM-III-R criteria:

- (a) The new fourth item in the DSM-III-R criteria for intrusion was previously contained in the group of DSM-III miscellaneous symptoms, so it was regrouped with intrusive recall.
- (b) One of the

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avoiding/numbing symptoms was previously contained in the DSM-III miscellaneous symptoms, so it was regrouped with avoidance/numbness. (c) One of the new DSM-III-R symptoms "irritability or outbursts of anger" was assessed as part of the Braverman and Lidvall criteria, so information is available on that symptom from the Symptom Checklist (to be discussed next). One of the six hyperarousal symptoms could not be assessed using the DIS. This was not a problem in the present research because all the subjects who met criteria for either intrusion or avoidance also endorsed at least two of the remaining five hyperarousal symptoms, thus meeting criteria anyway.

Symptom Checklist. A 22-item symptom checklist was constructed using a 5-point Likert scale to assess the presence of criterion symptoms for PTSD from Braverman (1980) and Lidvall et al. (1974). The checklist contains 10 Braverman symptoms and 9 Lidvall et al. symptoms. There is a copy of the checklist in Appendix D. There is an overlap between the two sets of criteria of five items. Eight additional symptoms of depression and anxiety were added as fillers. Of the 22 items, eight are similar or identical to DSM-III and DSM-III-R criteria for PTSD. The items are worded the same as they are in the Symptom Checklist-90 by Derogatis (1977). Symptoms of PTSD that did not appear in the SCL-90 were worded in a similar fashion to those that did. Subjects were asked to rate each item on a 5-point continuum from "not at all" to "extremely". To meet criteria an item had to be endorsed at least "moderately". An intensity score was also derived from the cumulative score of the endorsed symptoms (see Appendix E).

Derogatis, Lipman, Rickels, Uhlenhuth, and Covi (1974) discussed several advantages of self-report symptom checklists, or inventories, including economy of time in administration, scoring, and analysis; and objective scoring and easy incorporation into statistical analyses. The self-report scale also reflects phenomena the respondent is presumably experiencing in the here-and-now. Potential problems associated with self-report inventories included response set, issues of social desirability, acquiescence, unconscious defensiveness, and secondary gain.

The use of checklists of criterion symptoms is based on the assumption that the greater the number, intensity, or frequency of symptoms, the greater the severity of the disorder. Common to all checklists is the requirement that the symptom be endorsed by the respondent at a moderate level or more to be considered admissible. Checklists have been used in studies to diagnose PTSD according to DSM-III or alternative criteria (e.g., Frye & Stockton, 1982; Keane et al., 1986; Mason et al., 1987; Kulka & Schlenger, 1986).

Predictor Variables for Hypothesis Two

Distress Variables

A set of 15 predictor variables will be used in discriminant analyses to see if it is possible to distinguish between PTSD and non-PTSD groups on the basis of distress. These variables are the 3 validity scales, 10 clinical scales, and the Keane et al. (1984) PTSD content scale of the MMPI and a measure of anger or irritability. The MMPI scales represent a broad spectrum of distress observed in trauma survivors. They include the validity scales *F*, *K*, and *L*, the clinical scales *Hs* (Hypochondriasis), *D* (Depression), *Hy* (Hysteria), *Pd* (Psychopathic Deviant), *Mf* (Masculinity/Femininity), *Pa* (Paranoia), *Pt* (Psychasthenia), *Sc* (Schizophrenia), *Ma* (Mania), *Si* (Social Introversion), and the PTSD content scale (Keane et al., 1984). The PTSD scale by Keane et al. (1984) is included because it was developed for detecting the presence of PTSD in psychiatric patients. It is considered preferable to other (e.g., Penk et al., 1989) MMPI content scales for PTSD because it has achieved a wider range of applicability and utility, and is contained within the shorter 400 item version of the MMPI. The standardized T-scores were used for all the MMPI scales except for the *PTS D* scale, for which standardized values are not available.

Irritability or proneness to anger is a variable often observed among PTSD patients and is included in several sets of diagnostic criteria for PTSD. Yet, no psychometric data has been reported on this variable. The Novaco Anger Inventory was used to assess this symptom because there is no such content scale for it in the MMPI. There are MMPI content scales available to measure hostility (i.e., general antagonism or unfriendliness) but not anger or irritability.

Setwise regression is used to obtain an optimal subset of these variables for classification. This procedure, using BMDP9R 'All Possible Subsets Regression' (University of California, 1979), is recommended by Tabachnick and Fidell (1989) to reduce the number of predictor variables when (a) there are a large number of intercorrelated predictor variables, and (b) there is a smaller number of subjects in one of the groups than there are predictor variables.

Minnesota Multiphasic Personality Inventory (MMPI). The MMPI is a well known, and widely used measure of distress, maladjustment, or psychopathology. It contains 4 validity scales and 10 basic clinical or personality scales from which numerous content scales have been constructed. The literature on the reliability and validity of the MMPI is voluminous. There have been over 6,000 studies published on the MMPI. Summaries are available in many publications, including Dahlstrom

and Dahlstrom (1980), Dahlstrom, Walsh, and Dahlstrom (1975), Graham (1977), Greene (1988), Levitt (1989), and Newmark (1979).

The test-retest reliabilities of the MMPI scales, in general, range between .60 and .85 (Graham, 1987). Dahlstrom et al. (1975) presented information on the reliability of the MMPI scales: (a) test-retest reliability coefficients after 1 day for 288 male and 33 female college students ranged from .71 for the *Pa* scale (females) to .97 for the *F* scale (males) and after 1 to 2 weeks from .49 for the *Pa* scale (males) to .92 for the *K* and *Pt* scales (females), (b) test-retest reliability coefficients after 1 to 2 days for 35 males and 39 female psychiatric patients ranged from .46 for the *K* scale (males) to .86 for the *D* scale (females), (c) internal-consistency reliability coefficients ranged from -.05 for the *Hs* scale in 97 college students to .90 for the *Hs* scale in 200 Veterans Administration patients. Parker, Hanson, and Hunsley (1988) reviewed 33 studies (3,414 subjects) and estimated the reliability (includes interrater and intrarater reliability, K - R 20, alpha, and part-whole correlations) of the MMPI to be .84 (95% confidence intervals = .83 to .85). The trait stability (repeated administrations of the test) was estimated to be .74 (95% confidence intervals = .65 to .80) on the basis of 5 studies and 171 subjects. The convergent validity was estimated to be .46 (95% confidence interval = .44 to .48) on the basis of 30 studies and 4,980 subjects.

The MMPI is routinely included with the WAIS and Halstead-Reitan in most neuropsychological assessment batteries (Franzen 1989), as a measure of the patient's emotional state and response to his or her current psychological-medical situation. Farr and Martin (1988), Franzen (1989), and Newmark (1979) reviewed studies that investigated the statistical and clinical validity of the MMPI with various psychiatric, psychosomatic, and brain-damaged patients. In general, the MMPI has been found to differentiate among organic, psychiatric, and normal subjects, although no unique profile to one group has emerged. Farr and Martin (1988) examined the effect sizes (ES; Cohen, 1977) on mean scale scores between brain-damaged and psychiatric patients. The effect size indicates how far apart the population means are, in terms of standard deviations. Values range from an ES of 0.0 to 1.1 (over a standard deviation apart). The standard clinical and validity scales appeared to be differentially sensitive to brain damage. Studies on the descriptive and discriminative validity of the MMPI among head-injured, chronic pain, and PTSD groups were discussed in the literature review. The validity of the Keane et al. (1984) PTS content scale was also discussed in the literature review. It was developed by submitting all MMPI items to chi-square analysis to determine which items were endorsed differentially (at $p < .001$) by a rigorously-diagnosed PTSD group and a control group (Keane et al., 1984).

Novaco Anger Inventory. This questionnaire was developed by Novaco (1975) as an index of anger reactions to a wide range of provocations. It lists 90 potentially anger-provoking incidents. The subject indicates on a 5-point scale the degree of anger or provocation that he or she would experience if the incident were "actually happening". Novaco (1975, 1977) has reported that the inventory has high internal consistency (Cronbach alpha of .96) and has successfully discriminated between a normal sample and a psychiatric sample identified as having anger problems ($t = 2.43$, $p < .02$). The mean anger score for the psychiatric patients was 273.31, with a standard deviation of 51.83. Biaggio (1980) suggests that the inventory assesses the extent to which one is willing to admit angry feelings and the degree to which one becomes angry and irritable when provoked. She found it to correlate highly with another test called the Reaction Inventory designed for the same purpose ($r = .82$, $p < .01$). The Novaco Anger Inventory was also found least likely, of three other anger inventories, to be influenced by social desirability (Biaggio, 1980). There is a copy of this inventory in Appendix G.

Neuropsychological Variables

The 10 neuropsychological variables are those functions measured by the Halstead-Reitan Battery (i.e., Category, Tactual Performance Test [TPT] Time, Memory, and Location scores, Speech-Sound Perception, Seashore Rhythm, Sensory Deficit, Aphasia-Spatial Deficit, Finger Tapping and Trail Making). Setwise regression was used to obtain an optimal subset of these variables for classification.

General Description of the Halstead-Reitan Battery. The Halstead-Reitan consists of eight tests that provide ten measures of neuropsychological functioning. Each measure has a cut-off score that separates impaired from non-impaired scores. The total number of impaired scores is divided by the total number of measures to derive an Impairment Index between the values of 0.0 and 1.0. The eight subtests and ten measures are described as follows.

1. Halstead Category Test - Total error score. This is a measure of non-verbal abstraction and concept formation. The test is a multiple choice task in which immediate feedback is given. On each screen there is a set of four stimulus figures that vary in size, shape, number, intensity, colour, and location and are grouped by abstract principles. For each set of four figures, three will form a concept that the fourth one will not fit into. The task is to determine the concept and identify the

item that does not fit, without being informed of the intent. Instead, the individual is simply asked to select a number (from one to four) that they think of when they look at the screen. Once the idea or concept is determined, it may be used to provide the right answer for the remainder of the subgroup. The last subgroup does not have a main idea but is a review of the slides seen before.

2. Halstead Tactual Performance Test - Total time score, Memory score, Location score. This test measures psychomotor problem-solving ability. The blindfolded subject is asked to place ten blocks of varying sizes and shapes into their respective spaces on a formboard. There are three trials, first with the dominant hand, next the non-dominant hand, and lastly using both hands. After the board is put away and the blindfold removed, the subject is asked to draw from memory the formboard with the shapes in their appropriate places. The three assessments obtained from this test are (a) the length of time required to perform the task, (b) the number of correctly shaped blocks that can be drawn from memory, and (c) the correct location of these blocks drawn from memory.

3. Finger Tapping Test - Dominant Hand Score. This measure of manual dexterity is obtained by recording the maximum oscillation rate of the index finger. A tapping key with a device for recording the number of taps is presented to the patient who is asked to tap it as fast as possible for a 10-second period. The test is repeated 5 times for each hand.

4. Halstead Speech-Sound Perception Test - Total error score. This test is a measure of auditory acuity and assesses the ability to discriminate between similar sounding nonsense syllables. The double vowel "ee" is presented with various consonants at the beginning and the end of each ee. The test consists of 60 items spoken from a tape recording. The patient is asked to identify on a form which of four syllables he heard. A copy of the test form is included in Appendix H.

5. Seashore Rhythm Test - Ranked converted score. This test measures nonverbal auditory perception by assessing sustained auditory attention and rhythmical pattern discrimination ability. There are thirty pairs of rhythmical patterns presented on tape and the patient is asked to indicate on a test form whether each pair of patterns is exactly the same or different. The total number of correct answers is converted to a rank score using a conversion table.

6. Sensory Examination - Summary deficit score. This examination includes imperception testing, finger agnosia, and perception of numbers written to the fingertips. Imperception testing determines whether a patient senses tactile, auditory, and visual stimuli presented unilaterally or bilaterally. In finger agnosia, the patients' fingers are touched to determine if he/she can correctly

identify which finger is stimulated. In 'perception of numbers written to the fingertips' the ability to identify the number written on the fingertip is tested. The sensory deficit is a summary value derived by the number of errors obtained on the three tests just outlined.

7. Aphasia-Spatial Deficit Test - Deficit score. This test is used to assess expressive and receptive language functions, both verbal and written. It also includes a number of items designed to reveal visuo-constructional deficits. The patient is asked to reproduce figures on paper, identify items from pictures, mime how they would use certain items, repeat certain words, perform simple arithmetic, identify certain statements as true or false, and spell simple words out loud and on paper. A copy of the test form is included in Appendix H.

8. Trail Making Test - Total credits from Part A and Part B. This test measures rapid number and number-letter manipulation. Part A consists of numbers from 1 to 25 that must be joined in ascending order by connecting lines. In Part B the numbers up to 13 and letters A to L must be connected in ascending order, alternating between numbers and letters. Each part has an example and an actual trial. Each task must be performed as quickly as possible. The length of time required to perform the actual test parts is converted to a credit score. Research into the use of the Halstead-Reitan Battery to assess impairment and differentiate between neurological and pseudoneurological patients was discussed in the literature review. A copy of the test form is included in Appendix H.

Reliability of the Halstead-Reitan Battery. Franzen (1989) summarized the test-retest data on the Halstead-Reitan battery that was obtained in several studies of various normal and brain-damaged groups. The studies generally reported significant correlations. For example, Klonoff, Fibiger, and Hutton (1970) demonstrated test-retest correlations for the entire battery that ranged from .87 on Part B of the Trail Making Test to .59 for TPT Location. Several studies (Dodrill & Troupin, 1975; Matarazzo, Matarazzo, Wiens, Gallo & Klonoff, 1976) suggest that the Category Test, the TPT Location, and the Impairment Index are most sensitive to practice effects, however, Matarazzo et al. interpret this as support for the clinical reliability of the battery, as one would expect to find practice effects on a measure of cognitive ability. Furthermore, mildly to moderately impaired persons with stable brain conditions have test-retest reliabilities that are different from those of normal or head-injured patients. Assessments of split-half reliability have ranged from .98 for the Category Test (Shav, 1966) to .74 and .77 for the Rhythm test (Bornstein, 1983).

Validity of the Halstead-Reitan Battery. Attempts have been made to establish the concurrent validity of the Halstead-Reitan by correlating test findings with certain neuropathological conditions associated with cerebral dysfunction. Reviewed by Franzen (1989) these studies have demonstrated (a) a relationship between ventricular size and performance on the HR, (b) the HR to be sensitive to behavioural deficits related to impaired brain functions in brain-damaged patients who have either a normal or abnormal EEG, with a positive correlation between EEG abnormality and neuropsychological impairment, (c) the HR to have a better hit rate for the identification of brain damage than do medical procedures, (d) a higher level of agreement between HR test results and CT scans than between CT scans and EEG results or neurological examination.

It is also clear that individuals with affective disorders may also appear impaired on neuropsychological tests (Golden, Moses, Coffman, Miller, & Strider, 1983). Studies, reviewed in Golden et al., 1983, have compared affectives with schizophrenic and normal control groups and assessed the nature of the deficits. Some of the results indicate that: (a) affectives made errors in the Aphasia Test on items requiring functioning of the nondominant parietal area, and frontal areas; (b) depressed female psychiatric patients are significantly impaired on speeded psychomotor tests compared to non-depressed female psychiatric patients but not on unspeeded power tests of intelligence, and (c) affectives have considerable deficits on nondominant hemisphere tasks (Flor-Henry, 1976).

The majority of validity studies of the Halstead-Reitan (HR) investigate its use as a screening device to separate brain-damaged patients from neurologically-intact subjects, thus assessing its discriminant validity. Reported hit rates in the classification of brain-damaged patients using the HR Impairment Index average 75% (Filskov & Goldstein, 1974), while individual subtests have achieved prediction rate of up to 98% (e.g., Wheeler, Burke, & Reitan, 1963). Support for the statistical and clinical validity and utility of the HR subtests has been reported by many researchers (see reviews in Franzen, 1989; Parsons, 1970). Golden (1977), in a study using a mixed psychiatric and brain-injured sample of 116 patients, found the HR battery 90% effective in identification and localization of brain damage, according to a discriminant function analysis. Heaton, Smith, Lehman, and Vogt (1978) were able to correctly classify all subjects in a discriminant function analysis on the basis of HR subtests; the subjects were 16 volunteer malingerers and 16 head-trauma patients.

Kane, Parsons, and Goldstein (1985) compared 46 brain damaged patients (59% of whom had head trauma) with 46 control patients (57% had medically diagnosed conditions not involving

the CNS; 28% with neurotic disorders; and 15% with pseudoneurological complaints) in a study of the concordance rate among the Halstead-Reitan, WAIS-R, and Luria-Nebraska Neuropsychological Battery. All subtests from both neuropsychological batteries, as well as WAIS-R Verbal and Performance IQ's differentiated controls from brain-damaged groups at a highly significant level ($p < .0001$). The intercorrelation between scores on the Halstead-Reitan and the Luria-Nebraska ranged from .75 to .83. Correlations between summary scores on both neuropsychological batteries and WAIS-R VIQ and PIQ ranged between .64 and .78. The Halstead-Reitan subtests had a sensitivity of 92% and a specificity of 95% to discriminate brain-damaged from control groups. Likewise, sensitivity and specificity for the Luria-Nebraska was 93% and 100%, respectively, and for the VIQ and PIQ, 80% and 89%. The brain-damaged patients' average scores on all measures were more impaired than those for the control group, at $p < .0001$.

Cognitive Variables

The 14 cognitive variables are the cognitive functions assessed in the WAIS-R, including Vocabulary (V), Similarities (S), Comprehension (C), Information (I), Arithmetic (A), Digit Span (DS), Picture Arrangement (PA), Picture Completion (PC), Object Assembly (OA), Block Design (BD) and Digit Symbol (DSy), as well as the Verbal IQ, Performance IQ, and Full Scale IQ. Setwise regression was also used to obtain an optimal subset of these variables for classification.

Wechsler Adult Intelligence Scale - Revised (WAIS-R). The WAIS-R is widely used and recognized in both research and clinical applications. It was standardized on a sample of 1,880 individuals in the U.S. between the ages of 16 and 74. Discussions on this intelligence scale may be found in Mattarazzo (1972), Rapaport et al. (1968) and Zimmerman and Woo-Sam (1973), among others. According to the manual for the WAIS-R (Wechsler, 1981), reliability coefficients for the 11 subtests range from .52 for Object Assembly to .96 for Vocabulary, while the averages, across all age groups, for the Verbal, Performance, and Full Scale IQs are .97, .93, and .97, respectively. Test-retest reliability coefficients range from .69 for Digit Symbol to .94 for Information and from .89 to .97 for VIQ, PIQ, and FSIQ. The standard errors of measurement (i.e., the band of error surrounding an individual's "true" score) range from .61 scaled-score points for Vocabulary to 1.54 for Object Assembly; and for the Verbal, Performance, and Full Scale IQs, 2.74, 4.14, and 2.53, respectively. Correlations between the WAIS-R and the Wechsler Intelligent Scale for Children- Revised in a group of 80 16-year-olds were .89, .76, and .88 for Verbal, Performance,

and Full-Scale IQs; and ranged between .39 (i.e., Picture Arrangement) and .86 (i.e., Vocabulary) for individual subtests. Matarazzo (1972) determined that the correlation between IQ and performance in school is about $r = .50$. The correlation between the Full Scale IQ and the Stanford-Binet IQ is $r = .85$ (Wechsler, 1981). The scoring reliability of the WAIS-R was evaluated in a study by Ryan, Prifitera, and Powers (1983) comparing 19 Ph. D psychologists with 20 psychology graduate students on the scoring of two WAIS-R protocols. The IQ scores varied as much as 8 points across scorers, underlining the necessity for strict adherence to the standardized scoring system.

Parker Hanson, et al. (1988) examined articles published on WAIS over a 12 year period and estimated the average reliability of the WAIS to be .87 (95% confidence interval = .86 to .88) based on 12 articles and 1,759 subjects. Trait stability was estimated at .82 (95% confidence interval = .73 to .88) based on 4 studies and 93 subjects. The convergent validity was estimated to be .62 (95% confidence interval = .60 to .64) based on 26 articles and 3,441 subjects.

The factor structure of the WAIS-R is an important issue in the evaluation of the construct validity of the instrument as well as an important issue in the interpretation of the test results. Several investigations (reviewed in Franzen, 1989; Lezak, 1976; Matarazzo, 1972; Zimmerman & Woo-Sam, 1973) indicate the WAIS-R may be factor analyzed into verbal comprehension, perceptual organization, and possibly, freedom from distraction (Franzen, 1989) or memory factor (Lezak, 1976). According to Lezak (1976) the WAIS(-R) contributes much to neuropsychological assessment, but the WAIS subtests assess neither pure nor readily defined functions.

Predictor Variables for Hypothesis Three

Medical/Neurological Variables

The seven neurological variables are: (a) a global measure of overall severity of head injury, (b) initial Glasgow Coma Scale scores, (c) time (in hours) from admission until full continuous consciousness determined by a continual GCS of 15, (d) length of hospitalization, (e) presence of hematoma (epidural, subdural, or intradural), (f) presence of skull fracture, and (g) Halstead-Reitan Impairment Index. Setwise regression was used to produce an optimal subset of these predictor variables.

Severity of head injury was determined primarily by initial Glasgow Coma Scale (GCS) scores on admission to hospital. According to standard convention, an initial GCS of 13 to 15 implies a mild injury, 9 to 12 a moderate injury and 8 or less a severe injury. However this rating

system does not reflect secondary effects of the injury, such as hematoma. A more sensitive measure would have been GCS scores at 24 hours (Teasdale & Jennett, 1974), however, the use of endotracheal tubes (and neuromuscular blocking agents) in some of the patients prevented the use of this measure. If there were secondary complications such as hematoma or edema, the severity rating in this research was downgraded one level. For example, patients who initially had a GCS rating of 13 but developed complications were given a *moderate* injury rating rather than a rating of mild. Several patients received, on admission, a GCS rating between 9 and 12 but had extensive diffuse damage and displayed other neurological signs indicative of severe injuries. They were downgraded to *severe*. Thus, the rating of *mild* included injuries that were considered to cause little or no alteration in level of consciousness, recovery to a continuous Glasgow Coma Scale of 15 within 24 hours of accident, a short hospital stay (6 days or less), and no haemorrhage or hematoma. A few of these patients (3 out of 26) also received a non-depressed, linear skull fracture. *Moderate* injuries included those that led to a rating of 9 to 13 on the GCS upon admission to hospital, a recovery to full continuous consciousness (GCS=15) within two weeks of the accident, and a hospital stay of no more than one month. Of these 19 patients, 8 had haemorrhages (2 epidural, 3 subdural, and 3 intracerebral) and 7 had skull fractures. Severe injuries were those consisting of a Glasgow Coma Scale rating of 8 or less upon admission, full continuous consciousness occurring after 10 days, and hospital stays exceeding one month. Of these 15 patients, 9 had edema, haemorrhage, or hematoma (2 edema, 2 epidural, 2 subdural, 3 intracerebral) and five had skull fractures.

Glasgow Coma Scale (GCS). Teasdale and Jennett (1974) developed the Glasgow Coma Scale in order to characterize the continuum of impaired consciousness by a practical and reliable procedure. It evaluates three components of wakefulness independently of each other: the stimulus required to induce eye opening, the best motor response, and the best verbal response. Each component is described in terms of a well-defined gradient of responses and a final score is given that indicates the degree of dysfunction. There is high interobserver reliability in using the GCS among medical personnel. Coma corresponds to a score of 8 or less and is usually used as the criteria to separate severe from moderate head injuries. Patients with scores of 9 to 12 are generally designated as having sustained moderate head injuries, and patients whose initial score is 13 to 15 have usually received minor head injuries. However, such classification can be influenced by secondary complications, such as development of an intracranial hematoma.

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Inclusion of the patient's GCS score at 24 hours further refines the classificatory process but if an endotracheal tube is required, with the attendant use of neuromuscular blocking agents, scores can not be obtained for some time.

Halstead-Reitan Impairment Index. The Impairment Index is the number of subtest scores in the Battery (out of ten) that exceed the cutting scores established by Halstead in his study of frontal lobe patients (Halstead, 1947). Halstead set the cutting score for the Impairment Index at .05, with scores above .5 indicating impairment. The reliability and validity of the Halstead-Reitan battery was discussed in the previous section.

Demographic and Psychosocial Variables

The 5 demographic/psychosocial variables are age, sex, socioeconomic status, recent life events, and psychiatric history. Setwise regression was also used to produce an optimal subset of these variables for classification. Socioeconomic status was determined using the Blishen (1987) "Socioeconomic Index for Occupations in Canada". If the subject was unemployed and did not have an occupation because he/she was a student or a housewife, the occupation of the primary wage earner in the family was used. The variable 'recent life events' is the cumulated total score for life events occurring in the 12 months prior to the trauma, with those events scored from the Life Events Inventory developed by Cochrane and Robertson (1973). The presence of a previous psychiatric disability was determined using the Diagnostic Interview Schedule (DIS).

Measures of Demographic/Psychosocial Variables

Blishen Socioeconomic Index for Occupations in Canada (1987). Blishen and his associates (Blishen, Carroll & Moore, 1987; Blishen & McRoberts, 1976) use income level and educational status from Canadian census data, as well as a prestige variable, to rank occupations. The prestige variable is obtained using regression weights based on the Pineo and Porter (1966) prestige scores for 102 occupations. The regression weights are applied to all other occupations using income level and educational status as independent variables, thereby producing a socioeconomic score for each. Occupations are then ranked on the basis of the values. According to Blishen and McRoberts (1976), the $F(2,99)$ values of the regressions range upward from 158.2

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($p < .01$). Blishen et al. (1987) indicated that the multiple regression of prestige on education and income levels yields an R^2 of 0.87.

Life Events Inventory (Cochrane and Robertson, 1973). The Cochrane and Robertson scale was selected because it seemed to be an improved modification of the original Schedule of Recent Events developed by Holmes and Rahe (1967). Cochrane and Robertson (1973) deleted items that were ambiguous and developed a more comprehensive list of life changes including some considered stressful by psychiatric patients. The resulting Life Events Inventory contains 55 items (18 from Holmes and Rahe) and sections relevant to marital status. Readjustment ratings were derived from a group of psychiatric patients ($N = 42$) who were likely to have experienced stress, a group of university students ($N = 75$) and a group of psychiatrists and psychologists ($N = 60$). As in the original Holmes and Rahe (1967) inventory, readjustment ratings were derived by asking these three groups to rate the amount of "turmoil, upheaval, and social readjustment" that would follow each of 55 events, with the item "marriage" assigned an arbitrary value of 50 as a reference point. Good agreement was found in readjustment ratings for all three standardization groups, with the coefficient of concordance at .89, $p < .001$. Indicative of reliability was the high level of agreement between the three groups of subjects on relative assignment of weights. As expected, the psychiatric patients tended to assign higher weights across items (mean = 55.65) than did professionals (mean = 46.21) or students (mean = 47.86). A copy of the Life Events Inventory can be found in Appendix I.

RESULTS

Preliminary Results

Attrition Analysis

Of the 60 subjects initially evaluated, 46 patients responded to the telephone survey and 38 individuals participated in the follow-up assessment, although only 31 of the follow-up respondents agreed to complete the assessment battery. Not all 60 subjects completed the WAIS-R either. The 41 subjects who did complete the WAIS-R were compared with the entire sample ($N = 60$) on variables other than cognitive variables. The mean scores on all predictor variables for all four groups of subjects (i.e., initial 60 Ss, 41 Ss who completed the WAIS-R, 46 Ss who responded at midway, and 38 Ss from follow-up) are provided in Table 10. There were no significant differences among the groups on any of the predictor variables.

Internal-Consistency Reliability

The MMPI, WAIS-R, Halstead-Reitan test batteries have been used extensively in prior research with head-injured subjects; generally for the assessment of personality, cognitive and neuropsychological functioning and specifically for the differential diagnosis of brain damage from psychiatric disorders. There is a large body of information available on the validity of these batteries and some of this research was discussed in the previous chapter on Variables and Measures. The values for internal consistency obtained on the measures used in this study (i.e., Cronbach's alpha or Kuder - Richardson 20) are presented in Appendix J.

Table 10.
Attrition Analysis

Variables		Group Means				Scores	
		60 Subjects	41 Subjects (who completed the WAIS-R)	46 Midway Subjects	31 Follow-up Subjects	Raw	Standard
DISTRESS:							
Anger		310.2	316.5	308.8	298.2	✓	
MMPI	L	52.7	52.1	52.9	54.3		✓
	F	60.9	60.5	59.7	60.3		✓
	K	53.3	53.5	55.5	54.0		✓
	Hs	59.1	58.9	59.2	57.0		✓
	D	61.6	61.7	61.9	60.1		✓
	Hy	58.7	59.1	59.4	56.9		✓
	Pd	64.5	66.0	64.2	63.1		✓
	Mf	58.8	59.5	57.2	58.5		✓
	Pa	58.1	58.3	58.0	57.9		✓
	Pt	58.1	58.5	57.6	56.6		✓
	Sc	63.6	63.0	63.2	62.3		✓
	Ma	64.1	62.8	62.6	60.6		✓
	Si	50.2	49.7	49.0	50.0		✓
	PTS	11.7	11.6	10.3	10.3	✓	
NEUROPSYCHOLOGICAL:							
TPT Time		16.3	16.7	16.5	16.0	✓	
TPT Memory		6.4	6.4	6.4	6.4	✓	
TPT Location		3.8	3.6	3.7	3.9	✓	
Speech Perception		7.2	7.6	7.3	7.6	✓	
Rhythm		6.6	6.5	6.4	6.2		✓
Finger Tapping		42.0	41.6	42.3	42.9	✓	
Sensory Deficit		0.6	0.5	0.6	0.6		✓
Aphasia-Spatial		1.2	1.2	1.2	1.2		✓
Trail Making		13.3	13.3	13.1	13.2		✓

Note. The mean scores at initial assessment on all variables are given for different groups of patients (i.e., for all subjects, for those who completed all tests including the WAIS-R, for those who responded at midway, and for those who completed the follow-up battery); none of the differences in mean scores among different subgroups of patients were significant at $p < .05$. n/a = not applicable.

(Table 10 continued)

Variables	Group Means				Scores	
	60 Subjects	41 Subjects (who completed the WAIS-R)	46 Midway Subjects	31 Follow-up- Subjects	Raw	Standard
COGNITIVE:						
Vocabulary	–	8.3	8.1	8.3		✓
Information	–	7.5	7.5	7.6		✓
Comprehension	–	8.5	8.7	8.7		✓
Similarities	–	8.1	8.2	8.0		✓
Arithmetic –		7.9	7.7	8.0		✓
Digit Span –		8.0	7.9	8.2		✓
Object Assembly	–	7.6	7.2	7.6		✓
Block Design	–	8.8	8.4	8.8		✓
Picture Completion	–	7.7	7.6	7.8		✓
Digit Symbol	–	7.1	7.2	7.8		✓
Picture Arrangement	–	8.8	8.8	9.5		✓
Verbal IQ	–	90.4	90.8	91.0		✓
Performance IQ	–	89.6	88.7	90.8		✓
MEDICAL:						
Severity	1.8	1.9	1.8	1.8	n/a	
Hosp. Duration	34.8	46.1	36.1	32.8	n/a	
Imp. Consc.	201.0	225.8	214.7	200.9	✓	
GCS at adm.	11.9	12.0	11.8	12.1	✓	
Skull Fracture	0.3	0.3	0.3	0.3	n/a	
Imp. Index	0.5	0.5	0.6	0.5		✓
Hematoma	0.6	0.9	0.7	0.8	✓	
DEMOGRAPHIC/PSYCHOSOCIAL:						
Age	31.0	30.5	32.2	32.0	✓	
Sex	40M, 20F	26M, 15F	28M, 18F	19M, 12F	✓	
SES	45.6	48.0	47.6	48.3		✓
Life Events	316.3	302.8	292.7	278.2	✓	
Psych. Hx	1.0	0.8	0.8	0.8	✓	

Note. None of the differences in mean scores among different subgroups of patients were significant at $p < .05$.
n/a = not applicable.

Results for Hypothesis One

The Proportion of Individuals Diagnosed as Having PTSD:

Attempted Validation of DSM-III/III-R at the Diagnostic Level

Initial Assessment

The first result to be examined in this study of PTSD among the head injured is the incidence of PTSD according to each of the various sets of diagnostic criteria.

Variants of DSM-III/III-R criteria. There were 16 people (27% of the sample) who met full or partial criteria for PTSD according to any variant of DSM-III/III-R criteria at initial assessment. Of these, only two people met full *DSM-III* criteria for the diagnosis of PTSD, while four people met partial criteria for PTSD (i.e., endorsement of either intrusive recall or avoidance/numbing, as well as miscellaneous symptoms). This brought the total to six (10% of the sample) who met DSM-III (1) criteria. Later examination of patients led to three more diagnoses of PTSD (made in retrospect) bringing the total to 9 who met *DSM-III* (2) criteria at initial assessment (15% of the sample) : These three patients, most of whom were severely injured, endorsed symptoms (at midway or follow-up) that they claimed to have been experiencing since the injury even they had originally denied them. When DSM-III criteria were modified to reflect DSM-III-R changes, four more patients met full or partial criteria, bringing the total number of patients who met *DSM-III* (3) criteria to 10 (17% of the sample) at the time of initial testing. Six more diagnoses of PTSD made according to modifications of DSM-III-R were made in retrospect, bringing the total to 16 who met *DSM-III* (4).

Alternative criteria. Three patients met *Braverman* (1) criteria for the diagnosis of full or partial PTSD and 12 patients, or 17% of the sample, met *Braverman* (2) criteria. Ten patients or 17% of the subjects were given a *Lidvall* (1) diagnosis of PTSD and 13 patients or 22% were given a *Lidvall* (2) diagnosis. A total of 25 people met at least one of the eight sets of criteria for PTSD at initial assessment (i.e., any criteria).

Midway Assessment

Variants of DSM-III/III-R criteria. There were 12 patients out of 46 (26% of the sample) who endorsed enough symptoms at midway testing to meet criteria for a diagnosis of PTSD according to at least one variant of DSM-III/III-R criteria. Of these, only one met full criteria while 5 met full or partial criteria for *DSM-III (1)*. Two more people claimed later to have been experiencing enough symptoms at the time of midway to warrant a retrospective diagnosis of PTSD, thus bringing the total to 7 who met *DSM-III (2)* criteria. The modifications reflecting DSM-III-R criteria increased the total to 8 people who met full or partial criteria for *DSM-III (3)* at the time of midway testing. Two more people claimed at follow-up to have been experiencing symptoms at the time of midway testing, thus bringing the total to 12 patients who met DSM-III (4) criteria.

Alternative criteria. Only one person met *Braverman (1)* criteria. Nine subjects (20% of the sample) received a diagnosis of PTSD according to *Braverman (2)* criteria. Five patients (8%) met *Lidvall (1)* criteria and 8 patients (17%) met the *Lidvall(2)* criteria. A total of 17 people met any set of criteria for PTSD at midway.

Follow-Up Assessment

Variants of DSM-III/III-R criteria. At follow-up, 9 patients out of 38 (24%) received a diagnosis of full or partial PTSD, according to at least one variant of DSM-III/III-R. Two met full criteria and 5 more patients met partial criteria for a total of 7 patients meeting *DSM-III (1)*. Nine patients met *DSM-III (3)* criteria. There were no diagnoses made in retrospect as this was the final contact with the subjects, so no data are available on *DSM-III (2)* and *DSM-III (4)*.

Alternative criteria. Only one patient received a diagnoses of PTSD according to *Braverman (1)* criteria, while 9 people (24% of the sample) received a diagnosis of PTSD according to *Braverman (2)* criteria. Assessment according to *Lidvall (1)* criteria led to a PTSD diagnosis in 4 patients (11%) while 7 patients (18%) received a PTSD diagnosis according to *Lidvall (2)* criteria. A total of 16 people met any set of criteria for PTSD at follow-up.

Consistency of PTSD over Time

Over the course of the study, exactly half of the participants met criteria for a diagnosis of PTSD at some time during the assessment period, according to at least one set of criteria. There were 16 patients (27% of the sample) who never met criteria for a diagnosis of PTSD at any time, although they may have occasionally endorsed some symptoms. Although the remaining 14 patients did not meet criteria for PTSD at the time of initial assessment but they could not be located at both midway and follow-up to rule out a subsequent diagnosis of PTSD. Therefore, it could not be stated unequivocally that they never had PTSD.

The course of PTSD for those who did meet criteria at least once in the first year following trauma is contained in Table 11, together with their age, sex, and severity of head injury. As can be seen from this chart, most people who were PTSD-positive according to any set of criteria were this way for at least two assessments, and usually met criteria according to at least two major sets of criteria. Of the 30 people who were ever PTSD-positive, only 5 were PTSD-positive sporadically, that is having only once met any set of criteria. For the other 25 people, the disorder seemed to be both persistent and pervasive.

Summary

In summary, Braverman (1) was the most restrictive set of criteria, followed by DSM-III (1). Even though partial fulfillment of criteria was accepted for a diagnosis, the incidence rate of PTSD was less than 10%. The proportion of individuals who met full criteria for DSM-III (1) or Braverman (1) was less than 3.3%, compared with a median incidence rate of 20% as suggested in the literature review. The least restrictive set of criteria was DSM-III (4), which diagnosed up to 27% of the sample as PTSD-positive. Incidence rates ranged from 15% to 24% when other sets of criteria were used. Between 37% and 42% of the subjects met at least one set of criteria for PTSD at each assessment.

Table 11
Course of PTSD In Patients Diagnosed According to Each Set of Criteria

Patient		DSM-III			BRAVERMAN			LIDVALL		
		Initial	Midway	Follow-Up	Initial	Midway	Follow-Up	Initial	Midway	Follow-Up
Sex	Age									
M,	33,	Partial (4)	Partial (3)				Yes (2)	Yes (1)	Yes (2)	
F,	56,				Yes (2)	Yes (2)	Yes (2)	Yes (1)	Yes (1)	Yes (1)
F,	44,	Partial (3)			Partial (1)	Yes (2)	Yes (2)	Yes (1)	Yes (1)	Yes (2)
F,	22,						Yes (2)	Yes (1)	Yes (2)	
M,	19,	Full (1)	Partial (3)	Partial (1)						
M,	25,	Full (1)			Partial (1)	Yes (2)		Yes (1)		
F,	19,									
M,	29,				Yes (2)					
M,	20,	Partial (3)	Partial (3)	Partial (1)						
M,	17,	Partial (1)								
F,	33,									
M,	30,				Yes (2)	Yes (2)		Yes (1)	Yes (2)	
M,	28,									
M,	19,	Partial (2)	Partial (2)	Full (1)						Yes (1)
M,	29,	Partial (2)	Partial (2)	Partial (1)						
F,	18,	Partial (4)	Partial (4)	Partial (3)				Yes (2)		Yes (1)
F,	27,	Partial (4)	Partial (4)	Partial (3)				Yes (1)		
M,	25,				Yes (2)			Yes (2)	Yes (1)	
M,	34,	Partial (3)								
M,	18,									
F,	34,									
F,	61,				Yes (2)			Yes (1)		
M,	18,				Yes (2)			Yes (1)		
M,	21,	Partial (3)			Yes (2)					
M,	21,	Partial (1)	Partial (1)	Partial (1)		Yes (2)				
F,	26,				Yes (2)					
F,	18,	Partial (2)	Partial (1)							Yes (2)
F,	17,	Partial (1)	Partial (1)	Partial (1)						
M,	50,									
F,	55,	Partial (1)	Full (1)	Full (1)	Full (1)	Yes (2)	Full (1)	Yes (1)	Yes (1)	Yes (2)

Note. Under Braverman (2), Lidvall (1), and Lidvall (2) there is no breakdown according to partial or full criteria.

HI = severity of head injury.

() = the variant of criteria under which the subject met criteria for PTSD; subjects also received a diagnosis for PTSD according to lower-numbered variants (e.g., subjects who met criteria for DSM-III (3) also met criteria for DSM-III (1) and DSM-III (2)); — = indicates patient could not be reached for midway or follow-up assessment.

Concordance Among Sets of Criteria

Overlap of Subjects

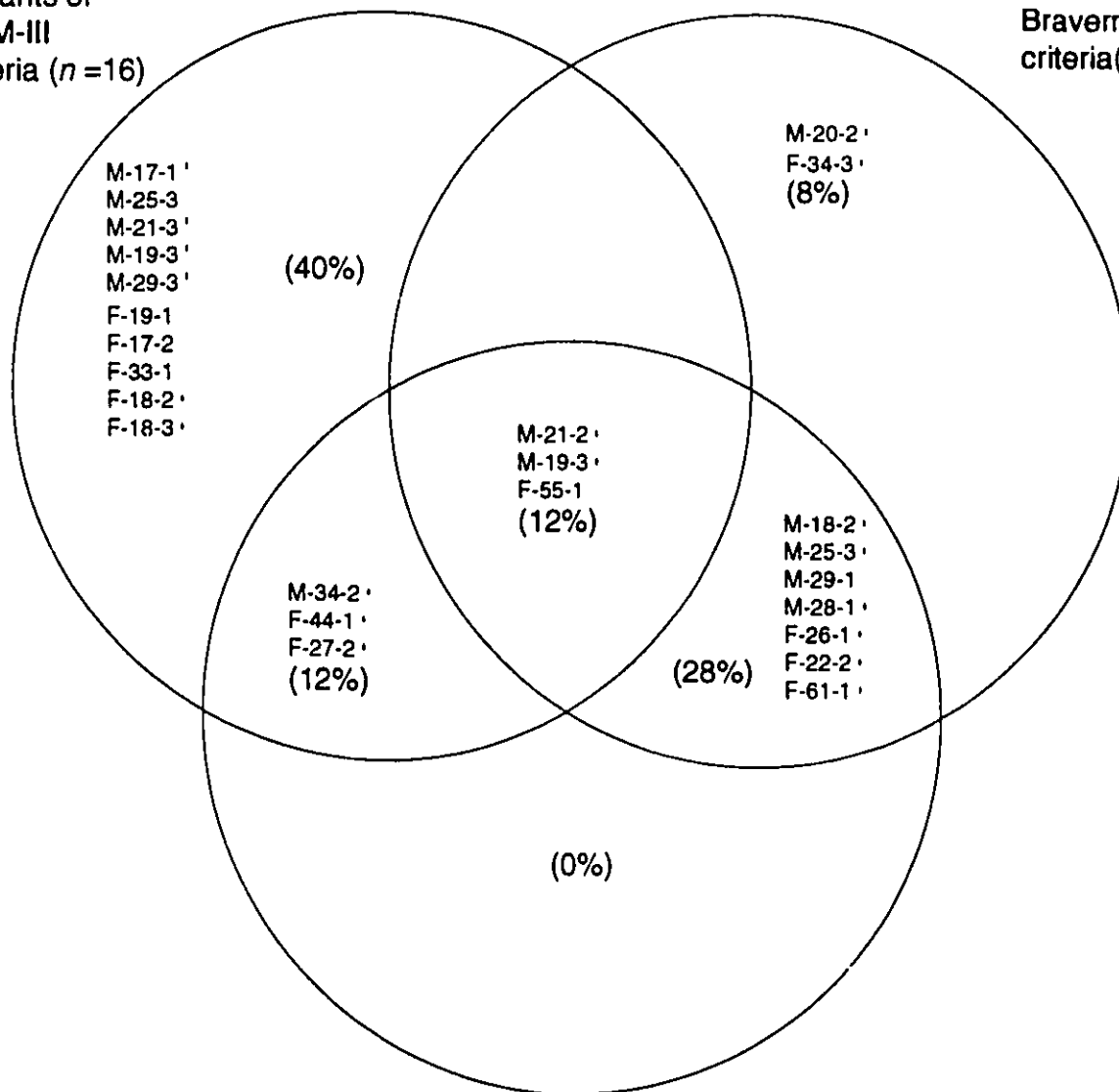
Initial assessment. The overlap among the three major sets of diagnostic criteria was examined. There was maximum overlap when all variants of both DSM-III/III-R and alternative criteria were used for diagnosis. The overlap for all variants of diagnostic criteria is displayed in Figure 4 together with the subjects' age, sex, and severity of head injury. As previously noted, ≥ 5 patients (42% of the sample) were diagnosed as having PTSD, according to at least one set of criteria, and 13 subjects met at least two of the three major sets of criteria. Patients who received a diagnosis of PTSD from only one of the three major sets of criteria were most likely to have been diagnosed as PTSD by a variant of DSM-III/III-R. In contrast, all of the patients diagnosed as meeting the *Lidvall (2)* criteria also met criteria for at least one of the other two major sets of criteria. This suggests concordance with other sets of criteria was maximal when Lidvall (2) criteria (one of the least restrictive sets of criteria) was used and minimal when DSM-III (1) criteria (one of the most restrictive sets of criteria) were used.

Midway assessment. A total of 17 patients or 37% of the sample were diagnosed as having PTSD at midway, according to at least one set of criteria. As before, there was maximum overlap when the most lenient scoring variations were used. Using such scoring, for example DSM-III(2), DSM-III (3), DSM-III (4), Braverman (2), and Lidvall (2), over half of those diagnosed as having PTSD were diagnosed as such by more than one major set of criteria. The overlap is displayed in Figure 5.

Follow-up assessment. A total of 16 patients or 42% of the sample obtained a PTSD diagnosis at follow-up, according to at least one set of criteria. Of these, almost half were diagnosed by more than one major set of criteria. The overlap is displayed in Figure 6.

Variants of
DSM-III
criteria ($n = 16$)

Variants of
Braverman
criteria ($n = 12$)



Variants of Lidvall criteria ($n = 13$)

Legend: M-male
F-female

Ages are as given

1-mild head injury

2-moderate head injury

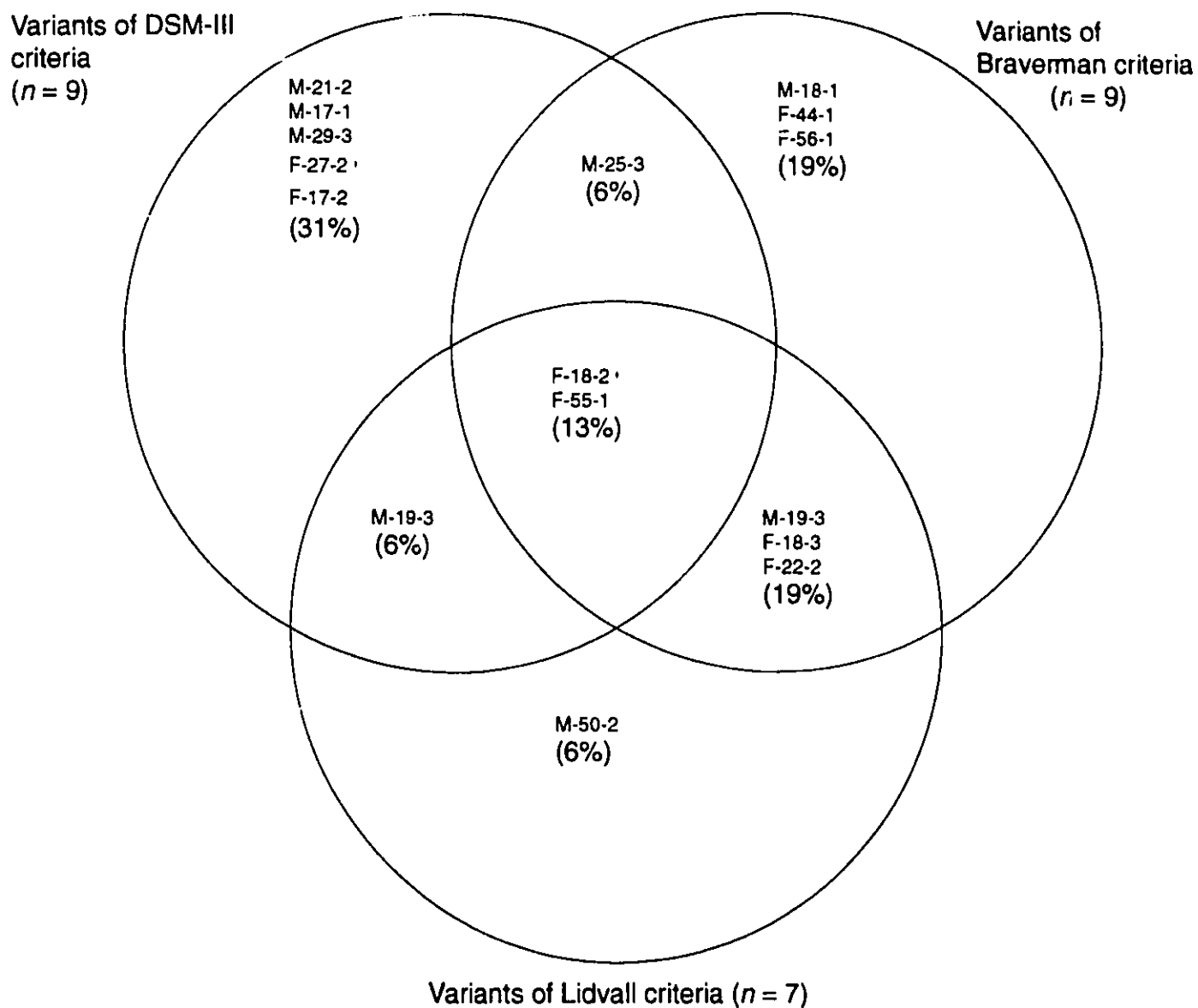
3-severe head injury

· - Subjects who met modified criteria only (e.g., DSM-III (2), DSM-III (3), DSM-III (4), Braverman (2), or Lidvall (2); all subjects who met unmodified criteria also met modified criteria.

% - The percentages given represented a proportion of the 25 patients who received a diagnosis of PTSD according to at least one set of criteria.

Figure 4.

Overlap at initial assessment of diagnoses of PTSD among three major sets of diagnostic criteria



Legend: M-male	Ages are as given	1-mild head injury
F-female		2-moderate head injury
		3-severe head injury
- Subjects who met modified criteria only (e.g., DSM-III (3), Braverman (2), or Lidvall (2); Note: all subjects who met unmodified criteria also met modified criteria. % - the percentages given are a proportion of the 16 patients who received a diagnosis of PTSD according to at least one set of criteria		

Figure 6.
Overlap at follow-up assessment of diagnoses of PTSD among three major sets of diagnostic criteria

Diagnostic Agreement Using Cohen's kappa (Convergent Validity)

Initial assessment. The agreement among the eight sets of diagnostic criteria was examined and the kappa values are presented in Table 12. As shown in the table, there was high agreement at the time of initial assessment among the variants of DSM-III/III-R diagnostic criteria, between *Braverman (1)* and *Braverman (2)* criteria, and between *Lidvall (1)* and *Lidvall (2)* criteria. In other words, each major set of diagnostic criteria agreed highly with a scoring modification of itself.

Diagnostic agreement at initial assessment between variants of DSM-III/III-R criteria and variants of Braverman or Lidvall criteria was poor and non-significant. The highest values obtained included a kappa of .23 between DSM-III (3) and Braverman (1) criteria and a kappa of .22 between DSM-III (4) and Lidvall (2) criteria. In contrast, there was good agreement at initial assessment between Braverman (2) criteria and variants of Lidvall criteria, significant at $p < .05$.

Midway assessment. At midway, the diagnostic agreement among variants of DSM-III/III-R was quite good, also presented in Table 12. The diagnostic agreement between *Braverman (1)* and *Braverman (2)* criteria was poor because only one person was diagnosed as having PTSD by *Braverman (1)* criteria. The agreement between *Lidvall (1)* and *Lidvall (2)* criteria was high.

Diagnostic agreement between variants of DSM-III/III-R criteria and variants of Braverman or Lidvall criteria was higher at midway assessment than it had been at initial assessment. There were several kappa values that were significant at $p < .05$. The highest agreements occurred between *Braverman (2)* criteria and DSM-III (3), DSM-III (4), and Lidvall (2). Agreement between DSM-III (3) criteria and Lidvall (1) criteria also reached significance at $p < .05$.

Follow-up assessment. The diagnostic agreement at follow-up is high between *DSM-III (1)* and *DSM-III (3)* criteria and between *Lidvall (1)* and *Lidvall (2)* criteria (see Table 12). The diagnostic agreement between the two variants of Braverman criteria is very weak because *Braverman (2)* criteria identified 9 cases of PTSD while only one of those cases met the more stringent *Braverman (1)* criteria. The highest agreement between major sets of criteria occurred between *Braverman (2)* criteria and *Lidvall (2)* criteria and between *Lidvall (1)* criteria and *DSM-III (3)* criteria.

Table 12.

Cohen's Kappa Values for Diagnostic Agreement (Convergent Validity)

Initial Assessment								
	DSM-III (1) (n = 6)	DSM-III (2) (n = 9)	DSM-III (3) (n = 10)	DSM-III (4) (n = 16)	Braverman (1) (n = 3)	Braverman (2) (n = 12)	Lidvall (1) (n = 10)	Lidvall (2) (n = 13)
DSM-III (1)	1.00	.67**	.70**	.45**	.21	.12	.01	.04
DSM-III (2)	.67**	1.00	.77**	.64**	.10	.00	.00	.00
DSM-III (3)	.70**	.77**	1.00	.76**	.23	.13	.00	.20
DSM-III (4)	.45*	.64**	.76**	1.00	.14	.00	.00	.22
Braverman (1)	.21	.10	.23	.14	1.00	.52**	.40	.32
Braverman (2)	.12	.00	.13	.00	.52*	1.00	.77**	.50*
Lidvall (1)	.01	.00	.00	.00	.40	.77**	1.00	.84**
Lidvall (2)	.04	.00	.20	.22	.32	.50*	.84**	1.00
Midway Assessment								
	DSM-III (1) (n = 5)	DSM-III (2) (n = 7)	DSM-III (3) (n = 8)	DSM-III (4) (n = 12)	Braverman (1) (n = 1)	Braverman (2) (n = 9)	Lidvall (1) (n = 5)	Lidvall (2) (n = 8)
DSM-III (1)	1.00	.82**	.75**	.52**	.18	.37	.28	.17
DSM-III (2)	.82**	1.00	.61*	.67**	.24	.21	.18	.08
DSM-III (3)	.75**	.61**	1.00	.74**	.21	.48*	.40*	.25
DSM-III (4)	.52*	.67**	.74**	1.00	.08	.44*	.27	.24
Braverman (1)	.31	.24	.21	.08	1.00	.18	.31	.21
Braverman (2)	.37	.21	.48*	.44*	.18	1.00	.37	.52*
Lidvall (1)	.28	.18	.40*	.27	.31	.37	1.00	.75**
Lidvall (2)	.17	.08	.25	.24	.21	.52*	.75*	1.00
Follow-Up Assessment								
	DSM-III (1) (n = 7)	DSM-III (3) (n = 9)	Braverman (1) (n = 1)	Braverman (2) (n = 9)	Lidvall (1) (n = 4)	Lidvall (2) (n = 7)		
DSM-III (1)	1.00	.82**	.21	.06	.27	.13		
DSM-III (3)	.82**	1.00	.08	.09	.36	.19		
Braverman (1)	.21	.08	1.00	.08	.33	.21		
Braverman (2)	.06	.09	.08	1.00	.36	.53*		
Lidvall (1)	.27	.36	.33	.36	1.00	.68*		
Lidvall (2)	.13	.19	.21	.53*	.68*	1.00		

Note. n = the number of patients in the PTSD group.

* $p < .05$. ** $p < .01$.

Comparison of PTSD Diagnoses with Other DSM-III Disorders

Other DSM-III disorders that were diagnosed using the DIS, both concurrently and prior to head injury, are listed in Table 13. The PTSD subjects are listed separately from the non-PTSD subjects. As can be seen, there is a tendency for the group of PTSD patients to have obtained other current and previous diagnoses. The association between global adjustment and PTSD will be discussed further in the section that discusses the contribution of psychosocial and demographic variables to the classification of PTSD.

Validation of PTSD Criteria at the Symptom Level:

Frequency of Symptom Reporting

Variants of DSM-III/III-R Criteria

The proportion of subjects reporting each criterion symptom in DSM-III/III-R at each assessment is displayed in Figure 7. As shown in Figure 7, symptoms of intrusive recall, avoidance-numbness, and guilt were infrequently endorsed. The DSM-III/III-R symptoms most frequently endorsed were those that fell into the miscellaneous or hyperarousal category. Memory and concentration problems were most common at each assessment, followed by sleep disturbance. At initial and midway sessions symptoms were denied that were later endorsed in retrospect. In general, symptom reporting increased over time, but there were exceptions. For example, the frequency of intrusive recall and guilt decreased over time. Among the intrusive symptoms, the incidence of "remembering or dreaming about the trauma" decreased over time, while "intensification of symptoms" increased over time. Symptoms of numbness increased over time, while avoidance remained the same at all three assessments. In comparison with the lack of temporal consistency among symptoms of intrusive recall and avoidance/numbness, all symptoms in the miscellaneous or hyperarousal category were more frequently endorsed over time.

Table 13
Other DSM-III Diagnoses Obtained by Each Subject;
Both Concurrently and Prior to Head Trauma

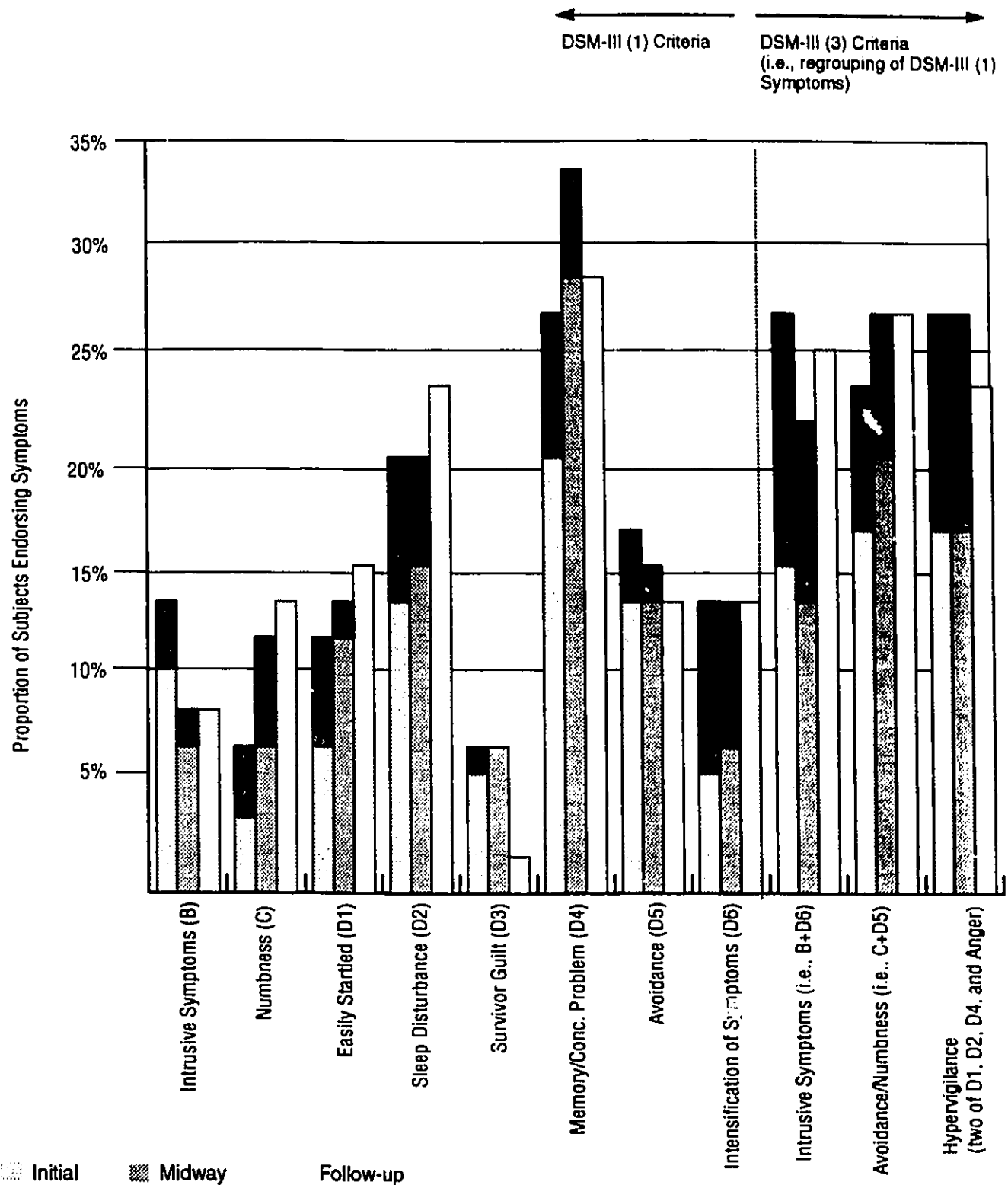
PTSD subjects			last	2 to	over	DSM-III Diagnoses
Sex,	Age,	HI	2 weeks	4 weeks ago	4 weeks ago	
M,	33,	2	0	0	0	None
F,	56,	1	0	0	0	None
F,	44,	1	0	0	1	Depression: Severe Bereavement (P)
F,	22,	2	0	0	0	None
M,	19,	3	2	0	4	Gen. Anxiety (P & C), Phobia (P & C), Alcohol Abuse (P), Previous PTSD
M,	25,	3	0	0	0	None
F,	19,	1	0	0	0	None
M,	29,	1	2	0	4	Phobia (C), Depression (P & C), Dysthymia (P), Alcohol Abuse and Dependence (P), Gen. Anxiety (C), Anti-Social Personality (P)
M,	20,	2	2	2	7	Phobia (P), Depression (P & C), Dysthymia (P), Alcohol Abuse and Dependence (P & C), Gen. Anxiety (P), Obsessive-Compulsive (P), Possibly Antisocial (P)
M,	17,	1	0	0	0	None
F,	33,	1	0	0	0	None
M,	30,	2	0	0	1	Alcohol Abuse (P)
M,	28,	1	1	0	4	Phobia (P & C), Alcohol Abuse and Dependence (P), Gen. Anxiety (P), Possibly Antisocial (P)
M,	19,	3	0	0	0	None
M,	29,	3	1	1	2	Alcohol Abuse (P), Anti-Social Personality (P & C)
F,	18,	2	0	0	0	None
F,	27,	2	0	0	2	Phobia (P), Gen. Anxiety (P)
M,	25,	3	1	1	2	Alcohol Abuse and Dependence (P), Anti-Social Personality (C)
M,	34,	2	1	1	3	Alcohol Abuse and Dependence (P), Gen. Anxiety (P), Anti-Social Personality (C)
M,	18,	1	0	0	0	None
F,	34,	3	0	0	0	None
F,	61,	1	0	0	0	None
M,	18,	2	0	0	0	None
M,	21,	3	1	1	2	Alcohol Abuse and Dependence (P), Anti-Social Personality (C)
M,	21,	2	0	0	1	Previous PTSD
F,	26,	1	0	0	0	None
F,	18,	3	0	0	0	None
F,	17,	2	0	0	1	Phobia (P)
M,	50,	2	1	1	3	Phobia (P), Alcohol Abuse and Dependence (P & C), Anti-Social Personality (P)
F,	55,	1	0	0	2	Depression (P), Dysthymia (P)

Note. HI = severity of head injury; 1 = mild, 2 = moderate, 3 = severe;
P = disorder occurred prior to head injury; (C) = disorder was current at the time of testing

(Table 13 continued)

		last 2 weeks	2 to 4 weeks ago	over 4 weeks ago		
non-PTSD subjects Sex, Age, HI					DSM-III Diagnoses	
M,	33,	1	0	0	1	Alcohol Abuse and Dependence (P)
M,	72,	2	0	0	0	None
M,	19,	1	0	0	1	Alcohol Abuse (P)
M,	83,	1	0	0	0	None
F,	20,	1	0	0	2	Phobia (P), Dysthymia (P)
M,	20,	3	0	0	0	None
M,	22,	3	0	0	0	None
M,	26,	1	0	0	0	None
M,	64,	2	0	0	1	Alcohol Abuse and Dependence (P)
M,	18,	1	0	0	2	Depression (P), Dysthymia (P)
M,	21,	1	1	1	1	Alcohol Abuse (P & C)
M,	31,	2	0	0	0	None
M,	19,	2	0	0	0	None
M,	33,	3	0	0	1	Alcohol Abuse (P)
M,	20,	1	0	0	0	None
M,	17,	1	0	0	0	None
F,	33,	2	0	0	0	None
F,	24,	3	0	0	0	None
M,	29,	2	0	0	2	Depression (P), Obsessive-Compulsive (P)
M,	34,	3	0	0	0	None
F,	23,	2	0	0	0	None
M,	22,	2	0	0	0	None
M,	21,	1	0	0	2	Alcohol Abuse and Dependence (P), Gen. Anxiety (P)
F,	50,	1	0	0	0	None
F,	31,	1	0	2	0	Depression (P), Previous PTSD
F,	67,	3	0	0	0	None
M,	16,	1	0	0	0	None
M,	73,	2	0	0	0	None
M,	35,	2	0	0	0	None
M,	20,	1	0	0	0	None

Note. HI = severity of head injury; 1 = mild, 2 = moderate, 3 = severe;
P = disorder occurred prior to head injury; (C) = disorder was current at the time of testing



() The letters and numbers in brackets correspond to the subcategorization of PTSD symptoms by DSM-III.

Figure 7

Frequency distributions at each assessment for reported DSM-III Symptoms

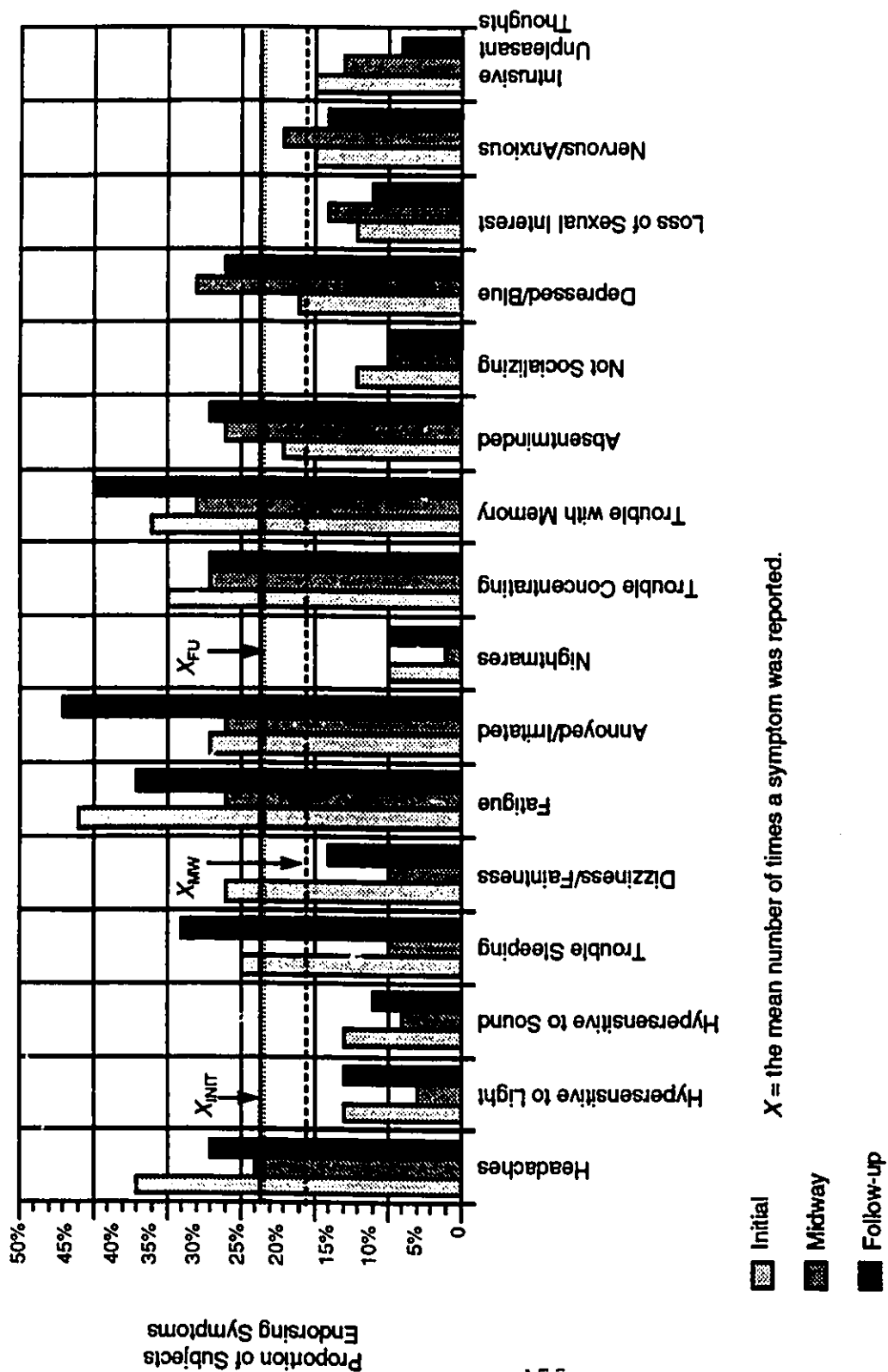


Figure 8.
Frequency distributions at each assessment for alternative PTSD criteria

Alternative Criteria

The endorsement frequency for symptoms used as criteria for PTSD by Braverman and Lidvall (endorsed at least at the moderate level) is displayed in Figure 8. Also included is trouble sleeping, a symptom reported in over 75% of observational studies of PTSD (see Tables 1 and 2 in the Literature Review), but not included by either Braverman or Lidvall. It should be noted that the inclusion of this symptom in Braverman or Lidvall criteria would not have changed the diagnoses of PTSD that were made in this study according to variants of Braverman or Lidvall.

As shown in Figure 8, fatigue at the time of initial assessment was reported most often. Memory impairment was most frequently reported at midway, while propensity to anger or irritability occurred most frequently at follow-up.

Initial assessment. At initial assessment a symptom was endorsed, on average, by 13 or 14 people ($X_{INIT}=13.7$). Therefore, at initial evaluation the symptoms reported more frequently than the mean were, in order, fatigue, headaches, trouble with memory and concentration, irritability, dizziness, and trouble sleeping. All but one of these symptoms is contained in the Lidvall criteria, and three of them are from Braverman.

Midway assessment. At midway testing, the items on the Symptom Checklist endorsed more frequently than the mean ($X_{MW} = 10.5$) were, in order, depression, trouble with memory and concentration, absentmindedness, irritability, fatigue, headaches, and anxiety. Most of these symptoms are part of both the Braverman criteria (all but fatigue and headaches) and the Lidvall criteria (all but depression and absentmindedness). Although fatigue and headaches were most frequently reported at initial assessment, their occurrence at midway decreased in frequency and in relation to other symptoms.

Follow-up assessment. At follow-up, the symptoms reported more frequently than the mean ($X_{FU} = 13.4$) on the Symptom Checklist were, in order, irritability, memory problems, fatigue, trouble sleeping, trouble concentrating, absentmindedness, headaches, and depression. Five of these symptoms are from Lidvall criteria and five are from Braverman criteria. The symptoms of

PTSD

irritability and trouble sleeping increased dramatically in frequency over the interim period between midway to follow-up testing.

Most and least frequently reported symptoms. Over all three evaluations the most frequently reported symptoms from Braverman and Lidvall criteria were, in no particular order, headaches, fatigue, irritability, and difficulties with both memory and concentration, depression, and absentmindedness. Symptoms that appeared least frequently were hypersensitivity to sensory stimuli, nightmares, 'not wanting to socialize with people or feeling no interest in things', and 'loss of sexual interest or pleasure'. These are the items that are most similar to those of DSM-III / III-R.

Summary

The two primary symptoms of DSM-III / III-R were infrequently reported compared to other symptoms, regardless of measure (i.e., DIS or SC). The most frequently reported symptoms in this group of head injured subjects were those considered by DSM-III/III-R to be miscellaneous symptoms or hyperarousal or associated features of PTSD. The Lidvall symptoms are among the most frequently reported at all three assessments.

Validation of PTSD Criteria at the Symptom Level:

Relationship of Symptoms to Diagnoses of PTSD (Sensitivity and Specificity), and Other Criterion Symptoms (Internal Consistency)

The utility and validity of any set of diagnostic criteria based on signs and symptoms relies upon the contribution of each symptom to a valid diagnosis. The following section examines the power of individual symptoms as markers of Post-Traumatic Stress Disorder. An examination of the correlational association is made between symptoms and both PTSD diagnoses according to various criteria, and other PTSD symptoms (internal consistency). For reference, the correlations are tabulated in Appendices N and O, respectively. Estimates of the sensitivity and specificity of each symptom are also presented in Table 14. *Sensitivity* refers to the percentage of patients diagnosed with PTSD (according to any set of criteria) who endorsed this symptom. *Specificity* refers to the percentage of patients diagnosed without PTSD (according to all sets of criteria) who did not endorse this symptom.

Table 14

Sensitivity and Specificity of Individual PTSD Symptoms to A Diagnosis of PTSD

Symptoms		Concurrent endorsement of DSM-III/III-R symptoms; or endorsement of Braverman and Lidvall symptoms at the level of "moderately" or greater.		Concurrent and retrospective endorsement of DSM-III/III-R symptoms; or endorsement of Braverman and Lidvall symptoms at the level of "a little bit" or greater.	
		Sensitivity	Specificity	Sensitivity	Specificity
Intrusive Recall (DSM-III/III-R)	Initial	24%	100%	32%	100%
	Midway	18%	100%	24%	100%
	Follow-up	19%	100%	19%	100%
Worsening of Symptoms (DSM-III/III-R)	Initial	16%	100%	32%	100%
	Midway	12%	97%	24%	93%
	Follow-up	38%	100%	38%	100%
Numbness (DSM-III/III-R)	Initial	8%	100%	16%	100%
	Midway	18%	100%	29%	100%
	Follow-up	31%	100%	31%	100%
Avoidance (DSM-III/III-R)	Initial	28%	97%	32%	94%
	Midway	29%	97%	29%	93%
	Follow-up	25%	95%	25%	95%
Jumpiness (DSM-III/III-R)	Initial	24%	100%	32%	100%
	Midway	24%	97%	24%	93%
	Follow-up	31%	95%	31%	95%
Sleep Disorder (DSM-III/III-R)	Initial	28%	97%	44%	97%
	Midway	41%	100%	47%	97%
	Follow-up	63%	100%	63%	100%
Guilt (DSM-III/III-R)	Initial	12%	100%	16%	100%
	Midway	12%	97%	12%	97%
	Follow-up	0%	100%	0%	100%
Cognitive Dysfunction (DSM-III/III-R)	Initial	44%	94%	56%	91%
	Midway	65%	93%	76%	93%
	Follow-up	50%	86%	50%	86%
Nightmares (Brav.)	Initial	16%	97%	36%	80%
	Midway	47%	90%	53%	79%
	Follow-up	19%	100%	44%	100%
Social Withdrawal (Brav.)	Initial	24%	97%	32%	80%
	Midway	12%	93%	35%	76%
	Follow-up	19%	100%	44%	91%
Sexual Displeasure (Brav.)	Initial	24%	97%	36%	91%
	Midway	29%	93%	29%	93%
	Follow-up	25%	100%	38%	100%
Depressed (Brav.)	Initial	32%	91%	72%	71%
	Midway	59%	86%	76%	66%
	Follow-up	56%	95%	69%	77%

Table 14 (continued)

		Concurrent endorsement of DSM-III/III-R symptoms; or endorsement of Braverman and Lidvall symptoms at the level of "moderately" or greater.		Concurrent and retrospective endorsement of DSM-III/III-R symptoms; or endorsement of Braverman and Lidvall symptoms at the level of "a little bit" or greater.	
Symptoms		Sensitivity	Specificity	Sensitivity	Specificity
Absentmindedness (Brav.)	Initial	36%	97%	76%	69%
	Midway	59%	90%	71%	62%
	Follow-up	56%	91%	69%	73%
Impaired Concentration (Brav., Lidv.)	Initial	60%	86%	88%	57%
	Midway	59%	93%	71%	72%
	Follow-up	50%	95%	94%	73%
Impaired Memory (Brav., Lidv.)	Initial	64%	86%	88%	49%
	Midway	65%	90%	82%	55%
	Follow-up	75%	82%	94%	73%
Anxiety (Brav., Lidv.)	Initial	28%	91%	52%	74%
	Midway	59%	93%	76%	66%
	Follow-up	56%	91%	69%	73%
Irritability (Brav., Lidv.)	Initial	44%	83%	68%	60%
	Midway	53%	90%	76%	72%
	Follow-up	81%	82%	68%	68%
Hypersens. to Sound (Brav., Lidv.)	Initial	28%	97%	44%	83%
	Midway	18%	100%	18%	93%
	Follow-up	13%	95%	25%	86%
Hypersens. to Light (Lidv.)	Initial	28%	97%	40%	77%
	Midway	12%	100%	18%	90%
	FU	25%	95%	44%	95%
Headaches (Lidv.)	Initial	60%	80%	72%	63%
	Midway	47%	90%	53%	79%
	Follow-up	44%	82%	69%	73%
Dizziness (Lidv.)	Initial	44%	86%	68%	66%
	Midway	24%	100%	35%	76%
	Follow-up	25%	91%	56%	82%
Fatigue (Lidv.)	Initial	72%	77%	84%	37%
	Midway	41%	83%	76%	45%
	Follow-up	63%	82%	88%	68%

Note. Brav. = Braverman criteria

Lidv. = Lidvall criteria

Two sets of values are given for both sensitivity and specificity. The first set of values for sensitivity and specificity were assessed with more restrictive criteria — in the case of DSM-III/III-R the individual acknowledged presence of the symptom at the time of assessment (not retrospectively); in the case of alternative criteria the symptom was endorsed at least at the level of "moderately". The second set of values were assessed more leniently — in the case of DSM-III/III-R the symptom may have been acknowledged either concurrently or retrospectively; in the case of alternative criteria, the symptom may have occurred as infrequently as "a little bit".

Intrusive recall (DSM-III/III-R Criteria)

Concordance with other PTSD criteria. At initial assessment, intrusive recall was significantly associated with receiving a diagnosis of PTSD from either any variant of DSM-III/III-R criteria or any criteria but not from any variant of Braverman or Lidvall criteria (see Appendix N). Endorsement of this symptom at initial assessment however, related significantly to receiving a PTSD diagnosis according to Braverman or Lidvall at the midway assessment. Reports of intrusive recall at midway correlated significantly with concurrent diagnoses of PTSD according to the first three variants of DSM-III/III-R. The appearance of intrusive recall at follow-up also related to concurrent diagnoses of PTSD according to DSM-III/III-R criteria. The highest correlation of this symptom with Braverman criteria occurred at midway. The sensitivity of this symptom ranged from 18% to 32% over the three assessments and the specificity was 100%.

There were, in general, good correlations between intrusive recall and other DSM-III symptoms but there were some notable exceptions (see Appendix O). For example, intrusive recall (at initial and midway assessment) was not associated concurrently with guilt or with "worsening of symptoms when reminded of the trauma" even though intrusion and worsening of symptoms are grouped together according to DSM-III-R. These two intrusive symptoms did correlate significantly at follow-up, however, further highlighting the complex temporal intrarelations of PTSD symptoms. Intrusive recall correlated moderately with concurrent experiences of numbness and avoidance at initial and follow-up assessments, but not at midway, partially supporting the concept of bidimensionality. Intrusive recall at all three assessments correlated moderately with concurrent reports of jumpiness, sleep disturbance, and impaired memory/concentration. At initial assessment, this symptom only correlated significantly with the Braverman-Lidvall symptoms "impaired memory" and "loss of interest or pleasure in sex", although initial intrusion symptoms correlated with several Braverman-Lidvall symptoms endorsed at midway. There was a strong positive relationship between intrusive recall at midway and follow-up and the concurrent endorsement of most of the Braverman/Lidvall symptoms.

Worsening of symptoms (at initial assessment) correlated with diagnoses of PTSD according to DSM-III (3) and DSM-III (4) only, and to symptoms of avoidance and guilt, only. At midway, worsening of symptoms correlated significantly with DSM-III (3), DSM-III (4), and Braverman (2); and with symptoms of numbness, guilt, depression, and impaired memory. At

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follow-up, worsening of symptom correlated significantly with diagnoses of PTSD according to all criteria, except Lidvall (2), and to many other PTSD symptoms used as criterion by both DSM-III/III-R and alternative criteria. The sensitivity of this symptom was 12% to 38% and the specificity was 93% to 100%.

Avoidance-Numbness (DSM-III /III-R Criteria)

Concordance with other PTSD criteria. Concurrent diagnoses of PTSD, according to all variants of DSM-III, correlated strongly with numbness and avoidance, but correlations were not as strong as they had been between PTSD diagnoses and the previous criterion — intrusive recall (see Appendix N). At initial assessment, there was no significant association between this symptom complex and diagnoses of PTSD according to variants of Braverman and Lidvall. With respect to alternative criteria, numbness had a significant correlation at initial assessment with "loss of interest or pleasure in sex" while avoidance related to hypersensitivity to sound, irritability, and sexual disinterest. At midway and follow-up, however, there were moderately strong relationships between numbness/avoidance and many of the Braverman/Lidvall symptoms. Numbness at midway and follow-up correlated with concurrent PTSD diagnoses made according to variants of Braverman and Lidvall.

Concurrent experiences of numbness and avoidance correlated with each other weakly at initial assessment and moderately at midway and follow-up (see Appendix O). At initial assessment, the association with DSM-III miscellaneous symptoms was weaker for numbness than it was for avoidance (or had been for intrusive recall). Correlations between avoidance and miscellaneous symptoms also remained relatively strong at midway and follow-up. At midway, numbness correlated strongly with sleep disorder and cognitive impairment, but not jumpiness. At follow-up, numbness correlated strongly with all three miscellaneous symptoms. The sensitivity of this item ranged between 12% and 38%, while the specificity was 93% to 100%.

Miscellaneous or Hyperarousal Symptoms (DSM-III/III-R Criteria)

Concordance with other PTSD criteria. These symptoms had moderate concurrent relationships at initial assessment with other DSM-III symptoms, as well as with PTSD diagnoses made according to variants of DSM-III, but not of Braverman or Lidvall. There were only moderate

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correlations between these symptoms when assessed on the DIS and identical symptoms when assessed by the Symptom Checklist.

Endorsement of the DSM-III miscellaneous symptoms at midway and follow-up always correlated moderately well with most other DSM-III symptoms, as well as with PTSD diagnoses made according to variants of DSM-III. Significant correlations occurred between these symptoms and PTSD diagnoses made from variants of Braverman and Lidvall occasionally, but relationships were not consistent. In general, Braverman (2) correlated higher with these symptoms than did variants of Lidvall. Jumpiness correlated significantly with concurrent Braverman/Lidvall symptoms at midway, but not at follow-up. Sleep disorder and difficulties with memory or concentration correlated moderately with identical items on the Symptom Checklist at both midway and follow-up (with the highest correlations at follow-up). The sensitivity of these items ranged from 24% to 63%, with sleep disorder being the most sensitive, especially at follow-up. The specificity of these items was from 93% to 100%.

Guilt (DSM-III Criteria)

Concordance with other PTSD criteria. The association with PTSD as diagnosed by DSM-III (3) and (4) (i.e., from which guilt was dropped) or variants of Braverman and Lidvall was positive and significant at initial assessment. In contrast, this symptom had a small negative correlation with concurrent diagnoses of PTSD according to DSM-III (1) and (2). Guilt was more frequently associated with PTSD diagnoses made according to variants of Braverman and Lidvall criteria than with variants of DSM-III criteria. However, the correlations were highest with Braverman and Lidvall symptoms that were most similar to DSM-III criteria (e.g., nightmares, absentmindedness, social withdrawal, depression, and hypersensitivity to sound or light). Guilt was poorly correlated with endorsement of many DSM-III symptoms on the DIS, except avoidance and "worsening of symptoms when reminded of the trauma". Correlations between guilt and all other variables or symptoms were almost identical at midway to what they had been at initial assessment, unlike other DSM-III symptoms in which there were temporal changes. This symptom was not reported at follow-up. This symptom was not very sensitive (12%) despite the many significant correlations with predictor variables and other PTSD criteria. The specificity was 97% to 100%.

Nightmares (Braverman Criteria)

Concordance with other PTSD criteria. Nightmares were infrequently endorsed on both the DIS and the Symptom Checklist. Nevertheless, the endorsement of nightmares on the Symptom Checklist was significantly and positively associated (at initial assessment) with PTSD diagnoses according to all variants DSM-III-R, Braverman, and Lidvall; but not to variants of DSM-III. Endorsement of this symptom at follow-up was strongly related to PTSD diagnoses from variants of DSM-III criteria, weakly with variants of Lidvall, and not at all with Braverman (2). This lack of a significant correlation with Braverman (2) diagnoses of PTSD at follow-up is surprising because this symptom is part of the Braverman criteria and it had a significant correlation with Braverman (2) diagnoses at earlier assessments. Nightmares at initial assessment were significantly associated with all Braverman and Lidvall symptoms, but only with guilt on the DIS. Only one person at midway endorsed nightmares, at least moderately, while two more people experienced them "a little bit". Nightmares at follow-up correlated more highly with criterion symptoms from DSM-III and Lidvall than from Braverman. The sensitivity and specificity of this symptom, if endorsed at least moderately, were: 16% and 97% at initial assessment, 47% and 90% at midway, and 19% and 100% at follow-up. The addition of infrequent reports of nightmares (e.g., "a little bit", on the Symptom Checklist) increased the sensitivity of this symptom, with little change to the specificity.

Social Withdrawal and Loss of Interest in People and Things (Braverman Criteria)

Concordance with other PTSD criteria. Social alienation/numbness correlated significantly, and strongly, with concurrent PTSD diagnoses made according to variants of Braverman and Lidvall and not according to DSM-III, even though this symptom is similar to the numbing symptom in DSM-III. While correlating strongly with other Braverman-Lidvall symptoms, this symptom did not correlate significantly with DSM-III/III-R criteria, except guilt. This symptom correlated significantly with concurrent diagnoses of PTSD made according to Braverman (2) and Lidvall (2) criteria at midway; but at follow-up it only correlated with DSM-III diagnoses of PTSD. The sensitivity and specificity of this symptom at all three assessments was: 24% and 97% at initial assessment, 12% and 93% at midway, and 19% and 100% at follow-up. Decreasing the criterion level to "a little bit" made this symptom more sensitive, but decreased specificity.

Loss of Sexual Interest or Pleasure (Braverman Criteria)

Concordance with other PTSD criteria. This symptom belongs with the symptom complex of numbness/avoidance and received similar values to the previous symptom for sensitivity and specificity: 24% and 97% at initial assessment, 29% and 93% at midway, 25% and 100% at follow-up. At initial assessment, diminished sexuality correlated with (a) PTSD diagnoses made according to all sets of criteria, except Lidvall, (b) approximately half of the Braverman-Lidvall symptoms, and (c) half of the DSM-III symptoms (i.e., intrusion, numbing, avoidance, and cognitive impairment). At later assessments, this symptom correlated significantly with concurrent PTSD diagnoses according to all sets of criteria, except Lidvall at midway. Concurrent relationship of this symptom with most other Braverman and DSM-III criteria were also significant. This symptom was less strongly related to Lidvall criterion symptoms and to DSM-III's intrusive recall; although, diminished sexuality correlated very strongly with "worsening of symptoms when reminded of the trauma" at follow-up.

Depression (Braverman Criteria)

Concordance with other PTSD criteria. Individuals who received a diagnosis of PTSD at initial and midway assessment according to DSM-III (4) and variants of Braverman and Lidvall were likely to endorse this symptom. This symptom also correlated significantly with other Braverman-Lidvall criteria, as well as with DSM-III's guilt and cognitive impairment. Depression correlated moderately to strongly with most other PTSD symptoms (from both the DIS and the SC), although at follow-up it only correlated significantly with intrusive phenomena and sleep disorder. Depression was related to concurrent diagnoses of PTSD at follow-up, according to DSM-III (3) and variants of Braverman and Lidvall criteria. The sensitivity of this symptom was between 32% and 56%, while the specificity was 86% to 95%. Endorsement of this symptom at the lower criterion level made the estimates of sensitivity and specificity roughly equivalent, at approximately 71%.

Irritability (Braverman and Lidvall Criteria)

Concordance with other PTSD criteria. This symptom was strongly related at all assessments to PTSD diagnoses made according to variants of Braverman or Lidvall, as well as to all the other Braverman-Lidvall symptoms. This symptom correlated significantly with PTSD diagnoses made according to variants of DSM-III, as well as with DSM-III criterion symptoms, but only at midway

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and follow-up. The sensitivity of this symptom ranged between 44% and 81%, while the specificity was between 82% and 90%.

Absentmindedness and Impaired Concentration and Memory (Braverman and Lidvall Criteria)

Concordance with other PTSD criteria. At initial assessment, these symptoms correlated (a) significantly and strongly with PTSD diagnoses made according to variants of Braverman or Lidvall, as well as with their criterion symptoms, but (b) weakly with diagnoses made by variants of DSM-III criteria, as well as their criterion symptoms. The correlations between identical symptoms of impaired cognitive functioning on the DIS and on the Symptom Checklist were in the moderate range of .22 to .35. Reported symptoms of cognitive impairment correlated very highly with all concurrent diagnoses of PTSD at midway and follow-up, regardless of diagnostic criteria.

Two of the most seriously injured patients in this study endorsed enough DSM-III symptoms to obtain a diagnosis of PTSD, but they were aware of intrusion and avoidance/numbness only in retrospect. In contrast, they were aware of impaired attention, concentration, and memory at the time of the earlier assessment. Persons suffering PTSD may be aware of symptoms of cognitive impairment and their cause-effect relationship with the accident long before they are aware of more subtle PTSD symptoms; suggesting that these symptoms were among the most sensitive of all PTSD markers. In this study, the sensitivity of these symptoms was higher than for any other criterion symptoms (i.e., 36% to 75%) while the specificity is around 90%.

Anxiety (Braverman and Lidvall Criteria)

Concordance with other PTSD criteria. While not correlating significantly with concurrent diagnoses of PTSD, according to DSM-III (1) and DSM-III (3), this symptom correlated significantly only with diagnoses given in retrospect, that is by DSM-III (2) and DSM-III (4). Although DSM-III classifies post-traumatic stress disorder with the anxiety disorders, personal awareness of this symptom correlated poorly (i.e., $-0.02 < r < .17$) with criterion symptoms used by DSM-III for PTSD. In contrast, anxiety correlated significantly with concurrent PTSD diagnoses made according to variants of Braverman and Lidvall criteria and to most of the criterion symptoms used in these alternative sets of criteria.

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Endorsement of anxiety at midway correlated significantly with PTSD diagnoses made according to all sets of criteria, as well as with all other PTSD symptoms, regardless of whether they were from variants of DSM-III, Braverman, or Lidvall. This symptom correlated highly at follow-up with other PTSD symptoms used by Braverman and Lidvall, but not with those used by variants of DSM-III (except for the symptom "worsening of symptoms when reminded of the trauma"). Correlations with PTSD diagnoses made according DSM-III (3) and variants of Braverman and Lidvall were significant, but the correlation of anxiety with DSM-III (1) diagnoses was very low. The sensitivity of this symptom was 28% to 59% while the specificity was about 91%.

Sensory Hypersensitivity (Braverman and Lidvall Criteria)

Concordance with other PTSD criteria. These symptoms had moderate correlations with concurrent diagnoses of PTSD according to variants of Braverman and Lidvall. Hypersensitivity to sound (possibly indicative of hyperarousal) was also very significantly related to DSM-III (3) diagnoses of PTSD. Hypersensitivity to light or sound correlated moderately with each other but did not show identical correlations with other symptoms. Both forms of hypersensitivity correlated significantly with headaches, sleep disorder, dizziness, fatigue, irritability, nightmares, cognitive dysfunction, social withdrawal, depression, anxiety, and guilt. At midway and follow-up, sensory hypersensitivity correlated with concurrent reports of intrusive recall and numbness/avoidance, in addition to other criterion symptoms, and with concurrent diagnoses of PTSD (according to all sets of criteria). The sensitivity of these symptoms ranged from 12% to 28% while the specificity was close to 100%.

Headaches (Lidvall Criteria)

Concordance with other PTSD criteria. The appearance of this symptom at initial assessment had a moderate association with PTSD diagnosed according to variants of Braverman or Lidvall. Endorsement of this symptom at midway correlated with diagnoses of PTSD made (a) several months earlier by DSM-III (3) and variants of Braverman and Lidvall criteria, and (b) concurrently with PTSD diagnoses made according to DSM-III (1) and variants of Lidvall criteria. The appearance of headaches at follow-up had no relationship with concurrent diagnoses of PTSD. They did have a significant positive relationship with diagnoses of PTSD made according to variants of DSM-III, however, at initial and midway assessments (up to eight months earlier). The

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explanation offered for this apparent paradox is that the brightest, most perceptive, and analytical persons were the most likely to have endorsed DSM-III criteria at initial and midway assessments. They were also the most likely to suffer headaches at follow-up, possibly because of resumption of work or activities requiring mental effort. The sensitivity of this symptom was 44% to 60% and the specificity was 80% to 90%.

Dizziness or Faintness (Lidvall Criteria)

Concordance with other PTSD criteria. Dizziness correlated well with concurrent diagnoses of PTSD made according to variants of Lidvall at all three assessments, and with variants of Braverman at initial assessment; but never with variants of DSM-III. This symptom correlated highly and significantly with other Braverman or Lidvall symptoms at initial and midway assessments but only with headaches, fatigue, anxiety, nightmares, and "loss of interest in sex" at follow-up. Correlations between this symptom and DSM-III criteria were small and non-significant and not always in the same direction. The sensitivity of this symptom was between 25% and 44% while the specificity ranged from 86% to 100%.

Fatigue (Lidvall Criteria)

Concordance with other PTSD criteria. This symptom correlated well with concurrent PTSD diagnoses made according to variants of Lidvall. At initial assessment, this symptom also correlated significantly with diagnoses of PTSD made according to Braverman (2) but not to variants of DSM-III, while the reverse was true at midway. At follow-up, this symptom correlated significantly with diagnoses of PTSD made according to all three sets of diagnostic criteria. Endorsement of this symptom was always strongly associated with concurrent endorsement of all Braverman and Lidvall symptoms, but not with DSM-III symptoms at initial assessment and only with one DSM-III symptom at midway (i.e., numbness). At follow-up, this symptom had significant correlations with intrusive recall, sleep disorder, and "worsening of symptoms upon reminder of the trauma". The mean sensitivity of this symptom, over all three assessments, was 59%; making it the most sensitive of all symptoms. The mean specificity, at 81%, was slightly lower than it had been for others.

Summary

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Hypothesis One was confirmed: The coverage of diagnostic criteria for traumatized head injured survivors and the diagnostic agreement between pairs of diagnostic criteria was maximum when alternative sets of criteria were used, in particular Braverman (2). Coverage and concordance between DSM-III (1) criteria and alternative criteria was quite poor. Concordance between sets of alternative criteria was good, except for Braverman (1). Diagnostic agreement among sets of criteria was highest at midway, possibly because of the time delay needed for individuals to establish the cause-effect relationship between trauma and consequences. The highest concordance between variants of DSM-III and alternative criteria occurred for DSM-III (3) at midway and follow-up assessments. It is this set of criteria that reflected DSM-III-R changes. The 1987 modifications to DSM-III seem to have moved it closer to the alternative sets of criteria. These results were reflected by assessment of the criterion symptoms. Few people endorsed DSM-III symptoms, especially intrusive recall and avoidance - numbness. While these symptoms correlated with receiving a DSM-III diagnosis of PTSD, they were not associated with diagnoses of PTSD made from alternative criteria. In contrast, PTSD symptoms relegated to miscellaneous or associative status by DSM-III had more frequent associations with diagnoses of PTSD by alternative criteria and by other criterion symptoms (internal consistency).

Results for Hypothesis Two: Discriminant Analyses of PTSD and non-PTSD Groups on the Basis of Distress and Impairment Variables

Direct discriminant function analyses were performed using a reduced optimal subset of predictor variables (obtained from BMDP9R) in order to predict group membership of cases previously diagnosed according to one of eight sets of criteria. Since there were only three cases of PTSD identified by Braverman (1) criteria, no further analyses were made using this set of criteria. The number of subjects was considered too small for a meaningful analysis and the three subjects met Braverman (2) criteria anyway.

To review, the three sets of predictor variables from which optimal subsets were chosen for discriminant analyses in Hypothesis Two were:

1. psychological distress, measured by the MMPI and including validity and clinical scales and the *PTSD* content scale by Keane et al. (1984), as well as propensity to become angry as assessed by the Novaco Anger Inventory;
2. neuropsychological impairment as measured by the subtests of the Halstead-Reitan battery; and
3. cognitive functioning as indicated by the WAIS-R subscale scores, and Verbal, Performance, and Full Scale IQ.

Information on missing values, outliers, conformity to the assumptions of normality and homogeneity of variance, and multicollinearity is given in Appendix K. Also discussed in Appendix K are the statistical procedures followed for these analyses, and the computer packages used.

Distress Variables (MMPI and Anger)

Initial Assessment

Results from the discriminant analyses using optimal subsets of MMPI and anger variables as predictors are displayed in Table 15. Provided in this table and each subsequent table of the multivariate statistical analyses are the following results: Listed for each set of PTSD diagnostic criteria are (a) the variables that were identified in the BMDP Setwise Regression as the optimal subset of predictors (according to criteria discussed in Appendix K); followed by (b) group sizes of the non-PTSD group and the PTSD group, respectively; (c) the squared multiple correlation, R^2 , (d) the square multiple correlation adjusted for shrinkage according to the more stringent Herzberg

formula for smaller sample sizes; (e) Hotelling's T^2 for the multivariate group difference; (f) Mahalanobis' distance, D^2 , a measure of the multivariate effect size that is independent of the sample size and is used in multivariate estimation of the power; (g) the power of the analysis to detect a true multivariate difference between groups; (h) the F ratio for testing the significance of the multivariate group effect and the discriminant function; (i) the degree of freedom associated with the F ratio; (j) the significance level of the F ratio; and (k) the classification matrix obtained through the discriminant analysis, which indicates on the first line the number of PTSD subjects correctly classified (i.e. sensitivity of the discriminant function), the number of non-PTSD subjects correctly classified (i.e. specificity of the discriminant function), and the total number of subjects correctly classified. On the second line are the same proportions of subjects that were correctly classified through the jackknife cross-validation method. Group means, univariate t-test values, and effect sizes for the distress variables are provided in Table 15. Provided in this and similar tables in the first column are the group means of the predictor variables, for each set of diagnostic criteria. In the second column of each set of criteria, the effect size is given and below that the multivariate t-test score. Adjustment for multiple t-tests according to the Bonferroni inequality is not possible due to significant correlations between predictor variables.

Variants of DSM-III/III-R criteria. Among the variants of DSM-III/III-R criteria, the best separation using an optimal subset of psychological distress variables was achieved when diagnoses were made using DSM-III (1) criteria (see Table 15). A discriminant function analysis using MMPI *K* and *L* accounted for 12% of the variability but less than 6% following shrinkage due to cross-validation. While 98% of non-PTSD cases were correctly classified through jackknife cross-validation, only 33% of the PTSD cases were correctly classified (i.e., greater specificity than sensitivity). The power to differentiate between the groups was adequate at approximately .80. The predictor variable was MMPI *K* while MMPI *L* was a suppressor variable.

Table 15
Results from Initial Multivariate Analyses Using as Predictors 'Best' Subsets of MMPI and Anger
Variables: Data Collected at Initial Assessment

Diagnostic Criteria	Optimal Subset of Predictors	Group Sizes n(non PTSD), n (PTSD)	R ²	Adj. R ² (pc)	T ²	D ²	Power	F ratio	degrees of freedom	sign. level	Classification Matrix, % of subjects correctly classified: PTSD non PTSD Total (Sensitivity ₂) (Specificity ₃)		
DSM-III (1)	MMPI L (S) K	53,6	.12	.06	8.39	1.55	.80	4.12	2,59	.021	33.3	100	93.2
											33.3	98.1	91.5
DSM-III (2)	Anger MMPI L (S) K	26,10	.25	.08	11.10	1.54	.75	3.48	3,36	.027	30.0	96.2	77.8
											20.0	96.2	75.0
DSM-III (3)	MMPI K Hs (S) Hy (S) Mf Sc (S)	49,10	.14	.03	9.3	1.12	.50	1.73	5,59	n.s.	30.0	100	88.1
											10.0	91.8	78.0
DSM-III (4)	Anger	21,16	.08	.02	3.16	.35	.55	3.16	1,37	n.s.	0.0	100	72.9
											0.0	100	72.9
BRAVERMAN (2)	Anger MMPI L (S) D Hy Pd (S) Ma	47,12	.53	.41	62.30	6.49	1.0	9.75	6,59	.000 (cons.)	75.0	95.7	91.5
											75.0	95.7	91.5
LIDVALL (1)	Anger MMPI L (S) F Hs Pd (S) Ma	45,10	.41	.25	42.30	5.07	1.0	6.59	6,59	.000 (lib.)	70.0	98.0	93.2
											70.0	94.0	91.5

(Table 15 continued)

Diagnostic Criteria	Optimal Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F ratio	degrees of freedom	sign. level	Classification Matrix, % of subjects correctly classified: PTSD non PTSD Total (Sensitivity) ₂ (Specificity) ₃		
LIDVALL (2)	Anger MMPI L (S) D Hy Pd (S) Mf Pa Pt (S) Sc Ma SI (S)	46,13	.55	.30	84.90	8.37	1.0	5.22	11,59	.000 (lib.)	69.2 61.5	95.7 93.5	89.9 86.4
Any Criteria 190	Anger MMPI Hy Pd (S) Ma	34,25	.23	.11	16.51	1.13	.85	4.11	4,59	.006	72.0 68.0	70.6 67.6	71.2 67.8

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 16

Group Means, Effect Sizes, and t-test Values for Distress Variables: Initial Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Braveman (2)		Lofall (1)		Lofall (2)		Any Criteria	
	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES
ANGER (I)	320.2	.47	331.7	.81	304.5	.12	320.4	.59	350.5	1.20	351.0	1.13	345.5	.95	328.8	.52
	310.3	.55	282.8	2.18*	312.6	.34	282.9	.78	301.5	3.72**	303.3	3.27**	301.8	3.02**	298.7	2.00*
MMPI L(I)	49.2	-.51	51.6	-.29	51.3	-.21	51.5	-.45	53.5	.17	53.0	.06	52.5	-.05	52.2	-.13
	53.1	-1.19	54.0	-.78	53.0	-.61	55.4	-1.35	52.5	.53	52.7	.17	52.8	-.17	53.1	-.48
MMPI F(I)	57.7	-.59	59.1	-.15	62.2	.12	60.0	-.01	65.6	.37	66.1	.35	64.00	-.25	61.7	.11
	61.3	-1.37	60.3	-.40	60.7	.35	60.1	-.03	59.7	1.15	59.9	1.02	60.1	.79	60.4	.41
MMPI K(I)	59.8	-.88	59.6	-.63	56.0	-.35	54.7	.16	50.3	.34	48.6	.51	49.6	.46	52.3	.17
	52.5	-2.04	54.3	-1.70	52.7	-1.00	56.2	.48	54.0	1.06	54.2	1.48	54.3	1.45	53.9	.64
MMPI Hs(I)	58.2	-.12	58.1	-.05	58.0	-.16	57.6	-.14	67.7	.84	68.5	.83	67.0	.78	61.5	.34
	59.2	-.28	58.5	-.14	59.3	-.45	58.9	-.41	56.9	2.59*	57.2	2.39*	56.8	2.53*	57.3	1.30
MMPI D(I)	66.3	.46	62.9	-.26	62.7	.12	60.9	.05	67.1	.60	61.8	.02	63.8	.24	62.2	.10
	61.1	1.07	60.2	.71	61.4	.33	60.3	.16	60.2	1.87	61.6	.06	61.0	.77	61.2	.38
MMPI Hy(I)	63.8	.95	62.3	.55	61.1	.35	60.1	.19	64.3	.94	63.0	.65	63.1	.61	61.2	.49
	58.1	2.20*	58.2	1.48	58.2	1.01	58.3	.58	57.2	2.92**	57.8	1.87	57.4	1.95	56.8	1.85
MMPI Pd(I)	66.7	.26	67.2	.34	65.8	.15	63.4	-.14	64.8	.02	63.0	-.14	63.1	-.14	62.8	-.25
	64.3	.61	63.7	.92	64.2	.42	65.2	-.41	64.4	.07	64.8	-.39	64.9	-.46	65.8	-.94
MMPI Ma(I)	54.2	.40	58.4	-.09	53.5	.56	54.9	.38	58.6	.02	56.7	.22	55.7	.35	56.6	.31
	59.3	.93	57.3	-.25	59.9	1.62	59.6	1.15	58.8	.07	59.2	.63	59.7	1.10	60.4	1.18
MMPI Pa(I)	57.5	-.11	57.2	-.20	59.8	.24	58.8	.05	62.0	.42	63.5	.54	62.7	.54	59.2	.19
	58.2	-.25	59.2	-.54	57.8	.68	58.3	.14	57.1	1.29	57.0	1.53	56.8	1.72	57.3	.73
MMPI Pt(I)	59.3	.28	57.9	.14	59.3	.16	56.8	-.01	63.6	.59	61.7	.32	60.0	.20	59.0	.14
	58.0	.65	56.9	.37	57.9	.45	56.9	-.03	56.7	1.81	57.4	.91	57.6	.63	57.5	.55
MMPI Sc(I)	62.3	-.17	62.3	-.14	66.9	.27	63.7	.05	72.3	.55	73.0	.51	69.0	.41	66.4	.32
	63.7	-.39	63.8	-.39	62.9	.79	63.0	.14	61.3	1.71	61.6	1.47	61.0	1.31	61.5	1.23
MMPI Ma(I)	58.5	-.49	60.9	-.06	65.1	.08	63.3	.23	72.6	.96	72.8	.86	70.8	.76	66.4	.34
	64.8	-1.15	61.7	-.16	63.9	.24	60.5	.71	62.0	2.98**	62.4	2.47*	62.2	2.43*	62.4	1.30
MMPI S(I)	49.7	-.12	46.8	-.35	48.5	-.30	47.7	-.06	53.2	.43	52.8	.37	51.9	.28	49.9	-.06
	50.2	-.28	48.8	-.93	50.5	-.86	48.1	-.19	49.4	1.32	49.7	1.06	49.7	.89	50.4	-.21
MMPI PTSD(I)	7.3	-1.18	7.8	-.55	11.7	-.00	10.3	.10	16.8	.63	17.3	.61	15.8	.53	12.8	.23
	12.2	-2.74*	10.5	-1.47	11.7	-.01	9.6	.30	10.4	1.96	10.6	1.76	10.5	1.70	10.9	.87

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group. X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. t = the t value given is that for the separate t-test; (I) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

There was a large effect size difference in mean scores on the *PTSD* content scale for the two groups, with the score for the PTSD group over a standard deviation lower than that of the non-PTSD group (i.e., $X = 7.3$, 12.2 , $ES = -1.18$, refer to Table 16), a result not expected in the light of the literature review. This indicates that the people diagnosed with PTSD by DSM-III (1) criteria endorsed less MMPI items on the PTSD content scale, as a group, than the non-PTSD group. Recall that this scale was developed by Keane et al. (1984) to reflect the occurrence of PTSD and has received endorsement by the U.S. Veterans Administration as a valid instrument for identifying cases of PTSD. The MMPI profile of the group diagnosed by DSM-III (1) as having PTSD suggests that the patients, on average, were trying to maintain an appearance of adequacy, control, and effectiveness; while either not experiencing distress or denying the presence of MMPI-derived symptoms of PTSD.

Discrimination between groups formed on the basis of optimal subsets of distress variables was decreased when other variants of DSM-III criteria were used. Multivariate group mean differences were either not significant or only marginally so (see Table 15 for the results). The discriminant functions were highly specific but not very sensitive. The cases of PTSD could not be separated from the cases of non-PTSD.

Braverman (2) criteria. As can be seen from Table 15, the maximum separation between the PTSD and non-PTSD groups, on the basis of an optimal subset of distress variables, was obtained when the groups were formed from diagnoses made according to *Braverman (2)* criteria. To interpret Table 15, it can be seen that the subset of Anger, MMPI *L*, *D*, *Hy*, *Pd*, and *Ma* led to a discriminant function that accounted for 53% of the between-group variability (R^2); shrinkage due to cross-validation - the adjusted R^2 - reduced this value to 41%. The multivariate group mean difference was highly significant: The Hotelling's T^2 of 62.30 suggests that there are reliable differences in the centroids of the two groups, with $F(6,59) = 9.75$, significant at $p = .000$. Heterogeneity of variance occurred on the variables Anger and MMPI *L*; however, the larger variance occurred in the larger group (i.e., non-PTSD) for both variables. This suggests that the observed alpha level may be conservative (e.g., the actual alpha is less than the alpha stated), with a possible overclassification of cases as non-PTSD. Due to the large multivariate effect, the estimated power to find group differences was approximately equal to 1, therefore the sample size was adequate in this analysis. As shown in the classification matrix, the discriminant function correctly classified 91.5% of the subjects (75% of the PTSD cases and 95.7% of the non-PTSD

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cases). Thus, the sensitivity of the discriminant function was 75.0% and the specificity was 95.7%. These results were replicated in the jackknife cross-validation procedure (the second line of the classification matrix).

The variables Anger, MMPI *D*, MMPI *Hy*, and MMPI *Ma* were highly correlated with the criterion variable when Braverman (2) was used, thus they accounted for most of the variance (see Appendix Q for correlations between the criterion, measured according to the different sets of diagnostic criteria, and the predictor variables). The PTSD group had higher mean scores (see Table 16) than the non-PTSD group on the optimal predictor variables, Anger, MMPI *D*, MMPI *Hy*, and MMPI *Ma*; suggesting the profile of an anxious, depressed person with possible low frustration tolerance and reacting to stress through the development of physical symptoms and increased irritability; but without insight into the cause of his or her symptoms (interpretation based on Graham, 1977).

The MMPI *L* and *Pd* scales were suppressor variables in this discriminant function (see Conger, 1974; Tabachnick & Fidell, 1988). They partialled out irrelevant variance through their correlations with other predictor variables, such as the likelihood of experiencing symptoms of psychological distress because of (in this case) attitude, social deviancy, and rebelliousness. For example, a large proportion of the subjects in this research were young men (35%) who, as a group, had a significantly higher mean score on the *Pd* scale than the overall sample mean. Suppression of variance accounted for by this variable (e.g., dissatisfaction with life, family problems, delinquency, sexual problems, and difficulties with authorities) increased the discrimination between PTSD and non-PTSD on the basis of the remaining predictor variables. The MMPI *Pd* scale correlated with the predictor variables MMPI *D*, MMPI *Hy*, MMPI *Ma*, and Anger ($.27 \leq r \leq .53$, $p < .02$). Likewise, the suppressor variable MMPI *L* (i.e., high scores reflect an attempt to deny psychopathology) correlated minimally with the criterion variable, but it had an inverse relationship with several of the MMPI clinical scales. It correlated significantly with MMPI *Ma* and Anger ($-.31 \leq r \leq -.40$, $p < .008$, refer to Appendix R).

Variants of Lidvall criteria. Good separation between the non-PTSD and PTSD groups was also achieved on a subset of the psychological distress variables when diagnoses of PTSD were made from Lidvall (1) criteria. As can be seen from Table 15, the subset of Anger, MMPI *L*, *F*, *Hs*, *Pd*, and *Ma* as predictor variables led to a jackknife cross-validation that correctly classified 70% of the PTSD cases and 94% of the non-PTSD cases (adequate sensitivity/high specificity). There

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was a large multivariate effect; thus the sample size was adequate. On the variable MMPI *F* there was greater variance in the smaller group, suggesting that the alpha level may have been liberal but still significant at $p < .05$. The PTSD group scored higher scores than the non-PTSD group on Anger, MMPI *F*, MMPI *Hs*, and MMPI *Ma*. This suggests that possibly the PTSD patients, as a group, were irritable and anxious, with many somatic complaints and low frustration tolerance. The suppressor variables were MMPI *L* and *Pd*, suggesting that variance due to attitude or social deviancy was removed to highlight the relationship between group membership and psychological symptoms of distress. The discriminant function analysis performed using the *Lidvall* (2) criteria for group formation resulted in the correct classification of 61.5% of the PTSD cases and 93.5% of the non-PTSD cases (i.e., jackknife classification). The multivariate group mean difference was also significant (see Table 15). The PTSD group was more distressed than the non-PTSD group (see Table 16 for group means).

Any set of criteria. To examine whether a group of PTSD patients would still be homogeneous on external predictor variables if the diagnostic criteria was relaxed to such an extent that almost 50% of the sample were PTSD-positive, discriminant analyses were also performed where the individuals with PTSD were diagnosed according to *any* set of criteria. Thus, patients who received a diagnosis of PTSD according to any set of criteria ($n = 25$) were combined to form one group and compared with subjects who had not received a diagnosis of PTSD ($n = 35$). This corresponds to the relaxing of criteria to the point where evidence of intrusive recall or avoidance- numbness or any subset of PTSD symptoms would lead to a PTSD diagnosis.

The optimal set of Anger, MMPI *Hy*, *Pd*, and *Ma* formed a discriminant function that accounted for 23% of the variance, 11% after shrinkage, and the multivariate group difference was significant. The number of cases correctly classified through the jackknife cross-validation was 68.0% of the PTSD group and 67.6% of the non-PTSD group. This PTSD group had higher Anger scores than the non-PTSD group, as well as higher MMPI *Hy* scores and MMPI *Ma* scores. The differences between the two groups on all the MMPI clinical and content scores were in the expected direction (i.e., greater maladjustment) except for MMPI *Pd*, which was a suppressor variable: The *Pd* scale correlated most highly with the *Ma* scale.

Summary. The maximum discrimination between PTSD and non-PTSD groups was achieved when variants of Braverman and Lidvall criteria were used for diagnosis, with the PTSD

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group showing the greater level of distress. This suggests that the alternative criteria for PTSD has greater convergent validity with distress variables than DSM-III/III-R criteria does. The sensitivity of the discriminant functions to correctly classify PTSD patients on the basis of optimal subsets of distress variables (when the cases had originally been diagnosed by alternative criteria) ranged between 60% and 75%; while the specificity ranged between 93% and 96%. The sensitivity of the discriminant function to identify cases originally diagnosed according to DSM-III (1) and DSM-III (2) was less than 33.3%, while most cases of non-PTSD were correctly classified. The multivariate difference between PTSD and non-PTSD groups when DSM-III (3) and DSM-III (4) were used was non-significant at $p < .05$. When the group formation was based on criteria combined from the three major sets of criteria, multivariate group separation was not as good as when diagnoses were based on a variant of Braverman or Lidvall criteria.

Regardless of diagnostic criteria, univariate differences between the PTSD and non-PTSD groups were apparent on certain variables including Anger, MMPI *D*, *Hy*, and *Pt*. This indicates that in some ways there was agreement among the different sets of diagnostic criteria, however, differences in the characteristics of the PTSD groups formed according to variants of DSM-III criteria and those formed according to variants of Braverman and Lidvall criteria emerged on other MMPI scales. On the MMPI scales that are usually considered sensitive to PTSD (i.e., *Hs*, *Pa*, *Sc*, *Ma*, and *PTSD*), the PTSD group diagnosed according to DSM-III had less psychological turmoil and maladjustment than the non-PTSD group did. When variants of Braverman or Lidvall criteria were used to diagnose PTSD, however, the PTSD groups had significantly higher scores on all clinical scales (except *Pd* and *Mf*) and the *PTSD* content scale than the corresponding non-PTSD group, indicating greater distress and maladjustment in the PTSD patients. When comparisons were made between PTSD and non-PTSD groups that were formed on the basis of DSM-III (3) criteria, the PTSD group scored slightly higher than the non-PTSD group on all of the MMPI scales, except *Hs* and *PTSD*. There was less multivariate and univariate separation between the two groups formed by DSM-III (3) criteria than between those formed by Braverman or Lidvall criteria, but the differences were generally in the same direction.

Midway Assessment

At midway, data was not collected on the distress variables, therefore, measures of distress are not concurrent with the diagnoses of PTSD. Analyses were conducted to see if relationships existed between PTSD diagnoses and both previous and later levels of distress.

Table 17

Results from *Midway* Multivariate Analyses Using as Predictors 'Best' Subsets of MMPI and Anger Variables: Data Collected at either Initial or Follow-Up Assessment

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1) (Init. Assess.)	Anger MMPI F (U) K (U) Hy Sc (U) Ma (U)	41,5	.38	.20	27.72	6.22	1.0	3.41	6,46	.006 (cons.)	80.0 60.0	97.6 92.7	95.7 89.1
(FU Assess.)	MMPI MF Pt Sc (S)	23,4	.30	.18	10.66	2.39	.90	3.27	3,27	.05	75.0 50.0	95.7 91.3	92.6 85.2
DSM-III (2) (Init. Assess.)	Anger MMPI K	26,9	.27	.14	12.10	1.81	.85	5.87	2,37	.007	33.3 33.3	96.2 92.3	80.0 77.1
(FU Assess.)	Anger MMPI F (U) Hy	20,7	.24	.11	8.93	1.33	.80	2.51	3,27	n.s.	28.6 28.6	95.0 90.0	77.8 77.8
DSM-III (3) (Init. Assess.)	Anger MMPI PTSD (U)	38,8	.15	.05	7.93	1.20	.70	3.88	2,46	.028	0.0 0.0	94.7 94.7	78.3 78.3
(FU Assess.)	Anger MMPI Hs Hy MF	21,6	.37	.20	15.55	2.35	.80	3.30	4,27	.020	50.0 50.0	95.2 90.5	85.2 81.5
DSM-III (4) (Init. Assess.)	Anger MMPI PTSD (U)	23,12	.29	.18	13.45	1.71	.85	6.52	2,35	.004 (cons.)	41.7 33.3	95.7 91.3	77.1 71.4
(FU Assess.)	Anger MMPI F	17,10	.33	.20	13.96	1.77	.90	6.03	2,27	.004 (cons.)	50.0 40.0	94.1 94.1	77.8 74.1
Braverman (2) (Init. Assess.)	Anger MMPI Pd (U)	37,9	.14	.04	7.00	.97	.65	3.42	2,46	.042	22.2 22.2	100 100	84.8 84.8
(FU Assess.)	Anger MMPI MF	21,6	.35	.21	14.45	2.00	.90	6.53	2,27	.003	50 50	100 100	88.9 88.9

(Table 17 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix, % of subjects correctly classified: PTSD (Sensitivity) ₂ (Specificity) ₃	Total
Lidvall (1) (Init. Assess.)	Anger MMPI Pd (U) Pa (S)	41,5	.23	.12	13.20	2.96	1.0	4.20	3,46	.011	20.0 20.0	87.0 87.0
(FU Assess.)	MMPI F Pd Pt SI	23,4	.55	.40	31.13	6.99	1.0	6.85	4,27	.001	75.0 75.0	92.6 92.6
Lidvall (2) (Init. Assess.)	MMPI L Pd (U) Pa (S)	38,8	.27	.15	16.31	2.47	1.0	3.46	5,19	.004	50.0 37.5	87.0 82.6
(FU Assess.)	MMPI Pd Pt (S) Sc (U) SI	22,5	.53	.39	27.72	4.19	1.0	6.10	4,27	.001	80 60	92.6 85.2
Any Criteria (Init. Assess.)	Anger MMPI PTSD	22,24	.20	.09	15.21	1.64	.80	3.11	2,46	.010	76.5 70.6	67.4 63.0
(FU Assess.)	Anger MMPI Hy Pd	14,13	.61	.50	20.96	2.26	1.0	9.54	3,27	.001	84.6 84.6	85.2 85.2

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 18

Group Means, Effect Sizes, and t-test Values for Distress Variables (Initial Data): Midway Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Brevin (2)		Level (1)		Level (2)		Any Criteria	
	XPTSD	ES	XPTSD	ES	XPTSD	ES	XPTSD	ES	XPTSD	ES	XPTSD	ES	XPTSD	ES	XPTSD	ES
ANGER (t)	340.2	1.03	337.8	.98	333.5	.82	338.2	1.10	328.1	.55	330.4	.57	311.0	.06	324.6	.48
	305.0	2.17	292.8	2.54*	303.6	2.11*	286.7	3.09**	304.1	1.48	306.2	1.21	308.4	.15	300.4	1.55
MMPI L(t)	55.6	.37	52.9	.14	53.4	.07	51.8	-.37	53.3	.07	52.4	-.10	49.6	-.63	51.7	-.26
	52.6	.79	54.0	-.37	52.8	.18	54.7	-1.04	52.6	.18	53.0	-.21	53.6	-1.63	53.6	-.85
MMPI F(t)	55.2	-1.25	58.8	-.19	55.4	-.79	56.3	-.60	55.8	-.62	54.0	-.82	58.3	-.20	58.2	-.25
	60.3	-2.63*	60.3	-.48	60.6	-2.02	61.8	-1.69	60.7	-1.67	60.4	-1.73	60.0	-.52	60.5	-.81
MMPI K(t)	63.8	-2.22	60.6	-.75	60.0	-.70	57.3	-.24	54.2	.18	58.2	-.28	54.4	.14	55.6	-.02
	54.5	-4.69**	54.3	-1.95	54.6	-1.60	55.1	-.67	55.8	.48	55.2	-.60	55.8	.37	55.5	-.06
MMPI Ha(t)	61.2	.40	59.2	.09	58.0	-.20	58.3	-.07	57.3	-.19	56.4	-.45	56.9	-.33	56.7	-.06
	58.9	.85	58.5	.23	59.4	-.51	59.0	-.21	59.6	-.51	59.5	-.94	59.7	-.96	59.4	-.20
MMPI D(t)	66.0	.34	62.9	.25	61.9	.00	61.7	.11	61.9	.00	58.2	-.50	57.4	-.63	59.9	-.29
	61.4	.72	60.2	.65	61.9	.01	60.5	.31	61.9	-.01	62.4	-1.05	62.9	-1.61	63.0	-.94
MMPI Hy(t)	64.2	.82	62.4	.56	62.1	.44	61.4	-.34	59.0	-.06	58.0	-.40	56.4	-.46	58.6	-.16
	58.9	1.73	58.2	1.44	58.9	1.12	58.2	-.96	59.5	-.17	59.9	-.84	60.1	-1.19	59.9	-.51
MMPI Pd(t)	62.4	-.21	66.2	.25	62.6	-.20	62.5	-.22	57.2	-.66	52.2	-1.54	54.4	-1.31	59.7	-.57
	64.4	-.44	63.7	.65	64.5	-.52	65.3	-.63	65.9	-1.77	65.7	-3.26*	66.3	-3.38**	66.6	-1.83
MMPI Ma(t)	54.4	.32	60.1	-.24	55.5	.18	56.7	.16	52.0	.49	45.4	1.97	52.1	.48	54.1	.39
	57.6	.68	57.3	-.62	57.6	.45	58.7	.46	58.5	1.31	58.7	4.16**	58.3	1.24	58.9	1.26
MMPI Pa(t)	53.6	-.46	57.3	-.18	55.3	-.38	57.5	-.19	54.7	-.48	57.2	-.10	57.9	-.02	56.9	-.18
	58.5	-.98	59.2	-.47	58.6	-.97	59.3	-.54	58.8	-1.29	58.1	-.22	58.0	-.04	58.5	-.57
MMPI Pt(t)	58.6	.19	57.5	.10	56.9	-.12	56.2	-.17	54.7	-.59	55.0	-.42	54.4	-.63	55.7	-.38
	57.5	.40	58.9	.27	57.8	-.32	57.6	-.48	58.3	-.59	57.9	-.86	58.3	-1.81	58.6	-1.22
MMPI Sc(t)	58.2	-.80	62.6	-.12	60.1	-.40	60.7	-.37	57.9	-.69	59.6	-.57	59.5	-.47	59.7	-.49
	63.8	-1.68	63.8	-.31	63.8	-1.02	64.9	-1.02	64.4	-1.85	63.6	-1.20	63.9	-1.21	65.0	-1.58
MMPI Ma(t)	54.5	-.67	61.8	.01	59.4	-.31	61.0	-.09	61.1	-.20	58.6	-.34	61.4	-.13	62.2	-.06
	63.6	-1.42	61.7	.02	63.3	-.79	62.0	-.25	62.9	-.55	63.1	-.71	62.8	-.34	62.8	-.18
MMPI Si(t)	49.4	.16	45.8	-.57	48.8	-.05	47.0	-.27	50.8	.34	50.6	.40	50.6	.28	48.6	-.08
	48.9	.34	48.8	-1.48	49.0	-.14	48.8	-.77	48.5	.92	48.8	.84	48.6	.73	48.2	-.25
MMPI PTSD(t)	5.2	-1.79	7.4	-.63	6.3	-1.22	7.5	-.63	7.7	-.71	7.6	-.56	8.6	-.40	8.4	-.50
	10.9	-3.77**	10.5	-1.63	11.1	-3.13**	10.9	-1.77	10.9	-1.92	10.6	-1.18	10.6	-1.02	11.2	-1.62

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (t) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

TABLE 19

Group Means, Effect Sizes, and t-test Values for Distress Variables (Follow-up Data): Midway Diagnoses of PTSD

	DSM-III (I)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Braverman (2)		Lohval (1)		Lohval (2)		Any Criteria	
	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES
	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)	(non-PTSD)	(PTSD)
ANGER(F)	329.7	.78	335.6	.89	339.0	1.11	349.0	1.55	360.2	1.78	350.3	1.61	338.0	.85	342.4	1.42
	308.4	1.45	303.6	2.05*	304.1	2.42*	291.5	3.68**	298.6	3.80**	305.1	2.99*	305.7	1.74	289.4	3.28**
MMPI L(F)	59.5	.42	54.9	-.18	56.8	.10	53.3	-.51	55.2	-.13	53.8	-.63	53.6	-.62	53.3	-.54
	55.6	.78	56.6	-.41	56.0	.21	57.8	-.120	56.4	-.27	56.6	-.116	56.7	-.126	58.5	-.140
MMPI F(F)	56.0	-.38	55.6	-.49	54.8	-.61	54.5	-.69	55.3	-.39	52.0	-.147	51.6	-.150	55.5	-.50
	59.0	-.70	59.6	-.112	59.7	-.131	61.0	-.172	59.5	-.82	59.7	-.271*	60.2	-.302**	61.1	-.130
MMPI K(F)	57.8	-.20	56.0	-.00	56.8	-.11	53.3	-.45	52.3	-.55	55.5	.05	55.0	-.12	53.3	-.47
	55.7	-.37	56.0	-.00	55.8	-.23	57.6	1.07	57.0	1.17	56.1	.10	56.2	.25	58.1	1.21
MMPI Hs(F)	64.5	.86	62.0	.53	61.7	.46	57.7	-.06	62.0	.21	60.0	.18	55.8	-.22	60.4	.25
	57.1	1.59	56.9	1.21	57.2	.99	58.5	-.16	57.1	.44	57.9	.34	58.5	-.45	56.5	.65
MMPI D(F)	67.0	1.09	63.4	.40	62.5	.25	63.0	.44	67.0	.82	63.5	.48	61.4	-.12	64.1	.68
	59.5	2.02	59.6	.92	60.1	.54	59.2	1.10	58.8	1.74	60.1	.89	60.5	.25	57.9	1.75
MMPI Hy(F)	64.8	1.58	63.3	.94	63.0	.86	59.6	.08	60.2	.10	58.3	-.14	57.6	-.27	61.0	.35
	58.2	2.91**	57.7	2.13*	58.0	1.85	58.9	.21	58.9	.21	59.3	-.26	59.5	-.54	57.5	.91
MMPI Pd(F)	61.8	.01	66.6	.39	60.3	-.42	62.1	-.24	55.7	-.77	50.3	-.113	51.6	-.120	59.6	-.68
	63.7	.02	62.8	.88	64.6	.91	64.6	-.60	66.0	-.164	66.0	-.209	66.4	-.242	66.9	-.175
MMPI M(F)	48.8	1.28	56.7	.07	49.2	1.22	54.0	.47	47.8	1.71**	46.5	2.02	50.6	.80	54.2	.53
	58.8	2.37	57.5	.15	59.6	2.63*	59.2	1.19	60.0	3.63**	59.2	3.72**	58.8	1.61	59.8	1.36
MMPI Pa(F)	58.8	.08	55.3	-.25	55.7	.18	55.5	-.23	53.5	-.62	53.0	-.83	52.4	-.105	53.8	-.73
	56.3	.15	56.8	-.56	56.6	.38	58.9	-.57	57.2	-.131	57.0	-.153	57.3	-.211	58.4	-.188
MMPI Pt(F)	64.3	.95	60.4	.24	61.0	-.31	57.3	-.27	60.5	.28	62.8	-.76	59.0	.00	59.3	-.05
	58.0	1.76	58.5	.54	58.4	-.67	59.9	-.68	58.5	.58	58.3	1.40	59.0	.01	58.7	-.14
MMPI Sc(F)	59.5	-.22	61.6	.20	58.7	-.38	59.0	-.27	60.0	-.06	57.3	-.77	52.6	-.93	59.3	-.20
	60.7	-.40	60.1	.45	61.0	-.82	61.4	-.69	60.7	-.13	61.1	-.42	62.3	-.187	61.5	-.52
MMPI Ma(F)	50.3	1.42	58.7	-.19	54.7	-.74	57.9	-.35	58.3	-.25	57.8	-.20	58.8	-.15	60.1	-.07
	62.4	2.62*	61.3	-.44	62.3	-.60	62.2	-.87	61.3	-.52	61.1	-.37	61.0	-.30	61.1	-.10
MMPI S(F)	53.3	.42	48.9	-.09	52.5	.35	51.0	.24	56.7	1.20	61.3	1.62	57.0	.80	52.2	.51
	48.9	.78	49.7	-.21	48.7	.75	48.6	.60	47.5	2.55	47.5	2.99	47.8	1.62	47.4	1.31
MMPI PTSD(F)	63	1.13	89	-.05	72	-.50	100	.27	107	.48	93	.04	82	-.22	96	.15
	9.6	2.08*	9.2	-.11	9.6	1.08	8.5	.69	8.6	1.02	8.0	.08	9.3	-.44	8.7	.38

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group. X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. t = the t value given is that for the separate t-test. (I) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

DSM-III (1) criteria. The best prediction of midway diagnoses of PTSD on the basis of MMPI/Anger scores that had been obtained two to four months earlier occurred when *DSM-III (1)* criteria was used (see Table 17). The optimal subset of Anger, MMPI *F*, *K*, *Hy*, *Sc*, and *Ma* accounted for 38% of the variability, and correctly identified 60% of the PTSD group and 92.7% of the non-PTSD group (after jackknife cross-validation). Examination of the group means (see Table 18) indicated that persons who had PTSD at midway according to *DSM-III (1)* criteria had perceived themselves several months earlier as generally well-adjusted and not experiencing emotional disturbance (i.e., MMPI *F*, *K*, *Sc*, *Ma*), in comparison to the non-PTSD group; although, the PTSD group had higher *Hy* scores than the non-PTSD group.

Significant group mean differences were also obtained when the final MMPI/Anger scores were used (also in Table 17). The PTSD and non-PTSD groups formed at midway on the basis of *DSM-III (1)* criteria were significantly different on an optimal subset of MMPI *Mf*, *Pt*, and *Sc* scores obtained two to four months later. Less variability was accounted for by the later MMPI scores, however, and both sensitivity and specificity were reduced slightly to what they had been when earlier distress data were used. The PTSD group was experiencing more turmoil a few months later than the corresponding non-PTSD group was on MMPI *Pt*, while variability accounted for by the MMPI *Sc* scale was suppressed (see Table 19 for group means, univariate t-test, and ES values). The PTSD group described themselves, at the time of follow-up, in terms of stereotyped sex roles (MMPI *Mf*) and there were high positive effect sizes on the three neurotic scales ($.86 < ES < 1.58$). The neurotic scales did not enter into the optimal subset for discriminant analysis because of their high intercorrelations with MMPI *Pt*. There were higher negative effect sizes on the MMPI *Ma* and PTSD content scale ($-1.13 < ES < -1.42$) showing that it was the non-PTSD group who had greater pathology, both several months earlier and several months later.

DSM-III (2) criteria. The inclusion of two retrospective diagnoses of PTSD, made according to *DSM-III (2)* criteria, produced a PTSD group that was quite similar to the non-PTSD group, except that they were more angry ($ES = .98$; refer to Table 18). Although the multivariate group separation on distress variables, from both earlier and later assessments, was significant and the discriminant function yielded good specificity, the sensitivity was quite poor. Less than a third of the PTSD patients could be correctly identified on the basis of emotional distress that they experienced either several months earlier or several months later (see Table 17).

DSM-III (3) criteria. When *DSM-III (3)* criteria was used, discrimination between groups on the basis of distress experienced several months later was similar to that obtained for *DSM-III (1)* criteria (see Table 17). It was not possible to accurately predict on the basis of initial distress, however, who would be PTSD-positive according to *DSM-III (3)* criteria at midway, despite adequate power and a significant multivariate group separation. The PTSD group formed at midway according to *DSM-III (3)* criteria were more angry at initial assessment compared to the non-PTSD group, but had much lower scores on the *PTSD* content scale. Although other MMPI variables assessed at initial assessment did not enter into the optimal discriminant function, moderate effect sizes on MMPI *F* and *K* ($-.70 < ES < -.79$) suggested that the PTSD group perceived themselves at initial assessment as better adjusted, less distressed, and more conventional than did the non-PTSD group. At follow-up, the discriminant function was adequate (sensitivity of 50% and specificity of 91%); the PTSD group had higher anger and neurotic scale scores than the non-PTSD group (see Table 19). The former group also had low MMPI *Mf* scores, indicating greater gender stereotyping.

DSM-III (4) criteria. When retrospective diagnoses of PTSD according to modified *DSM-III (4)* were regrouped with the PTSD group from *DSM-III (3)*, the discriminant function analysis using initial Anger and MMPI *PTSD* scores produced somewhat better multivariate group separation than in the previous analysis of *DSM-III (3)* (see Table 17). The sensitivity improved somewhat but it only reached 33%, compared with a specificity of 91%. The PTSD group had been more angry at initial assessment than had the non-PTSD group ($ES = 1.10$) but the PTSD patients experienced much less of the PTSD symptomatology assessed by the *PTSD* content scale ($ES = -.63$, refer to Table 18). By follow-up, the midway PTSD group had a significant multivariate difference from the non-PTSD group on an optimal subset of Anger and MMPI *F*. Correctly classified were 40% of the PTSD group and 94% of the non-PTSD group after jackknife cross-validation (see Table 17). The PTSD group formed at midway from *DSM-III (4)* criteria were significantly more angry at follow-up than the corresponding non-PTSD group ($ES = 1.55$), yet perceived themselves as psychologically healthier and better adjusted than did the non-PTSD group ($ES = -.69$ on MMPI *F*, refer to Table 19).

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Braverman (2) criteria. To identify cases of PTSD diagnosed on the basis of *Braverman*(2) criteria at midway, an optimal subset of Anger and MMPI *Pd* from the initial administration was used in the discriminant analysis (see Table 17). While specificity was high (100%), sensitivity was very low (22%) and the multivariate group separation was barely significant. The PTSD group had, compared to the non-PTSD group, higher anger scores at initial assessment ($ES = .55$) but little distress evident on the mean MMPI profile, including the *PTSD* content scale ($ES = -.71$, refer to Table 18). When follow-up distress scores were used, the variables Anger and MMPI *Mf* optimized the classification of the midway diagnoses made by *Braverman* (2) : 50% of the PTSD patients and 100% of the non-PTSD patients were correctly identified (see Table 17). The PTSD group was, compared to the non-PTSD group, more angry at follow-up ($ES = 1.78$) and had greater stereotyping of gender roles ($ES = 1.71$, refer to Table 19).

Lidvall (1) criteria. The groups formed from *Lidvall* (1) criteria could be separated on the basis of distress scores at initial assessment, in particular Anger, *Pd*, and *Pa*; the discriminant function had very low sensitivity (20%) and high specificity (95%) after jackknife cross-validation (see Table 17). At initial assessment, the PTSD group (compared to the non-PTSD group) had greater anger ($ES = .57$) but much less social deviancy ($ES = -1.54$ on MMPI *Pd*, refer to Table 18). At the time of follow-up, this PTSD group was still significantly more angry than the corresponding non-PTSD group ($ES = 1.61$, refer to Table 19). They perceived themselves as well-adjusted and conformed to social expectations, in particular on MMPI *F* and *Pd* ($-1.47 < ES < -1.13$); while experiencing more anxiety ($ES = .76$ on MMPI *Pt*) and social introversion ($ES = 1.62$ on MMPI *Si*). The discriminant analysis had good sensitivity (75%) and specificity (96%) and there was a large multivariate group mean separation on the basis of MMPI *F*, *Pd*, *Pt*, and *Si* (see Table 17).

Lidvall (2) criteria. The discriminant function for *Lidvall* (2) criteria, using an optimal subset of MMPI *L*, *Pd*, and *Pa* (recorded at initial assessment), correctly identified 38% of the PTSD patients and 92% of the non-PTSD patients through the jackknife procedure (see Table 17). The PTSD group appeared to be better adjusted at initial assessment than the non-PTSD group ($ES = -.63$ on MMPI *L*, refer to Table 18) and less deviant ($ES = -1.31$ on MMPI *Pd*). This appearance of psychological adjustment (at the time of initial assessment) in the midway PTSD group, formed according to *Lidvall* (2) criteria was still evident at follow-up; except on Anger and MMPI *Si*. The PTSD group had, compared to the non-PTSD group, less psychopathology on the MMPI *Pd* and

PTSD

Sc scales at follow-up ($-1.20 < ES < -.93$, refer to Table 19), but was significantly more angry ($ES = .85$) and socially introverted ($ES = .80$ on MMPI *Si*). The discriminant function (formed from the optimal subset of MMPI *Pd*, *Pa*, *Sc*, and *Si*) correctly classified 60% of the PTSD cases and 91% of the non-PTSD cases through the jackknife procedure (see Table 17).

Any set of criteria. At the time of midway assessment, an optimal subset of Anger and PTSD content scale scores from the initial administration correctly classified 71% of all PTSD cases and 59% of all non-PTSD cases in a discriminant analysis, after jackknife cross-validation (see Table 17). The PTSD group, which was formed with patients who met any set of diagnostic criteria for PTSD at midway, had been more angry than the non-PTSD group at the initial assessment ($ES = .48$) but endorsed less symptomatology on the PTSD content scale ($ES = -.50$, refer to Table 18). When the PTSD group was comprised of people who met any set of diagnostic criteria at midway, the discriminant function formed on the basis of follow-up distress levels had a sensitivity and specificity of 85% on the basis of Anger, MMPI *Hy*, and *Pd*. The PTSD group had, compared with the non-PTSD group, greater anger ($ES = 1.42$, refer to Table 19) and MMPI *Hy* scores ($ES = .35$) but lower MMPI *Pd* scores ($ES = -.68$).

Summary. The MMPI scores suggested that, in general, all midway PTSD groups were less distressed than corresponding non-PTSD groups at the initial assessment (most obvious for the DSM-III (1) PTSD group). The PTSD groups displayed more distress than the corresponding non-PTSD groups by the time of follow-up however. This association between midway PTSD diagnoses and later distress was highest when variants of Lidvall criteria were used. There was little indication at initial assessment of who would experience PTSD in a few months time. There were some univariate differences, however, between PTSD groups formed according to variants of DSM-III and those formed according to variants of Braverman or Lidvall. The PTSD groups derived from DSM-III/III-R criteria at midway perceived themselves as more well-adjusted (on the MMPI validity scales) at the time of initial assessment than did the PTSD groups formed from alternative criteria, even though the DSM-III PTSD groups had higher neurotic scale scores. The PTSD groups formed from alternative criteria had quite low *Mf* scores, suggesting stereotyped gender roles, and higher PTSD scores than the PTSD groups formed from DSM-III (1) and DSM-III (3) criteria (but not higher than the corresponding non-PTSD groups).

PTSD

Groups of patients diagnosed as having PTSD at midway were still very irritable, conventional, and gender-stereotyped when tested at follow-up, as well as having relatively high mean scores on anxiety (MMPI *Pa*). Comparison of the DSM-III derived PTSD groups at midway with those formed from variants of Braverman and Lidvall indicated that when tested several months later (at follow-up) the former group (e.g., DSM-III/III-R) still had higher neurotic scale scores, but lower MMPI *PTSD* scores. In comparison, the Braverman-Lidvall PTSD groups appeared much more conventional, conforming, and introverted; and had higher *PTSD* scale scores. The two PTSD groups formed at midway that had the highest *PTSD* content scale scores were DSM-III (4) and Braverman (2).

Follow-Up Assessment

A comparison was made between initial and follow-up distress scores (see Table 20). As can be seen, univariate group mean scores were generally lower at follow-up than they had been at initial assessment. The only variable that changed significantly at follow-up was MMPI *L*. The relatively higher scores at follow-up may suggest that the respondents were somewhat less frank at follow-up.

Variants of DSM-III criteria. The best classification that was obtained through jackknife classification occurred when the groups were formed with *DSM-III (3)* criteria (see Table 21). Discrimination was maximized by Anger and MMPI *Si* scores, with the suppression of variability accounted for by MMPI *Ma*. Modest separation was obtained when diagnoses were made using *DSM-III (1)* criteria and an optimal subset of Anger and MMPI *Si*. For both sets of criteria, the PTSD groups had higher anger scores ($1.01 < ES < 1.45$, refer to Table 22) and lower scores on MMPI *Si* ($-.93 < ES < -.40$, indicative of extroversion) compared to the non-PTSD groups. This suggests possible problems among the PTSD group with irritability and impulse control. There is no data on DSM-III (2) and DSM-III (4) because there were no retrospectively-diagnosed cases of PTSD, as this was the final assessment.

Alternative criteria. When *Braverman (2)* criteria was used, the discriminant function that was produced with an optimum subset of distress variables (Anger, MMPI *Pd*, and *Pa*) correctly classified 57% of the PTSD cases and 91% of the non-PTSD cases (see Table 21). The PTSD group had higher scores, compared with the non-PTSD group, on Anger and MMPI *Pa* ($.50 < ES < .96$, refer to Table 22) but lower scores on MMPI *Pd* ($ES = -.33$).

Table 20
Mean Scores Obtained on Distress Variables by All Subjects At Initial and Follow-Up

	Mean Initial Score	Mean Follow-Up Score
Anger	310.2	310.0
MMPI L	52.7	56.7*
F	60.9	58.9
K	53.3	55.9
Hs	59.1	57.5
D	61.6	60.1
Hy	58.7	58.2
Pd	64.5	63.3
Mf	58.8	57.4
Pa	58.1	55.9
Pt	58.1	58.9
Sc	63.6	60.3
Ma	64.1	61.2
Si	50.2	49.6
PTSD	11.7	9.1

Note. * = Mean score on this variable changed significantly, at $p < .05$, from initial to follow-up assessment.
The scores given for Anger and MMPI PTSD are raw scores; the remainder are standardized scores.

Table 21

Results from *Follow-Up Discriminant Function Analyses Using as Predictors 'Best' Subsets of MMPI and Anger Variables: Data Collected at Follow-Up Assessment*

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix, ¹ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	ALL
DSM-III (1)	Anger MMPI Si	24, 5	.21	.10	8.08	1.41	.70	3.49	2,29	.030	40.0	95.8	86.2
											40.0	95.8	86.2
DSM-III (3)	Anger MMPI Ma (S) Si	20, 9	.45	.28	21.87	3.52	1.0	6.75	3,29	.002	71.4	95.5	89.7
											71.4	95.5	89.7
Braverman (2)	Anger MMPI Pd (U) Pa	22, 7	.43	.26	20.51	3.86	1.0	6.33	3,29	.002	57.0	100	89.7
											57.0	91.0	82.8
Olsson (1)	Anger	25, 4	.14	.04	5.19	1.51	.75	5.19	1,29	.040	25.0	100	90.3
											25.0	100	90.3
Lidvall (2)	Anger MMPI F D	23, 6	.30	.09	11.40	2.40	1.0	3.52	3,29	.050	50.0	91.3	82.8
											33.3	91.3	79.3
Any criteria	Anger MMPI Hy	16, 13	.51	.40	20.27	2.19	1.00	13.59	2,29	.000	92.3	81.3	86.2
											92.3	81.3	86.2

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Hertzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 22

Group Means, Effect Sizes, and t-test Values for Distress Variables: Follow-up Diagnoses of PTSD

	DSM-III (1)		DSM-III (3)		Braveman (2)		Levial (1)		Levial (2)		Any Criteria	
	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES
ANGER (F)	338.6 302.5	1.01 2.06	354.0 295.0	1.45 3.33**	342.5 296.4	.96 2.34*	360.2 300.6	1.26 2.35	338.3 299.5	.78 1.82	341.3 281.1	1.41 3.92**
MMMPI L(F)	51.6 57.0	-.82 -1.67	50.6 57.8	-1.03 -2.37	54.0 56.7	-.26 -.59	51.3 56.8	-.86 -1.59	55.2 56.3	-.11 -.25	52.8 58.7	-.64 -1.71
MMMPI F(F)	56.2 59.4	-.40 -.81	54.6 60.2	-.67 -1.54	59.9 58.5	.08 .18	51.5 60.0	-1.21 -2.25	56.2 59.6	-.31 -.67	57.9 60.1	-.18 .49
MMMPI K(F)	53.4 56.4	.29 .59	51.7 57.2	.58 1.34	52.14 57.0	.60 1.38	51.8 56.5	.55 1.02	53.8 56.4	.31 .68	52.3 58.5	.67 1.79
MMMPI Hs(F)	60.4 56.9	.52 1.05	55.9 58.0	-.19 -.43	52.3 59.1	-.63 -1.46	51.5 58.4	-.55 -1.03	62.8 56.1	.28 .62	58.5 55.9	.24 .64
MMMPI D(F)	60.0 60.1	-.01 -.02	60.7 59.9	.11 .24	64.0 58.8	.75 1.73	60.8 60.0	.19 .36	66.8 58.3	.83 1.81	64.5 56.5	.91 2.44*
MMMPI Hy(F)	63.2 57.1	1.03 2.09*	59.0 57.9	.12 .28	55.6 59.0	-.41 -.95	55.3 58.6	-.31 -.58	61.7 57.3	.32 .69	60.1 58.6	.35 .93
MMMPI Pd(F)	66.8 62.6	.58 1.18	64.3 63.0	.14 .33	59.6 64.5	-.33 -.77	57.5 64.3	-.40 -.75	60.8 64.0	-.23 -.49	62.2 64.2	-.16 -.44
MMMPI Ma(F)	57.6 58.0	.03 .06	55.7 58.7	.24 .56	52.3 59.8	.77 1.78	54.8 58.5	.25 .46	54.0 59.0	.40 .88	54.8 60.5	.53 1.42
MMMPI Pa(F)	53.2 56.5	-.60 -1.23	54.4 56.4	-.35 -.81	59.3 54.9	.50 1.15	54.5 56.2	-.30 -.55	54.5 56.3	-.28 -.60	56.5 55.5	.13 .33
MMMPI Pz(F)	58.6 58.9	-.04 .08	54.6 60.2	-.57 -1.31	62.4 57.5	.53 1.21	57.0 59.2	-.36 -.66	60.0 58.7	.14 .30	59.9 58.0	.19 .51
MMMPI Sc(F)	62.4 59.9	.37 .76	59.4 60.6	-.14 -.33	61.0 60.1	.08 .19	57.5 60.8	-.50 -.92	61.7 60.0	.16 .35	62.9 58.2	.48 1.24
MMMPI Ma(F)	63.8 60.7	.23 .46	60.9 61.4	-.04 -.10	61.6 61.1	.04 .07	59.8 61.5	-.12 -.22	58.3 62.0	-.30 -.65	62.8 59.9	.23 .61
MMMPI S(F)	45.5 50.5	-.93 -1.89	47.1 50.4	-.40 -.92	56.4 47.5	1.10 2.54*	55.3 48.7	.75 1.42	53.8 48.5	.68 1.48	51.5 48.1	.36 .97
MMMPI PTSD(F)	9.8 8.9	.13 .27	10.4 8.6	.30 .70	12.0 8.1	.73 1.68	12.0 8.6	.72 1.34	11.0 8.6	.51 1.18	11.2 7.3	.68 1.82

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (1) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

The poorest classification was obtained when *Lidvall (1)* criteria was used, even though the power, at .75, was adequate (see Table 21). Classification could not be improved by the addition of more predictor variables. The PTSD group had higher anger scores than the non-PTSD group ($ES = 1.28$, refer to Table 22). Discrimination between groups was only slightly better when *Lidvall (2)* criteria was used. The PTSD group (from *Lidvall (2)* criteria) had higher scores than the non-PTSD group on Anger and MMPI *D* ($.78 < ES < .83$, refer to Table 22) but lower scores on MMPI *F* ($ES = -.31$).

Any set of criteria. When the criteria for inclusion in a PTSD group was a PTSD diagnoses according to *any set of diagnostic criteria*, multivariate group separation on the basis of psychological distress (specifically Anger and MMPI *Hy*) was quite good; as was the classification of cases: 92% of the PTSD cases and 81% of the non-PTSD cases (see Table 21). The PTSD group was very significantly more angry ($ES = 1.41$, $p = .000$) and had slightly higher MMPI *Hy* scores ($ES = .35$) than the non-PTSD group.

Summary. All multivariate group mean differences were significant at the $p < .05$ level using optimal subsets of MMPI/Anger variables. Maximum classification was achieved when DSM-III (3) or *any set of criteria* was used. Univariate group mean differences were highest on Anger ($.78 < ES < 1.45$) for all sets of diagnostic criteria. The PTSD group that was identified by DSM-III criteria at follow-up seemed slightly more troubled than the non-PTSD group on most of the MMPI, but not on the *PTSD* scale. The PTSD groups formed from Braverman or *Lidvall* criteria still had the highest scores on the *PTSD* content scale.

Graphical Representation of the MMPI Profiles

To aid further in the interpretation of group mean differences on the MMPI, mean profiles have been plotted for PTSD and non-PTSD groups, according to different diagnostic criteria. These are presented in Figures 9 to 11. As can be seen in these figures, group mean differences appeared larger when diagnoses were made according to variants of Braverman and *Lidvall*; the PTSD groups appeared to be the most distressed. In contrast, there is little separation on the MMPI between PTSD and non-PTSD groups when diagnoses were made according to variants of DSM-III, at both initial and follow-up assessment.

PTSD

In an effort to reduce the amount of qualitative analysis required to interpret MMPI profiles, the group means for all MMPI clinical scales, MMPI neurotic scales (i.e., *Hs*, *D*, *Hy*), psychotic scales (*Pa*, *Sc*, *Ma*), and for the scales used in the Keane et al. (1984) PTSD decision rules (*F*, *D*, *Sc*) are presented in Appendix M. The mean group differences on these four subsets of scales will be discussed later (i.e., Discussion of Predictor Variables). Also presented in Appendix M for reference are the MMPI two-code types received by each subject. The most frequently occurring two-point code type among PTSD subjects was 89/98. The 49/94 code occurred most frequently among the non-PTSD patients. This difference between groups will also be discussed in the section "Discussion of Predictor Variables".

Summary

In conclusion, it appeared that the patients who received a diagnosis of PTSD were in general distress, but there were substantial differences in the characteristics of the PTSD groups formed according to the various sets of diagnostic criteria. Those who met Braverman or Lidvall criteria for PTSD appeared on the MMPI to be more troubled or maladjusted than those who received a diagnosis of PTSD according to variants of DSM-III criteria; however, these differences were less evident at the later assessment. The variants of Braverman and Lidvall criteria seemed to produce PTSD groups that were quite similar in degree of psychological distress. The results also suggested that DSM-III (3) criteria falls between DSM-III and alternative criteria in the identification of distressed individuals. Multivariate group separation and classification on the basis of anger and MMPI scales was most adequate at follow-up when any set of diagnostic criteria was used to diagnose PTSD; thus, supporting the liberalization of DSM-III/III-R criteria.

Neuropsychological Variables (Halstead-Reitan Subtests)

Initial Assessment

DSM-III (1) criteria. The best discrimination with an optimal subset of Halstead-Reitan tests as predictors occurred when *DSM-III (1)* criteria was used to diagnose PTSD: accounting for 30% of the variability between groups or 16% after cross-validation (see Table 23).

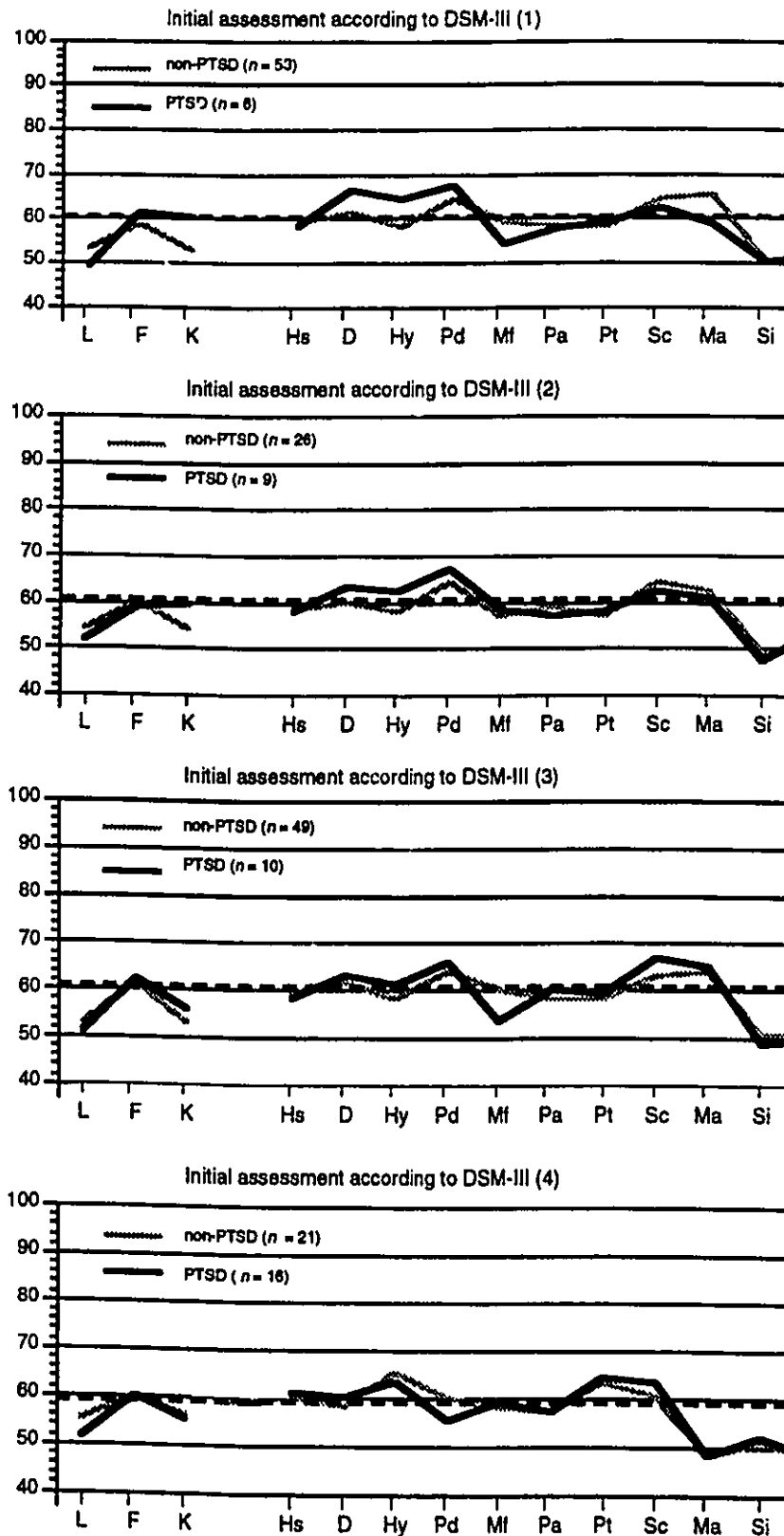
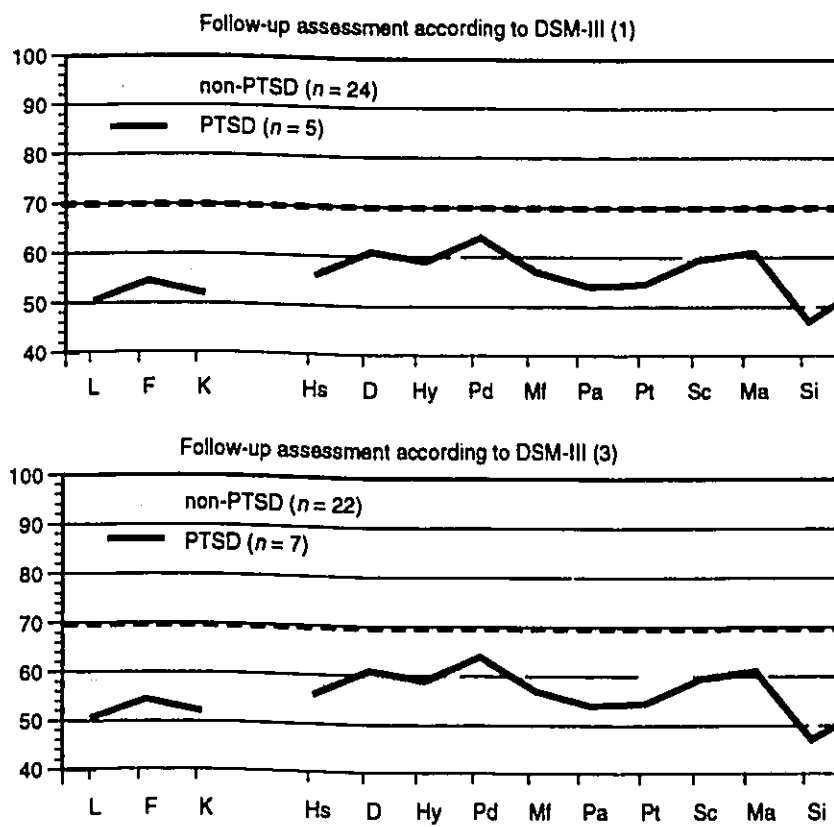
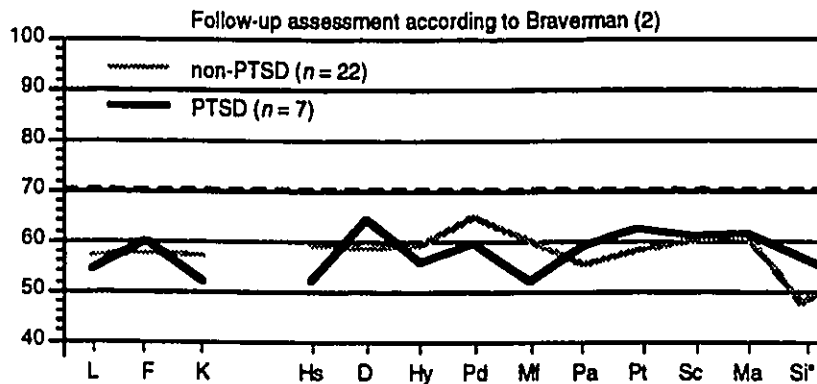
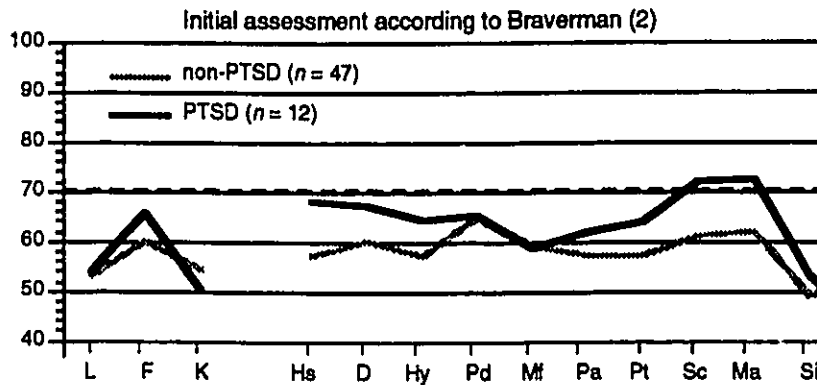
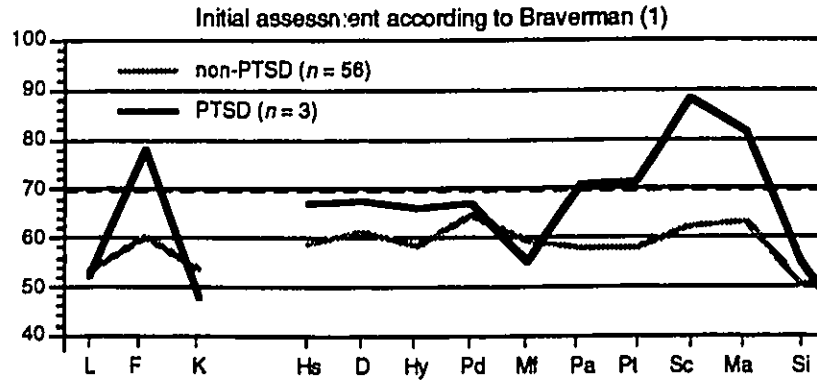


Figure 9.
Mean MMPI profiles for groups formed from variants of DSM-III criteria.



(Figure 9 continued)



Note. Only one person was diagnosed with PTSD according to Braverman (1) at follow-up and therefore MMPI results were not plotted.

Figure 10.
MMPI profiles for groups formed from variants of Braverman criteria

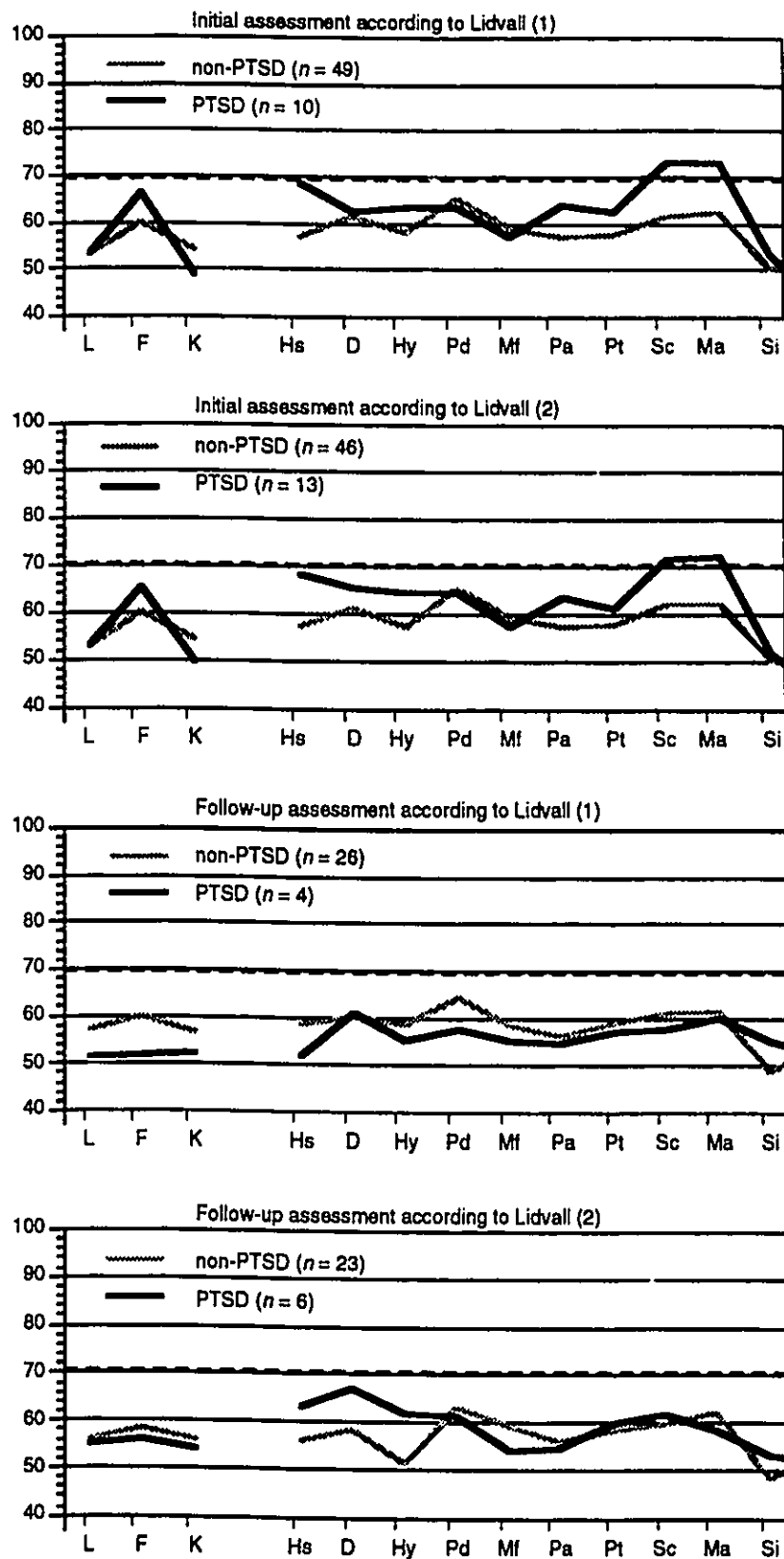


Figure 11.

MMPI Profiles for groups formed from variants of Lidvall criteria

Table 23

**Results from Initial Multivariate Analyses Using as Predictors 'Best' Subsets of Neuropsychological Variables:
Data Collected at Initial Assessment**

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n(PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Speech Perception (U) Trail Making TPT Time (U) Aphasia-Spatial (U) Rhythm (S) Finger Tapping (U)	54,6	.30	.16	24.73	4.58	1.0	3.77	6,60	.003	50.0 50.0	94.4 90.7	90.0 86.7
DSM-III (2)	Speech Perception (U) Trail Making Finger Tapping (U) Sensory Deficit (S)	26,10	.35	.20	18.91	2.51	1.0	4.08	4,36	.015	50.0 40.0	100.0 84.5	86.1 72.1
DSM-III (3)	Finger Tapping	50, 10	.02	.00	0.95	0.11	.95	0.95	1,60	n.s.	0.0 0.0	100 100	83.6 83.6
DSM-III (4)	TPT Memory (U) TPT Location Finger Tapping (U) Trail Making	20, 16	.31	.14	15.82	1.74	.80	3.62	4,36	.015	31.3 25.0	95.2 90.5	67.6 62.2
Braverman (2)	Rhythm (S) Sensory Deficit	48, 12	.07	.00	4.12	0.43	.35	2.02	2,60	n.s.	8.3 8.3	100 100	81.7 81.7
Lidvall (1)	Rhythm (S) Sensory Deficit	50, 10	.13	.07	8.97	1.08	.75	4.41	2,60	.017	20.0 20.0	100 100	86.7 86.7
Lidvall (2)	Aphasia-Spatial Sensory Deficit	47, 13	.08	.00	4.81	0.47	.55	2.36	2,60	n.s.	7.7 0.0	100 100	80.0 78.3
Any Criteria	Sensory Deficit Speech Perception	35,25	.07	.00	4.56	0.41	.55	2.14	2,60	n.s.	75.0 66.7	47.2 41.7	58.3 51.7

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 24

Group Means, Effect Sizes, and t-test Values for Neuropsychological Variables: Initial Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Bevanman (2)		Lohval (1)		Lohval (2)		Any Criteria	
	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES
TPT Time(I)	12.6	-1.05	15.5	-1.18	14.8	-1.37	17.2	-2.0	16.3	-1.01	18.2	-2.5	17.0	-1.0	17.0	-1.5
(N=15.7)	16.7	-2.43*	16.7	-1.49	16.7	-1.04	15.7	.61	16.4	-1.04	16.0	.71	16.2	.33	15.9	.55
TPT Mem(I)	6.4	.04	6.8	-.27	6.4	.03	6.5	-.13	6.5	-.02	6.2	.18	6.2	-.16	6.8	-.23
(N=5)	6.5	.08	6.2	-.73	6.5	.09	6.3	-.38	6.5	-.08	6.5	.51	6.5	.52	6.3	.84
TPT Loc(I)	4.0	-.09	3.9	-.15	3.6	-.12	3.4	-.20	3.8	.03	3.7	.07	3.5	.16	3.7	-.08
(N=4)	3.8	-.20	3.6	-.40	3.9	.34	3.8	.60	3.8	.11	3.8	.19	3.9	.54	3.9	-.29
Apb Spat(I)	0.33	-.75	0.40	-.51	0.60	-.18	0.63	-.05	0.81	.19	0.80	.16	0.92	.39	0.71	-.01
(N=1)	0.75	-1.75	0.73	-1.36	0.73	-.53	0.67	-.16	0.69	.59	0.69	.45	0.65	1.23	0.71	-.03
Sena. Defic(I)	1.80	.17	1.44	-.17	1.50	-.08	1.67	.08	2.00	.46	2.30	.81	2.08	.57	1.67	.11
(N=1)	1.58	.40	1.65	-.46	1.60	-.23	1.57	.25	1.49	1.43	1.45	2.35*	1.45	1.62	1.55	.41
Finger Tap(I)	55.8	-.73	55.7	-.88	54.7	-.59	54.6	-.75	49.2	.12	52.8	-.18	53.6	-.29	51.8	-.14
(N=50)	50.4	-1.55	48.4	-2.37*	50.2	-1.69	47.2	-2.26*	51.3	.38	50.5	-.51	50.1	-.91	50.1	-.51
Speech Perc(I)	4.3	-1.00	4.9	-.69	7.4	.03	6.7	-.28	6.8	-.08	6.7	-.09	6.8	-.07	5.9	-.42
(N=8)	7.5	-2.33*	8.5	-2.40*	7.2	.09	8.3	-.84	7.3	-.27	7.3	-.25	7.3	-.24	8.1	-1.59
Rhythm(I)	7.0	.14	6.6	-.04	7.0	.16	7.1	.18	6.3	-.12	6.4	-.06	6.8	.09	6.7	.09
(N=6)	6.5	.33	6.7	-.11	6.5	.45	6.5	.54	6.6	-.36	6.6	-.16	6.5	-.29	6.4	.34
Trail Making(I)	11.0	.51	11.8	-.38	12.7	.14	12.6	.17	12.6	.16	12.9	.08	13.2	.01	13.3	.00
(N=12)	13.5	1.19	13.5	-1.02	13.4	.40	13.4	.50	13.5	.50	13.4	.23	13.3	.04	13.3	.00
Imp. Index	0.53	-.05	0.53	-.13	0.56	.09	0.57	.07	0.55	.05	0.56	.10	0.59	.25	0.53	-.03
(N= .50)	0.54	-.11	0.57	-.36	0.53	.25	0.55	.21	0.54	.16	0.53	.28	0.52	.79	0.54	-.13

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. t = the t value given is that for the separate t-test; (I) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

Correctly classified were 50% of the PTSD patients and at least 90% of the non-PTSD patients. Differences between groups on these variables were neither in the expected direction nor consistent with results to be shown that were obtained from Braverman or Lidvall criteria. For example, the PTSD group in this analysis had better performance than the non-PTSD group on Speech Perception, Finger Tapping, TPT Time, and Aphasia-Spatial examination ($-1.05 < ES < -.73$, refer to Table 24 for group means). The only task that the PTSD group performed poorly was Trail Making ($ES = .51$). These results suggest that the PTSD group had better auditory discrimination, faster psychomotor and problem solving skills, better spatial and language functioning, but poorer tracking or attention. Variability accounted for by Seashore Rhythm (i.e., ability to sustain auditory attention) was suppressed.

DSM-III (2) criteria. When groups were formed from *DSM-III (2)* criteria, the multivariate group mean difference was also significant ($p < .015$) with modest classification results: 40% of PTSD patients and 84.5% of non-PTSD patients. As with the previous results from *DSM-III (1)*, the PTSD group had superior performance compared to the non-PTSD group on Speech Perception and Finger Tapping (large effect sizes), but poorer performance on Trail Making (see Table 24). Variability due to sensory functioning was suppressed.

DSM-III (3) and DSM-III (4) criteria. There was no significant group mean difference in neuropsychological functioning when *DSM-III (3)* criteria was used to form groups. However, *DSM-III (4)* criteria identified a PTSD group that was significantly different from the non-PTSD group (see Table 23), but the discriminant function correctly classified only 25% of the PTSD cases. Consistent with the results obtained using other variants of *DSM-III* criteria, the PTSD group had much better performance than the non-PTSD group on Finger Tapping (see Table 24).

Alternative criteria. Multivariate separation between PTSD and non-PTSD groups was, in general, not significant when alternative criteria was used. Although *Lidvall (1)* criteria produced a significant multivariate difference, classificatory results were poor. This suggests possibly an inflated F-value (see Table 23). In this analysis, the PTSD group had a greater Sensory deficit compared to the non-PTSD group. Variability accounted for by Seashore Rhythm was suppressed (see Table 24).

PTSD

Any set of criteria. When all cases of PTSD were combined into one group and their scores on the neuropsychological variables were compared with subjects who never had PTSD, multivariate group separation was poor and non-significant (see Table 23). Furthermore, classification on the basis of an optimal set of predictor variables did not exceed a probability of chance .

Summary. The results suggest that the PTSD group formed using DSM-III criteria generally had superior neuropsychological skills compared with the non-PTSD group; while Braverman and Lidvall diagnostic criteria lead to groups that were inseparable on the basis of Halstead-Reitan subtest scores. Group scores on the Impairment Index were the same for both PTSD and non-PTSD groups, regardless of diagnostic criteria. Each group had impaired scores on approximately half of the Halstead-Reitan battery at initial assessment.

Midway Assessment

Variants of DSM-III criteria. Multivariate group separation on the basis of early neuropsychology test results was largest when variants of *DSM-III* criteria were used (and when the PTSD group was formed from persons who were PTSD-positive according to *any set of criteria*). Optimal subsets of Halstead-Reitan tests lead to the correct classification of at least a third of the PTSD cases diagnosed according to variants of DSM-III criteria and at least 92% of the non-PTSD cases (see Table 25). However, discrimination of groups on the basis of an optimal subset of neuropsychology variables from follow-up was small and non-significant.

Moderate to very large effect sizes between the PTSD and non-PTSD groups were obtained across all variants of DSM-III criteria on Aphasia-Spatial, Finger Tapping, and Speech Perception at the time of initial assessment (see Table 26). The superior scores were obtained by the PTSD groups. Trail Making was the only subtest on which the PTSD group obtained poorer scores, with the group means slightly below the impairment cutoff. At follow-up, the PTSD group still produced the best results on the Aphasia-Spatial and Speech Perception tasks with effect sizes remaining moderate to very large (see Table 27). Thus, the PTSD groups formed from variants of DSM-III criteria at midway were very significantly less impaired than the non-PTSD group at follow-up. Effect sizes on the Impairment Index ranged from -1.51 to $-.45$.

Table 25

Results from *Midway* Discriminant Function Analyses Using as Predictors 'Best' Subsets of Neuropsychological Variables:
Data Collected at either Initial or Follow-up Assessment

Diagnostic Criteria	Best Subset of Predictors	n(non-PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified: PTSD (Sensitivity) ₂ non PTSD (Specificity) ₃ Total		
DSM-III (1) (Init. Assess.)	TPT Memory (S) Finger Tapping (U) Aphasia-Spatial (U) Trail Making	41,5	.29	.15	17.10	3.84	1.0	3.98	4,46	.008	40.0	97.6	91.3
											40.0	95.1	89.9
(FU Assess.)	Finger Tapping Speech Percap.(U)	25,4	.11	.01	3.05	0.20	0.15	1.66	2,29	n.s.	25.0	96.0	86.2
											0.0	92.0	79.3
DSM-III (2) (Init. Assess.)	Trail Making (U) Speech Percap. (U)	26,9	.30	.18	14.40	2.15	.95	4.51	.010	.010 (cons.)	33.3	96.2	80.0
											33.3	96.2	80.0
(FU Assess.)	Category (U) Aphasia-Spatial	20,7	.07	.00	2.16	0.15	0.10	1.43	2,27	n.s.	0.0	90.0	66.7
											0.0	90.0	66.7
DSM-III (3) (Init. Assess.)	Trail Making Finger Tapping (U) Aphasia-Spatial (U);	38,8	.18	.10	9.73	1.47	.35	3.10	3,46	.037 (cons.)	40.0	97.6	91.3
											40.0	92.7	87.0
(FU Assess.)	TPT Location (U) Finger Tapping	21,6	.10	.00	2.31	0.18	0.15	1.52	2,27	n.s.	16.7	95.2	77.8
											0.0	90.5	70.4
DSM-III (4) (Init. Assess.)	TPT Location (U) Finger Tapping (U) Speech Percap. (U) Trail Making	23,12	.39	.27	21.39	2.71	1.0	4.86	4,35	.004 (cons.)	50.0	95.7	80.0
											41.7	95.7	77.1
(FU Assess.)	TPT Memory (U) TPT Location (S)	19,10	.18	.05	3.23	0.41	0.35	3.23	2,29	n.s.	0.0	100	85.5
											0.0	94.7	62.1

(Table 25 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified: PTSD (Sensitivity) ₂ non PTSD (Specificity) ₃ Total		
Braverman (2) (Init. Assess.)	TPT Location Finger Tapping (U)	37,9	.15	.03	7.77	1.07	.65	3.00	2,46	n.s.	22.2	100	84.8
(FU Assess.)	TPT Location (U) Trail Making (S)	21,6	.12	.02	3.09	0.21	0.15	2.01	2,27	n.s.	22.2	97.3	82.6
Lidvall (1) (Init. Assess.)	Speech Percap. (U)	41,5	.04	.00	4.68	1.05	.60	2.29	1,46	n.s.	0.0	100	79.3
(FU Assess.)	TPT Memory (U) Location (U) Rhythm (U)	23,4	.35	.20	13.41	3.01	1.0	4.14	3,27	.020	0.0	95.2	74.1
Lidvall (2) (Init. Assess.)	TPT Location Finger Tapping (U) Speech Percap. (U)	38,8	.18	.06	9.60	1.45	.65	3.05	3,46	n.s.	20.0	92.7	84.8
(FU Assess.)	TPT Time (U) Location (U)	22,5	.27	.17	10.36	1.57	0.70	4.99	2,27	.015	75.0	100	96.6
Any Criteria (Init. Assess.)	TPT Location Finger Tapping (U) Speech Percap. (U)	29,17	.33	.23	22.12	2.06	.90	7.04	3,46	.000 (cons.)	75.0	96.6	93.1
(FU Assess.)	Category (U) TPT Time (U)	9,13	.15	.03	3.45	0.23	0.20	1.70	2,22	n.s.	40.0	95.8	86.2
											40.0	95.8	86.2
											82.4	65.5	71.7
											76.5	65.5	69.6
											87.5	57.0	68.2
											87.5	57.0	68.2

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R^2 = squared multiple correlation; Adj. R^2 = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R^2 rather than the more liberal Wherry formula used in BMDP; T^2 = Hotelling's multivariate group difference; D^2 = Mahalanobis' distance; τ_1 = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; τ_2 = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; τ_3 = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 26

Group Means, Effect Sizes, and t-test Values for Neuropsychological Variables (Initial Data), Midway Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Benveniste (2)		Liberal (1)		Liberal (2)		Any Criteria	
	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES
TPT Time(I)	14.3	-.35	15.7	-.14	17.7	.11	17.0	.10	18.0	.16	17.6	.08	18.3	.21	17.3	.11
(>=15.7)	17.0	-.66	16.7	-.35	16.6	.27	16.2	.27	16.5	.44	16.7	.16	16.5	.53	16.6	.29
TPT Mem(I)	6.5	-.07	6.4	-.09	5.9	.31	6.3	-.02	5.8	.35	6.6	-.15	5.9	.30	6.2	.14
(<=5)	6.4	-.13	6.2	-.21	6.5	.76	6.2	-.06	6.5	.93	6.3	-.31	6.5	.76	6.4	.72
TPT Loc(I)	4.0	-.21	3.5	.05	3.4	.11	3.4	.18	2.9	.44	4.0	-.24	3.0	.36	3.1	.41
(<=4)	3.6	-.40	3.6	.13	3.6	.26	3.7	.46	3.8	1.17	3.6	-.50	3.8	.92	3.9	1.09
Aph-Spell(I)	0.20	-1.08	0.44	-.44	0.25	-.95	1.50	-.53	1.89	-.16	0.80	-.12	1.75	-.25	0.69	-.00
(>=1)	0.75	-2.27*	0.73	-1.14	0.78	-2.44*	2.74	-1.39	2.22	-.45	0.68	.25	2.24	-.63	0.69	-.01
Serie-Delic(I)	2.00	.24	1.63	-.02	1.71	.07	1.82	.23	1.78	.16	1.80	.12	1.50	-.11	1.47	-.24
(>=1)	1.59	.50	1.65	-.06	1.61	.18	1.57	.60	1.58	.42	1.60	.25	1.65	-.27	1.70	-.63
Finger Tap(I)	59.0	-1.84	56.8	-1.12	57.5	-1.38	56.0	-1.04	55.6	-1.10	54.7	-.85	56.3	-1.04	56.5	-1.06
(<=50)	48.8	-3.50**	48.4	-2.90**	48.2	-3.51**	47.7	-2.71**	47.9	-2.97	49.0	-1.80	48.2	-2.68**	46.2	-3.43**
Speech Perc(I)	6.0	-.49	5.3	-.83	5.3	-.77	5.1	-.98	5.1	-.71	4.0	-1.17	4.5	-1.02	5.1	-.96
(>=6)	7.5	-1.02	8.5	-2.15	7.8	-1.97	9.1	-2.57*	7.9	-1.90	7.7	-2.47*	7.9	-2.62	8.5	-2.55*
Rhythm(I)	6.2	-.10	6.2	-.16	6.5	-.01	6.5	-.05	6.9	.14	4.8	-.59	5.4	-.39	6.1	-.26
(>=6)	6.6	-.22	6.7	.41	6.5	-.02	6.6	-.13	6.4	.37	6.7	-1.24	6.8	-1.01	6.8	-.88
Trail Making(I)	10.0	-.69	11.3	.48	11.5	.37	11.9	.39	12.0	.25	12.4	.09	12.5	.11	13.0	-.02
(<=12)	13.3	1.45	13.5	1.25	13.3	.97	13.5	1.01	13.2	.66	13.0	.20	13.1	.28	12.9	-.05
Imp. Index	0.53	-.06	0.56	-.02	.54	-.04	0.56	-.05	0.58	.11	0.41	-.58	0.51	-.21	0.55	-.03
(>=50)	0.58	-.12	0.57	-.04	.56	-.11	0.57	-.13	0.54	.30	0.57	-1.23	0.56	-.53	0.56	-.10

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group. X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. t = the t value given is that for the separate t-test; (I) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

TABLE 27

Group Means, Effect Sizes, and *t*-test Values for Distress Variables (Follow-up Data): Midway Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Bremner (2)		Lewin (1)		Lewin (2)		Any Criteria	
	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES	XPTSD nonPTSD <i>t</i>	ES
Category (F)	22.3	-1.13	25.8	-.62	31.8	-.17	30.0	-.30	31.6	-.17	34.5	-.03	34.5	-.03	29.0	-.38
(>=50)	37.2	-1.91	38.6	-1.30	36.2	-.23	38.1	-.69	36.3	-.34	35.4	-.06	35.4	-.06	38.3	-.90
TPT Total (F)	16.1	.36	13.3	-.14	14.7	.15	12.7	-.29	10.4	1.30	12.3	-.46	13.1	-.26	12.5	-.39
(>=15.7)	13.6	.67	14.2	-.33	13.8	.26	14.5	-.71	14.7	2.63*	14.1	-.85	14.1	-.48	14.9	-1.01
TPT Mem (F)	7.3	-.20	7.7	-.62	7.6	-.46	7.7	-.59	7.8	-.70	7.7	-.56	8.3	-.90	7.9	-.82
(<=5)	7.0	-.37	6.7	-1.41	6.9	-.94	6.7	-1.46	6.8	-1.41	6.9	-.92	6.8	-1.66	6.4	-2.11*
TPT Loc (F)	5.0	-.40	4.4	-.18	5.2	-.56	4.1	-.02	5.8	-.86	7.0	-1.77	7.0	-2.08	4.9	-.52
(<=4)	3.9	-.74	4.0	-.42	3.8	-1.13	4.1	-.06	3.7	-1.74	3.7	-2.90	3.6	-3.85**	3.5	-1.34
Aph. Spec (F)	0.00	-1.54	0.14	-.73	0.00	-1.33	0.70	-.74	0.83	-.73	0.50	.04	0.60	-.92	0.33	-.28
(>=1)	0.54	-2.85**	0.57	-1.67	0.59	-2.89**	2.89	-1.88	2.45	-1.59	0.46	.08	2.43	-1.87	0.56	-.72
Sens. Data (F)	0.50	-.20	0.43	-.35	0.39	-.46	0.30	-.56	0.33	-.46	0.50	-.20	0.50	-.20	0.27	-.63
(>=1)	0.71	-.37	0.76	-.78	0.77	-1.00	0.89	-1.46	0.77	-1.00	0.71	-.37	0.71	-.37	0.84	-1.64
Finger Tap (F)	48.9	.63	52.3	.02	51.6	.16	52.6	-.03	54.1	-.33	52.0	.12	56.2	-.67	54.1	-.33
(<=50)	53.0	1.17	52.5	.05	52.7	.34	52.3	-.08	52.0	-.66	52.5	.22	51.6	-1.36	51.4	-.85
Speech Perc (F)	4.0	-1.17	5.7	-.37	5.5	-.43	5.5	-.49	4.7	-.85	5.0	-.70	4.6	-.89	5.3	-.59
(>=8)	7.1	-2.17	7.0	-.85	7.0	-.94	7.3	-1.25	7.2	-1.85	7.0	-1.30	7.1	-1.81	7.6	-1.52
Rhythm (F)	5.3	-.06	4.6	-.40	4.8	-.27	4.6	-.41	5.2	-.09	4.3	-.70	3.6	-.95	4.3	-.59
(>=6)	5.4	-.12	5.7	-.75	5.6	-.59	5.8	-1.04	5.5	-.19	5.6	-1.30	5.8	-1.94	6.2	-1.52
Trial Making (F)	15.0	-.27	15.1	-.10	14.4	-.00	14.9	-.00	14.7	-.10	15.0	-.17	15.3	-.27	15.6	-.56
(<=12)	14.3	-.51	14.8	-.25	14.4	-.01	14.9	-.01	14.3	-.24	14.3	-.31	14.2	-.60	13.4	-1.55
Imp. Index (F)	0.22	-1.51	0.27	-.84	0.30	-.47	0.31	-.45	0.28	-.53	0.28	-.48	0.22	-.77	0.27	-.78
	0.38	-2.81**	0.40	-1.91	0.39	-1.02	0.40	-1.12	0.39	-1.15	0.36	-.89	0.40	-1.57	0.44	-2.08*

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; *t* = the *t* value given is that for the separate *t*-test; (1) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

Alternative criteria. In contrast to the previous analyses (i.e., using variants of DSM-III to diagnose PTSD), multivariate group mean differences did not reach significance at $p < .05$ when alternative diagnostic criteria were used at midway and neuropsychological data was collected at initial assessment (see Table 25). Follow-up results from some Halstead-Reitan tasks did contribute to significant multivariate group separation when variants of Lidvall were used. When Lidvall (1) criteria was used, the discriminant function correctly classified 75% of the PTSD cases and 97% of the non-PTSD cases. The PTSD group, as defined by variants of Lidvall criteria, had better auditory perception and psychomotor problem-solving skills at follow-up (i.e., TPT and Rhythm, refer to Table 27) than the non-PTSD group did. Furthermore, the PTSD group was less impaired on the Impairment Index ($-.77 < ES < -.48$).

Any set of criteria. Optimal subsets of initial neuropsychology test data contributed to a significant multivariate group mean difference when the PTSD group was composed of individuals who were PTSD-positive according to *any set of diagnostic criteria* (see Table 25). While sensitivity was good (76%), specificity was somewhat lower (65.5%). The PTSD group had slightly poorer TPT Location scores than the non-PTSD group but superior Finger Tapping and Speech Perception scores. Both groups displayed the same level of impairment on the battery (Impairment Index = .5, refer to Table 26).

Summary. It was only possible to statistically predict group membership at midway on the basis of initial neuropsychological functioning when variants of DSM-III were used, while the multivariate association between midway diagnoses and follow-up neuropsychological test performance was only significant at $p < .05$ when variants of Lidvall criteria were used. All of the discriminant analyses were far more specific than sensitive, except when diagnoses were based on *any set of criteria*. The test differences in neuropsychology results between the PTSD and non-PTSD groups formed at midway were remarkably consistent across diagnostic criteria at both initial and follow-up assessment. There was little objective evidence of impairment among the PTSD patients; the non-PTSD groups had the greater neuropsychological impairment at both initial and follow-up sessions.

Follow-Up Assessment

Mean scores on the Halstead-Reitan subtests at initial and follow-up sessions are provided in Table 28. As can be seen from this study, mean scores on all subtests improved over the course of the study, albeit non significant at $p < .05$.

Variants of DSM-III criteria. Classification of cases was modest when *DSM-III (1)* or *DSM-III (3)* criteria were used for diagnoses and the discriminant function was based on an optimal subset of neuropsychological variables collected at initial assessment (see Table 29). Less than half of the PTSD cases were classified correctly, while approximately 90% of the non-PTSD cases were classified correctly. The same subtests were selected as optimal predictors in both sets of analyses, with mean differences in the same direction and of the same magnitude (see Table 30): The PTSD groups formed according to either variant of DSM-III criteria were moderately more impaired than the non-PTSD group on Trail Making and TPT Location but were significantly less impaired on Speech Perception and Finger Tapping. These results suggest that the follow-up PTSD group was more impaired on cognitive processing and incidental learning at the time of the initial assessment, but superior on auditory processing and sustained attention.

The use of follow-up test results led to poorer classificatory results: When the groups were formed according to *DSM-III (3)* criteria and the discriminant function was based on Category, TPT Memory, and TPT Location, only one case of PTSD was classified correctly after cross-validation; the specificity was 92%. Group means and effect sizes are provided in Table 31.

Variants of alternative criteria. Classificatory results were poor when *Braverman (2)* criteria was used to form groups and neuropsychology test results were obtained at either assessment. Discrimination between groups was moderate when *Lidvall (1)* criteria were used for group formation (see Table 29): The optimal subset of predictors using initial test results correctly classified 50% of the PTSD and 97% of the non-PTSD. At the time of initial assessment, the PTSD group had greater impairment than the non-PTSD group on Trail Making but better performance on Speech Perception and TPT Memory (see Table 29). Other multivariate separations between groups based on variants of Lidvall criteria were non-significant.

Any set of criteria. When the PTSD group was composed of patients who met *any criteria for PTSD*, the discriminant function using an optimal set of neuropsychological variables that were

Table 28
Mean Scores Obtained on Halstead-Reitan Subtests by All Subjects
at Initial and Follow-Up Assessments

	Mean Initial Score	Mean Follow-Up Score
Category (≥ 50.0)	–	34.3
TPT Time (≥ 15.7)	16.3	13.7
TPT Memory (≤ 5)	6.4	7.1
TPT Location (≤ 4)	3.8	4.4
Speech Perc. (≤ 8)	7.2	7.1
Rhythm (≤ 6)	6.6	5.5
Finger Tapping (≤ 50)	50.4	52.9
Sensory Def. (≤ 1)	0.6	0.0
Aphasia-Spatial (≤ 1)	1.2	1.1
Trail Making (≤ 12)	13.3	14.9
Imp. Index ($\geq .5$)	0.54	0.37

Note. No mean scores changed significantly,
at $p \leq .05$, from initial to follow-up assessment.
The scores given for TPT Time, TPT Memory, TPT Location, Finger Tapping, and Speech Perception
are raw scores; the remainder are standardized scores.

Table 29

Results from *Follow-Up* Multivariate Analyses Using as Predictors 'Best' Subsets of Neuropsychological Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1) (Init. Assess.)	Trail Making Speech Perception (U) Finger Tapping (U) TPT Location	31, 7	.25	.07	14.48	2.54	1.0	3.32	4, 38	.022	57.1 42.9	93.5 93.5	86.8 84.2
(FU Assess.)	Rhythm (U)	26, 5	.07	.00	2.21	.39	.26	2.21	1, 31	n.s.	0.0 0.0	100 100	83.9 83.9
DSM-III (3) (Init. Assess.)	Speech Perception (U) Trail Making Finger Tapping (U) TPT Time (U) TPT Location	29, 9	.35	.15	19.39	2.82	1.0	3.45	5, 38	.013	44.4 44.4	93.1 89.7	81.6 78.9
(FU Assess.)	TPT Memory (U) TPT Location Category (U)	24, 7	.23	.12	9.04	1.3	.65	2.85	3, 31	.050	28.6 14.3	95.7 91.7	80.6 74.2
Braverman (2) (Init. Assess.)	Sensory Deficit	29, 9	.02	.00	1.25	0.25	.20	1.97	1, 38	n.s.	0.0 0.0	96.6 96.6	92.1 92.1
(FU Assess.)	TPT Location (U) Sensory Deficit	23, 8	.19	.09	6.80	.99	.63	3.31	2, 31	.048	25.0 12.5	95.5 91.3	77.4 71.0

(Table 29 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ⁵ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
Lidvall (1) (Init. Assess.)	Trail Making Speech Perception (U) TPT Memory (U)	34, 4	.32	.20	16.90	4.72	1.0	5.32	3,38	.004	50.0 50.0	97.1 97.1	92.1 92.1
(FU Assess.)	Rhythm (U)	27, 4	.13	.04	4.53	.65	.40	4.01	1,31	n.s.	0.0 0.0	100 100	87.1 87.1
Lidvall (2) (Init. Assess.)	TPT Memory (S) TPT Location Trail Making Finger Tapping	31, 7	.21	.06	7.73	1.30	.81	2.18	4,38	n.s.	42.9 28.6	100 93.5	89.5 81.6
(FU Assess.)	TPT Location (U)	24, 7	.04	.00	1.82	.21	.15	1.98	1,31	n.s.	0.0 0.0	100 100	77.4 77.4
Any Criteria (Init. Assess.)	TPT Time (S) TPT Location Finger Tapping (U) Speech Perception (S) Rhythm	22, 16	.29	.15	60.67	1.93	1.00	3.76	5,38	.007	88.2 82.4	69.0 69.0	76.1 73.9
(FU Assess.)	TPT Memory (FU) (U) Category (FU)	17, 14	.09	.00	2.75	.30	.26	1.33	2,31	n.s.	64.3 64.3	41.2 41.2	51.6 51.6

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 30

Group Means, Effect Sizes, and t-test Values for Neuropsychological Variables (Initial Data): Follow-up Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		Bremner (2)		Lower (1)		Lower (2)		Any Criteria	
	XPTSD Non-PTSD t	ES	XPTSD Non-PTSD t	ES	XPTSD Non-PTSD t	FS	XPTSD Non-PTSD t	ES	XPTSD Non-PTSD t	ES	XPTSD Non-PTSD t	ES
TPT Total (1)	15.2	-.20	14.3	-.40	17.9	.29	13.3	-1.00	16.2	-.02	16.1	.02
(>=15.7)	16.2	-.48	16.5	-1.06	15.4	.75	16.4	-1.90	16.1	-.04	16.0	.06
TPT Mem (1)	5.8	.36	6.1	.17	6.1	.16	7.5	-.89	7.0	-.41	6.1	.18
(<=5)	6.5	.86	6.4	.45	6.4	.42	6.2	-1.66	6.2	-.97	6.5	.54
TPT Loc (1)	3.0	.64	3.3	.50	3.6	.25	4.3	-.31	3.7	.15	3.3	.48
(<=4)	4.1	1.52	4.1	1.31	4.0	.65	3.8	-.59	4.0	.35	4.3	1.45
Appt Spec (1)	0.57	-.12	0.67	.07	0.67	.06	1.00	.50	0.86	.39	0.69	.11
(>=1)	0.65	-.29	0.62	.19	0.62	.16	0.59	.95	0.58	.92	0.59	.35
Seqa Defc (1)	1.83	.26	1.88	.36	1.89	.33	2.00	.31	1.86	.26	1.80	.34
(>=1)	1.52	.63	1.48	.95	1.46	.86	1.52	.58	1.50	.61	1.41	1.06
Finger Tap (1)	55.7	-.84	55.2	-.70	52.9	-.26	53.9	-.48	54.0	-.48	53.8	-.41
(<=50)	50.5	-1.87	50.2	-1.75	50.8	-.68	51.0	-.90	50.7	-1.14	49.7	-1.26
Speech Perc (1)	5.3	-.84	4.9	-.94	7.9	.05	2.5	-1.92	7.4	-.03	7.1	-.13
(>=6)	8.1	-2.00	8.4	-2.46	7.5	.12	8.2	-3.64**	7.6	-.06	8.0	-.40
Rhythm (1)	6.6	.14	6.4	.09	7.0	.31	3.5	-1.52	6.0	-.08	7.3	.57
(>=6)	6.1	.33	6.1	.24	6.0	.80	6.5	-2.87*	6.3	-.18	5.4	1.75
Trail Making (1)	10.7	.61	11.7	.40	12.0	.31	10.3	.51	11.9	.29	12.6	.22
(<=12)	13.7	1.45	13.6	1.08	13.5	.82	13.5	.97	13.5	.69	13.6	.67
Imp. Index (1)	0.65	.53	0.60	.31	0.55	.07	0.41	-.63	0.51	-.11	0.59	.40
(>=50)	0.51	1.27	0.52	.82	0.53	.19	0.55	-1.19	0.54	-.27	0.50	1.08

Note. ES = effect size; a negative sign indicates that the PTSD group was *less* distressed or *less* impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (1) = data collected at initial assessment; (2) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

TABLE 31

Group Means, Effect Sizes, and *t*-test Values for Neuropsychological Variables (Follow-up Data): Follow-up Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		Brewman (2)		Litzell (1)		Litzell (2)		Any Criteria	
	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES
Category (F)	28.3	-.43	24.2	-.72	42.1	.30	27.0	-.44	29.5	-.34	38.6	.27
($p < .05$)	35.9	-.86	37.2	-1.67	31.1	.73	36.1	-.83	36.3	-.69	31.5	.74
TPT Time(F)	13.4	-.04	12.7	-.21	12.2	-.35	10.7	-1.22	12.5	-.32	12.4	-.37
($p < .15$)	13.8	-.06	14.0	-.46	14.2	-.85	14.2	-2.28*	14.1	-.65	14.7	-1.02
TPT Mem(F)	7.6	-.40	7.6	-.40	7.6	-.36	7.8	-.59	7.7	-.61	7.6	-.42
($p < .5$)	7.0	-.82	7.0	-.83	7.0	-.82	7.0	-1.10	7.0	-1.22	6.7	-1.17
TPT Loc(F)	3.6	-.37	3.4	-.54	6.0	-.89	4.8	-.12	5.3	-.47	4.7	-.18
($p < .4$)	4.6	.76	4.7	1.26	3.9	-2.17*	4.3	-.22	4.1	-.95	4.2	-.50
App Spell(F)	0.20	-.58	0.14	-.76	0.50	.05	0.75	.34	0.71	.47	0.43	-.09
($p < .1$)	0.52	-1.18	0.57	-1.74	0.45	.14	0.42	.64	0.39	.85	0.50	-.23
Sens. Def(F)	0.60	-.12	0.42	-.36	1.25	.44	0.75	.06	0.86	.19	0.79	.12
($p < .1$)	0.72	-.25	0.78	-.86	0.50	1.08	0.69	.11	0.65	.39	0.63	.34
Finger Tap(F)	52.5	.07	53.5	-.10	52.6	.08	52.2	.20	52.8	.02	53.3	-.08
($p < .50$)	53.0	.14	52.8	-.23	53.1	.20	53.0	.46	53.0	.05	52.7	-.20
Speech Perc(F)	5.8	-.34	5.3	-.57	6.8	-.02	4.0	-1.26	6.1	-.23	6.6	-.08
($p < .6$)	7.0	-.70	7.3	-1.32	6.9	-.06	7.3	-2.35*	7.0	-.46	7.0	-.21
Rhythm(F)	3.4	-1.23	3.7	-.82	5.3	.07	2.3	-2.42**	5.4	-.01	5.3	-.09
($p < .6$)	5.8	-2.51	6.0	-1.92	5.5	.18	5.9	-4.52**	5.5	-.02	5.6	-.24
Trait Making(F)	15.2	-.09	15.5	-.26	14.4	.21	15.8	-.30	15.4	-.24	15.3	-.15
($p < .12$)	14.9	-.18	14.8	-.60	15.2	.51	14.9	-.57	14.8	-.47	14.7	-.42
Imp. Index (F)	0.30	-.58	0.30	-.53	0.35	.05	0.23	-1.04	0.30	-.46	0.35	-.08
	0.37	-1.17	0.38	-1.21	0.37	.13	0.38	-1.84	0.38	-.82	0.37	-.23

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group. X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. *t* = the *t* value given is that for the separate *t* test. (1) = data collected at initial assessment; (2) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

assessed at initial assessment had good sensitivity (82.4%) and moderate specificity (69.0%)- see Table 29. The PTSD group had poorer scores than the non-PTSD group on TPT Location and Rhythm but better scores on Finger Tapping. Variability accounted for by Speech Perception and TPT Time was suppressed. These results indicate that there was some consistency on the initial neuropsychological functioning of the PTSD patients, regardless of diagnostic criteria. The PTSD group formed on the basis of all criteria had impaired scores on roughly half of the Halstead Reitan battery at initial testing, as did the corresponding non-PTSD group. The analysis using an optimal subset of neuropsychological variables collected at follow-up was non-significant at $p < .05$.

Summary. Discrimination between groups was poor to moderate when optimal subsets of neuropsychological tests were used as predictor variables. In general, separation was greatest when test results were from the initial assessment. When analyses were attempted with the test results from follow-up, optimal subsets of predictor variables accounted for much less of the variability after adjustment and multivariate group mean differences were small: Two analyses barely reached significance at $p = .05$ and the others were non-significant.

The results of this section suggest that it was possible, to some extent, to statistically predict on the basis of neuropsychological test results whether or not a patient would suffer from PTSD at a later date. Impairment Index means for all groups hovered around the impairment cutoff (i.e., 0.5). Scores on Speech Perception were unexpected: Mean scores for the non-PTSD groups were generally impaired and much poorer than those for the PTSD group when diagnoses were made on the basis of DSM-III (1), DSM-III (3) or Lidvall (1) criteria. Comparison of group mean scores show that there was some evidence of neuropsychological recovery on the Halstead-Reitan over the first year post-trauma, albeit not significant at $p < .05$.

Summary

The classification of cases on the basis of neuropsychology variables in the discriminant analyses ranged from poor to adequate. Prediction of group membership was greater when initial neuropsychology test results were used to predict diagnoses of PTSD at the time of initial, midway, and follow-up assessments. Discrimination was poorer when follow-up test results were used to predict concurrent diagnoses of PTSD. The PTSD group diagnosed on the basis of DSM-III criteria was superior in neuropsychological functioning to the corresponding non-PTSD group and to

PTSD

other PTSD groups. For example, the DSM-III PTSD group had a significantly faster performance than any other group on the TPT, while all other group means on TPT Time and Location were at or below the impairment cut-off. The TPT test is considered quite sensitive to impairment in general because of the number of skills necessary to execute the test. The patients diagnosed according to variants of DSM-III at the initial assessment also had significantly better scores on Speech Perception than the non-PTSD patients, yet no differences were apparent between PTSD and non-PTSD groups formed from other sets of diagnostic criteria. In summary, test scores on the neuropsychology variables indicated superior neuropsychology functioning among the patients who obtained a DSM-III diagnosis of PTSD at the time of the initial assessment. The greatest separation between PTSD and non-PTSD groups at initial assessment occurred when Braverman (2) criteria was used, with the PTSD group clearly inferior.

Examination of neuropsychological test scores that were obtained shortly after the head injury suggested that it was possible to predict, on the basis of neuropsychological functioning, who would be at risk of having PTSD up to a year later. In general, groups of patients who received later diagnoses of PTSD, according to any set of diagnostic criteria, had (a) more sensory impairment; (b) poorer attentional functions including visuospatial scanning and conceptualization; but (c) better verbal/auditory perception and fine motor control. These characteristics were most reflected in the group of patients who met DSM-III criteria for PTSD at follow-up. Whereas the group of patients who met DSM-III criteria for PTSD at the initial assessment were clearly superior to the non-PTSD group on neuropsychological functioning, this was not necessarily true at follow-up: The patients who later met DSM-III criteria at follow-up seemed to have been slightly more impaired at the time of initial assessment than the non-PTSD group.

The PTSD group formed at follow-up that was least impaired at the initial assessment was diagnosed according to Lidvall (1) criteria. This group had significantly better auditory perception and sustained attention shortly after the head injury than the non-PTSD group, as well as a lower Impairment Index score. At follow-up, the Lidvall (1) group still had superior auditory perception and sustained attention. They performed better than the non-PTSD group at follow-up on all of the neuropsychological tests, however, it was not possible to distinguish between the groups on the basis of these variables in a discriminant function analysis. There did not appear to be any multivariate differences between groups on neuropsychological functioning at follow-up, regardless of diagnostic criteria.

Cognitive Variables (WAIS-R)

Initial Assessment

Prediction of group membership was good when cognitive variables were used as predictors, even though there was a reduction in sample size. Despite the loss of almost one-third of the cases, there seemed little evidence of overfitting because, in general, classification results remained the same following cross-validation through the jackknife procedure (see Table 32). The group means, t-test values and effect sizes are presented in Table 33.

Variants of DSM-III criteria. Multivariate group mean differences were highly significant in three of the four discriminant analyses that were conducted with group assignments based on variants of DSM-III criteria. These three discriminant functions correctly classified over 90% of the non-PTSD patients and over 50% of the PTSD patients (see Table 32). Cognitive performances in the PTSD groups were generally superior to the non-PTSD groups when variants of DSM-III criteria were used for diagnoses. This is in contrast to both the expected results and the inferior results obtained from PTSD patients diagnosed according to variants of Braverman or Lidvall criteria, yet to be discussed.

A pattern of superior cognitive functioning among the PTSD group was most apparent when diagnoses were made according to DSM-III (1) and DSM-III (3) criteria: There were negative effect sizes on all the WAIS-R variables (i.e., higher scores were obtained by the PTSD group), especially Picture Arrangement, Similarities, and Verbal, Performance, and Full Scale IQ (see Table 33). The relationship between group formation and cognitive functioning was considerably reduced, however, when retrospective cases were added to those initially diagnosed as PTSD: The multivariate group mean difference for *DSM-III (2)* criteria was non-significant. When *DSM-III (4)* criteria were used, the pattern of superior performance among the PTSD patients was almost reversed to what it had been with the other DSM-III variants: Using as an optimal subset Digit Span, Vocabulary, Picture Arrangement, Digit Symbol, and Verbal IQ, the discriminant function analysis correctly classified 67% of the PTSD cases and 79% of the non-PTSD cases, following jackknife classification (see Table 32). Suppression of variability due to certain WAIS-R tasks, including Vocabulary, Picture Arrangement, and Verbal IQ increased the predictability of this discriminant function. The PTSD group had poorer scores compared to the non-PTSD group on Digit Span, possibly because of test anxiety, and on Digit Symbol, a measure of ability to learn quickly and

PTSD

persist at an unfamiliar task (see Table 33). In general, scores were similar to those obtained when diagnoses of PTSD were made according to variants of Braverman or Lidvall criteria, to be discussed next.

Braverman (2) criteria. When diagnoses were made according to *Braverman (2)* criteria, multivariate group means were significantly different and the discriminant function analysis correctly classified 60% of the PTSD cases and 94% of the non-PTSD cases (see Table 32). The PTSD group obtained poorer scores than the non-PTSD group on Arithmetic, Information, and Vocabulary (see Table 33). Variability due to performance on Block Design (e.g., analytical ability) was suppressed.

Variants of Lidvall criteria. Maximum separation on the basis of cognitive functioning was obtained when an optimal subset of WAIS-R Arithmetic, Vocabulary, Comprehension, Picture Arrangement, Block Design, and Verbal IQ was used to classify cases that had been diagnosed according to *Lidvall (2)* criteria (see Table 32). The sensitivity was 83% and the specificity was 94%. The PTSD group had poorer scores than the non-PTSD group on Arithmetic and Verbal IQ (see Table 33). Variability due to certain cognitive functions such as word usage (i.e., Vocabulary), ability to analyze and synthesize (i.e., Comprehension, Block Design), and understanding of social customs (i.e., Picture Arrangement) was suppressed.

There was also good separation between groups when Lidvall (1) criteria was used for group assignment. A subset of Vocabulary, Verbal IQ, Picture Arrangement, and Block Design produced a discriminant function that correctly classified 80% of the PTSD cases and 97% of the non-PTSD cases. The PTSD group formed from diagnoses made according to Lidvall (1) criteria had poorer Verbal IQ scores compared to the non-PTSD group (see Table 33): While the effects of certain cognitive functions were suppressed (i.e., Vocabulary, Picture Arrangement, and Block Design).

Any set of criteria. When all diagnoses of PTSD were combined into one group and compared with subjects who were non-PTSD according to *all sets of diagnostic criteria*, predictability of group membership on the basis of WAIS-R subtest scores was moderately good (see Table 32). The discriminant function using the optimal subset of WAIS-R Comprehension,

Table 32
Results from *Initial/Multivariate Analyses Using as Predictors 'Best' Subsets of*
Cognitive Variables (WAIS-R): Data Collected at Initial Assessment

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Digit Symbol (S) Picture Arrangement (U)	37, 4	.28	.18	15.53	2.88	1.0	7.63	2,41	.001	50.0	94.6	90.2
											50.0	94.6	90.2
DSMS-III (2)	Vocabulary Similarities Comprehension Picture Arrangement Object Assembly Digit Symbol	18, 8	.40	.00	15.12	2.78	.95	1.97	6,25	n.s.	50.0	100	84.0
											50.0	76.5	68.0
DSM-III (3) 2,3,3	Vocabulary (S) Picture Arrangement (U) Digit Symbol (S) Full Scale IQ (U)	34, 7	.40	.23	26.06	3.13	1.0	6.10	4,41	.000 (cons.)	57.0	97.0	90.2
											57.0	94.0	87.8
DSM-III (4)	Digit Span Vocabulary (S) Digit Symbol Picture Arrangement (S) Verbal IQ (S)	14, 12	.57	.30	31.64	3.48	1.0	5.27	5,26	.001 (cons.)	75.0	93.0	84.6
											67.0	79.0	73.1
Braverman (2)	Information Arithmetic Vocabulary Block Design (S)	36, 5	.28	.08	15.21	1.58	.60	3.50	4,41	.015	60.0	94.4	90.2
											60.0	94.4	90.2
Lidvall (1)	Vocabulary (S) Block Design (S) Picture Arrangement (S) Verbal IQ	36, 5	.48	.34	35.13	8.03	1.0	8.26	4,41	.000	80.0	97.2	95.0
											80.0	97.2	95.0

(Table 32 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n(PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (Sensitivity ₂)	non PTSD (Specificity ₃)	Total
Lidvall (2)	Arithmetic Vocabulary (S) Comprehension (S) Verbal IQ Picture Arrangement (S) Block Design (S)	35, 6	.58	.40	54.25	10.64	1.0	7.93	6,41	.000 (cons.)	83.3	100	97.6
											83.3	94.3	92.7
Any criteria	Comprehension (U) Vocabulary Digit Span Picture Arrangement (U) Digit Symbol	25,16	.55	.40	48.31	3.31	1.00	8.67	5,41	.000	87.5	76.0	80.5
											87.5	76.0	80.5

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is nonconservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after Jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 33

Group Means, Effect Sizes, and t-test Values for Cognitive Variables: Initial Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Brennan (2)		Lofsted (1)		Lofsted (2)		Any Criteria	
	PTSD	ES	PTSD	ES	PTSD	ES	PTSD	ES	PTSD	ES	PTSD	ES	PTSD	ES	PTSD	ES
	Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)		Mean (SD)	
WAIS-R I	8.5	-.48	8.2	-.29	7.6	-.05	7.6	.02	5.6	1.56	6.8	.38	6.7	.49	7.1	.24
Information	7.4	-.92	7.5	-.67	7.4	-.13	7.6	.07	7.7	3.26**	7.6	.79	7.6	1.12	7.7	.76
WAIS-R C	10.0	-.74	9.6	-.51	9.3	-.36	9.5	-.41	7.8	.50	8.2	.20	8.3	.13	9.2	-.46
Comprehension	8.4	-1.40	8.5	-1.20	8.4	-.85	8.5	-1.03	8.6	1.05	8.6	.42	8.6	.29	8.1	-1.43
WAIS-R A	9.3	-.64	8.3	-.08	8.1	-.14	7.6	.27	5.2	1.66	5.2	1.66	5.5	1.48	6.9	.63
Arithmetic	7.7	-1.22	8.1	-.18	7.8	-.34	8.4	.68	8.2	3.48**	8.2	3.48**	8.3	3.35**	8.5	1.96
WAIS-R S	10.5	-.97	8.9	-.28	9.5	-.55	8.7	-.10	6.8	.64	6.4	1.07	6.3	1.17	8.3	-.07
Similarities	7.9	-1.85	8.1	-.65	7.8	-1.32	8.4	.24	8.3	1.35	8.4	2.24*	8.4	2.64*	8.0	-.22
WAIS-R DS	9.3	-.82	8.0	.14	8.4	-.20	7.0	.79	5.6	1.63	5.0	1.52	5.3	1.42	6.7	.85
Digit Span	7.9	-1.55	8.4	.33	7.9	-.48	9.2	2.01	8.4	3.41**	8.4	3.18*	8.5	3.22*	8.9	2.67*
WAIS-R V	9.0	-.36	8.1	.19	7.6	-.17	7.8	.33	7.2	.65	8.2	.05	8.0	.15	7.8	.34
Vocabulary	8.2	-.69	8.5	.44	8.5	.80	8.6	.84	8.5	1.38	8.3	.10	8.4	.33	8.6	1.06
WAIS-R PC	8.5	-.26	8.4	-.31	8.9	-.52	8.6	-.50	6.8	.65	7.4	.27	7.8	-.07	8.1	-.27
Pict. Compl.	7.6	-.50	7.5	-.74	7.5	-1.25	7.4	-1.24	7.9	1.36	7.8	.57	7.7	-.16	7.5	-.85
WAIS-R BD	9.8	-.32	9.4	-.24	10.3	-.62	9.5	-.27	8.6	.09	9.2	-.29	9.3	-.39	9.3	-.32
Block Design	8.7	-.61	8.7	-.56	8.5	-1.50	8.7	-.68	8.8	.18	8.7	-.61	8.7	-.89	8.4	-.99
WAIS-R PA	13.3	-1.43	10.8	-.38	11.6	-.96	10.3	-.31	8.4	.09	9.8	-.26	9.8	-.30	9.9	-.53
Pict. Arrang.	8.3	-2.72	9.2	-.89	8.2	-2.32*	9.1	-.79	8.8	.18	8.6	-.54	8.6	-.69	8.0	-1.65
WAIS-R OA	8.3	-.24	7.9	-.02	8.7	-.54	8.1	-.15	7.6	.00	7.8	-.08	8.3	-.30	7.9	-.19
Obj. Assembly	7.5	-.45	7.7	-.04	7.4	-1.29	7.6	-.39	7.6	.01	7.6	-.17	7.5	-.69	7.4	-.60
WAIS-R DSY	7.3	-.08	7.1	.48	7.0	.08	6.8	.80	6.0	.44	6.4	.31	6.3	.38	6.7	.30
Digit Symbol	7.1	-.15	8.1	1.13	7.1	.20	8.8	2.03	7.3	.93	7.2	.64	7.3	.85	7.4	.94
WAIS-R Verbal IQ	97.8	-.71	93.5	-.21	93.1	-.28	90.8	.15	80.4	.98	82.6	.78	83.3	.69	88.3	.31
Verbal IQ	89.6	-1.34	91.2	-.59	89.9	-.68	92.5	.38	91.8	2.06*	91.5	1.57	91.7	1.58	91.8	.98
WAIS-R Perform. IQ	95.0	-.48	91.6	.01	95.4	-.55	91.5	.06	86.2	.26	90.6	-.12	91.3	-.14	90.5	-.11
Perform. IQ	88.9	-.92	91.8	.02	88.4	-1.32	92.4	.17	80.1	.54	88.4	-.24	89.3	-.31	88.0	-.34
WAIS-R IQ	96.3	-.66	91.6	-.09	93.4	-.45	89.7	.19	81.6	1.00	84.8	.64	84.8	.67	87.9	.18
	88.4	-1.25	90.6	-.20	88.3	-1.08	92.0	.48	90.2	2.09	89.8	1.34	89.9	1.52	90.0	.55

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (t) = data collected at initial assessment; (f) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

Vocabulary, Digit Span, Picture Arrangement, and Digit Symbol correctly classified 87.5% of the PTSD patients and 76% of the non-PTSD group. The PTSD group had superior scores compared to the non-PTSD group on Comprehension and Picture Arrangement (see Table 33), probably because of the exceedingly high scores on these subtests from those individuals who met DSM-III (1) and DSM-III (3) criteria for PTSD. This PTSD group (diagnosed according to any set of criteria), had poorer scores than the non-PTSD group on Vocabulary, Digit Symbol, and Digit Span. The large difference on the Digit Span test could be accounted for by the inclusion of PTSD cases diagnosed according to variants of Braverman or Lidvall criteria.

Summary. Discrimination between groups on the basis of optimal subsets of cognitive variables as predictors was, in general, adequate to good. Univariate group mean differences were significant and quite consistent on certain key subscales, in particular Digit Span, Arithmetic, and Picture Arrangement. When diagnoses were made using a variant of Braverman or Lidvall criteria, the PTSD group scored one standard deviation below the non-PTSD group on both Digit Span and Arithmetic, indicating impairment from anxiety. Meanwhile, the PTSD group as defined by DSM-III (1) or DSM-III (3) criteria, scored one and a half standard deviations above the non-PTSD group on Picture Arrangement, indicating sophistication and superior concept formation.

Multivariate group separation was maximum when diagnoses were made according to Lidvall (2) criteria. The observed pattern of cognitive functioning among the PTSD groups that were formed according to variants of DSM-III criteria was superior to that seen in either the corresponding non-PTSD group or the PTSD groups formed according to variants of Braverman or Lidvall criteria. For example, when DSM-III (1) criteria was used, the PTSD group had higher mean scores than the non-PTSD group on all WAIS-R subscales and the difference in IQ between the groups was also significant. When retrospective diagnoses of PTSD were added, according to DSM-III (2) and DSM-III (4), the mean differences between groups were less apparent. When diagnoses were made according to a variant of Braverman or Lidvall criteria, the PTSD group had scores on most WAIS-R subtests that were inferior to the non-PTSD group. For example, Braverman (2) criteria produced a PTSD group that had lower mean scores than the non-PTSD group on all WAIS-R subscales.

Midway Assessment

Discrimination between PTSD and non-PTSD groups formed at midway on the basis of optimal subsets of cognitive variables, which were administered at the initial assessment, was modest to good. Please refer to Table 34.

Variants of DSM-III criteria. When *DSM-III (3)* criteria was used for diagnoses, it was possible to modestly and significantly separate between groups formed at midway on the basis of earlier WAIS-R subtest scores (see Table 34). However, the discriminant function formed from the variables Picture Arrangement and Digit Symbol was quite a bit less sensitive (33%) than it was specific (96%). The PTSD group obtained superior scores to the non-PTSD group on Picture Arrangement. Variability accounted for by Digit Symbol was suppressed. Similar results were obtained when *DSM-III (4)* criteria were used. The statistical analysis of WAIS-R test scores when the PTSD and non-PTSD group were diagnosed according to *DSM-III (1)* and *DSM-III (2)* were non-significant.

Braverman (2) criteria. The optimal subset of Digit Span and Digit Symbol produced a discriminant analysis when *Braverman (2)* criteria was used that had relatively low sensitivity (40%), high specificity (92%), and modest group separation (see Table 34). There were several univariate differences that were moderate to large: For example, the Braverman (2) PTSD group had experienced a few months earlier impaired attention and concentration (on Digit Span and Arithmetic), despite generally superior functioning on the Performance subtests (see Table 35).

Variants of Lidvall criteria. The best rates for correct identification on the basis of cognitive functioning occurred when variants of Lidvall criteria were used. Due to methodological issues previously discussed (i.e. recalcitrant subjects), only three patients who were diagnosed with PTSD according to Lidvall (1) criteria at midway had been tested previously on the WAIS-R. Therefore, caution must be taken when interpreting the high values for multivariate group separation, sensitivity, and specificity. There were WAIS-R scores for five of the subjects who met *Lidvall (2)* criteria for PTSD. The sensitivity and specificity of the discriminant function was 80% and 100%, respectively, on the basis of an optimal subset of Digit Span, Picture Arrangement, and IQ scores measured two to four months earlier (see Table 34). The discriminant function accounted for about half of the variability in the criterion variable. The PTSD group identified at midway from Lidvall (2)

Table 34

Results from Midway Multivariate Analyses Using as Predictors 'Best' Subsets of Cognitive Variables (WAIS-R): Data collected at Initial Assessment

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified: PTSD (Sensitivity ₂) non PTSD (Specificity ₃) Total
DSM-III (1)	Information (S) Digit Span (S) Vocabulary (S) Arithmetic (S) Similarities (S) Comprehension (U) Picture Arrangement (U) Verbal IQ (S)	28,3	.50	.20	29.29	6.57	1.0	2.50	8,31	n.s.	100 33.3 96.4 85.7 96.8 80.6
DSM-III (2)	Vocabulary Comprehension (U) Picture Arrangement (U) Digit Symbol	17,7	.25	.10	7.96	1.19	.50	1.72	4,24	n.s.	28.6 14.3 94.1 88.2 75.0 66.7
DSM-III(3)	Digit Symbol (S) Picture Arrangement (U)	25,6	.24	.12	8.95	1.35	.70	4.32	2,31	.019	33.3 33.3 96.0 96.0 83.9 83.9
DSM-III (4)	Digit Symbol Picture Arrangement (U)	15,9	.28	.16	8.41	1.07	.65	4.01	2,24	.027	22.2 22.2 100 100 70.8 70.8
Braverman (2)	Digit Span Digit Symbol(U)	26,5	.19	.08	6.89	.95	.60	3.38	2,31	.044	100 92.3 83.9 83.9
Lidvall (1)	Digit Span Picture Arrangement (U) Object Assembly (S)	28,3	.62	.46	47.84	10.73	1.0	14.85	3,31	.000	100 100 100 100 100 100
Lidvall (2)	Digit Span Picture Arrangement (U) Full Scale IQ (S)	26,5	.55	.40	35.81	5.42	1.0	11.11	3,31	.000	80 80 100 100 96.8 96.8
Any Criteria	Verbal IQ (S) Picture Arrangement	19,12	.29	.15	12.77	1.19	.75	6.16	2,31	.004 (cons.)	66.7 66.7 78.9 78.9 74.2 74.2

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 35

Group Means, Effect Sizes, and t-test Values for Cognitive Variables: Midway Diagnoses of PTSD

	DSM-IV (1)		DSM-IV (2)		DSM-IV (3)		DSM-IV (4)		Brenner (2)		Local (1)		Local (2)		Any Criteria	
	APTSO	ES	APTSO	ES	APTSO	ES	APTSO	ES	APTSO	ES	APTSO	ES	APTSO	ES	APTSO	ES
	non-PTSD	t	non-PTSD	t	non-PTSD	t	non-PTSD	t	non-PTSD	t	non-PTSD	t	non-PTSD	t	non-PTSD	t
WAIS-R I	7.3	.08	7.7	-.10	8.0	-.30	7.8	-.15	7.2	.21	9.0	-.91	8.6	-.76	7.8	-.23
Information	7.5	.14	7.5	-.22	7.4	-.66	7.5	-.36	7.6	.43	7.4	-1.50	7.3	-1.56	7.4	-.62
WAIS-R C	10.7	-.23	9.3	-.38	9.3	-.38	9.3	-.46	8.4	.13	10.3	-1.93	9.6	-.62	9.0	-.20
Comprehension	8.5	-.3.85***	8.5	-.84	8.6	-.85	8.3	-1.09	8.8	.27	8.5	-3.17	8.5	-1.27	8.6	-.52
WAIS-R A	9.0	-.66	7.9	-.09	7.8	-.05	7.6	-.28	6.2	1.02	7.0	-.23	7.0	.33	7.4	-.24
Analogic	7.6	-1.09	8.1	.19	7.7	-.11	8.3	.66	8.0	2.09	7.8	.38	7.8	.67	8.0	.64
WAIS-R S	9.0	-.44	8.1	-.04	8.2	-.00	7.9	.12	7.6	.48	9.0	-.49	9.0	-.55	8.2	-.02
Similarities	8.1	-.72	8.1	-.08	8.2	-.01	8.2	.28	8.3	.99	8.1	-.61	8.0	-1.13	8.2	-.04
WAIS-R DS	7.7	.05	7.7	.23	7.2	.23	7.0	.69	6.0	.68	6.7	.33	6.6	.51	7.3	.32
Digit Span	7.9	.09	8.4	.52	8.0	.52	8.9	1.51	8.2	1.39	8.0	.54	8.1	1.05	8.2	.84
WAIS-R V	9.0	-.31	7.9	.32	8.7	-.10	8.2	.08	8.2	.13	10.7	-1.76	9.8	-.67	8.5	-.04
Vocabulary	8.4	-.51	8.5	.72	8.4	-.21	8.4	.18	8.5	.26	8.3	-2.80*	8.2	-1.37	8.5	-.10
WAIS-R PC	6.3	.57	8.3	-.26	8.2	-.23	8.4	-.43	9.0	-.71	8.7	-1.15	9.0	-.81	8.4	-.45
Picture Completion	7.8	.95	7.5	-.59	7.5	-.51	7.3	-1.02	7.4	-1.45	7.5	-1.89	7.4	-1.65	7.3	-1.20
WAIS-R BD	8.7	-.15	8.7	-.00	8.8	-.24	8.8	-.05	8.6	.15	9.7	-.83	9.0	-.39	8.9	-.35
Block Design	8.4	-.24	8.7	-.01	8.3	-.53	8.7	-.11	8.3	.30	8.3	-1.37	8.3	-.80	8.1	-.93
WAIS-R PA	11.7	-.58	10.1	-.23	11.3	-.85	10.3	-.36	10.0	-.32	15.3	-2.48	13.2	-1.47	10.6	-.76
Picture Arrangement	8.5	-.97	9.2	-.52	8.2	-1.88	9.0	-.85	8.6	-.65	8.1	-4.08*	8.0	-3.01*	7.8	-2.03
WAIS-R OA	6.3	.65	7.1	.26	7.0	.09	7.3	.13	7.8	-.37	6.7	.32	7.4	-.16	7.4	-.14
Object Assembly	7.3	1.07	7.7	.58	7.2	.21	7.7	.31	7.0	-.74	7.2	.53	7.1	-.32	7.1	-.36
WAIS-R DSY	7.7	-.53	6.9	.65	6.8	.24	6.7	.83	8.0	-.39	8.0	-.35	7.2	-.02	7.5	-.19
Digit Symbol	7.1	-.88	8.1	1.44	7.2	.53	8.4	1.97	7.0	-.79	7.1	-.57	7.2	-.04	7.0	-.50
WAIS-R Verbal IQ	87.3	-.83	91.7	-.05	93.3	-.26	91.0	.05	86.0	.99	92.3	-.23	89.8	.15	90.4	.06
Verbal IQ	90.1	-1.37	88.4	-.12	90.2	-.58	91.5	.12	91.7	1.97	90.6	-.38	91.0	.30	91.0	.17
WAIS-R Perform. IQ	88.7	-.00	88.4	.29	91.0	-.25	89.3	.19	93.8	-.53	89.0	-1.28	94.4	-.89	91.7	-.38
Performance IQ	88.7	-.01	91.8	.64	88.2	-.58	91.7	.46	87.8	-1.06	87.6	-2.10	87.7	-1.41	87.1	-1.00
WAIS-R IQ	92.0	-.37	89.0	.15	91.2	-.30	88.6	-.23	88.0	.16	94.3	-.91	90.8	-.27	89.7	-.12
Full-Scale IQ	88.6	-.62	90.6	.34	88.4	-.66	91.1	.55	89.1	.32	88.4	-1.50	88.6	-.56	88.5	-.32

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (1) = data collected at initial assessment; (2) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

criteria, could be predicted on the basis of poor scores on Digit Span and high scores on Picture Arrangement, with the effect of IQ suppressed. Moderate to large effect sizes were also found on other subtests but they did not enter into the optimal subset. From these results, it could be determined that although the PTSD group had been generally superior to the non-PTSD group on most cognitive skills at initial assessment, the PTSD patients were more anxious (see Table 35).

Any set of criteria. When all PTSD diagnoses from midway were combined and compared to those who were always non-PTSD classification rates were moderately better than chance. Paradoxically, people who had perceptual skill (i.e., on Picture Arrangement), regardless of IQ had an increased likelihood of meeting any set of criteria for PTSD at midway.

Summary. At midway, the results were similar to those obtained earlier, but there was a shift to greater similarity in initial cognitive functioning between the PTSD groups formed from variants of DSM-III (at midway) and those formed from variants of Lidvall criteria. Maximum separation between groups on the basis of cognitive variables was achieved when Lidvall criteria was used. What differentiated PTSD groups formed at midway by alternative criteria from corresponding non-PTSD groups was the level of impairment on Digit Span at initial testing. This suggests that persons who have impaired attention and concentration, probably because of anxiety, are at greater risk of PTSD as defined by alternative criteria, despite good cognitive skills and resources. The utility of using WAIS-R subtest scores at the time of initial assessment to accurately predict PTSD a few months later was modest when diagnostic criteria other than Lidvall were used, in spite of significant multivariate group separation and generally adequate power.

Follow-Up Assessment

Variants of DSM-III criteria. When *DSM-III (1)* criteria were used, the multivariate group mean difference on an optimal subset of predictors was not significant. When *DSM-III (3)* criteria were used to form the groups, the multivariate group mean difference approached significance (at $p = .053$), but classification based on the discriminant function was poor: While all cases of non-PTSD were correctly classified, no cases of PTSD were correctly classified in the jackknife classification.

Table 36
Results from Follow-Up Multivariate Analyses Using as Predictors 'Best' Subsets of
Cognitive Variables (WAIS-R): Data Collected at Initial Assessment

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Picture Completion Digit Symbol	21, 5	.13	.02	3.49	.61	.30	1.67	2,26	n.s.	20.0	100	85.7
											0.0	100	80.9
DSM-III (3)	Picture Completion Digit Symbol	21, 5	.22	.10	6.59	.96	.50	3.20	2,26	n.s. (.053)	33.0	100	84.6
											16.7	100	80.8
Braverman (2)	Arithmetic Digit Span Full-Scale IQ (S)	19, 7	.50	.27	24.40	3.55	1.0	7.55	3,26	.000	71.4	100	92.3
											71.4	94.7	88.5
Lidvall (1)	Only 2 cases, considered too few for analysis.												
Lidvall (2)	Information Digit Span Picture Completion Block Design (S) Object Assembly (S) Digit Symbol (S)	21, 5	.48	.25	21.82	3.82	1.0	3.08	6,26	.031	80.0	100	96.2
											60.0	81.0	76.0
Any criteria	Arithmetic Picture Completion (U)	13, 13	.43	.33	17.86	1.93	.90	8.56	2,26	.000	92.3	76.9	84.6
											76.9	76.9	76.9

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R^2 = squared multiple correlation; Adj. R^2 = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R^2 rather than the more liberal Wherry formula used in BMDP; T^2 = Hotelling's multivariate group difference; D^2 = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 37

Group Means, Effect Sizes, and t-test Values for Cognitive Variables: Follow-up Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		Bremner (2)		Lewin (1)		Lewin (2)		Any Criteria	
	AP(PTSD) mean/SD	ES	AP(PTSD) mean/SD	ES	AP(PTSD) mean/SD	ES	AP(PTSD) mean/SD	ES	AP(PTSD) mean/SD	ES	AP(PTSD) mean/SD	ES
WAIS-R I (I)	7.6	.02	7.3	.23	7.3	.15			6.4	1.04	7.2	.35
Information	7.6	.03	7.7	.40	7.7	.34			7.9	2.08	8.0	.88
WAIS-R C (I)	8.6	.05	8.7	.02	8.7	-.01		bo few cases of PTSD for comparison	8.4	.12	8.5	.19
Comprehension	8.7	.11	8.7	.04	8.7	-.02			8.7	.24	8.8	.47
WAIS-R A (I)	7.4	.45	7.3	.50	5.1	1.91			6.6	.92	6.3	1.42
Arithmetic	8.2	.90	8.3	1.07	9.1	4.31**			8.4	1.84	9.8	3.61**
WAIS-R S (I)	7.8	.13	7.5	.32	7.0	.44			7.0	.77	7.2	.56
Similarities	8.0	.26	8.2	.68	8.4	1.01			8.2	1.55	8.8	1.44
WAIS-R DS (I)	8.2	.02	8.0	.12	5.4	1.62			6.2	.91	6.8	1.07
Digit Span	8.2	.03	8.3	.26	8.3	3.68**			8.7	1.82	9.6	2.73**
WAIS-R V (I)	7.6	.44	7.5	.55	6.1	.08			6.8	.92	7.8	.38
Vocabulary	8.5	.89	8.6	1.18	8.4	1.18			8.7	1.85	9.8	.97
WAIS-R PC (I)	8.6	-.32	8.8	-.47	7.9	-.04			8.6	-.47	8.2	-.30
Pict. Compl.	7.6	-.64	7.5	-1.01	7.7	-.09			7.6	-.94	7.4	-.77
WAIS-R BD (I)	8.4	.22	8.7	.08	7.9	.56			8.8	.00	8.5	.25
Block Design	8.9	.45	8.9	.17	9.2	1.26			8.8	.01	9.2	.63
WAIS-R PA (I)	9.6	-.06	9.7	-.10	9.0	.14			8.8	.18	9.1	.20
Pict. Arrange.	8.4	-.13	9.4	-.21	8.6	.31			8.6	.37	8.8	.51
WAIS-R OA (I)	7.2	.25	7.8	-.12	7.1	.25			7.8	-.12	7.5	.05
Obj. Assembly	7.7	.50	7.6	-.25	7.8	.57			7.6	-.25	7.7	.14
WAIS-R DSY (I)	6.6	.81	6.5	.94	7.0	.40			8.4	-.33	7.2	.50
Digit Symbol	8.0	1.63	8.2	2.01	8.1	.80			7.6	-.67	8.4	1.27
WAIS-R (I)	80.8	.03	80.2	.12	85.4	.62			84.2	1.31	87.8	.47
Verbal IQ	81.1	.06	81.3	.25	83.1	1.46			82.7	2.63	84.2	1.42
WAIS-R (I)	87.2	.41	88.5	.27	88.3	.25			91.8	-.10	88.6	.12
Perform. IQ	91.6	.82	91.4	.58	91.7	.57			90.5	-.20	91.7	.35
WAIS-R IQ (I)	89.8	-.25	87.5	.34	85.7	.45			86.0	.58	87.3	.42
	90.3	.50	90.6	.73	91.4	1.01			90.8	1.16	92.5	1.08

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more distressed PTSD group. X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. t = the t value given is that for the separate t-test. (I) = data collected at initial assessment; (2) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

PTSD

Braverman (2) criteria. Classification of cases on the basis of a discriminant function analysis was good when *Braverman (2)* criteria was used for diagnoses and WAIS-R Arithmetic, Digit Span, and IQ were the predictor variables (see Table 36). Almost all the non-PTSD cases (94.7%) and 71.4% of the PTSD cases were correctly classified. The multivariate group mean difference was highly significant at $p < .000$. The PTSD group had, compared to the non-PTSD group, poorer performance on Arithmetic and Digit Span. Variability due to IQ was suppressed, thus highlighting the relationship between PTSD and poor performance on Arithmetic and Digit Span scores.

Lidvall (2) criteria. When *Lidvall (2)* criteria was used to diagnose PTSD, the discriminant function using an optimal subset of predictors yielded a multivariate group mean difference that was significant (see Table 36). There was some evidence of overfitting: jackknife classification reduced the number of correct classifications, resulting in a sensitivity of 60% and a specificity of 81%. The PTSD group had, compared with the non-PTSD group, poorer performance on Information and Digit Span but better performance on Picture Completion (see Table 37). Variability accounted for by scores on Block Design, Object Assembly, and Digit Symbol was suppressed.

Any set of criteria. The discriminant analysis using the optimal subset of Arithmetic and Picture Completion and groups formed from the combination of *all diagnostic criteria* correctly classified approximately three-quarters of the subjects. The multivariate group mean difference was highly significant ($p < .000$), but not as large as when *Braverman (2)* was used for group formation.

Summary. It was modestly possible to predict the occurrence of PTSD at one year post-trauma on the basis of WAIS-R subscale scores obtained within a few months of head injury, but only when PTSD was defined by *Braverman (2)* or *Lidvall (2)* criteria. Persons who were suffering from PTSD at follow-up, according to these criteria, were highly likely to have received a low score on Digit Span and Arithmetic when tested at least nine months earlier. For example, the *Braverman (2)* PTSD group had scores on Arithmetic and Digit Span that were one and a half standard deviations below their estimated premorbid functioning. The DSM-III diagnoses of PTSD at follow-up could not be predicted from initial WAIS-R results: there were no differences between the PTSD and non-PTSD groups in cognitive functioning at the time of initial assessment on any subscale.

Summary of Hypothesis Two

Hypothesis Two was confirmed: Maximum multivariate separation between PTSD and non-PTSD groups on distress and impairment variables was obtained when alternative criteria was used to diagnose PTSD. Furthermore, the PTSD groups formed from these sets of criteria were the most distressed and impaired. What was distinctive about PTSD groups formed from variants of DSM-III was both a general lack of distress and superior neuropsychological and cognitive skills, especially at initial assessment. The neuropsychological test scores indicated that auditory and verbal perception and coordination of language processing was superior in the DSM-III PTSD patients. Results from the WAIS-R Digit Span and Arithmetic also provided evidence that the DSM-III PTSD group had superior attention and concentration. Groups of PTSD patients formed from DSM-III/III-R criteria at follow-up appeared more distressed than similar groups formed earlier: but, they were still not as distressed as the PTSD groups formed from alternative criteria. There was a substantive difference between PTSD and non-PTSD groups on the Halstead-Reitan subtests at follow-up.

Unfortunately, the WAIS-R was not administered at follow-up; however, PTSD groups formed at any time from variants of Braverman or Lidvall criteria had poor Digit Span and Arithmetic scores at initial assessment (i.e., suggestive of anxiety). In contrast, the PTSD groups formed at any time from variants of DSM-III criteria always had superior Picture Arrangement scores (i.e., suggestive of superior perceptual and analytical skills). These differences between PTSD groups diagnosed according to DSM-III/III-R and PTSD groups diagnosed according to alternative criteria were not as large at follow-up as they had been at initial assessment.

Hypothesis Three

Medical/Neurological Variables

Initial Assessment

Variants of DSM-III criteria. The maximum separation between groups, at initial assessment, on the basis of medical/neurological variables occurred when *DSM-III (2)* criteria were used. Results are presented in Table 38. While severity of head injury and duration of impaired consciousness accounted for 21% of the variability, only 9% was accounted for after shrinkage for cross-validation. The discriminant function analysis correctly classified 30% of the PTSD patients and 96.2% of the non-PTSD patients. The PTSD group had a longer period of impaired consciousness compared to the non-PTSD group, with variability due to global severity suppressed.

Variants of alternative criteria. The discriminant function analysis based on an optimal subset of predictors accounted for very little of the variability between the two groups when diagnoses were made according to *Braverman (2)* criteria: Correct classification occurred in 25% of the PTSD cases and over 93% of the non-PTSD cases (see Table 38). The multivariate group mean difference was barely significant; although the power had dropped to .55. The PTSD group formed with *Braverman (2)* criteria was less likely to have received a skull fracture and had a slightly shorter duration of impaired consciousness than the non-PTSD group (see Table 39). Variability due to initial Glasgow Coma scores was suppressed. The remainder of the discriminant analyses using medical indices were non-significant.

Midway Assessment

It was generally not possible to discriminate between groups on the basis of medical/neurological variables at midway, with one exception (see Table 40). When cases of PTSD diagnosed according to *DSM-III (2)* criteria were compared to the non-PTSD group, a significant multivariate group mean difference was obtained and the discriminant function analysis correctly identified a third of the PTSD cases and almost all of the non-PTSD cases. The PTSD group had, compared with the non-PTSD group, more hours of impaired consciousness (i.e., $ES = .72$, refer to Table 41) and more days in hospital ($ES = .70$), yet were only slightly more seriously injured (i.e., $ES = .34$).

Table 38

Results from Initial Multivariate Analyses Using as Predictors 'Best' Subsets of Medical/Neurological Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified as:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Severity Duration of hospitalization Skull fracture	54, 6	.08	.03	7.36	1.36	.50	1.75	3,60	n.s.	0.0	100	89.8
											0.0	100	89.8
DSM-III (2)	Duration of impaired consciousness Severity (S)	26, 10	.21	.09	8.94	1.24	.70	4.34	2,36	.025	30.0	96.2	77.8
											30.0	96.2	77.8
DSM-III (3)	Duration of Hospitalization	50, 10	.02	.00	1.25	.15	.10	1.25	1,60	n.s.	0.0	100	89.8
											0.0	100	89.8
DSM-III (4)	Duration of impaired consciousness	20, 16	.06	.01	2.36	.26	.40	2.36	1,36	n.s.	0.0	100	89.8
											0.0	100	89.8
Braverman (2)	G.C.S. score at admission (S) Duration of impaired consciousness Skull fracture	48, 12	.13	.02	8.84	.92	.55	2.84	3,60	.046	25.0	95.8	81.7
											25.0	93.8	80.0
Lidvall (1)	Severity G.C.S. score at admission Hematoma	50, 10	.12	.01	4.57	.55	.37	1.47	3,60	n.s.	10.0	98.0	83.1
											10.0	98.0	83.1
Lidvall (2)	Duration of impaired consciousness	47, 13	.07	.00	2.14	.21	.30	2.14	1,60	n.s.	0.0	100	89.8
											0.0	100	89.8
Any criteria	Duration of hospitalization	35,25	.04	.00	2.50	.17	.40	2.53	1,60	n.s.	32.0	82.9	61.7
											32.0	82.9	61.7

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R^2 = squared multiple correlation; Adj. R^2 = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R^2 rather than the more liberal Wherry formula used in BMDP; T^2 = Hotelling's multivariate group difference; D^2 = Mahalanobis' distance; χ^2 = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; χ^2 = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; χ^2 = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 32

Group Means, Effect Sizes, and t-test Values for Medical / Neurological Variables: Initial Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Bremner (2)		Lewin (1)		Lewin (2)		A7-C-44a	
	AP/PTSD	ES	AP/PTSD	ES	AP/PTSD	ES	AP/PTSD	ES	AP/PTSD	ES	AP/PTSD	ES	AP/PTSD	ES	AP/PTSD	ES
	Non-PTSD		Non-PTSD		Non-PTSD		Non-PTSD		Non-PTSD		Non-PTSD		Non-PTSD		Non-PTSD	
Severity	1.67	-.23	2.00	.22	1.90	.09	2.06	.37	1.83	.00	1.60	-.34	1.69	-.24	1.65	.27
	1.85	-.53	1.81	.58	1.82	.27	1.76	1.11	1.83	.00	1.88	-.97	1.87	-.75	1.74	1.02
OCS #/Item	12.5	-.18	11.2	.24	11.9	.01	11.4	.23	11.1	.27	12.2	-.09	12.2	-.11	11.4	.29
	11.8	-.45	12.1	.65	11.9	.03	12.1	.69	12.1	.85	11.9	-.25	11.9	-.36	12.3	1.09
Hosp Duration	58.8	.33	63.6	.61	48.7	.26	49.7	.45	40.8	.11	29.3	-.10	25.0	-.22	48.5	.39
	32.3	.76	23.2	1.64	32.1	.74	24.7	1.36	33.3	.34	35.9	-.30	37.6	.71	25.1	1.49
Imp. Consec.	235.0	.10	289.7	.63	231.9	.12	311.7	.48	165.9	-.16	74.9	-.86	88.4	-.73	253.1	.28
	197.2	.23	143.2	1.68	194.8	.33	150.5	1.46	209.7	-.49	226.2	-.248*	232.1	-.234*	163.7	1.05
Hemidoma	1.17	.34	0.90	.04	1.00	.30	0.81	-.03	0.58	-.04	0.70	.08	0.62	-.00	0.68	.05
	0.56	.80	0.85	.10	0.54	.86	0.86	-.10	0.63	-.11	0.60	.23	0.62	-.00	0.57	.35
Skull Fract.	0.00	-1.94	0.20	-.42	0.20	-.14	0.31	-.14	0.08	-.63	0.10	-.53	0.23	-.06	0.24	-.04
	0.28	-4.51**	0.38	-1.12	0.26	-.41	0.39	-.42	0.29	-1.86	0.28	-1.52	0.26	-.18	0.26	-.15
Imp. Index	0.53	-.05	0.53	-.13	0.56	.09	0.57	.07	0.55	.05	0.56	-.10	0.59	.25	0.53	-.03
	0.54	-.11	0.57	-.36	0.53	.25	0.55	.21	0.54	.16	0.53	.28	0.52	.79	0.54	-.13

Note. ES = effect size; a negative sign indicates that the PTSD group was less distressed or less impaired than the non PTSD group, or have scores that are unexpected for the supposedly more distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non PTSD group; t = the t value given is that for the separate t-test; (f) = data collected at initial assessment; (f) = data collected at follow-up assessment

* = $p < .05$; ** = $p < .01$

Table 40

Results from *Midway* Multivariate Analyses Using as Predictors 'Best' Subsets of Medical/Neurological Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	n ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix: % of subjects correctly classified:	Total
											PTSD (Sensitivity ₂)	non PTSD (Specificity ₃)
DSM-III (1)	GCS at adm. (U) Duration of hospitalization	41.5	.06	.00	3.04	.68	.40	1.49	2,46	n.s.	0	100
											0	100
DSM-III (2)	Duration of Impaired consciousness Severity (S)	26.9	.22	.11	9.47	1.43	.70	4.59	2,35	.018	33.3	96.2
											33.3	96.2
DSM-III (3)	GCS at adm. (U) Duration of hospitalization	38.8	.13	.04	5.90	.89	.60	2.88	2,46	n.s.	25.0	97.4
											12.5	97.4
DSM-III (4)	GCS at adm. (U) Duration of Impaired consciousness	23.12	.14	.04	5.17	.66	.50	2.50	2,35	n.s.	16.7	95.7
											16.7	91.3
Braverman (2)	Hematoma Duration of Impaired consciousness	37.9	.05	.00	2.16	.30	.22	1.05	2,46	n.s.	0.0	100
											0.0	100
Lidvall (1)	Duration of hospitalization (U) Duration of Impaired consciousness (U)	41.5	.11	.02	5.29	1.19	.55	2.58	2,46	n.s.	20.0	100
											0.0	100
Lidvall (2)	Skull Fracture Duration of hospitalization Duration of Impaired consciousness (U)	38.8	.10	.01	2.91	.44	.25	1.42	3,46	n.s.	0.0	100
											0.0	100
Any Criteria	Duration of impaired consciousness Skull Fracture	22.24	.04	.00	1.54	.25	.10	1.09	2,46	n.s.	52.9	58.6
											35.3	41.4
												56.5
												39.1

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 41

Group Means, Effect Sizes, and t-test Values for Medial/Neurological Variables, Midway Diagnoses of PTSD

	DSM-11		DSM-12		DSM-13		DSM-14		Briere et al.		Local (1)		Local (2)		Any Criteria	
	Mean	ES	Mean	ES	Mean	ES	Mean	ES	Mean	ES	Mean	ES	Mean	ES	Mean	ES
Severity	1.80	-.07	2.11	.34	1.75	-.14	2.00	.23	2.00	.26	1.40	-.87	1.75	-.16	2.00	.30
	1.85	-.14	1.81	.89	1.87	-.35	1.83	.59	1.81	.70	1.90	-.83	1.87	-.42	1.77	.99
CCS#Item	12.6	-.36	10.8	.36	12.5	-.27	11.5	.12	11.4	.15	13.6	-.85	12.1	-.12	11.4	.17
	11.7	-.78	12.1	.82	11.6	-.68	11.9	.30	11.9	.41	11.6	-.79	11.7	-.31	12.0	.54
Hosp. Duration	58.2	.37	70.7	.70	60.6	.40	55.1	.52	45.9	.18	31.4	-.09	48.8	.22	45.2	.23
	33.4	.78	23.2	1.82	31.0	1.02	25.2	1.36	33.7	.49	36.6	-.19	33.4	.56	31.2	.75
Imp. Conc.	282.0	.18	433.0	.72	301.1	.25	339.9	.55	319.6	.33	22.4	-.1.82	186.5	-.10	285.0	.30
	206.5	.39	143.2	1.87	196.5	.63	154.0	1.42	189.2	.90	238.1	-.3.85***	220.6	-.25	177.2	.98
Hemibody	1.00	.23	1.00	.10	1.13	.32	0.83	-.06	1.22	.42	0.60	-.10	1.00	.22	0.94	.25
	0.68	.48	.85	.26	.63	.81	0.91	-.16	0.59	1.13	0.73	-.21	0.66	.57	0.60	.82
Skull Fract.	0.20	-.15	.22	.36	.13	-.44	0.25	-.33	0.33	.18	0.40	-.29	0.38	.28	0.38	.37
	0.27	-.32	.38	-.92	.28	-.1.13	0.38	-.65	0.24	.50	0.24	.61	0.24	.71	0.20	1.20
Imp. Index	0.53	-.06	0.56	-.02	.54	-.04	0.56	-.05	0.58	.11	0.41	-.58	0.51	-.21	0.55	-.03
	0.56	-.12	0.57	-.04	.56	-.11	0.57	-.13	0.54	.30	0.57	-.23	0.56	-.53	0.56	-.10

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t test; (f) = data collected at initial assessment; (f) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

Follow-Up Assessment

It was not possible to discriminate between groups on the basis of medical indices at follow-up, regardless of diagnostic criteria (see Table 42). In general, all cases were identified as non-PTSD by the discriminant function analyses. However, because of the small multivariate effect and the small group sizes, there was inadequate power to find significant multivariate group mean differences if there were any. Group means are provided in Table 43.

A Qualitative Analysis of Halstead-Reitan, WAIS-R, and Neuroradiological Results to Examine a Possible Connection Between PTSD and Brain Damage

It was possible to use the patterns and relationships of subtest scores on the Halstead-Reitan and the WAIS-R, as well as neuroradiological findings to examine the condition of the brain and of specific cortical areas for both general and specific signs of damage. With these results, this study (a) addressed the appropriateness of using Lidvall et al. criteria to validate DSM-III criteria, and (b) DSM-III's contention that certain symptoms, such as difficulties with memory or concentration, headaches, and vertigo, are indicative of a possible Organic Mental Disorder and not PTSD. The overall integrity of the cerebral cortex is assessed from tests of abstraction and concept formation, as well as tests that can be divided into five other areas of mental function: visuospatial, sensory-perceptual, motor, verbal, and memory function. The Impairment Index is considered remarkably sensitive to the integrity of the brain, including even mild or diffused damage, regardless of where it occurs (refer to Reitan, 1986). Tests of abstraction and concept formation (i.e., Category, Trail Making, TPT Location, and WAIS-R Digit Symbol) and the Impairment Index were highly correlated in this study with all measures of severity except incidence of skull fracture, and with most test scores on the neuropsychological and cognitive variables, as expected from the literature. It was obvious from the mean test results obtained during the initial assessment that this was a head-injured population. Most overall scores, regardless of PTSD symptomatology, were at or below the impaired level. Furthermore, by one year post-injury there was improvement in neuropsychological functioning. It was not possible, however, to separate PTSD from non-PTSD groups on the basis of these test scores. All PTSD and non-PTSD groups were generally impaired on these tests and had Impairment Index scores of approximately .5 at initial assessment and .3 at follow-up.

Table 42

Results from *Follow-Up* Multivariate Analyses Using as Predictors 'Best' Subsets of Medical/Neurological Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Duration of Impaired consciousness Skull Fracture	31, 7	.14	.04	5.97	1.05	.65	2.11	2,38	n.s.	0.0	100	81.6
											0.0	100	81.6
DSM-III (3)	Duration of impaired consciousness	29, 9	.06	.00	2.43	.35	.30	2.43	1,38	n.s.	11.0	93.0	73.7
											0.0	93.0	71.0
Braverman (2)	Hematoma Severity Duration of impaired consciousness	29, 9	.12	.01	5.12	.75	.40	1.61	3,38	n.s.	0.0	100	76.3
											0.0	100	76.3
Lidvall (1)	Duration of hospitalization GCS at admission Impairment Index	34, 4	.03	.00	4.52	1.26	.58	1.42	2,38	n.s.	0.0	100	89.5
											0.0	100	89.5
Lidvall (2)	Duration of hospitalization Severity Impairment Index	31, 7	.17	.06	7.48	1.31	.45	2.03	3,38	n.s.	0.0	100	81.6
											0.0	100	81.6
Any criteria	Impaired consciousness	22,16	.05	.00	1.74	.19	.20	1.73	1,38	n.s.	37.5	77.3	60.5
											37.5	77.3	60.5

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R^2 = squared multiple correlation; Adj. R^2 = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R^2 rather than the more liberal Wherry formula used in BMDP; T^2 = Hotelling's multivariate group difference; D^2 = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 43

Group Means, Effect Sizes, and t-test Values for Medical / Neurological Variables: Follow-up Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		Bremner (2)		Udell (1)		Udell (2)		Any Criteria	
	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES	X(PTSD) non-PTSD	ES
Severity	2.14 1.77	.42 1.01	2.11 1.76	.45 1.18	1.88 1.83	.07 .18	2.00 1.82	.22 .41	2.29 1.74	.72 1.71	2.00 1.72	.38 1.04
GCS at Adm.	10.3 12.3	.52 1.25	10.9 12.2	.38 1.01	11.7 12.0	-.09 -.24	11.0 12.0	.27 .51	10.3 12.3	.56 1.33	11.3 12.4	.36 .98
Hosp Duration	52.9 28.3	.34 .92	43.9 29.3	.23 .60	47.0 26.4	.29 .75	15.5 34.8	-.92 1.74	36.3 32.0	.09 .22	38.2 28.9	.19 .52
Imp. Conc.	414.0 152.8	.66 1.57	342.2 157.1	.50 1.31	282.6 175.6	.27 .72	204.5 200.5	.02 .03	307.7 176.8	.36 .87	279.6 143.7	.46 1.24
Hemoglobin	1.00 0.77	.14 .33	0.89 0.78	.06 .17	1.33 0.66	.43 1.14	0.75 0.82	-.05 -.09	1.43 0.68	.54 1.30	1.13 0.59	.44 1.19
Skull Fract.	0.14 0.39	-.61 1.45	0.22 0.38	-.35 -.91	0.33 0.34	-.02 -.06	0.50 0.32	.31 .59	0.57 0.29	.54 1.29	0.38 0.32	.13 .35
Imp. Index (1)	0.65 0.51	.53 1.27	0.60 0.52	.31 .82	0.55 0.53	.07 .19	0.41 0.55	-.63 1.19	0.51 0.54	-.11 -.27	0.59 0.50	.40 1.06

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group. X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group. t = the t value given is that for the separate t test. (1) = data collected at initial assessment; (2) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

Localization of brain damage. It was possible to localize brain damage for half of the subjects in this study on the basis of neuroradiological findings. These results are tabulated in Tables 44 to 47. Separate tables are provided for both the entire sample and the sub-sample to whom the entire assessment battery was administered (i.e., including the WAIS-R), at initial and follow-up sessions. Because of the small number of subjects in each cell, extreme caution must be used when examining these tables. Although it was not possible to quantify this information for use in multivariate analyses, it can be seen from the tables that most brain damage that could be localized occurred among non-PTSD patients, with the following exception: There was a disproportionately higher number of right hemisphere lesions among the PTSD patients diagnosed on the basis of variants of Braverman or Lidvall criteria (i.e., 3 or 4 cases when only 1 was expected on the basis of prior probabilities). Yet, scores on neuropsychological and cognitive subtests considered sensitive to right-hemisphere damage (i.e., Performance subtests) did not indicate deficits among these patients.

While the number of cases that could be localized to any specific area of the brain was quite small, it was possible to analyze left versus right hemisphere involvement. At follow-up, for example, the number of either left or right hemisphere cases that met criteria for PTSD, according to DSM-III (1) or DSM-III (3) criteria, were equal to or below the number that would be expected on prior probabilities based on group size. When PTSD diagnoses were based on variants of Braverman or Lidvall criteria, the proportion of localized cases that met PTSD criteria exceeded that of chance alone. This meant that there was a higher likelihood of being able to localize damage to either hemisphere when diagnoses were based on Braverman or Lidvall criteria. In the case of non-localized mild injuries, there was a lower-than-expected likelihood, albeit slight, of belonging to a PTSD group diagnosed according to Lidvall criteria. There was a higher-than-expected likelihood of being diagnosed with PTSD according to Lidvall (2) criteria at follow-up if damage was to the left temporal area. This was the reverse of the results from initial assessment; then, the PTSD groups formed from Lidvall criteria had slightly more right hemisphere cases. Because of the small number of subjects in each cell, however, both of these findings may be spurious.

Table 44

**Classification of Brain Damage by Location for All Subjects
PTSD Diagnoses Made at Initial Assessment**

All Subjects	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Braverman (2)		Lidvall (1)		Lidvall (2)		Any Criteria	
	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD
Not Localized	23															
mild	3	20	4	8	4	19	5	7	5	18	6	17	6	17	9	14
	(2.3)	(20.7)	(3.3)	(8.7)	(3.8)	(19.2)	(5.2)	(6.8)	(4.6)	(18.4)	(3.8)	(19.2)	(5.0)	(18.0)	(9.6)	(13.4)
moderate	1	5	1	2	1	5	1	2	2	4	0	6	1	5	2	4
	(0.6)	(5.4)	(0.8)	(2.2)	(1.0)	(5.0)	(1.3)	(1.7)	(1.2)	(4.8)	(1.0)	(5.0)	(1.3)	(4.7)	(2.5)	(3.5)
severe	0	1	1	0	0	1	1	0	0	1	0	1	0	1	0	1
Occipital	0	2	1	1	0	2	1	1	0	2	0	2	0	2	1	1
Left Frontal	0	7	0	3	0	7	1	2	0	7	0	7	0	7	1	6
	(0.7)	(6.3)	(0.8)	(2.2)	(1.2)	(6.8)	(1.3)	(1.7)	(1.4)	(5.6)	(1.2)	(6.8)	(1.5)	(5.5)	(2.9)	(4.1)
Right Frontal	0	4	0	1	1	3	1	0	3	1	2	2	2	2	3	1
	(0.4)	(3.6)			(0.7)	(3.3)			(0.8)	(3.2)	(0.7)	(3.3)	(0.9)	(3.1)	(1.7)	(2.3)
Left Parietal	0	2	0	1	1	1	2	0	0	2	0	2	1	1	2	0
Right Parietal	0	1	0	1	0	1	1	0	1	0	1	0	1	0	1	0
Left Temporal	0	4	1	3	0	4	1	3	0	4	0	4	0	4	1	3
	(0.4)	(3.6)	(1.1)	(2.9)	(0.7)	(3.3)	(1.7)	(2.3)	(0.8)	(3.2)	(0.7)	(3.3)	(0.9)	(3.1)	(1.7)	(2.3)
Right Temporal	0	1	0	1	0	1	0	1	1	0	1	0	1	0	1	0
Left Basilar	0	3	0	2	1	2	1	1	0	3	0	3	1	2	1	2
Basal Ganglia	1	0	1	0	1	0	1	0	0	1	0	1	0	1	1	0
Brain Stem	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Int'l Capsule	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Unknown	1	2	1	1	1	2	1	1	1	2	1	2	1	2	2	1
Left Hemisphere	0	13	1	9	1	12	5	8	0	13	0	13	2	11	5	8
	(1.3)	(11.7)	(2.8)	(7.2)	(2.2)	(10.8)	(5.6)	(7.4)	(2.6)	(10.4)	(2.2)	(10.8)	(2.8)	(10.2)	(5.4)	(7.6)
Right Hemisphere	0	6	0	3	1	5	1	5	4	2	3	3	3	3	4	2
	(0.6)	(5.4)	(0.8)	(2.2)	(1.0)	(5.0)	(2.6)	(3.4)	(1.2)	(4.8)	(1.0)	(5.0)	(1.3)	(4.7)	(2.5)	(3.5)

Note. For those areas of the brain from which there are four or more subjects, the number of subjects in each group expected a priori to have received damage to that part of the brain (based on the proportion of subjects in each group) is given in brackets.

Table 45

Classification of Brain Damage by Location for Subjects Who Completed the WAIS-R:
PTSD Diagnoses Made at Initial Assessment

	All Subjects	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Braverman (2)		Lidvall (1)		Lidvall (2)		Any Criteria	
		PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD
Not Local- ized	23	2	16	3	8	3	15	4	7	1	17	2	16	2	16	5	13
		(1.8)	(16.2)	(3.5)	(2.5)	(3.1)	(14.9)	(5.1)	(5.9)	(2.2)	(15.8)	(2.2)	(15.8)	(2.6)	(1.54)	(7.0)	(11.0)
moderate	6	0	1	0	0	0	1	0	0	0	1	0	1	0	1	0	1
severe	1	0	1	1	0	0	1	1	0	0	1	0	1	0	1	1	0
Occipital	2	0	2	1	1	0	2	1	1	0	2	0	2	0	2	1	1
Left Frontal	7	0	3	0	0	0	3	0	0	0	3	0	3	0	3	0	3
		(0.3)	(2.3)			(.5)	(2.5)			(0.4)	(2.6)	(0.4)	(2.6)	(0.4)	(2.6)	(1.2)	(1.8)
Right Frontal	4	0	3	0	1	0	3	1	0	2	1	1	2	1	2	2	1
		(0.3)	(2.3)			(.5)	(2.5)			(0.4)	(2.6)	(0.4)	(2.6)	(0.4)	(2.6)	(1.2)	(1.8)
Left Parietal	2	0	2	0	1	1	1	1	0	0	2	0	2	1	1	1	1
Right Parietal	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Left Temporal	4	0	3	1	2	0	3	2	1	0	3	0	3	0	2	2	1
		(0.3)	(2.3)	(1.0)	(2.0)	(0.5)	(2.5)	(1.4)	(1.6)	(0.4)	(2.6)	(0.4)	(2.6)	(0.4)	(2.6)	(1.2)	(1.8)
Right Temporal	1	0	1	0	1	1	0	0	1	1	0	1	0	1	0	1	0
Left Basilar	3	0	1	0	0	0	1	0	0	0	1	0	1	0	1	0	1
Basal Ganglia	1	1	0	1	0	1	0	1	0	0	1	0	1	0	1	1	0
Brain Stem	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Int'l Capsule	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1	0	1
Unknown	3	1	2	1	1	1	0	1	1	1	2	1	2	1	2	2	1
Left Hemisphere	13	0	8	1	3	1	7	3	1	0	8	0	8	1	7	3	5
		(0.8)	(7.2)	(1.3)	(2.7)	(1.4)	(6.6)	(1.8)	(2.2)	(1.0)	(7.0)	(1.0)	(7.0)	(1.2)	(6.8)	(3.1)	(4.9)
Right Hemisphere	6	0	5	0	3	1	4	1	2	3	2	2	3	2	3	3	2
		(0.5)	(4.5)	(1.0)	(2.0)	(0.9)	(4.1)	(1.4)	(1.6)	(0.6)	(4.4)	(0.6)	(4.4)	(0.7)	(4.3)	(2.1)	(3.0)

Note. For those areas of the brain from which there are four or more subjects, the number of subjects in each group expected a priori to have received damage to that part of the brain (based on the proportion of subjects in each group) is given in brackets.

Table 46

Classification of Brain Damage by Location for Subjects Assessed at Follow-Up

All Subjects		DSM-III (1)		DSM-III (3)		Braverman (2)		Lidvall (1)		Lidvall (2)		Any Criteria	
	FU	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD
Not Localized	23	13	2	11	3	10	3	1	12	1	12	3	10
			(2.4)	(10.6)	(3.1)	(9.9)	(3.1)	(1.3)	(11.7)	(2.4)	(10.6)	(5.5)	(7.5)
	6	3	1	2	1	2	0	0	3	0	3	1	2
severe	1	1	1	0	1	0	0	0	1	0	1	1	0
			(6)	(2.4)	(0.7)	(2.3)	(0.7)	(0.3)	(2.7)	(0.6)	(2.4)	(1.3)	(1.7)
Occipital	2	2	0	2	0	2	2	0	2	1	1	2	0
Left Frontal	7	3	0	3	0	3	1	2	1	2	2	1	2
			(0.6)	(2.4)	(0.7)	(2.3)	(0.7)	(0.3)	(2.7)	(0.6)	(2.4)	(1.3)	(1.7)
Right Frontal	4	1	0	1	0	1	1	0	0	1	0	1	0
Left Parietal	2	1	0	1	1	0	0	1	0	1	0	1	0
Right Parietal	1	1	0	1	0	1	0	1	0	1	0	1	0
Left Temporal	4	4	1	3	1	3	0	4	1	3	2	2	2
			(0.7)	(3.3)	(0.7)	(3.3)	(0.7)	(0.4)	(3.6)	(0.7)	(3.3)	(1.7)	(2.3)
Right Temporal	1	1	0	1	0	1	1	0	1	0	1	1	0
Left Basilar	3	3	0	3	0	3	0	3	0	3	0	3	0
Basal Ganglia	1	1	1	1	0	1	0	1	0	1	0	1	0
Brain Stem	1	1	0	1	0	1	0	1	0	1	0	1	0
Int'l Capsule	1	1	0	1	1	0	0	1	0	1	0	1	0
Unknown	3	2	1	1	1	1	1	1	0	2	0	1	1
Left Hemisphere	13	8	1	7	2	6	1	7	2	6	3	4	4
			(1.5)	(6.5)	(1.9)	(6.1)	(1.9)	(6.1)	(0.8)	(7.2)	(1.5)	(3.4)	(4.6)
Right Hemisphere	6	3	0	3	0	3	2	1	1	2	1	2	1
			(0.5)	(2.5)	(0.7)	(2.3)	(0.7)	(2.3)	(0.3)	(2.7)	(0.5)	(1.3)	(2.7)

Note. For those areas of the brain from which there are four or more subjects, the number of subjects in each group expected a priori to have received damage to that part of the brain (based on the proportion of subjects in each group) is given in brackets.

Table 47

Classification of Brain Damage by Location for Subjects Who Completed the WAIS-R: PTSD Diagnoses were made at Follow-Up

	All Subjects		DSM-III (1)		DSM-III (3)		Braverman (2)		Lidvall (2)		Any Criteria	
	1	FU	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD	PTSD	nonPTSD
Not Localized	23	13	1	10	1	10	2	9	0	11	2	9
			(2.1)	(8.9)	(2.1)	(8.9)	(3.0)	(8.0)	(2.1)	(8.9)	(5.5)	(5.5)
moderate	6	3	0	0	0	0	0	0	0	0	0	0
severe	1	1	1	0	1	0	0	1	0	1	1	0
Occipital	2	2	0	2	0	2	2	0	1	1	2	0
Left Frontal	7	3	0	0	0	0	0	0	0	0	0	0
Right Frontal	4	1	0	1	0	1	1	0	1	0	1	0
Left Parietal	2	1	0	1	1	0	0	1	0	1	1	0
Right Parietal	1	1	0	1	0	1	0	1	0	1	0	1
Left Temporal	4	4	1	2	1	2	0	3	2	1	2	1
			(0.6)	(2.4)	(0.6)	(2.4)	(0.8)	(2.2)	(0.6)	(2.4)	(1.5)	(1.5)
Right Temporal	1	1	0	1	0	1	1	0	1	0	1	0
Left Basilar	3	3	0	1	0	1	0	1	0	1	0	1
Basal Ganglia	1	1	1	0	1	0	0	1	0	1	1	0
Brain Stem	1	1	0	0	0	0	0	0	0	0	0	0
Int'l Capsule	1	1	0	1	0	1	0	1	0	1	0	1
Unknown	3	2	1	1	1	1	1	1	0	2	1	1
Left Hemisphere	13	8	1	3	2	2	0	4	2	2	3	1
			(0.8)	(3.2)	(0.8)	(3.2)	(1.1)	(2.9)	(0.8)	(3.2)	(2.0)	(2.0)
Right Hemisphere	6	3	0	3	0	3	2	1	2	1	2	1
			(0.6)	(2.4)	(0.6)	(2.4)	(0.8)	(2.2)	(0.6)	(2.4)	(1.5)	(1.5)

Note. There were only 2 cases of PTSD for whom WAIS-R scores are available when diagnoses were made with Lidvall criteria, so this set of data is dropped from this analysis.

For those areas of the brain from which there are four or more subjects, the number of subjects in each group expected a priori to have received damage to that part of the brain (based on the proportion of subjects in each group) is given in brackets.

Left-hemisphere lesions. It is known that the presence of low scores on Speech Perception and on the WAIS-R Similarities and Arithmetic tests (compared with other verbal subtests) may reveal left hemisphere lesions. The PTSD groups, formed by variants of DSM-III criteria were superior on these tests, thereby possibly ruling out left hemisphere damage in these PTSD groups. In contrast, PTSD groups formed at initial assessment according to variants of Braverman and Lidvall criteria received inferior scores. Brain damage is not suspected as the cause of these low scores either because examination of the location of lesions that could be localized (see Tables 43 to 46) indicated that all PTSD groups, regardless of diagnostic criteria, had fewer cases of left hemisphere damage than expected from chance alone (except the PTSD group formed from DSM-III (4) criteria). This latter PTSD group contained three-quarters of the left hemisphere cases, but mean scores on the three tests (i.e., Speech Perception, WAIS-R Similarities, and Arithmetic) did not differ from those of the corresponding non-PTSD group. Furthermore, none of the mean scores on Speech Perception were impaired regardless of group status and all PTSD groups had better scores than their corresponding non-PTSD group, regardless of criteria or time of assessment. While the preponderance of left hemisphere cases in the non-PTSD groups may have accounted for their poorer scores, it could not be said that the PTSD groups were more brain-damaged. In fact, left hemisphere damage was associated with being less likely to meet diagnostic criteria for PTSD regardless of criteria, even though left hemisphere damage has generally been considered more closely associated with psychiatric disorders than are right hemisphere lesions (refer to Lishman, 1968, 1968). This further substantiates the finding thus far in this study that PTSD following head injury was not directly caused by either location or extent of brain damage.

The Braverman and Lidvall PTSD groups formed at initial and follow-up assessments had relatively poorer scores on Digit Span (.91 < ES < 1.63), Arithmetic (.92 < ES < 1.91), and Similarities (.44 < ES < 1.17) at initial assessment than either the corresponding non-PTSD group or the DSM-III PTSD groups. Although low scores on Digit Span, Arithmetic, and Similarities may indicate brain damage to the left hemisphere, examination of the site of focal lesions among the former PTSD groups revealed that focal damage was to the right hemisphere in all but one patient. This patient met criteria for a diagnosis of PTSD according to Lidvall (2) criteria only. She received a skull fracture and a small epidural hematoma to the left temporoparietal area from a fall on ice. Her scores on those three subtests were low (median score = 6.7) but not impaired, nor were they lower

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than her verbal comprehension score. Furthermore, her scores on these three subtests were slightly higher than the group means.

Brain damage to the left and right temporal regions. To examine the possible influence of left temporal brain damage on PTSD status and on neuropsychological and cognitive scores in this study, the four patients who sustained left temporal damage will be discussed. Three of these cases were always diagnosed as non-PTSD. The fourth patient met DSM-III (2) and DSM-III (4) criteria for a PTSD diagnosis. It is known the left temporal brain damage may cause impaired scores on Speech Perception. Only one left temporal lobe patient had a high error score on Speech Perception, but he was impaired on all of the Halstead-Reitan battery subtests. He was also poorly educated, with a premorbid intellectual functioning that was probably borderline retarded. The one PTSD subject who had left temporal damage received a score on Speech Perception that was not impaired and was superior to the group mean. On the basis of these results, it does not seem possible that left temporal damage could have accounted for PTSD status.

Poor performance on the Seashore Rhythm test may be caused by attentional or rhythmic problems, possibly indicating right temporal lobe injuries. But, there was little difference between groups on this test; all group means were slightly below the "impaired" cutoff. There was only one patient in the study to whom damage could be localized to the right temporal lobe. However, this patient obtained quite a good score (i.e. only three errors, compared to the overall mean of 6.6 errors). It is of interest to note that the DSM-III group of PTSD patients had clearly superior scores on the Speech Perception test yet were impaired on the Rhythm test, even though both tests are purported to measure auditory perception and require sustained attention and concentration. Examination of suspected brain damage to either the right or left temporal lobe does not appear to account for this discrepancy. A possible explanation lies in the superior verbal facility of this PTSD group. Their language skills may have compensated for any impairment to verbal auditory perception that could have been consequential to their head injury, yet not improve their non-verbal perception.

Right-hemisphere lesions. As previously mentioned, the PTSD groups formed from variants of Braverman and Lidvall criteria at all assessments were more likely to have received right-hemisphere lesions than could be expected from chance alone. The two WAIS-R tests considered good indicators of right hemisphere damage are Picture Arrangement and Block Design (refer to

Reitan, 1986): There was no separation between groups on the basis of these tests, nor were the group means on these subtests below expectation, based on Performance or Full Scale IQ for the group. On the contrary, the PTSD groups (i.e., from variants of Lidvall) that contained the most right-hemisphere cases had higher scores on these two WAIS-R tests than did the corresponding non-PTSD groups.

As previously stated, the number of patients with localized brain damage who were also PTSD-positive was generally at or below a projected figure based on chance alone. The exception was the four people (all right-handed) who received right frontal damage. While one subject never met PTSD criteria, three subjects met Braverman (2) criteria. Two of the PTSD patients also met at least one other set of criteria: DSM-III (3) or a variant of Lidvall. In contrast, only one of seven left frontal patients ever met PTSD criteria, according to DSM-III (4). It is known that nondominant frontal lesions may cause emotional changes, as well as disruption to high-level cognition (Damasio, 1979). The following discussion will show that while the right frontal damage explains the neuropsychological/ cognitive impairment, it does not account for variability in PTSD status.

Examination of the four people with right frontal lesions (test scores are provided in Appendix L) revealed the following:

1. The one non-PTSD subject (Mr. E.H., aged 33) had a normal MMPI profile, but was very impaired on the Halstead-Reitan and WAIS-R Performance subtests (especially Digit Symbol) although his literacy and verbal skills were intact.
2. A 34-year old woman (Mrs. M.O.) was PTSD-positive, according to variants of Braverman and Lidvall criteria. She had several slightly elevated MMPI scale scores (i.e., $68 \leq T \leq 73$ on *Hs*, *D*, *Hy*, *Sc*), good verbal comprehension and memory, but at least two-thirds of her Halstead-Reitan test scores were impaired, as were her WAIS-R Performance scores.
3. The two remaining right frontal patients had very elevated scores on the MMPI, especially *F*, *Pa*, *Sc*, *Ma*, and the PTSD content scale: These two young men (ages 18 and 19) had T-scores on the first four scales that differed from the other two right frontal patients by 27 to 47 T-score points. Their pattern of neuropsychological and cognitive functioning, however, was similar to the older right-hemisphere patients.

There are several explanations for the differences in both PTSD status and distress levels between Mr. E.H. and the other three subjects. It was possible that the absence of PTSD symptoms, together with a normal MMPI profile, obtained from the non-PTSD patient (Mr. E.H.) were the result of being assessed during a period of blunted affect early in his recovery. He was

tested before leaving hospital and was very cooperative at that time. In contrast, the other three individuals completed testing up to two months following discharge, and then there was generally less rapport with the examiner. According to Damasio (1979), frontal lobe patients tend to have either shallow or blunted affect or show sudden bursts of short-lived anger. Stressful circumstances, for example the assessment session, may set the patient's emotional tone toward a reaction that is inappropriate for the circumstances. In this study, Mr. E.H. displayed the shallow blunted affect of a right-frontal patient, while Mr. D.B. displayed anger, inappropriate aggression, and made threats of violence during the testing sessions. These results are also in keeping with the suspected location of the brain damage. While the former patient, Mr. E.H., had an acute subdural hematoma to the right frontal parietal area, causing emotional blunting according to Valenstein and Heilman (1979), the latter patient (Mr. D. B.) had neuroradiological evidence of damage to both the orbital surface of the frontal lobe and the anterior portion of the right temporal lobe. This could cause the inappropriate irritability and anger seen during the assessment (refer to Valenstein & Heilman, 1979) .

Another explanation for the apparent lack of distress in the non-PTSD patient was that he had fewer recent life events (i.e., score of 127) than the other three patients (i.e., $X = 826$). Also he (as well as Mrs M.O.) were hospitalized much longer (i.e., 175 and 182 days) than the two young men (i.e., 6 and 54 days): In this study, persons hospitalized longer were slightly less likely to be diagnosed with PTSD than those with short hospital stays. Finally, the high level of maladjustment seen in the two younger men can also be explained by pretraumatic factors. As well as having lower SES, one of the men (Mr. D. B.) tested positive for four pre-traumatic DSM-III disorders on the Diagnostic Interview Schedule. He also had a high Recent Life Event score of 727. The other patient (Mr. P.R.), while showing no evidence of pretraumatic psychiatric disorder, had an unusually high number of recent life events (score=1057), over three standard deviations above the mean. Not only had he recently lost both his parents; his grandmother (with whom he lived) died in the same accident in which he was injured. They were hit by a train at a railway crossing with the grandmother driving the car. Therefore, the post-traumatic emotional state of these two young men could certainly be accounted for by such pretraumatic factors. Of course, these results do not completely rule out the possibility that it was brain damage to the frontal lobe that most heavily contributed to their PTSD. However, in this research most of the individuals diagnosed with PTSD did not receive frontal lobe damage.

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While the connection between frontal lobe damage and PTSD is not clear, the neuropsychological test scores for these four right-frontal patients are completely explainable by brain damage: Memory and abstraction were highly impaired and an excessively high number of impaired scores on the other tests indicates that the overall integrity of the cerebral cortex was compromised. For example, the error scores obtained on the Category test by the older frontal patients, who had the most normal MMPI profiles (Mr. E.H. and Mrs. M.O.), were about twice as high as the mean for the other 14 subjects who completed this task at the initial assessment. This finding is consistent with those of Milner (1963) who found that the ability to shift from one strategy to another, such as in a sorting task, was more impaired in frontal-lobe patients (due to perseveration). Also in accordance with Milner (1971), some or all of the right frontal patients in this study had very impaired scores on TPT, Trail Making, and the WAIS-R Performance subtests that measure spatial learning .

Other neurological findings. Further investigation of the relationship between location and severity of injury and PTSD phenomena failed to disclose any other significant findings; although, the number of patients who could be subdivided into any specific location of brain damage was quite small. For example, a comparison of individuals with and without non-depressed skull fractures failed to reveal any evidence of behavioural differences; nor did patients with hematoma differ from those without hematoma.

Attention, Concentration and Memory. The Rhythm, Speech Perception, Category, TPT (Memory and Location), WAIS-R Arithmetic, and Digit Span tests may be used to objectively assess memory, concentration, and memory. In this study, the PTSD group diagnosed according to DSM-III criteria at initial assessment had either superior or equivalent scores to the non-PTSD group on these tests. Furthermore, the PTSD group scores were normal when compared either to published norms or to estimates of premorbid functioning. The PTSD group formed from DSM-III criteria also had means on these tests that were superior to those of the PTSD groups formed from alternative criteria. The latter PTSD groups were either slightly or significantly more dysfunctional on these tests than were the corresponding groups of non-PTSD patients. This occurred despite the non-PTSD patients being generally more seriously injured.

Interpretation of these differences in test scores together with group formation did not lead to conjecture of underlying neurological causes that would account for PTSD categorization: The

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scores on these tests reflected PTSD status only. Group mean differences on test scores were not consistent with those that have been found between head-injured and non-injured persons (see Dikmen et al., 1963). Furthermore, there were no group differences on either the Trail-Making test or the TPT Time measure (i.e., speed and flexibility of thought processes) between PTSD and non-PTSD groups, nor among PTSD groups; these measures may be impaired when there is brain damage. Finally, the Braverman and Lidvall PTSD groups did poorly on WAIS-R Digit Span and Arithmetic, but these tests are considered to be most affected by anxiety. Poorest mean scores on measures of sustained attention (Category and Rhythm), at approximately the level of impairment, occurred generally in the non-PTSD groups.

Attentional and memory variables measured shortly after the injury were able to predict who would have PTSD at follow-up, more than 8 months later. Individuals with poor Digit Span and Arithmetic scores at initial assessment, together with superior Speech Perception and Rhythm scores, were most likely to receive a PTSD diagnosis according to variants of Braverman or Lidvall at follow-up. In contrast, the PTSD groups formed at follow-up according to DSM-III/III-R criteria were either equivalent to or superior the corresponding non-PTSD groups in Digit Span and Arithmetic at initial assessment. Regardless of criteria, all PTSD groups were superior to non-PTSD groups on the Speech Perception and Rhythm tests at follow-up. Most objective measurements of cognitive functioning related to severity of head injury at initial assessment. At follow-up, scores on TPT Time related strongly to global severity of head injury. Scores on Digit Span and Arithmetic were not associated with any medical/neurological variable but were related to PTSD group formation when diagnoses were made according to variants of Braverman and Lidvall. It may be speculated that test scores on Digit Span and Arithmetic were more related to the subjective anxiety resulting from the trauma, than to the brain damage. In contrast, other measures of memory (TPT Location and Memory) not so affected by anxiety did not relate to PTSD group formation, but did relate to medical/neurological variables.

According to both Golden et al. (1981) and Lezak (1977), Digit Symbol is the subtest most sensitive to cognitive disruption caused by brain damage; regardless of the locus of the lesion. Mean scores on this test were lower than expected (from estimated premorbid functioning) for all groups, indicating that all subjects, taken together had some level of disruption probably caused by some degree of brain damage. Furthermore, of all the WAIS-R subtests, Digit Symbol correlated most highly with both the medical/neurological variables and the Halstead-Reitan Impairment Index.

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This impairment did not seem to be related to PTSD symptomatology, however; nor did Digit Symbol correlate with any of the MMPI scales or with previous psychiatric history.

Sensory and psychomotor functioning. There were no differences between PTSD and non-PTSD groups on Sensory Deficit scores when variants of DSM-III criteria were used for diagnosing patients. There were clear differences when variants of Braverman or Lidvall were used. The PTSD groups, formed from alternative sets of criteria, were two to three times as likely to have sensory impairment. This may reflect differences in attention and cooperation since these test scores had no observable association with medical indices of brain damage or localization of brain damage in this research. The PTSD group mean scores on the Finger Tapping test were almost always superior to the non-PTSD groups, possibly because of increased arousal, as they correlated highly with Anger scores.

Summary. The results from this study confirm the contention made in this study that the validity of dismissing "post-concussional symptoms" (e.g., headaches, vertigo, and impaired attention, concentration, and memory) by DSM-III/III-R as either associated features or indications of an "Organic Brain Syndrome" is questionable. The differences found (a) between PTSD and non-PTSD groups and (b) among PTSD groups formed from various sets of diagnostic criteria, were not explained by differential brain damage. Nor did these differences bear any resemblance to differences found in the literature between severely head injured and control subjects (refer to Bond, 1975; Levin et al., 1979; and Mandleberg & Brooks, 1975). For example, studies of severely head injured persons have found most of the Performance subtests to be impaired compared to Verbal subtests. This was generally not the case in this research. While there was some intertest scatter on the WAIS-R battery, especially for the Digit Symbol test, that may have indicated some level of impairment among all groups, it did not reflect PTSD status. The only subtests that were significantly impaired along group divisions were the WAIS-R Digit Span and Arithmetic tests, but only for variants of Braverman and Lidvall. These results can be fully explained by anxiety, distress and/or maladjustment, and not by brain damage.

In conclusion, the use of Lidvall et al. (1974) criteria in this study to diagnose PTSD was appropriate. The disorder identified by this criteria appeared to be of psychogenic origin and was not caused by any specific form of brain damage, despite having been labelled as Post-

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Concussional Syndrome in the past. Therefore, it appears that *PCS* and PTSD are equivalent. The results indicate that there was no association between PTSD diagnostic status as defined by Lidvall criteria and medical/neurological variables. Therefore, DSM-III does not seem justified in its dismissal as definitive of alternative PTSD/PCS symptoms that have been identified frequently among survivors of head injury and that have no known neurological cause. The validity of categorizing such symptoms into Organic Mental Disorder is also questionable. Furthermore, PTSD groups formed on the basis of Lidvall criteria come closest to meeting DSM-III's definition of a mental disorder (i.e., as being associated with distress and impairment). Thus, it appeared in this research that the use of alternative criteria, like Lidvall, led to more valid diagnoses of PTSD than did DSM-III/III-R.

Hypothesis Four

Demographic/Psychosocial Variables

Initial Assessment

Variants of DSM-III criteria. Results from the discriminant function analyses using demographic and psychosocial variable as predictors are shown in Table 48. The analyses using variants of DSM-III/III-R criteria were only significant when *DSM-III (4)* criteria was used: The subset of Age, Sex, and Psychiatric History accounted for 25% of the variability between groups (8% after cross-validation shrinkage). Less than a quarter of the non-PTSD group were correctly classified. The multivariate group mean difference was significant and the power was adequate. The PTSD group formed from DSM-III (4) criteria was compared with the non-PTSD group and the PTSD patients were found to be generally younger and to have a greater number of possible DSM-III disorders (see Table 49). The effect of sex on the discriminant function was suppressed: The males were more likely to have had a history of psychiatric disorders.

Braverman (2) criteria. As can be seen in table 49, the maximum separation between groups was achieved when *Braverman (2)* diagnostic criteria was used to form the groups, however, the optimal subset of Sex and Recent Life Events accounted for only 24% of the variability (17% after shrinkage for cross-validation). Only 50% of the PTSD patients were correctly classified while 93.8% of non-PTSD patients were correctly classified. There was greater variance among the smaller group on the variable Recent Life Events; suggesting that the alpha level ($p < .050$) was liberal, but still significant at $p < .05$. The PTSD group had a much higher score on the variable Recent Life Events than the non-PTSD group ($ES = 1.02$, refer to Table 49), and there was suppression of the gender effect. Males, as a group, obtained higher scores on Recent Life Events than females did.

Variants of Lidvall criteria. The optimal set of demographic/psychosocial variables that predicted group membership when diagnoses were made using either *Lidvall (1)* or *Lidvall (2)* criteria consisted of Recent Life Events and Psychiatric History, with variability due to gender suppressed (see Table 48). The power to separate the groups was adequate in both analyses. The PTSD group formed from either variant of Lidvall diagnostic criteria higher on Recent Life Events and had a greater history of psychiatric problems than did the non-PTSD group (see Table

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49). Despite multivariate group mean differences being significantly different, the discrimination function analyses resulted in poor classification of PTSD cases. Most of the PTSD cases were incorrectly classified, while approximately 95% of the non-PTSD cases were correctly classified.

Any set of criteria. There was significant group separation on the basis of Sex, Recent Life Events, and Psychiatric History when the PTSD group included patients who had been diagnosed as such by *any set of criteria* (see Table 48). The discriminant function correctly classified about 75% of all patients through jackknife cross-validation. The PTSD group contained a higher proportion of females than the non-PTSD group did, had significantly more recent life events, and more psychiatric disorders (see Table 49).

Summary. The multivariate group separation between PTSD and non-PTSD groups on the basis of psychosocial/demographic variables was greatest when the PTSD group was composed of patients who had received a PTSD diagnosis according to any set of diagnostic criteria. Regardless of diagnostic criteria, the group of all PTSD patients had more recent life events and a higher proportion of females. Except for those diagnosed as having PTSD by DSM-III (1) and DSM-III (2), the PTSD groups also had more premorbid psychiatric problems.

Midway Assessment

There was very poor discrimination on the basis of demographic/psychosocial variables between the groups that were formed at midway, regardless of diagnostic criteria (see Table 50). All multivariate group mean differences were small and non-significant. Due to the small size of the multivariate effect and the small number of subjects, the power was inadequate to find any multivariate group mean differences. Univariate group mean differences are given in Table 51.

Follow-up Assessment

Regardless of diagnostic criteria, there was very poor discrimination between the groups formed at follow-up when optimal subsets of demographic/psychosocial variables were used as predictors. In most of the analyses (see Table 52) all subjects were classed as non-PTSD. Multivariate group mean differences were small and non-significant. Due to the small size of the multivariate effect sizes and the small number of subjects at follow-up, the power was inadequate to

Table 48

Results from *Initial* Multivariate Analyses Using as Predictors 'Best' Subsets of Demographic and Psychosocial Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified: PTSD (Sensitivity) ₂ non PTSD (Specificity) ₃ Total		
DSM-III (1)	Sex	54, 6	.08	.03	5.10	.94	.60	2.50	1,60	n.s.	15.7	96.3	88.3
											0.0	94.0	83.5
DSM-III (2)	Age	26,10	.06	.02	2.03	.28	.30	2.03	1,36	n.s.	0.0	100	72.2
											0.0	100	72.2
DSM-III (3)	Age	50,10	.11	.04	7.26	.87	.40	1.70	3,60	n.s.	10.0	98.0	83.1
	Sex										10.0	98.0	83.1
	Psych. Hx.												
DSM-III (4)	Age	20,16	.25	.08	12.17	1.34	.75	3.83	3,36	.019	25.0	95.2	64.9
	Sex (S)										18.8	95.2	62.2
	Psych. Hx												
Braverman (2)	Sex (S)	48,12	.24	.17	18.40	1.92	1.0	9.04	2,60	.000 (lib.)	50.0	93.8	85.0
	Life Events										50.0	93.8	85.0
Lidvall (1)	Sex (S)	50,10	.20	.13	12.01	1.44	.85	3.88	3,60	.014	20.0	94.0	81.7
	Life Events										20.0	94.0	81.7
	Psych. Hx												
Lidvall (2)	Sex (S)	47,13	.23	.17	16.47	1.62	.80	5.51	3,60	.003	23.1	97.9	81.7
	Life Events										15.4	93.6	76.7
	Psych. Hx												
Any criteria	Sex	35,25	.34	.24	27.02	1.85	.95	8.70	3,60	.000 (lib.)	88.0	80.0	83.3
	Life Events										76.0	74.3	75.0
	Psych. Hx												

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 49

Group Means, Effect Sizes, and t-test Values for Demographic / Psychological Variables: Initial Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Bremner (2)		Loyal (1)		Loyal (2)		Any Criteria	
	AP/PTSD t-test	ES	AP/PTSD t-test	ES	AP/PTSD t-test	ES	AP/PTSD t-test	ES	AP/PTSD t-test	ES	AP/PTSD t-test	ES	AP/PTSD t-test	ES	AP/PTSD t-test	ES
Age	28.3 31.3	.21 .48	25.3 34.5	.65 1.75	26.1 32.0	.46 1.33	26.0 36.0	.63 1.91	29.8 31.3	.10 .32	32.7 30.7	-.13 -.37	31.5 30.9	-.04 -.12	27.2 33.8	.45 1.71
Sex	1.67 1.30	.72 1.68	1.50 1.38	.24 .60	1.40 1.32	.16 .45	1.50 1.33	.33 1.00	1.42 1.31	.21 .64	1.50 1.30	.39 1.12	1.46 1.30	.32 1.03	1.48 1.23	.53 2.01*
SES	44.7 45.7	.07 .17	47.8 48.5	.05 .13	43.1 46.1	.19 .55	45.3 48.5	.30 .91	40.0 46.9	.52 1.61	41.6 46.4	.33 .97	41.8 46.6	.35 1.12	42.9 47.4	.32 1.23
Recent Events	315.8 316.4	-.00 -.01	324.1 274.2	.27 .73	380.4 301.5	.41 1.18	378.3 237.7	.71 2.14*	537.3 261.1	1.02 3.15**	482.0 283.2	.68 1.96	461.5 276.2	.71 2.28*	432.3 233.5	.88 3.35**
Psych. Hx	0.67 1.02	-.38 -.88	0.60 0.81	-.19 -.52	1.60 0.86	.38 1.11	1.31 0.38	.67 2.02	2.25 0.67	.67 2.07	1.90 0.80	.51 1.47	2.08 0.68	.73 2.32*	1.56 0.57	.58 2.22*

Note. ES = effect size; a negative sign indicates that the PTSD group was *less* distressed or *less* impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (t) = data collected at initial assessment; (F) = data collected at follow-up assessment.

* = $p < .05$; ** = $p < .01$

Table 50

Results from Midway Multivariate Analyses Using as Predictors 'Best' Subsets of Psychosocial and Demographic Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix, % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Sex	41,5	.07	.00	5.91	1.33	.60	2.89	1,46	n.s.	20.0 0.0	92.7 92.7	84.8 82.6
DSM-III (2)	Age	26,9	.05	.00	1.57	.23	.20	1.57	1,35	n.s.	0.0 0.0	100 100	74.3 74.3
DSM-III (3)	Sex	38,8	.12	.03	2.71	.41	.60	1.33	1,46	n.s.	0.0 0.0	100 100	82.6 82.6
DSM-III (4)	Sex Age	23,12	.13	.04	4.91	.62	.45	2.38	2,35	n.s.	0 0	100 100	65.7 65.7
Braverman (2)	Sex	37,9	.03	.00	1.25	.17	.10	1.25	1,46	n.s.	0 0	100 100	80.4 80.4
Lidvall (1)	Sex Psych Hx.	41,5	.11	.03	5.45	1.22	.65	2.66	2,46	n.s.	0.0 0.0	100 92.7	89.1 82.6
Lidvall (2)	SES	38,8	.01	.00	.61	.09	.05	0.61	1,46	n.s.	0.0 0.0	100 100	82.6 82.6
Any Criteria	Age Sex	22,24	.06	.00	3.63	.39	.15	1.03	2,46	n.s.	52.9 35.3	58.6 41.4	56.5 39.1

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 51

Group Means, Effect Sizes, and t-Test Values for Demographic / Psychosocial Variables: Midway Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		DSM-III (3)		DSM-III (4)		Breveman (2)		Loyal (1)		Loyal (2)		Any Criteria	
	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES
Age	26.9	.24	26.0	.50	28.8	.29	26.9	.54	31.4	.07	37.6	-.46	34.5	-.23	29.1	.33
	32.7	.51	34.5	1.54	33.0	.74	35.2	1.53	32.4	.18	31.6	-.97	31.8	-.58	33.9	1.07
Sex	1.80	1.02	1.44	.12	1.63	-.55	1.58	.56	1.56	.40	1.80	1.02	1.50	.25	1.44	.14
	1.34	2.15	1.38	.30	1.34	-1.42	1.30	1.57	1.35	1.06	1.34	-2.15	1.37	.64	1.37	.45
SES	48.4	-.07	48.1	-.05	50.1	-.21	49.8	-.14	44.7	.28	50.8	-.27	49.6	-.16	48.7	-.12
	47.5	-.14	48.5	-.13	47.1	-.55	48.0	-.40	48.3	.76	47.2	-.58	47.2	-.40	47.0	-.58
Recent Events	324.0	.21	325.2	.27	276.6	-.12	322.9	.29	313.3	.16	349.8	.39	303.7	.08	313.7	.17
	289.0	.44	274.2	.69	296.1	-.31	268.8	.82	287.8	.44	285.8	.82	290.4	.21	281.6	.56
Psych Hz	0.80	-.03	.67	-.13	.63	-.25	0.75	-.03	0.89	.07	1.20	.25	0.88	.04	0.94	.15
	0.83	-.06	.81	-.34	.87	-.65	0.78	-.08	0.81	.18	0.78	.54	0.82	.11	0.77	.33

Note. ES = effect size, a negative sign indicates that the PTSD group was *less* distressed or *less* impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (1) = data collected at initial assessment; (2) = data collected at follow-up assessment

• = $p < .05$; ** = $p < .01$

PTSD

find any multivariate group mean differences. Univariate group mean differences are given in Table 53.

All Predictor Variables

All the variables from the five optimal subsets of predictor variables were combined and entered into BMDP's Setwise Regression to produce new best subsets of predictor variables. Discriminant analyses were performed on these best subsets to find an optimal subset of predictors that would provide maximum classification of cases. These analyses are a condensation and summary of the results obtained in Hypothesis Two and Three and will provide information on the types of cases for which the different sets of diagnostic criteria disagree. In the following discussion, the group means and effect sizes for the univariate group differences are given for all the predictor variables used in the multivariate analyses. This is to aid in the interpretation of results and to save the reader from having to flip back to tables presented earlier. The order for the group means given is always the PTSD group first, followed by the non-PTSD group mean.

Initial Assessment

DSM-III (1) criteria. There was good discrimination on the basis of all predictor variables between groups that were diagnosed according to DSM-III criteria, although group separation was not as high as it was under alternative criteria (see Table 54). The discriminant function used for *DSM-III (1) criteria* correctly classified 75% of the PTSD cases and 94% of the non-PTSD cases when an optimal subset of MMPI *L*, duration of hospitalization, and WAIS-R Picture Arrangement was used. Univariate group mean differences showed that the PTSD group was hospitalized longer (58.8, 32.3, $ES = .33$) and had scores on MMPI *L* ($X = 49.2, 53.1, ES = -.51$) that were indicative of self-confidence. As an aside, they also had lower scores on the MMPI *PTSD* content scale ($X = 7.3, 12.2, ES = -1.18$). The PTSD group scored almost 1.5 standard deviations higher than the non-PTSD group on Picture Arrangement ($X = 13.3, 8.3, ES = -1.43$), a WAIS-R subtest purported to measure social knowledge and skill. Low scores (as obtained by the DSM-III non-PTSD group) may indicate transient inattention or impulsiveness, as well as failure to monitor one's behaviour. These results are in a direction contrary to what was expected and to the group mean differences when diagnoses were based on Braverman or Lidvall criteria: When alternative criteria were used, the PTSD group had equal scores on the MMPI *L* scale and higher scores on the MMPI *PTSD* scale (by

Table 52

Results from Follow-Up Multivariate Analyses Using as Predictors 'Best' Subsets of Demographic/Psychosocial Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ¹ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1)	Age SES	31, 7	.09	.00	3.36	.59	.30	1.06	2,38	n.s.	0.0	100	81.6
											0.0	100	81.6
DSM-III (3)	Life Events Age	29, 9	.07	.00	2.63	.38	.30	1.28	2,38	n.s.	0.0	100	76.3
											0.0	100	
Braverman (2)	Sex	29, 9	.11	.01	1.30	.19	.26	1.30	1,38	n.s.	0.0	100	76.3
											0.0	100	76.3
Lidvall (1)	Sex Life Events	34, 4	.13	.02	5.55	1.55	.60	1.75	2,38	n.s.	25.0	97.0	89.5
											25.0	91.0	89.5
Lidvall (2)	Sex Psych. Hx	31, 7	.10	.01	4.31	.75	.50	2.02	2,38	n.s.	14.2	100	84.2
											0.0	90.3	73.7
Any criteria	Sex Psych. Hx	22, 16	.11	.01	4.61	.49	.40	2.24	2,38	n.s.	62.5	63.6	63.2
											62.5	63.6	63.2

Note. *n* = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at *p* < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ¹ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ² = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ³ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

TABLE 53

Group Means, Effect Sizes, and t-test Values for Demographical / Psychosocial Variables: Follow-up Diagnoses of PTSD

	DSM-III (1)		DSM-III (2)		Bereavement (2)		Lowell (1)		Lowell (2)		Any Criteria	
	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES	X(PTSD)	ES
Age	26.1	.50	25.3	.63	30.6	.11	28.5	.22	28.7	.24	28.4	.42
	33.3	1.18	34.0	1.66	32.4	.29	32.4	.41	32.7	.58	34.5	1.13
Sex	1.28	-.21	1.44	.18	1.67	.80	1.75	.86	1.57	.47	1.50	.53
	1.39	-.50	1.34	.50	1.28	2.09	1.32	1.62	1.32	1.13	1.27	1.41
SES	51.4	-.26	51.2	-.29	49.8	-.13	55.0	-.76	46.6	.16	50.0	-.25
	47.6	-.63	47.4	-.75	47.8	-.32	47.5	-.43	48.7	.39	47.0	-.66
Recent Events	345.6	.41	342.7	.46	300.1	.13	359.7	.53	383.4	.65	313.6	.35
	263.0	.89	258.2	1.21	271.4	.35	268.6	1.07	254.5	1.55	252.5	.93
Psych. Hx	0.86	.05	0.89	.09	0.89	.05	0.25	-.96	1.43	.35	1.12	.43
	0.81	.12	0.79	.23	0.79	.14	0.88	-1.82	0.68	.84	0.59	1.14

Note. ES = effect size, a negative sign indicates that the PTSD group was less distressed or less impaired than the non-PTSD group, or have scores that are unexpected for the supposedly more-distressed PTSD group; X = the group mean for the PTSD group is given on the first line, followed by the group mean of the non-PTSD group; t = the t value given is that for the separate t-test; (1) = data collected at initial assessment; (2) = data collected at follow-up assessment.

• = $p < .05$; ** = $p < .01$

Table 54
Results from *Initial* Multivariate Analyses Using as Predictors 'Best' Subset of All Variables

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified: PTSD (Sensitivity) ₂ non PTSD (Specificity) ₃ Total		
DSM-III	MMPI L (U) Duration of hospitalization WAIS - R Picture Arrangement (U)	36, 4	.50	.28	22.44	4.16	1.0	5.92	3,40	.001	75.0 75.0	97.2 94.4	95.0 92.5
DSM-III (2)	MMPI L (S) K Impaired Consciousness Severity (S) WAIS - R Vocabulary (S) Digit Symbol Picture Arrangement (U)	17, 8	.66	.41	40.88	5.66	1.0	4.82	7,25	.003 (lib.)	75.0 62.5	100 88.2	92.0 84.0
DSM-III (3) 275	MMPI Sc Sex (S) Finger Tapping (U) WAIS - R Vocabulary (S) Picture Arrangement (U) Digit Symbol (S) Full Scale IQ (U)	33, 7	.54	.34	41.15	4.94	1.0	4.86	7,40	.001	83.3 66.7	93.9 93.9	91.7 88.9
DSM-III (4)	Psych. Hx Duration of impaired consciousness TPT Location WAIS-R Vocabulary (S) Digit Span Picture Arrangement (S) Digit Symbol Full Scale IQ (S)	14, 12	.83	.60	60.16	6.63	1.0	9.29	8,26	.000	100 81.8	100 92.3	100 87.5
Braverman (2)	MMPI Hy Pd (S) Life Events GCS score at adm. Severity (S) WAIS-R Arithmetic Block Design (S)	35, 5	.53	.28	79.35	8.27	1.0	5.15	7,40	.001	80.0 80.0	100 97.0	97.5 95.0

(Table 54 continued)

Diagnostic Criteria	Best Subset of Predictors	α (non PTSD), n (PTSD)	R^2	Adj. R^2	T^2	D^2	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified: PTSD (Sensitivity) ₂ non PTSD (Specificity) ₃ Total		
Lidvall (1)	MMPI L (S) F Hs Pd (S) Severity (S) GCS score at adm. (S) Sensory Deficit WAIS-R Vocabulary (S) Verbal IQ Block Design (S)	36, 5	.79	.55	138.87	31.74	1.0	7.00	10,40	.000 (lib.)	100 80.0	100 100	100 97.5
Lidvall (1) (alternative)	Psych. Hx WAIS-R Vocabulary (S) Picture Arrangement (S) Verbal IQ	36, 5	.48	.34	36.18	4.34	1.0	8.46	4,41	.000	80 80	97.2 97.2	95.0 95.0
Lidvall (2)	MMPI Mf Sc WAIS-R Arithmetic Vocabulary (S) Picture Arrangement (S) Block Design (S) Comprehension (S) Verbal IQ	34, 6	.69	.51	83.15	16.30	1.0	8.48	8,40	.000 (cons.)	100 100	100 100	100 100
Any Criteria	Anger MMPI Ma Sex Duration of hospitalization WAIS-R Vocabulary Picture Arrangement (U) Digit Span:	25,15	.72	.55	136.88	9.39	1.00	12.67	7,40	.000	100 81.3	100 91.7	100 87.5

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; $n.s.$ = not significant at $p < .05$; R^2 = squared multiple correlation; Adj. R^2 = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R^2 rather than the more liberal Wherry formula used in BMDP; T^2 = Hotelling's multivariate group difference; D^2 = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

PTSD

0.5 standard deviations) than the non-PTSD group, thus indicating greater distress in the PTSD groups. Furthermore, there was little or no difference between groups on the Picture Arrangement scale when diagnoses were based on Braverman or Lidvall criteria. DSM-III (2) criteria. Discrimination between groups was also adequate when diagnoses were made on the basis of *DSM-III (2) criteria* and the group mean difference was significant at $p < .005$ (see Table 54). The discriminant function analysis correctly classified 88% of the non-PTSD cases and 63% of the PTSD cases. The PTSD group, formed on the basis of *DSM-III (2) criteria* had (a) higher scores than the non-PTSD group on the MMPI *K* scale ($X = 59.6, 54.3, ES = -.63$) with variability due to scores on the MMPI *L* scale suppressed; (b) a longer period of impaired consciousness ($X = 389.7, 143.2, ES = .63$), with variability due to overall severity suppressed; (c) slightly lower scores on WAIS-R Digit Symbol (i.e., learning and persevering at an unfamiliar task, $X = 7.1, 8.1, ES = .48$), and (d) slightly higher scores on Picture Arrangement (i.e., analyzing and applying knowledge of social situations, $X = 10.8, 99.2, ES = -.38, p < .10$), with variability accounted for by Vocabulary suppressed.

The univariate group mean differences on the MMPI validity scales *L* and *K* are a good example of the differences that occurred between PTSD and non-PTSD groups when a variant of *DSM-III* criteria was used for diagnosis and when Braverman (2) or Lidvall (2) criteria were used. The PTSD group had consistently lower *L* scores and higher *K* scores than the non-PTSD group (by 0.5 standard deviation, on average) when diagnoses are made using *DSM-III* criteria. In contrast, when the diagnoses of PTSD were made using any variant of Braverman or Lidvall criteria, the PTSD group had higher *L* scores and lower *K* scores than the non-PTSD group. This suggests that clinically the group of patients who were diagnosed as having PTSD by *DSM-III/III-R* had a tendency to be self-reliant, insightful, to present themselves in a favourable light, and to be able to cope with (or at least reduce) the impact of psychological problems. This observation is further supported by the results that show the *DSM-III* PTSD groups, on the whole, obtained lower scores on the clinical and content MMPI scales (less distress) and consistently superior performance on neuropsychological and cognitive tests (than the non-PTSD groups did). Formation of groups on the basis of Braverman or Lidvall criteria lead consistently to PTSD groups that had consistently higher scores on the clinical and content scales of the MMPI and lower scores on the WAIS-R subscales than the non-PTSD groups: The PTSD group mean profile suggests that as a group there was a tendency to be less insightful and to have poorer tolerance for stress than the non-PTSD group.

PTSD

DSM-III (3) criteria. The contrast between PTSD groups formed from DSM-III (1) or (2) criteria and those formed from Braverman or Lidvall criteria began to change when DSM-III (3) criteria were used. This suggests that the 1987 revisions brought DSM-III-R criteria for PTSD closer to alternative criteria, however, there was a smaller multivariate group difference between the PTSD and the non-PTSD group when DSM-III (3) criteria were used than had been the case when DSM-III (1), Braverman (2), Lidvall (1), or Lidvall (2) criteria were used (see Table 54). Still, the PTSD group formed on the basis of *DSM-III (3)* was significantly different from the non-PTSD group: with higher scores on the MMPI *Sc* scale ($X = 66.9, 62.9, ES = .27$), and superior scores on WAIS-R Picture Arrangement ($X = 11.6, 8.2, ES = -.96$) and Full Scale IQ ($X = 93.4, 88.3, ES = -.45$). Variability accounted for by Vocabulary and Digit Symbol was suppressed. These results suggest that the PTSD group was distressed, but not impaired.

DSM-III (4) criteria. When diagnoses of PTSD were made according to *DSM-III (4)* criteria, the multivariate group mean difference between the PTSD and non-PTSD groups increased and the discriminant function accounted for well over half of the variability in the criterion variable. While all of the cases were initially classified correctly, there was evidence of overfitting because the sensitivity and specificity decreased to 81.8% and 92.3%, respectively, on cross-validation (see Table 54). The PTSD group, compared with the non-PTSD group, had a more troubled psychiatric history ($ES = .67$) and a longer period of impaired consciousness ($ES = .48$). The PTSD group had poorer scores than the non-PTSD group on TPT Location ($X = 3.4, 3.8, ES = .20$), WAIS-R Digit Span ($X = 7.0, 9.2, ES = .79$), and Digit Symbol ($X = 6.8, 8.6, ES = .80$). Variability accounted for by Vocabulary, Picture Arrangement, and Full Scale IQ was suppressed. There was evidence of impairment in this PTSD group.

Braverman (2) criteria. This discriminant function analysis (see Table 54), using an optimal subset of all predictor variables, correctly classified through the jackknife procedure all but one of the PTSD group and all but one of the non-PTSD group. The PTSD group had, compared with the non-PTSD group, a higher score on MMPI *Hy* ($X = 64.3, 57.2, ES = .94$) suggesting greater utilization of hysterical reactions to stress situations. Variability accounted for by MMPI *Pd* (i.e., social maladjustment) was suppressed. The PTSD group also endorsed more recent life events than the non-PTSD group ($X = 537.3, 261.1, ES = 1.02$) and had lower GCS scores when admitted to hospital ($X = 11.1, 12.1, ES = .27$), with variability due to overall severity suppressed.

PTSD

Scores on the WAIS-R Arithmetic test were lower for the PTSD group than for the non-PTSD group ($X = 5.2, 8.2, ES = 1.66$) with variability accounted for by Block Design (i.e., analytic ability) suppressed.

Lidvall (1) criteria. There was also good separation between groups diagnosed on the basis of *Lidvall (1)* criteria. A discriminant function based on a large subset of variables accounted for 79% of the variability (55% after shrinkage). All cases were correctly classified initially, but one PTSD patient was misclassified in the jackknife classification (see Table 54). Multivariate group mean differences were very significant but the number of predictor variables was over twice the number of cases in the small group. This probably gave the discriminant function a positive bias. Another discriminant function was tried with a smaller best subset of predictors. This function, although more stable, misclassified one non-PTSD patient and one PTSD patient. The multivariate group mean difference was also not as large. The PTSD group that had been formed on the basis of *Lidvall (1)* criteria had higher scores, compared with the non-PTSD group, on MMPI *Hs* ($X = 68.5, 57.2, ES = .83$) and MMPI *F* ($X = 66.1, 59.9, ES = .35$) with suppression of variability accounted for by MMPI *L* and *Pd*. On neuropsychological functioning, the PTSD group had a greater sensory deficit ($X = 2.3, 1.4, ES = .81, p < .05$), and lower Verbal IQ ($X = 82.6, 91.5, ES = 1.57, p < .00$) than did the non-PTSD group. Variability due to word usage (i.e., Vocabulary), analytical ability (i.e., Block Design), and severity of injury was suppressed, thus highlighting the relationship between cognitive impairment and diagnoses of PTSD from *Lidvall (1)* criteria. The PTSD group in this analysis was characterized by both level of distress and impairment of certain cognitive functions.

Lidvall (2) criteria. For groups that were diagnosed on the basis of *Lidvall (2)* criteria, an optimal subset of all predictor variables correctly classified 100% of the cases through the jackknife procedure (see Table 54). Over half of the variability between the groups (even after adjustment for shrinkage) was accounted for by an optimal subset of variables and the multivariate group mean difference was highly significant at $p < .000$. Furthermore, this estimate of the alpha level may have been conservative as there was greater variability in the larger group on the variable WAIS-R Block Design. The PTSD group formed on the basis of *Lidvall (2)* criteria had significantly higher scores than the non-PTSD group on MMPI *Sc* ($X = 69.9, 61.8, ES = .41$) and lower scores on *Mf* ($X = 55.7, 59.7, ES = .35$), WAIS-R Arithmetic ($X = 5.5, 8.2, ES = 1.48$), and Verbal IQ ($X = 83.3, 91.7$,

PTSD

ES = 1.48). These results suggest that this PTSD group was very homogeneous on variables of distress, cognitive impairment, and gender stereotyping. The suppressor variables were Vocabulary (i.e., word usage), Picture Arrangement (i.e., social knowledge), Block Design (i.e., analytical ability), and Comprehension (i.e., ability to analyze social customs).

Any set of criteria. In response to the issue of whether less restrictive criteria for PTSD increases or decreases the homogeneity of PTSD groups, results indicated that it was possible to obtain good multivariate group separation and discrimination between the PTSD and the non-PTSD group when PTSD diagnoses were made according to any set of diagnostic criteria: An optimal subset accounted for over half of the variability between groups and produced a large multivariate group separation (see Table 54). Although the discriminant function initially identified all cases correctly, jackknife classification reduced this figure to 81% of the PTSD cases and 92% of the non-PTSD cases. The PTSD group: (a) was significantly more angry than the non-PTSD group ($X = 328.8, 298.7, ES = .52$), (b) had higher scores on MMPI Ma ($X = 66.4, 62.4, ES = .34$), (c) had a significantly high proportion of women, (d) was hospitalized longer ($X = 48.5, 25.1, ES = .39$), and (e) had lower scores on WAIS-R Vocabulary ($X = 7.8, 8.6, ES = .34$) and Digit Span ($X = 6.7, 8.9, ES = .85$), but (f) higher Picture Arrangement scores ($X = 9.9, 8.0, ES = -.53$). The high group mean score on Picture Arrangement was largely accounted for by the cases of PTSD diagnosed by DSM-III criteria; while the low group mean score on Digit Span was heavily influenced by PTSD cases diagnosed according to Braverman or Lidvall.

Summary. Multivariate group separation on the basis of optimal subsets of all predictor variables was maximal when diagnoses were made on the basis of Lidvall (1) criteria, Lidvall (2) criteria, or the combination of criteria (i.e., $83.15 < T^2 < 138.87, p < .009$). The best discrimination of cases on the basis of an optimal subset of all predictors was obtained in a discriminant analysis of Lidvall (2) diagnoses, in which all cases were correctly identified. It could also be concluded that the most homogeneity among PTSD patients occurred at initial assessment when less restrictive criteria were used for diagnosis.

Midway Assessment

DSM-III (1) criteria. Of the DSM-III variants, the best prediction of midway PTSD diagnostic status (on the basis of the initial assessment data) occurred for *DSM-III (1)*. Multivariate group

PTSD

separation was significant ($p < .000$), the sensitivity was 80%, and the specificity was 95% (see Table 55). This PTSD group (composed of four women and one man) had, compared with the non-PTSD group, been more angry ($X = 340.2, 305.0, ES = 1.03$) at initial assessment but presented themselves as psychologically healthy and relatively free of psychopathology (X on MMPI $K = 63.8, 54.5, ES = -2.22$; X on MMPI $F = 55.2, 60.3, ES = -1.25$). Serious pathology or maladjustment was denied. For example, mean scores for the PTSD group were lower than those for the non-PTSD group on MMPI Ma ($X = 54.4, 63.6, ES = -.67$). As an aside, all of the high scorers on the PTSD content scale at initial assessment were non-PTSD at that time according to DSM-III (1), and remained so at midway (X on MMPI PTSD = 5.2, 10.9, $ES = -1.79$). The PTSD group had superior motor functioning, compared to the non-PTSD group, on Finger Tapping ($X = 59.0, 48.8, ES = -1.84$). The only Halstead-Reitan task that the PTSD group had poor scores on was Trail Making ($X = 10.0, 13.3, ES = .69$), a measure of cognitive flexibility and sequencing skills. The discriminant analysis conducted of midway DSM-III (1) groups with follow-up distress and neuropsychological variables, and medical/neurological and demographic/psychosocial variables was non-significant at $p < .05$.

DSM-III (2) criteria. The discriminant function conducted with initial scores on predictor variables produced a very significant multivariate group separation, but the values for sensitivity and specificity were reduced after jackknife cross-validation; thus suggesting a positive bias (see Table 55). Univariate analysis revealed that the PTSD group had experienced a longer duration of impaired consciousness ($X = 433.0, 143.2, ES = .72$) and were, at the time of initial assessment, more angry ($X = 337.8, 292.8, ES = .98$), yet trying to appear psychologically healthy (X on MMPI $K = 60.6, 54.3, ES = -.75$). The PTSD group, although hospitalized longer and experiencing a longer period of impaired consciousness, appeared to be neither more seriously injured nor to be more neuropsychologically impaired. For example, the PTSD group received superior scores at the initial assessment on Speech Perception ($ES = -.83$) and Finger Tapping ($ES = -1.12$).

The group that was PTSD-positive at midway according to DSM-III (2) was still statistically distinct from the non-PTSD group by the time of follow-up (see Table 55). The PTSD group, at the time of follow-up, was still more angry ($X = 335.6, 303.6, ES = .89$) and had higher scores on MMPI Hy ($X = 63.3, 57.7, ES = .94$).

Table 55

**Results from Midway Multivariate Analyses Using as Predictors 'Best' Subsets of All Variables:
Data Collected at either Initial or Follow-up Assessment**

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix, % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
DSM-III (1) (Init. Assess.)	Anger MMPI K (U) Ma (U) TPT Memory (S) Finger Tapping (U) Trail Making	41, 5	.48	.35	28.77	6.46	1.0	4.45	7,46	.000	80.0 80.0	94.9 94.9	93.0 93.0
(FU Assess.)	Sex GCS at adm. Duration of hospitalization Speech Percep.	25, 4	.50	.30	7.00	1.57	.75	2.18	4,29	n.s.	50.0 25.0	96.0 92.0	89.7 82.8
DSM-III (2) (Init. Assess.)	Anger MMPI K (U) Duration of impaired consciousness Finger Tapping (U)	26, 9	.49	.35	31.55	4.72	1.0	7.17	4,35	.000	77.8	100 55.6	94.3 88.5
(FU Assess.)	Anger MMPI Hy Duration of impaired consciousness	20, 7	.55	.37	15.85	2.37	1.0	4.19	3,27	.005	42.9 42.9	90.0 90.0	77.8 77.8
DSM-III (3) (Init. Assess.)	Duration of hospitalization WAIS-R Picture Arrangement (U)	25, 6	.28	.18	9.20	1.39	.80	4.29	2,31	.020	33.3 33.3	96.0 96.0	83.9 83.9

(Table 55 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix; % of subjects correctly classified:		
											PTSD (Sensitivity ₂)	non PTSD (Specificity ₃)	Total
DSM-III (3) (FU Assess.)	Anger MMPI Hs Hy Duration of hospitalization GCS at adm. Finger Tapping (U)	21, 6	.58	.40	44.32	6.69	1.0	4.63	6,27	.001	100 83.3	100 85.7	100 85.2
DSM-III (4) (Init. Assess.)	MMPI PTSD (U) Age WAIS-R Digit Symbol	15, 9	.55	.41	34.31	4.29	1.0	8.17	3,24	.000 (cons.)	88.9 88.9	93.3 86.7	91.7 87.5
(FU Assess.)	Anger Sex Duration of Impaired consciousness GCS at adm. TPT Memory (U) Location (S)	19, 10	.63	.45	24.51	3.10	1.0	3.07	6,29	.018	50.0 50.0	89.5 89.5	75.9 75.9
Braverman (2) (Init. Assess.)	Hematoma WAIS-R Digit Span Digit Symbol	26, 5	.54	.34	12.62	1.74	.75	5.61	3,31	.008	60.0 40.0	96.2 96.2	90.3 87.1
(FU Assess.)	Anger MMPI Mf Speech Percep. (U)	21, 6	.42	.28	18.12	2.50	1.0	5.46	3,27	.003	66.7 66.7	95.2 90.5	88.9 85.2
Lidvall (1) (Init. Assess.)	Anger MMPI Pd (U) Duration of hospitalization (U) Duration of Impaired consciousness (U) Rhythm (U) Finger Tapping (U)	41, 5	.38	.20	21.84	4.90	1.0	2.59	7,46	.023	40.0 40.0	97.4 94.9	90.9 88.6

(Table 55 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
Lidvall (1) (FU Assess.)	MMPI F (U) Si TPT Location (U)	23, 4	.57	.40	32.70	7.34	1.0	10.22	3,27	.000	75.0	95.7	92.6
											75.0	95.7	92.6
Lidvall (2) (Initial Assess.)	Duration of hospitalization (U) Duration of impaired consciousness (U) Skull Fracture Finger Tapping (U) WAIS-R Digit Span Picture Arrangement (U)	26, 5	.70	.48	42.59	6.45	1.0	9.26	6,31	.000	100	100	100
											80.0	96.2	93.5
(FU Assess.)	MMPI Si TPT Location (U)	22, 5	.43	.29	17.92	2.71	1.0	8.98	2,27	.000	60.0	100	92.6
											60.0	100	92.6
Any Criteria (Init. Assess.)	Anger MMPI Hy (S) WAIS-R Picture Arrangement (U) Full Scale IQ (S)	19, 12	.73	.55	42.19	3.07	1.0	9.94	4,31	.000	90.9	100	95.0
											90.9	88.9	90.0
(FU Assess.)	Anger MMPI Hy (S) Pd (U) Duration of impaired consciousness	14, 13	.69	.50	47.12	4.40	1.0	8.26	4,27	.000	92.3	85.7	88.9
											84.6	85.7	85.2

Note. n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at $p < .05$; R^2 = squared multiple correlation; Adj. R^2 = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R^2 rather than the more liberal Wherry formula used in BMDP; T^2 = Hotelling's multivariate group difference; D^2 = Mahalanobis' distance; τ_1 = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; τ_2 = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; τ_3 = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria.

DSM-III (3) criteria. The PTSD and non-PTSD groups formed at midway according to *DSM-III (3) criteria* could be more readily discriminated at follow-up than at initial assessment. The discriminant function using follow-up data correctly identified all cases but there was evidence of overfitting because both sensitivity and specificity decreased after jackknife classification. The midway PTSD group formed from *DSM-III (3) criteria* had a longer hospital stay ($X = 60.6, 31.0, ES = .40$), despite slightly better GCS scores at admission ($X = 12.5, 11.6, ES = -.27$); and (compared to non-PTSD patients) was quite angry at both assessments (effect sizes $> .82$) with higher MMPI *Hs* and *Hy* scores (effect sizes $> .44$). As an aside, high scorers on the *Ma* and *PTSD* scales were diagnosed as non-PTSD (effect sizes on these scales were moderate to very large). Members of the PTSD group had good sensorimotor skills ($ES = -1.38$ on Finger Tapping). Other univariate results indicated that both groups were equally impaired on the Halstead Reitan Impairment Index at initial assessment. By follow-up, most of the PTSD patients were less impaired than the non-PTSD group ($ES = -.47$).

DSM-III (4) criteria. Analysis of the univariate scores obtained when *DSM-III (4) criteria* were used at midway indicated that the PTSD group, compared to the non-PTSD group, were more angry ($ES > 1.0$), but considered themselves as functioning relatively effectively (MMPI *F*, $ES > -.60$) at the time of both initial and follow-up assessment. As with all variants of *DSM-III criteria*, high scorers on the *F* and *PTSD* scales were more inclined to be diagnosed as PTSD-negative. All of the PTSD patients had good sensorimotor and language function at initial assessment ($ES > -.53$ on Speech Perception, Finger Tapping, and Aphasia-Spatial) and good language, sensory-spatial skills, and memory at follow-up ($ES > -.49$ on TPT Memory, Speech Perception, Aphasia-Spatial and Sensory Deficit tasks) compared to the non-PTSD group.

Braverman (2) criteria. The PTSD group formed at midway from *Braverman (2) criteria* was statistically distinct from the non-PTSD group at initial assessment and at follow-up (see Table 55). Examination of univariate group mean differences that are moderate or greater revealed that the PTSD group endorsed less symptoms of pathology on the MMPI at initial assessment (MMPI *F*, *Pd*, *Pt*, *Sc*, and *PTSD* content scales) but were more angry than the corresponding non-PTSD group ($X = 328, 304, ES = .55$). At follow-up, the PTSD group appeared socially conforming and introverted ($.55 \leq ES \leq 1.71$ on MMPI *K*, *Mf*, and *Si*), but still very angry ($ES = 1.78$).

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Lidvall (1) criteria. When *Lidvall (1)* criteria were used to diagnose PTSD at midway, multivariate group separation and classification results had greater significance when distress and impairment variables were recorded at follow-up assessment. The discriminant function analysis using initial scores was less sensitive (40%) than specific (95%). The optimal subset using follow-up scores was more specific (75%), while specificity remained the same (96%). Examination of univariate group means from both assessments revealed that the PTSD-group formed at midway according to Lidvall criteria was, in comparison to the non-PTSD group: (a) predominantly female, (b) angry at both assessments ($.57 \leq ES \leq 1.61$), but (c) had lower scores on all of the MMPI clinical and content scales with moderate to very large effect sizes on MMPI *D*, *Pd*, *Sc*, and *PTSD* (i.e., $-.48 \leq ES \leq -1.54$). The PTSD patients, as a group, perceived themselves as well adjusted (lower *F*, higher *K*), stereotypical (MMPI *Mf*, $ES \geq 1.97$), and introverted (MMPI *Si*, $ES \geq .40$). The PTSD group was generally less severely injured than the non-PTSD group ($ES = -.87$) and had generally superior neuropsychological and cognitive functioning.

Lidvall (2) criteria. When *Lidvall (2)* criteria were used to form groups at midway, multivariate group separation was good and highly significant ($p < .000$); the specificity was high (96% to 100%) and sensitivity was moderate (60% to 80%), regardless of whether the optimal subsets contained initial or follow-up data. Like the previous analyses of Lidvall (1) criteria, this PTSD group appeared to have been at initial assessment psychologically more healthy and performing at a higher cognitive level than the non-PTSD group. Men and women were equally represented in the PTSD group. There were no distinguishable differences between the PTSD and non-PTSD groups on the basis of medical/neuropsychological and psychosocial/demographic variables. Despite the PTSD group being superior on most neuropsychological and cognitive skills, they had lower mean scores on WAIS-R Digit Span ($ES = .51$) and Arithmetic ($ES = .33$), suggesting impaired attention and concentration due to anxiety.

Any set of criteria. The discriminant function analysis conducted with scores from initial assessment correctly identified 90% of all cases. The discriminant analysis based on follow-up scores had sensitivity and specificity figures of 85%. Both analyses were significant at $p < .000$ (see Table 55). All PTSD patients at midway had been, in comparison to all non-PTSD patients, more angry at the initial assessment ($ES = .48$), more socially conforming (MMPI *Pd*, $ES = -.57$), and

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experienced a longer period of impaired consciousness. The combined PTSD group had also been superior to the non-PTSD group on WAIS-R Picture Arrangement ($ES = -.76$), with Full Scale IQ suppressed. By follow-up, the PTSD group was still quite angry ($ES = 1.42$) and socially conforming ($ES = -.68$). The PTSD group had no evidence of neuropsychological impairment at either initial or follow-up assessment. They generally performed superior to the non-PTSD group on all of the Halstead-Reitan battery.

Summary. Prediction of PTSD diagnoses at midway on the basis of all variables was moderate to very good, regardless of diagnostic criteria, however, there were no concurrent measures of distress and impairment. Examination of group means showed that the PTSD groups formed according to the various diagnostic criteria did differ in some aspects of the predictor variables at earlier and later examination. Discrimination on the basis of initial data between the PTSD and non-PTSD groups formed at midway was better when variants of DSM-III criteria were used than when variants of Braverman or Lidvall criteria were used, although all were moderate. With respect to the follow-up data, variants of Lidvall led to the largest discrimination between PTSD and non-PTSD groups.

Follow-Up Assessment

DSM-III (1) criteria. The optimal subset of predictor variables used to discriminate between groups when *DSM-III (1)* diagnoses were used yielded a multivariate group mean difference that was significant, however, there was evidence of overfitting (see Table 56). While the specificity of 94% remained after jackknife classification, the 100% correctly-diagnosed PTSD cases dropped to 75% after cross-validation. The PTSD group, compared to the non-PTSD group, were younger ($X = 26, 33, ES = .50$), and had longer periods of impaired consciousness ($X = 414, 153, ES = .66$), scored higher on the MMPI *Hy* scale ($X = 63.2, 57.1, ES = 1.03$), and lower on WAIS-R Digit Symbol ($X = 6.6, 8.0, ES = .81$).

DSM-III (3) criteria. A large multivariate group mean difference occurred when diagnoses were made using *DSM-III (3)* criteria (see Table 56) and all cases were correctly classified. Ninety-one percent of the variability between the groups (73% after adjustment) was accounted for by the discriminant function. The PTSD group, compared to the non-PTSD group, was significantly more

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prone to anger ($X = 354, 295, ES = 1.45$), had a poorer performance on Trail Making at initial assessment ($X = 11.7, 13.6, ES = .40$) and on TPT Location at follow-up ($X = 3.4, 4.7, ES = .54$).

Variability due to the effect of MMPI Si (Social Introversion) on Anger was suppressed to highlight the relationship between PTSD and Anger. Variability accounted for by WAIS-R Digit Span and Picture Completion (at initial assessment), and TPT Memory (at follow-up) was also suppressed.

Braverman (2) criteria. The multivariate group mean difference obtained when *Braverman (2) criteria* was used to form groups was also large and highly significant. The sensitivity was 80% and the specificity was 100%, after jackknife classification. The PTSD group, compared with the non-PTSD group, had higher scores on MMPI Pa ($X = 59.3, 54.9, ES = .50$) and poorer performance (at initial assessment) on WAIS-R Arithmetic ($X = 5.1, 9.1, ES = 1.91$). Variability accounted for by MMPI Pd, severity, duration of impaired consciousness, and Full Scale IQ was suppressed.

Lidvall (1) criteria. The multivariate group mean difference was highly significant ($p \leq .000$) when *Lidvall (1) criteria* were used and the discriminant function analysis correctly classified all cases through the jackknife procedure (see Table 56). The PTSD group was more angry at follow-up than the non-PTSD group ($X = 338, 300, ES = .78$) and had a poorer performance at initial assessment on Trail Making ($X = 10.3, 13.5, ES = .51$) but received better scores on TPT Memory ($X = 7.5, 6.2, ES = -.89$). To highlight the relationship between PTSD and performance on Trail Making and TPT Memory, variability due to the effects of severity of injury (as measured by GCS scores at admission, duration of hospitalization, and the Impairment Index) was suppressed.

Lidvall (2) criteria. The use of *Lidvall (2) criteria* with an optimal subset of predictor variables produced a multivariate group mean difference that was significant ($p \leq .001$), and correctly classified all cases in the discriminant function analysis. The PTSD group compared with the non-PTSD group, had higher scores on the MMPI D scale ($X = 66.8, 58.3, ES = .83$), had been more severely injured ($X = 2.29, 1.74, ES = .72$), and had received poorer scores on WAIS-R Digit Span ($X = 6.2, 8.7, ES = .91$) but higher scores on Digit Symbol ($X = 8.4, 7.6, ES = -.33$) at initial assessment. Variability due to overall neuropsychological impairment was partialled out of the relationship between PTSD and scores on Digit Span and Digit Symbol. The PTSD patients, as a

Table 56

Results from *Follow-Up Multivariate Analyses Using as Predictors 'Best' Subsets of All Variables*

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified: PTSD (Sensitivity) ₂ non PTSD (Specificity) ₃ Total		
DSM-III (1)	MMPI Hy Age Duration of Impaired consciousness WAIS-R Digit Symbol	17, 4	.46	.11	16.28	5.03	1.0	3.48	4,21	.033	100 75	94.1 94.1	95.2 90.5
DSM-III (3)	Anger MMPI SI (S) Trail Making (I) TPT Location (FU) TPT Memory (FU) (S) WAIS-R Digit Span (S) Picture Completion (S)	16, 5	.91	.73	106.35	21.57	1.0	16.83	7,21	.000	100 100	100 100	100 100
Braverman (2)	MMPI Pa MMPI Pd (S) Duration of Impaired consciousness (S) Severity WAIS-R Arithmetic WAIS-R Full Scale IQ(S)	16, 5	.80	.60	48.76	7.10	1.0	9.40	6,21	.000	100 80	100 100	100 100
Lidvall (1)	Anger Duration of hospitalization (S) G.C.S. score at admission (S) Impairment Index (I) (S) Trail Making (I) TPT Memory (I) (U)	25, 4	.71	.51	68.48	19.85	1.0	9.30	6,29	.000 (cons.)	100 100	100 100	100 100

(Table 56 continued)

Diagnostic Criteria	Best Subset of Predictors	n(non PTSD), n (PTSD)	R ²	Adj. R ²	T ²	D ²	Power	F-ratio	degrees of freedom	sign. level	Classification matrix ₁ % of subjects correctly classified:		
											PTSD (Sensitivity) ₂	non PTSD (Specificity) ₃	Total
Lidvall (2)	MMPI D	17, 4	.73	.49	46.30	14.30	1.0	8.17	5,21	.001	100	100	100
	Severity										100	100	100
	Impairment Index (I) (S)										100	100	100
Any criteria	WAIS-R Digit Span												
	Digit Symbol (U)												
	Anger	17,14	.78	.58	21.52	2.32	1.0	7.91	6,31	.000	85.7	82.4	83.9
Any criteria	MMPI Hy										85.7	76.5	80.6
	TPT Location (I) (S)												
	TPT-Memory (FU) (U)												
	Category (FU)												
	WAIS-R Arithmetic												

Note: n = number of subjects in each group; (S) = suppressor variables; (U) = univariate group mean difference is in a direction other than expected; (cons) = nominal alpha level is conservative and actual alpha is less than that stated, because of the smaller group being less variable; (lib.) = nominal alpha level is liberal and actual alpha is greater than that stated, because of the smaller group being more variable; n.s. = not significant at p < .05; R² = squared multiple correlation; Adj. R² = the more stringent Herzberg formula for smaller sample sizes was used to calculate the adjusted R² rather than the more liberal Wherry formula used in BMDP; T² = Hotelling's multivariate group difference; D² = Mahalanobis' distance; ₁ = on the first line of the classification matrix is the correct classification of cases, the second line indicates correct classification after jackknife cross-validation; ₂ = Sensitivity of the discriminant function to correctly classify the cases of PTSD that were so classified by a set of diagnostic criteria; ₃ = Specificity of the discriminant function to correctly classify the cases of non-PTSD that were so classified by a set of diagnostic criteria; (I) = data collected at initial assessment; (F) = data collected at follow-up.

PTSD

group, were probably more anxious and less attentive than the non-PTSD group, yet were still able to learn and persist at an unfamiliar task probably because they had less brain damage.

Any set of criteria. When the PTSD group was formed with patients who had received a PTSD diagnosis according to *any set of criteria*, the discriminant function correctly classified 85.7% of the PTSD cases and 76.5% of the non-PTSD cases. The PTSD group had higher Anger scores than the non-PTSD group ($X = 341, 281, ES = 1.41$), as well as higher MMPI H_y scores ($X = 60, 57, ES = .35$), lower WAIS-R Arithmetic scores ($X = 6.3, 9.8, ES = 1.42$), but better Category scores (at follow-up, $X = 29, 39, ES = -.38$), and better TPT Memory scores ($X = 7.9, 6.4, ES = -.82$). The group of people who met any set of diagnostic criteria for PTSD at follow-up were generally more distressed and more angry than the non-PTSD group. While the PTSD group had poorer scores on most of the Halstead-Reitan battery and the WAIS-R at initial assessment, they were less impaired than the non-PTSD group at follow-up on most of the Halstead-Reitan battery.

Summary. When optimal subsets of all predictor variables were used in discriminant function analyses, 100% of the PTSD cases and 100% of the non-PTSD cases were correctly classified through the jackknife cross-validation when the criterion variable was a variant of Lidvall or DSM-III-R. Classification of cases that had been diagnosed by other sets of criteria was also good.

Summary

Univariate and multivariate group mean differences on all predictor variables showed that, in general, the people who met variants of DSM-III criteria for PTSD (compared with those who do not meet criteria): (a) had less distress (on the MMPI), (b) had received more serious injuries (in terms of hospital duration, duration of impaired consciousness, and likelihood of hematoma), (c) were less impaired in neuropsychological and cognitive function, and (d) had higher estimated levels of premorbid intelligence, especially on verbal subtests. More specifically, these patients were superior in their ability to comprehend or size up a total situation from scrambled clues (i.e., WAIS-R Picture Arrangement): thus able to relate parts to the whole in a logical manner, and to make cause-effect relationships (refer to Zimmerman & Woo-Sam, 1973). This skill may have been a prerequisite for the individual to be able to understand that the recent injury/accident met the definition of a "horrifying incident" referred to in the DIS (see Discussion). Analytical ability was also required to make the causal connection between various symptoms of PTSD and the accident

PTSD

(within a few months of the injury). There were no longer any mean differences between the PTSD and non-PTSD groups on this ability at follow-up. Greater analytical skill may have been no longer required at follow-up to make the connection; with time, the less perceptive people could also make the causal connection between symptoms and injury.

The people who meet criteria for a PTSD diagnosis according to a variant of Braverman or Lidvall criteria seemed generally to (a) have a higher level of or maladjustment on the MMPI compared to the non-PTSD group, (b) be much more prone to anger or irritability, and (c) have more pre-traumatic psychiatric problems and recent life events. Although there were shorter hospital stays and shorter periods of impaired consciousness, the PTSD group was more impaired on neuropsychological and cognitive function (especially memory, attention, and concentration) despite equivalent estimated premorbid intelligence: The PTSD group was much more anxious than as the non-PTSD group. Comparison of the PTSD groups formed from variants of DSM-III criteria and the PTSD groups formed from alternative criteria also indicated that the Braverman-Lidvall PTSD groups were more distressed, angry, impaired (on memory, attention, and concentration), and had a greater history of psychiatric problems and stressful events.

In conclusion, these results suggest that the validity of DSM-III is questionable, at least for diagnosing PTSD among head injured survivors of accidents or assault. Instead these results support the validity of alternative sets of diagnostic criteria for PTSD. The PTSD patients diagnosed according to variants of Braverman and Lidvall were more distressed and impaired than the non-PTSD group while the reverse was true for DSM-III criteria. The results further indicated that the DSM-III/III-R PTSD groups were healthy and well-adjusted, both before and after the injury. The DSM-III/III-R admixture of intrusion and denial may not be inappropriate as criteria for PTSD in a head-injured population. The people who acknowledged the experiences of intrusive recall or avoidance/numbness did not appear distressed on traditional psychometric measures of maladjustment such as the MMPI, nor were they as likely to experience cognitive impairment.

Descriptive Validation of Criterion Symptoms: Relationship with Predictor Variables

As previously discussed, the validity of any set of diagnostic criteria depends upon the criterion symptoms. This section investigates the correlational association between criterion symptoms and predictor variables. The correlations are tabulated in Appendix P. Only the

correlations that are significant and meaningful are discussed. This section also provides information on the types of subjects who are likely to endorse each symptom.

Intrusive recall (DSM-III/III-R Criteria)

Descriptive validity. At initial and midway assessment, females and high MMPI *K* scorers (i.e., conventional, appearance of adequacy and control) were more likely to report intrusive recall (correlation values are presented in Appendix P). Endorsement of this symptom was also associated (at initial assessment) with high scores on WAIS-R Picture Arrangement and Similarities, implying good judgment, attention, and concept formation among individuals who endorsed this symptom. At follow-up, this symptom did not display the same strong association with initial psychological health and cognitive abilities. For example, endorsement of this symptom at follow-up was positively associated with some level of distress and neuropsychological impairment at the time of initial assessment (i.e., MMPI *H*y and Trail Making). However at follow-up, this symptom had no relationship with concurrent measures of distress and impairment.

In contrast, the symptom "worsening of symptoms when reminded of the trauma" correlated positively at initial assessment with (a) distress on the MMPI *F* and *Ma* scales, (b) pretraumatic recent events and psychiatric difficulties, (c) severity of head injury (including initial GCS scores, duration of impaired consciousness and Impairment Index), and (d) verbal and auditory perceptual deficits (i.e., Speech Perception and Rhythm). Thus, this symptom related more to impairment and distress than did evidence of intrusive recall (in thoughts or dreams). At midway, the worsening of symptoms related to initial introversion (MMPI *S*), anxiety (i.e., poor WAIS-R Digit Span), and pretraumatic recent events, and psychiatric difficulties. At follow-up, this symptom correlated positively with concurrent scores on Anger but inversely with MMPI *Pt* (i.e., low anxiety or lack of psychological turmoil).

Avoidance-Numbness (DSM-III/III-R Criteria)

Descriptive validity. Experiences of numbness or avoidance had few significant relationships with demographic/psychosocial, medical/neurological, and neuropsychological variables (see Appendix P). There were several moderate positive correlations between endorsement of numbing/avoiding symptoms at all three assessments and superior scores on several cognitive functions, especially on the performance subtests that reflect perception, concept formation, and sophistication (i.e., WAIS-R *PA*, *S*, *BD*, *PC*, *OA*). MMPI *D* and numbness

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was the only significant relationship that existed between one of the numbness/avoidance symptoms and the MMPI scales at initial assessment. Endorsement of numbness at midway correlated positively with the MMPI *K* (i.e., looking good) and *D* scales from initial assessment, and negatively with MMPI *Ma* at follow-up. Avoidance at midway was associated with MMPI *Hs* and *Hy*. In general, symptoms of avoidance and numbness at follow-up did not relate to concurrent MMPI scores.

Miscellaneous or Hyperarousal Symptoms (DSM-III/III-R Criteria)

Descriptive validity. The miscellaneous symptoms (at initial assessment) had no association with psychosocial/demographic, medical/neurological, or neuropsychological variables, except that complaints of impaired memory/concentration increased as recent life events did. Despite subjective complaints of cognitive dysfunction, there was no objective evidence of this. Actually, as complaints of these symptoms increased, so too did scores on the WAIS-R, especially on Picture Arrangement, Picture Completion, Block Design, and both Verbal and Performance IQ. Simply, the people who complained the most (on the DIS) had the highest WAIS-R subtest scores (i.e., no impairment). There were a few MMPI scales that were positively associated with these symptoms, although the correlations were only moderate (median of $r = .22$, $p < .05$).

At midway, jumpiness related positively to distress on the MMPI scales *F* and *Sc* (administered a few months earlier), as well as with recent life events, psychiatric history, and various indices of severity of head injury. The incidence of jumpiness at midway and follow-up (but not at initial assessment) correlated inversely with initial WAIS-R scores. Sleep disorder and impaired memory/concentration at midway had few significant correlations with the predictor variables, other than MMPI scales. Endorsement of these symptoms correlated negatively with symptoms on the PTSD content scale at initial assessment and the MMPI *Ma* scale at follow-up, but positively with anger and traditional gender roles (MMPI *Mf*). By follow-up, severity of head injury no longer had an association with jumpiness, but severity did relate positively to sleep disorder and complaints of poor memory and concentration. Subjective reports of memory and concentration problems did not relate to any objective measure of neuropsychological impairment on the Halstead-Reitan.

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Guilt (DSM-III Criteria)

Descriptive validity. Although dropped from DSM-III-R and endorsed infrequently in this study (not at all at follow-up), guilt correlated significantly with predictor variables more frequently than it did any other DSM-III symptom, at both initial and midway assessment. For example, there were negative correlations with SES, admission GCS score, and cognitive functioning; and positive correlations with Recent Life Events, psychiatric history, severity of head injury, and psychological distress (MMPI *F*, *Hs*, *D*, *Pd*, *Pa*, *Pt*, *Sc*, *Ma*, and *PTSD*). Guilt was the only DSM-III symptom that correlated significantly and positively with the MMPI PTSD content scale (e.g., $r = .51$, at initial assessment, $p < .000$).

Nightmares (Braverman Criteria)

Descriptive validity. This symptom was positively related to many predictor variables, including Recent Life Events, Psychiatric History, and distress on the MMPI clinical scales; and negatively associated with SES and intellectual resources. Correlations with predictor and criterion variables must be interpreted with caution because only three people endorsed this symptom initially. At the time of follow-up, nightmares appeared in individuals who had poor cognitive functioning and displayed evidence of psychological distress and turmoil on the MMPI (at the initial and follow-up assessments).

Social Withdrawal and Loss of Interest In People and Things (Braverman Criteria)

Descriptive validity. This item, approximately equivalent to DSM-III's numbness criterion, was positively associated at initial assessment with high scores on Recent Life Events, psychiatric history, and most of the MMPI scales; also generally poor cognitive functioning, although significance was only reached on a few tests (e.g., Sensory Deficit, Speech Perception, WAIS-R Comprehension, Similarities, and Verbal IQ). Reports of this symptom at midway were still positively related to pretraumatic problems including Recent Life Events and psychiatric history. Unlike the earlier assessment, individuals who reported this symptom at midway had good neuropsychology and cognitive functioning (TPT Time, Rhythm, WAIS-R *A*, *DS*, *BD*, Verbal, Performance, and Full Scale IQ at initial assessment), and no distress apparent on the MMPI at both initial and follow-up sessions. Possibly the appearance of this symptom at initial assessment signalled distress, yet at midway represented coping. A U-shaped relationship appeared to have existed between this

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symptom and distress/impairment. Only at initial and follow-up assessment did the endorsement of this symptom correlate strongly and positively with measures of distress and neuropsychological impairment.

Loss of Sexual Interest or Pleasure (Braverman Criteria)

Descriptive validity. Diminished sexuality correlated significantly at Initial assessment with Recent Life Event scores, MMPI *D*, and *Hy*. At midway and follow-up, this symptom correlated significantly with anger and (not surprisingly) a stereotyped sex role.

Depression (Braverman Criteria)

Descriptive validity. At initial assessment, reports of depression appeared most often among those with high Recent Life Event scores, pretraumatic psychiatric problems, and elevated MMPI scores. At midway, individuals with pretraumatic problems were still inclined to report this symptom but the association between this symptom and the MMPI was minimal. At follow-up, this symptom was most frequently reported by women and people who had high Recent Life Event scores. Scores on the MMPI suggested that they were overly self-critical, anxious, introverted, conforming, distressed, and angry (MMPI *L*, *K*, *Mf*, *Si*, *PTSD*, and *Anger*).

Irritability (Braverman and Lidvall Criteria)

Descriptive validity. Irritability was positively associated at initial assessment with premorbid psychiatric problems, social introversion, and maladjustment as measured on MMPI *K*, *Pa*, *Ma*, and *PTSD* scales. Finger Tapping scores were also positively correlated with this symptom. The association between irritability and psychomotor speed may relate to a relationship found in the univariate analysis between PTSD diagnoses and high Finger Tapping scores: all indicate increased arousal.

At midway, irritability was positively associated with having shown good verbal and perceptive skills (WAIS-R Vocabulary, Comprehension, Picture Arrangement) at initial assessment, negatively with maladjustment (i.e., MMPI *Pd* and *PTSD* at initial assessment), and being female. This symptom seemed to be less related to distress at midway and more to health. It is possible that irritability at initial assessment was a symptom of distress, yet represented coping at midway. At

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follow-up, irritability correlated significantly with (a) being female, (b) having received poor Digit Span and Arithmetic scores at initial assessment, (c) concurrent measures of distress (MMPI *D*, *Pa*, *Pt*, *Si*, and *PTSD*), but (d) no longer with psychomotor speech (i.e., Finger Tapping). Being irritated, or easily annoyed, seemed to have a U-shaped relationship with distress and impairment. At the initial assessment, correlations with distress variables indicated that irritable people appeared least able to cope with their accident. At midway, this phenomena of increased arousal and irritability appeared among individuals with greater intellectual resources and with no evidence of earlier distress or premorbid problems (e.g, small negative correlation with psychiatric history). The appearance of this symptom at follow-up was strongly related to distress and maladjustment on the MMPI.

Absentmindedness and Impaired Concentration and Memory **(Braverman and Lidvall Criteria)**

Descriptive validity. Although significant correlations between predictor variables and impaired cognition differed somewhat, depending on which of the above functions was impaired, these symptoms will be analyzed together; the differences between these symptoms (with respect to variables they correlated highly with) were slight and the trends were in the same direction. Furthermore, these symptoms also correlated quite strongly with each other.

Self-reports of cognitive impairment at initial assessment correlated positively and significantly with Recent Life Event scores, Anger, turmoil and distress on most MMPI scales, and poor performance on WAIS-R Digit Span. Absentmindedness was also significantly associated with poor WAIS-R Arithmetic and Finger Tapping scores; meanwhile, self-reports of impaired concentration were related to superior performance on certain neuropsychology tests (TPT Memory, Trail Making) and weakly on others. At midway, self reports of impaired cognition (i.e., memory, attention, and concentration) were still weakly associated with most predictor variables that had been assessed initially, except for a few WAIS-R subtests. Subjective reports of poor memory were related to poor Digit Span scores obtained a few months earlier, while reports of poor concentration related to good Picture Completion scores. Self-reports of cognitive inefficiency at midway were correlated significantly and positively with MMPI scores obtained a few months later on scales measuring neurotic and anxious symptoms.

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The symptoms of memory and attentional impairment, but not concentration problems, were strongly associated with anger scores obtained at both earlier and later assessments. This was the same as found between subjective reports of irritability and objective measures of memory. As mentioned previously, hyperarousal may have been the underlying factor. This suggests that the changes made to DSM-III-R, in which memory impairment is removed from the so-called hyperarousal symptoms (while impaired concentration is retained), are invalid. There is evidence here that concentration was less strongly associated, than were memory or attention, with the objective measures of behaviour thought to be indicative of increased arousal (e.g., Anger Inventory, Finger Tapping) and other PTSD phenomena (e.g., MMPI PTSD content scale).

Despite subjective reports of difficulties with memory, attention, and concentration, the endorsement of these symptoms at midway and follow-up; was positively associated with good Halstead-Reitan scores at follow-up, although only a few tests reached significance (e.g., TPT Location, Impairment Index). There were no relationships between these symptoms of cognitive impairment and measures of severity of head injury; thus, ruling out brain damage as the probable cause of these symptoms. It seemed possible that individuals who used their cognitive skills the most are the most likely to notice changes in their functioning.

Anxiety (Braverman and Lidvall Criteria)

Descriptive validity. Anxiety at initial assessment correlated significantly with psychiatric history and high scores on MMPI *Hs*, *Hy*, *Pt*, *Pa*, *Pt*, and *PTSD*. At midway, this symptom correlated significantly with (a) psychiatric history, (b) having received a hematoma as a result of the accident, and (c) displaying manic symptoms (MMPI *Ma*, initial and follow-up). At follow-up, anxiety was likely to be reported by women, people who were conventional (i.e., low MMPI *Pd* scores), and people with good verbal and perceptual skills (Speech Perception at both initial and follow-up assessment and WAIS-R Picture Arrangement and Digit Symbol at initial assessment).

Sensory Hypersensitivity (Braverman and Lidvall Criteria)

Descriptive validity. Although infrequently endorsed, these symptoms were associated with other symptoms and predictor variables in meaningful ways. Hypersensitivity to sound and/or light showed moderate correlations (range of $r = .25$ to $.45$) with recent life events, premorbid psychiatric dysfunction, psychological distress or maladjustment on the MMPI, as well as to poor

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performance on the WAIS-R Digit Span (suggestive of anxiety). Hypersensitivity to light had more frequent and higher correlations with maladjustment on the MMPI scales than did hypersensitivity to sound.

Headaches (Lidvall Criteria)

Descriptive validity. The occurrence of headaches had a positive association with distress variables, in particular with the MMPI scales measuring neurotic, anxious, and PTSD phenomena (i.e., *Hs, Hy, Ma, PTSD*), and an inverse relationship with variables measuring severity of head injury. As the severity of injury increased, the reports of headaches decreased. Headaches were most likely to appear among subjects with the best analytical and cognitive skills and who displayed no evidence of impairment (e.g., WAIS-R *PA*, TPT, Trail Making, Speech Perception). These results suggest that individuals who have good cognitive skills are the most likely to get headaches. This was most obvious at the time of follow-up.

Dizziness or Faintness (Lidvall Criteria)

Descriptive validity. Experiences of dizziness, or faintness, at the time of initial assessment were positively correlated with Recent Life Event scores and Psychiatric History and inversely with all measures of severity of head injury, in particular, duration of impaired consciousness and hospitalization. Therefore, a psychogenic cause is suspected, rather than a neurogenic one. This symptom correlated significantly with concurrent scores on MMPI scales *Hs, D, Hy, P, Pt, Sc, Ma*, and *PTSD*, while the association with neuropsychology/ cognitive test scores was small and mostly non-significant. As with headaches, the people with superior cognitive functions tended to endorse this symptom most frequently. At midway, the correlation of this symptom with superior neuropsychology test performance reached significance for both initial and follow-up scores. This symptom was still inversely related to severity of head injury at midway (i.e., duration of hospitalization and impaired consciousness), but was not related to MMPI scores.

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Fatigue (Lidvall Criteria)

Descriptive validity. As with other Lidvall symptoms, fatigue was positively and significantly associated with Recent Life Events and Psychiatric History; while inversely related to measures of severity, in particular, duration of impaired consciousness. This symptom was generally not highly related to neuropsychology/cognitive performance, however, there was a trend to better cognitive functioning among those who experienced this symptom (e.g., on TPT Time, Rhythm, Impairment Index, WAIS-R Picture Arrangement and Vocabulary). There was a positive relationship between endorsement of this symptom and distress on some MMPI clinical and content scales, as well as the Anger Inventory.

Summary

The correlations between a criterion symptom and its external predictor variables indicated that endorsement of intrusive recall and avoidance-numbness are, in general, positively associated with mental health (minimal self-reports of distress and no evidence of cognitive impairment) at the time of the assessment. The changes brought about by DSM-III-R (including worsening of symptoms with intrusion, and avoidance with numbness) increased the association between DSM-III/III-R criteria and distress/ impairment. However, the primary criteria of DSM-III/III-R have relatively little association with the concept of a disorder (e.g., distress and impairment) compared with the criteria used in alternative sets of diagnostic criteria. These alternative symptoms, identified by DSM-III/III-R as miscellaneous (hyperarousal) or associated features of PTSD, have generally high positive correlations with external variables indicative of distress and impairment.

PTSD symptoms relegated to miscellaneous or associative status by DSM-III also had more frequent associations with predictor variables indicative of distress and impairment. Thus, specific criterion symptoms from alternative criteria had greater descriptive validity (associations with external predictors) than DSM-III/III-R criterion symptoms. This correlational analysis of criterion symptoms with external psychometric data/variables reflects the results obtained from Hypothesis One and Two. While doubt is cast on the diagnostic validity of DSM-III/III-R criteria, the validity of alternative criteria is supported.

This analysis of the descriptive validity of the criterion symptoms also supported the results of Hypothesis Three: The Lidvall et al. criterion symptoms were inversely associated with severity of head injury and positively associated with other predictor variables, including distress. Many of

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the Lidvall symptoms that might have suggested an underlying neurological disorder (e.g., headaches, dizziness) were most often endorsed by bright, analytical individuals. In addition to not being indicative of Organic Brain Disorder, the results strongly support a psychogenic etiology to the symptoms labelled (in the past) Post-Concussional Syndrome.

DISCUSSION

Hypothesis One

The first hypothesis was confirmed: DSM-III/III-R criteria had low concordance with alternative diagnostic criteria for PTSD in this sample of head-injured survivors. The diagnostic agreement between any variant DSM-III criteria and any variant of Braverman or Lidvall criteria was low at initial assessment, moderate at midway, and inconsistent at follow-up. There was adequate agreement (generally significant at $p \leq .05$) at all three assessments between Braverman (2) criteria and either variant of Lidvall. The results also indicated that alternative criteria were more sensitive at identifying cases of PTSD (diagnosed as such by any set of criteria) than DSM-III/III-R criteria were; all sets of criteria were equally specific.

The lack of significant diagnostic agreement between DSM-III/III-R criteria and sets of alternative criteria, representative of prevailing diagnostic practices up until the publication of DSM-III, demonstrates that either the validity of DSM-III/III-R criteria is less than optimal or that attempts were being made in DSM-III/III-R to redefine PTSD. While Spitzer et al. (1979) contend that new criteria should not be evaluated by the criteria that it is intended to replace, Overall and Hollister (1979) argue that new criteria should not be allowed to redefine the concept of a disorder without providing evidence of superior validity. As has been shown in the Results, this research has not found DSM-III/III-R criteria to have superior validity. Rather, the high diagnostic agreement between Braverman (2) and variants of Lidvall suggests that alternative criteria may have greater validity in a head-injured population. Although part of the high agreement may be explained by the high overlap of symptoms (roughly 50%) between Braverman and Lidvall criteria, there is also roughly a 50% overlap in criterion symptoms between these alternative sets of criteria and the DSM-III/III-R criteria, albeit different measures were used to assess these symptoms and there were stricter rules to be followed in the DSM-III/III-R criteria.

Restrictiveness of PTSD Criteria

Comparison of diagnostic results from DSM-III, Braverman, and Lidvall criteria revealed that the overlap of PTSD diagnoses among the various criteria was maximized when the least restrictive set of scoring modifications was used: When Lidvall (2) criteria was used all or almost all PTSD cases (depending on the time of assessment) were also diagnosed as having PTSD by at least one

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other set. In contrast, less than half of the patients who met DSM-III (1) criteria for PTSD also met criteria according to Braverman (2) or variants of Lidvall.

No more than 3.3% of the accidentally head-injured adults in this study met at any one time the full criteria for PTSD according to DSM-III (e.g., evidence of intrusive recall *and* avoidance/numbing *and* hyperarousal). When the bidimensional view of PTSD offered by Horowitz (1986) as an alternative to DSM-III (and fully supported by several researchers including Laufer et al., 1984 and McFarlane, 1988b) was used in the present research to provide partial diagnoses of PTSD, the incidence of PTSD more than tripled. These figures are similar to the number of cases of PTSD obtained in similar studies by Malt (1988) with 107 accident victims in Norway and by Laufer et al. (1985a) with Vietnam veterans. Regrouping of DSM-III symptoms and the addition of anger/irritability (obtained from the Symptom Checklist) in accordance with the DSM-III-R 1987 modifications led to rates of PTSD more similar to those of alternative criteria and that agreed with those of Boulanger et al. (1986) who identified veterans experiencing stress reactions following moderately-intensive combat.

Only one person ever met full Braverman criteria (i.e., 10 out of 10 symptoms) and she met this criteria at all three assessments. The modification made to Braverman criteria in this research (i.e., a dimensional scale based on intensity of distress) led to diagnoses of PTSD that were similar to those in other studies (e.g., Boulanger et al., 1986; Mahan & Elger, 1989) and similar to those of the less restrictive Lidvall criteria. These differential incidence rates of PTSD lead to questions about coverage. How valid are criteria such as DSM-III (i.e., endorsement of all criterion symptoms) and Braverman (10 out of 10 criterion) if they are so restrictive that they identify only a few cases of PTSD in a population for which the criteria are intended; compared with other estimates of PTSD found in the literature in the range of 20%.

Coverage and Concordance of the Criterion Symptoms

The DSM-III/III-R symptoms of intrusive recall and avoidance/numbness were the least frequently endorsed symptoms of PTSD in this research. The most frequently endorsed DSM-III/III-R symptoms were memory/concentration problems and sleep difficulties. These symptoms were also endorsed frequently when they were part of the alternative criteria, together with headaches, fatigue, anger/irritability, absentmindedness, dizziness and depression. Sensory hypersensitivity, nightmares, social withdrawal, and loss of sexual interest (i.e., alternative criteria) were infrequently endorsed at all assessments.

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It was possible to compare intrusive, avoidance and hyperarousal symptoms on the Diagnostic Interview Schedule (DIS) and the same or similar symptoms on the Symptom Checklist (SC). The SC contains items that correspond to DSM-III/III-R's intrusive or avoiding/numbing symptoms, although the wording is not identical. For example, the items "nightmares or disturbing dreams" and "repeated unpleasant thoughts that won't leave your mind" are more general than those asked on the DIS; yet they were as infrequently endorsed on the SC as they were on the DIS. The items "not wanting to socialize with people or feeling no interest in things" and "loss of sexual interest or pleasure" from the SC are roughly equivalent to DSM-III's avoidance category. These items were infrequently endorsed on the SC (compared with the other criterion symptoms), just as they had been on the DIS. Furthermore, there were high correlations between the DIS and the SC on these items. While symptom reporting, in general, on the DIS was less frequent than symptom reporting on the SC, the relative frequencies of intrusive recall, avoidance/numbing, and hyperarousal symptoms were the same on both questionnaires. In summary, regardless of the manner in which queries were made, head-injured patients experienced much less intrusive recall and avoidance/numbness than they did other symptoms of PTSD.

The frequency distributions of the Braverman-Lidvall symptoms are similar to those found in studies of accidentally injured adults, with or without head injury (Jones & Riley, 1987; Jonsson et al., 1967; Lidvall et al., 1964; Lishman, 1978; Mahan & Elger, 1989; Malt et al., 1989; Wilson et al., 1985), as well as rape victims (e.g., Dahl, 1989), traumatized firefighters (McFarlane, 1988b), disaster victims (e.g., Wilkinson, 1983), combat and nurse veterans (e.g., Archibald & Tudckenham, 1965; Baker, Menard & Johns, 1989), and death camps (e.g., Eitinger, 1969). Although a disorder is not operationally defined by simply choosing the most frequently occurring symptoms, these descriptive results suggest that the criterion symptoms of intrusion and avoidance/numbness chosen by DSM-III appear to have less coverage for this traumatized population than other criterion symptoms do. The precedent of removing infrequently endorsed items from DSM-III criteria has already been established. According to Brett et al. (1988), survivor guilt was excluded from DSM-III-R because it was not clear to the subcommittee that guilt was present in all cases of PTSD.

As the results indicated, the coverage (i.e., sensitivity and specificity) of DSM-III symptoms for PTSD and their concordance (i.e., correlational association) with other DSM-III symptoms (internal consistency) and alternative criterion symptoms were less than that demonstrated by

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alternative criterion symptoms. The validation results obtained when diagnoses of PTSD were examined at the diagnostic level were confirmed at the symptom level.

Hypothesis Two

The second hypothesis was also confirmed: The multivariate separation on sets of distress and impairment variables was less satisfactory when variants of DSM-III/III-R criteria were used to form groups than when variants of Braverman or Lidvall criteria were used. In this hypothesis, called the second stage of validation by Klerman (1989) or descriptive validity by Blashfield and Draguns (1976), the relationship of the syndrome with external validators is examined; however, this is an examination of convergent validity only. Multivariate analyses revealed that the largest group separation and highest discrimination rates using distress and impairment variables were achieved for alternative criteria. The sensitivities of the discriminant functions were above 70% and the specificities were above 90%.

Those who met DSM-III criteria for PTSD at initial assessment appeared less distressed and more healthy than corresponding non-PTSD groups; this was less obvious at follow-up. These results are opposite to those obtained in other studies (presented in the Literature Review in Figure 4), in which the traumatized groups had higher scores on the MMPI clinical scales than groups of normal people or groups of psychiatric patients. In contrast, those who met alternative criteria for PTSD at all assessment appeared more distressed and impaired than non-PTSD groups. DSM-III-R fell somewhere between DSM-III and alternative criteria in terms of univariate group scores. This suggests that the modifications made in 1987 to DSM-III-R come closer to alternative criteria than did DSM-III, however the separation between PTSD and non-PTSD groups were not as great as when DSM-III or alternative criteria were used.

While DSM-III/III-R criteria for PTSD may have been created to increase the efficiency and usefulness of diagnostic activity, it appeared that DSM-III criteria did not identify individuals who were distressed and impaired in the early months after their recent accident. The DSM-III/III-R lacked convergent validity because its criterion symptoms were infrequently associated with external measures of distress, turmoil, and impairment. For example, it was only when the variants of Braverman and Lidvall criteria were used that the MMPI profiles of PTSD groups resembled those obtained in other trauma studies (Archibald & Tuddenham, 1965; Burke & Mayer, 1985; Fairbank et al., 1983; Foy et al., 1984; Keane et al., 1984; Vanderploeg et al., 1987). Furthermore, evidence from the WAIS-R and the Halstead-Reitan battery suggested that the PTSD groups

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formed from variants of DSM-III at initial assessment had no apparent cognitive disruption as a consequence of the head injury and were superior to all other groups in intellect. Nor was there any evidence of maladjustment on the WAIS-R. The Picture Arrangement subtest is, according to Rapaport et al. (1968/1978), the most vulnerable to maladjustment, yet the PTSD group formed according to DSM-III (1) criteria had significantly higher scores than those of the corresponding non-PTSD group (by one and a half standard deviations); These high scores on Picture Arrangement suggested social sophistication. When diagnoses of PTSD were made using variations of Braverman or Lidvall criteria, difficulties with attention, concentration, and memory were quite apparent, for example, on Arithmetic and Digit Span. This indicates anxiety because these two subtests generally hold up well as a record of premorbid intellectual achievement in brain damaged persons, according to Golden et al. (1981) and Lezak (1977).

The observable and measurable differences among PTSD groups formed from various sets of criteria were less apparent at follow-up than at initial assessment. While each set of diagnostic criteria led to slight differences in the actual patients who were diagnosed as PTSD at follow-up, it was not clear that there were observable differences among these PTSD groups on distress and impairment variables, yet the PTSD groups were generally discernible from the corresponding non-PTSD groups.

While it is not possible to disprove validity on the basis of discriminant analyses using independent predictor variables, the meaningfulness of a diagnosis of PTSD made by DSM-III/III-R seems suspicious when PTSD is inversely related to psychometric evidence of distress or impairment. Thus, it is concluded that DSM-III is not the optimal diagnostic criteria for operationally defining PTSD in a head-injured population, especially in the early stages of recovery. The evidence against the validity of DSM-III was not as strong at the later stages of recovery. Starting at midway, the PTSD groups began to have greater similarity among themselves, especially as the DSM-III PTSD group did not appear as well-adjusted and resourceful as it had earlier. At the same time, the differences between PTSD and non-PTSD groups diagnosed from alternative criteria was not as apparent. The loss of almost 50% of the subjects at follow-up may have caused some obscuring of earlier patterns because of the drop in statistical power. However, there were large group effect sizes on univariate variables at follow-up and multivariate discrimination and prediction increased. These results indicate that there are complex temporal issues that need to be addressed in further research in order to understand the general unfolding of the stress reaction

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and the stages of recovery, specifically as they relate to the diagnostic validity of DSM-III/III-R criteria.

Coping responses. It also appeared that symptoms used by DSM-III as definitive of PTSD were coping mechanisms, as Kardiner (1941) had said they were; thus reflecting an adaptive process. In this research the presence of intrusion and avoidance-numbness was highly related to social, financial, cognitive, and psychological resources and a lack of distress or impairment in the early post-traumatic period. While the presence of these adaptive processes may indicate that there has been a traumatic incident, they do not imply that the individual is disordered. However, these coping responses may be distressing in themselves. There was evidence that some of the PTSD criterion symptoms represented distress at some times and coping mechanisms at other times: Intrusive recall, numbness, avoidance, anger, and others had non-linear relationships with both predictor variables and other PTSD criteria. For example, anger was strongly associated with distress at initial and follow-up assessment but with mental health at midway. There may be an appropriate time to be angry; at other times it may be inappropriate (i.e., signalling maladjustment).

There was evidence in this research that individuals who experienced the DSM-III criterion symptoms had greater social and cognitive skills, especially social acculturation, verbal comprehension, and perceptive/analytical capabilities (i.e., WAIS-R PA, I, C). These skills imply the presence of coping resources because coping may be operationally equated with mastery over the environment. Lazarus and Folkman (1984) suggested that the more quickly people can apply learned skills automatically, the more effectively and efficiently they can manage their relationships with the environment. The ability to know one's own intrasubjective and intersubjective situations and act in that framework is, according to Haan (1977), the hallmark of coping. Adaptation leads to lowered arousal and diminution of psychophysiological disturbance.

This research contends that evidence of adaptive mechanisms are not good markers for diagnosing a disorder, contrary to DSM-III /III-R or Kardiner (1941); coping is not always associated with distress and/or impairment. In the same way as one would not consider a person who was recently bereaved as having an "Adjustment Disorder" simply through evidence of the grieving process, one should not consider a traumatized survivor as having PTSD on the basis of the coping process. Other markers (i.e., classical symptom formation) should be used to assess whether the survivor is disordered .

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A last word may be said on the relationship between coping and distress at follow-up. At that time, the DSM-III PTSD group bore greater resemblance to the PTSD groups formed from alternative criteria. People who were still needing to use such coping mechanisms at one year were showing an unfavourable outcome (i.e., distress). One might wonder: If there was evidence of coping among individuals diagnosed by DSM-III as having PTSD, then how come they appeared distressed at follow-up. It is important that the coping process not be confused with outcome. Coping does not imply success (Lazarus & Folkman, 1984). To be effective a person in jeopardy must change something in order to restore a more harmonious relationship with the environment. The similarity at follow-up between PTSD groups that were defined primarily on the evidence of coping (DSM-III criteria) and on those defined primarily on the evidence of symptom formation (alternative criteria) may be explained in two ways: Either individuals who were still trying to cope at one year but who were ineffective or unsuccessful had finally developed symptoms, or those who had developed symptoms earlier and were still in distress at follow-up finally began to develop some coping mechanisms.

Hypothesis Three

The third hypothesis in this study was confirmed: A person who received a moderate to severe brain injury was no more likely to receive a diagnosis of PTSD on the basis of Lidvall criteria than on any other set of diagnostic criteria. Symptoms of headache, failing memory, difficulty in concentrating and vertigo, as well as other Lidvall criterion symptoms were not related to brain damage, thus casting doubt on the validity of DSM-III/III-R's dismissal of such symptoms as indicative of Organic Mental Disorder.

Multivariate group differences on medical indices were frequently not significant. It was generally not possible to discriminate between PTSD and non-PTSD patients on the basis of these predictor variables: Thus, as a general application of discriminant validity, PTSD (regardless of criteria) did not appear to be caused by brain damage, therefore it could not have been Organic Mental Disorder. Subjects who received a PTSD diagnosis from Lidvall criteria were generally less seriously injured than the non-PTSD subjects were. If anything, it was the PTSD groups formed on the basis of variants of DSM-III criteria that were most seriously injured, at least on the basis of a longer hospital stay, a longer period of impaired consciousness, and the highest likelihood of having experienced diffuse or secondary brain damage. The PTSD groups identified at the first two assessments from the Lidvall criteria (i.e., that captures the symptoms of Post-Concussional

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Syndrome) were the least severely injured of all groups. At follow-up, there did appear to be a relationship between severity of injury and PTSD as defined by DSM-III criteria and to a lesser extent by Lidvall criteria.

No relationship could be found in a qualitative analysis between PTSD status and location of brain damage, although the cell sizes for different areas of the cortex were very small. Examination of the interaction between location (of damage) and neuropsychological/cognitive test scores also failed to reveal any discrimination between PTSD and non-PTSD groups. The entire sample had evidence of some impairment (e.g., Impairment Index, WAIS-R Digit Symbol), presumably as a result of the head injury, but there was no relationship with PTSD status.

Hypothesis Four

Hypothesis Four was confirmed: Discrimination and multivariate group separation was highest, generally, when a variant of Lidvall criteria was used as criteria and optimal subsets of all predictors were used. The utilization of all predictors increased the rates of classification; up to 100% of cases were correctly classified through the jackknife procedure. Although the validity of DSM-III/III-R criteria appeared questionable in the initial aftermath of the trauma, such criteria became increasingly more valid through out the course of the study. Similarity in PTSD group composition among the various sets of criteria increased over the first year post-trauma; however, due to attrition and subsequent loss of power this finding is tentative.

There was generally little that was significantly different between groups of PTSD patients and corresponding groups of non-PTSD patients on psychosocial and demographic variables. Multivariate group means that were significantly different at initial assessment did not remain so at follow-up. Discriminant function analyses also failed to adequately classify cases. The PTSD groups formed according to variants of Braverman and Lidvall criteria were most similar in terms of demographic and psychosocial variables, especially at initial assessment. They had a more troubled pretraumatic history (Recent Life Events and Psychiatric Disorders). No such relationship existed for PTSD groups formed from DSM-III criteria at initial assessment. Groups formed from DSM-III (3) criteria had mean differences consistent with those found in groups formed by variants of Braverman and Lidvall criteria. At follow-up, however, there was some suggestion of a relationship between Recent Life Events and PTSD diagnoses when variants of either DSM-III or Lidvall were used.

**Alternative Explanations for an Apparent Lack of Validity
of DSM-III/III-R Criteria**

Low Incidence Rate

One-third of all subjects who ever met criteria for PTSD according to a variant of DSM-III/III-R, were diagnosed only in retrospect. These individuals either did not know they had PTSD or they did not acknowledge it at the time of assessment. There are three possible explanations for the low rate of prospective DSM-III/III-R diagnoses: It is possible that the subjects who later admitted to symptomatology were at the time of the earlier assessment (a) in a state of shock or denial, (b) were too confused to be either aware of symptoms or able to make the connection between symptoms and injury, (c) were not honest about their symptoms or had faulty recall of when their symptoms began. The last item implicates weaknesses in the use of retrospective studies, a topic already discussed in the Literature Review.

State of shock or denial. In order to positively endorse a PTSD symptom on the Diagnostic Interview Schedule it was necessary for the patient to make the connection between the occurrence of the symptom and the trauma/injury. Of the patients who only endorsed DSM-III /III-R symptoms in retrospect, one patient had a minor injury, two had moderate injuries (this represents only 10.5% of the moderately injured Ss) and three had severe injuries (this represents only 20% of the severely injured patients). While it is possible that the denial or "blandness of personality" that has been reported to accompany severe injuries (e.g., Levin et al., 1979) may account for some of these retrospective diagnoses of PTSD, this explanation is not sufficient to explain all of the early denial of symptoms. Furthermore, it took up to four months for the minimally injured person and up to eight months for some of the moderately injured individuals to link symptoms to their accident.

Linkage of cause and effect. In the PTSD section of the DIS it is up to the respondent to make the connection between PTSD symptoms and a traumatic event that could have caused them. This is without any prompting from the examiner as to what types of events qualify as traumatic. For example, the DIS (Version III, 1981, p. 72) asks the question of intrusive recall: "Did you ever see something so horrifying or frightening or have something so horrible happen to you

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that you kept having dreams or nightmares about it or kept remembering it when you didn't want to?" If the subject's answer is yes then he or she is asked what the experiences were. If the respondent's response is negative, he or she is asked the same question but with avoidance/numbness (and then hyperarousal/miscellaneous symptoms) substituted for the intrusive symptoms. Once the respondent answers affirmatively to a PTSD symptom, the patient is quizzed on the remaining symptoms in a way that cues him or her to the fact that the recent head injury qualifies. The questions then take the form of "After your injury (or whatever the traumatic event is), did you lose the ability to care about other people or lose interest in things you used to enjoy?" While the respondent is at least cued, at this point, to think about the association between the recent injury (or other event) and PTSD symptoms, he or she must still be the one to make the connection between a symptom and the trauma. This may become increasingly difficult as the association between symptoms and events becomes more subtle, as with sleeping difficulties, trouble concentrating, or jumpiness.

Support for this explanation of both the high number of retrospective diagnosis and the generally low incidence of DSM-III/III-R diagnoses of PTSD in this study and others (e.g., Malt, 1986, 1988) comes from the observation by the examiners that several respondents had to ask (in some cases, timidly) for clarification: Some subjects asked during the initial administration whether their recent injury/accident counted as the "horrible experience" alluded to by the examiner. In contrast, subjects did not ask this question at midway and follow-up assessments, presumably because they had realized by then that their accident did qualify. Solomon and Canino (1990) also believe that the PTSD section of the DIS requires knowledge not available to the respondent, and thus underestimates rates of PTSD by failing to pick up symptoms. The need for the respondent to attribute causality is not required in other sections of the DIS. For example, in the somatization section, the examiner asks "Have you ever had a lot of trouble with headaches?" If the respondent says yes, further inquiries are made on whether a physician was consulted and if so what the physician said was causing the headaches. The respondent will only be asked what he or she thinks was causing the headaches if a physician was not consulted. Even then it is up to the examiner to decide whether to attribute the suspected cause of the symptom to a physical problem or to a psychiatric problem.

On the Symptom Checklist of the Braverman and Lidvall criteria the connection between symptoms and head injury was made for the respondent. The instructions read "Below is a list of problems and complaints that people sometimes have after receiving an injury to the head. For

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each symptom that you have had since the injury, please check the appropriate column that best describes how much discomfort that problem has caused you." Comparison of symptom endorsement between the two questionnaires showed that more people endorsed symptoms on the Symptom Checklist (SC) than on the DIS at initial and follow-up assessments but not at midway. A possible explanation for the discrepancy at midway may lie in the fact that the symptom query at that time was done over the phone; however, while the mean symptom reporting on the SC decreased at midway the last three symptoms asked at midway on the SC were more frequently endorsed at that time than at either of the other two sessions.

After this research was conducted, the Diagnostic Interview Schedule was revised to incorporate DSM-III-R changes and made available in 1989. It also made changes to the wording of the PTSD questions such that the respondent would know what kinds of traumatic events were to be considered. It was changed from "something so horrifying or frightening or have something so horrible happen to you that ", in the 1981 edition, to "A few people have terrible experiences that most people never go through -- things like being attacked (IF FEMALE: or raped), being in a fire or flood or bad traffic accident, being threatened with a weapon, or seeing someone being badly injured or killed. Did something like this ever happen to you?" This is a commendable improvement because respondents will no longer be in doubt about the relevancy of their recent injury or accident.

It is possible that incidence rates of PTSD as diagnosed according to DSM-III/III-R may be deflated in this study because of the nature of the questions on the DIS. This is compensated, however, by the inclusion of cases that met partial criteria for PTSD or were diagnosed in retrospect. The incidence rates of PTSD (made according to variants of DSM-III criteria) in this study were between 10% and 27%, comparable to results from other studies of traumatized populations (e.g., Boulanger et al., 1986; Lidvall et al., 1974; Mahan & Elger, 1989; Malt, 1988); and similar to the diagnostic results obtained when most variants of Braverman or Lidvall criteria were used.

Global maladjustment. As an alternative explanation to Hypothesis Two, it is possible that the sets of alternative criteria were not diagnosing PTSD so much, but rather, comorbid or pretraumatic disorders: Both Braverman and Lidvall et al. criteria contained symptoms of general maladjustment that cut across several DSM-III/III-R disorders. This would explain the likelihood of these PTSD groups showing signs of psychopathology on the MMPI. Support for this contention comes from the strong univariate relationship at initial assessment between alternative criteria and

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both Recent Life Event and Psychiatric History. In contrast, the PTSD groups formed according to DSM-III criteria had no such relationship. When DSM-III-R criteria were used, especially if retrospective diagnoses were included, group differences were similar to those shown in alternative criteria: The PTSD groups had experienced greater pretraumatic problems (by moderate effect sizes). Several key issues are raised when attempts are made to differentiate between "global adjustment" and "adjustment specific to the trauma": (a) the etiological role of PTSD; (b) the etiological role of trauma in the appearance of subsequent disorders (e.g., alcoholism) or general symptoms of maladjustment; and (c) comorbidity. These issues have already been discussed in the Literature Review. Because this research was non-experimental and thus based on correlational relationships, it was not possible to address the first two issues. Furthermore, this research was primarily a study of convergent validity and as such did not include several measures of other disorders.

The possibility that medical indices were indirect measures of the intensity of the trauma. It is possible that the finding of a slight relationship between some medical/neurological variables and PTSD according to DSM-III/III-R criteria may lend greater validity to DSM-III/III-R. Some medical indices, such as length of hospitalization and duration of impaired consciousness, may have been indirectly measuring the intensity of the trauma. Several studies of Vietnam veterans have shown PTSD status to be related to intensity of battle (e.g., Atkinson et al., 1984; Fairbank et al., 1983; Foy et al., 1987). If alternative criteria had no relationship to the intensity of the trauma, they may not have been measuring PTSD, but rather, global adjustment.

Discriminant analyses may only be used to confirm validity, not refute it. The results from this research may not be used to dismiss DSM-III/III-R criteria as invalid. It is possible that either the alternative criteria or the external predictor variables, or both, that were chosen to examine convergent validity were inappropriate. As previously discussed, alternative criteria may have been more sensitive to global maladjustment, such as is measured by the MMPI, than DSM-III/III-R criteria were. Because this study did not incorporate several adequate measures of other mental disorders, it was not possible to assess discriminant validity.

Implications for DSM-IV Criteria for PTSD

Make PTSD criteria less restrictive. It was clear from this research that the best discrimination between PTSD and non-PTSD groups of head injured survivors occurred when less restrictive criteria were used for diagnoses. There are several ways to make the PTSD criteria less restrictive: (a) use polythetic criteria (e.g., the endorsement of a minimum number of criterion symptoms) as in Lidvall et al. (1974); (b) require evidence of intrusion or avoidance/numbness but not necessarily both; (c) increase the categories of intrusion and avoidance-numbness to include more symptoms of each, as has been put forward by Horowitz (1976, 1986); and (d) give equal weight to the categories of intrusion, avoidance-numbness, and hyperarousal. This research also indicated that when the criteria became too lenient, as in whether the individual met any set of criteria, the discrimination between PTSD and non-PTSD groups was not as great as when PTSD groups were diagnosed according to only one set of criteria.

Include more somatic symptoms or symptoms indicative of dissociation or conversion. The results from this research suggest that somatic symptoms are frequent in the head-injured, despite a lack of association between such symptoms and medical variables. Studies of other traumatized groups (reviewed in the literature review) also have suggested that somatic complaints frequently occur; albeit possibly they also relate to some situational factors. As well, personality may also predispose some individuals to display somatization following trauma. Theoretically, somatization is considered a result of the process of dissociation or conversion. Furthermore, according to Brett et al. (1988), there was considerable discussion within the DSM-III-R Nomenclature Advisory Committee on whether PTSD shouldn't be categorized with the dissociative disorders. For those reasons, it is believed that the results of this study on somatization generalize to other traumatized populations.

Include symptoms of PCS, such as headache and vertigo, as PTSD criteria. This research has found that DSM-III/III-R's dismissal of PCS symptoms as indicative of Organic Mental Disorder may not be justified. No evidence could be found that suggested a link between severity of brain damage and PTSD that was diagnosed according to PCS criteria. This lack of association has also been found in much of the neurological literature. It appears to be the consensus in the literature

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that PCS is most influenced by psychogenic factors. Furthermore, numerous studies discussed in the literature review have also observed these symptoms to occur in other traumatized populations.

Recognize that global maladjustment following a trauma may be indicative of PTSD.

Results from numerous studies have shown that PTSD as diagnosed according to DSM-III/III-R criteria is seldom a discrete entity but rather appears with numerous other DSM-III/III-R disorders. Furthermore, measures of global adjustment (e.g., SCL-90, MMPI) have been shown to discriminate between PTSD and non-PTSD groups in veterans. In this head-injured sample, discrimination on the basis of MMPI variables between groups formed according to DSM-III/III-R criteria was less than when alternative criteria were used. Although it is true that alternative criteria contains more symptoms of global maladjustment than DSM-III/III-R criteria does, it is not possible to rule out on the basis of correlational research the possibility of this being a cause and effect relationship.

Recognize that symptoms of intrusion and denial may be adaptive, and as such do not warrant a clinical diagnosis. Theoretically, these symptoms are considered to be coping responses to stressors. In some situation they may be beneficial, in others, maladaptive. According to DSM-III/III-R, a clinical disorder is associated with either distress or impairment, or both. Yet, in this research PTSD as defined by DSM-III/III-R was most frequently associated with psychological adjustment and relatively superior cognitive functioning. Thus, it is proposed that the presence of coping responses should not be used as markers of PTSD unless there is coexistent distress and/or impairment.

Strengths and Limitations of this Study

This research is a prospective study of non-help-seeking, non-litigating survivors of accident trauma, in which diagnoses of PTSD according to alternative criteria are compared with those made from DSM-III/III-R criteria. This research responded to several methodological weaknesses, as elucidated by Malt (1986) and McFarlane (1988b), that are inherent in much of the PTSD research that has been done to date. The 60 subjects represented, as much as possible, serial admissions to the hospital. Of them, only one was known to have sought medical or psychological help for PTSD, but only after she had already been solicited to participate in the

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study. After her participation, this same patient launched a civil suit against the person who caused her accident. Diagnoses of PTSD according to prospective and retrospective endorsement of DSM-III and DSM-III-R criteria were made and compared to those made by two sets of alternative diagnostic criteria, each scored two ways (i.e., categorical or dimensional). The classifications were then validated with a variety of standard psychometric measures: Discriminant analyses were conducted with predictive variables drawn from measures of psychological distress, neuropsychological and cognitive impairment, as well as psychosocial/demographic and medical/neurological variables. This examined the convergent validity of DSM-III/III-R.

The limits of this study are: (a) the relatively small number of subjects and large attrition rate; (b) the lack of alternative measures of mental disorders, in order to examine discriminant validity; (c) the unwillingness of almost one-quarter of the patients originally solicited to participate in this study, especially when the reason given by them for declining was stress-related, (d) extending these validation results to trauma survivors who are not head-injured, because the confounding effect of brain damage cannot be completely ruled out, (e) the inability to measure the extent of the trauma separate from the extent of the head injury, and (f) differences in psychometric properties between the two instruments used to assess PTSD symptoms (i.e., DIS and SC). It is also unfortunate that there were not WAIS-R protocols for all subjects. In retrospect, it would have been better to drop the Halstead-Reitan and retain the WAIS-R, as it gave better discrimination between PTSD and non-PTSD patients.

Discussion of Predictor Variables

The remainder of this discussion is centred around the individual predictor variables. This provides valuable, if secondary, information on the personality, demographic, psychosocial, neuropsychological and cognitive attributes, and characteristics of those suffering PTSD following head injury.

Distress Variables

Anger

Irritability or proneness to anger was the strongest and most consistent predictor of membership in a PTSD group. It was the only predictor variable that all PTSD groups had in common. Other studies of survivors have shown anger to be a persistent and frequently endorsed consequence in the aftermath of various traumas (Adams & Adams, 1984; Adler, 1945; Berger, 1977b; Boulanger, 1981; Braverman, 1980; Foy & Card, 1987; Jones & Riley, 1987; Laufer et al., 1981; Modlin, 1983, 1986; Pearce et al., 1985; Penk et al., 1981; Silver & Iacono, 1984; Titchener & Kapp, 1976; Wilkinson, 1983; Wilson et al., 1985). Kardiner and Spiegel (1947) were convinced that irritability is present in every case of traumatic neurosis and Braverman and Hacker (1968) considered post-traumatic hyperirritability to be the sine qua non of PTSD. Anger has been considered by some to be a coping mechanism; several studies have shown a more favourable outcome among persons who react to stressful situations with anger rather than with compliance, denial, or depression (e.g., Aldrich & Mendkoff, 1963; Janoff-Bulman & Marshall, 1982). Lazarus and Folkman (1984) suggest that anger is a reaction, or outcome variable (i.e., distress), to an appraisal of being harmed.

High mean scores on the Anger Inventory were more likely to be obtained from PTSD groups that had been formed according to a variant of Braverman or Lidvall criteria. The PTSD and non-PTSD groups formed on the basis of DSM-III criteria showed modest separation on this variable. The groups formed on the basis of DSM-III (3) criteria could not be differentiated on the basis of this variable at initial assessment, but by follow-up the PTSD group was very significantly more angry than the non-PTSD group.

As well as correlating highly with group formation in this study, irritability was significantly associated with several of the MMPI scales (i.e., *L*, *F*, *K*, *Pd*, *Pt*, *Si*, *PTSD*) indicating frankness,

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anxiety, introversion and distress. High anger scores at the time of the initial assessment were also negatively associated with performance on the WAIS-R Similarities (verbal abstraction, generalization) and Digit Symbol (code learning) subtests.

MMPI Variables

The discussion that follows will be organized into sections on the validity scales and the scales that measure neurotic, psychotic, anxiety, and personality variables, as well as the Keane et al. (1984) decision rules and content scale for identifying cases of PTSD.

Validity Scales. At initial assessment, the PTSD groups formed from Braverman and Lidvall criteria endorsed symptoms of psychological dysfunction (high *F* scores); while PTSD groups formed from variants of DSM-III criteria did not (low *F*, higher *L* and *K*). At midway, people who were presenting themselves favourably at initial assessment (low *F*, high *K*) were even more likely to endorse DSM-III criteria. High scores on the *F* scale indicate a self-admittance to symptoms of psychopathology either because of maladjustment or as a cry for help. High scores on scales *L* and *K* indicate a reluctance to admit symptoms of pathology; and possibly as an attempt to present a picture of adequacy or control possibly through the use of denial or by trying to make a favourable impression. At midway, univariate differences between DSM-III PTSD and non-PTSD groups were highly significant on the *F* and *K* scales from the initial assessment. In fact, it was possible at initial assessment to predict on the basis of these scales who would also meet DSM-III criteria at midway (i.e., people who try to make a favourable presentation). Scores obtained on these MMPI scales at follow-up no longer reflected differences between the PTSD and non-PTSD groups.

In this study, people who were trying to make a favourable impression (as indicated on the MMPI validity scales) were more likely to be older, to be women and to have a higher *SES*. When this appearance of control and adjustment was maintained by defensive means (i.e., high *L*, high *K*) most neuropsychological and cognitive functions were adversely affected. On the other hand, 'frankness' (i.e., low *L*, low *K*) had a favourable affect. Three-quarters of the high *L* scores in this study came from either elderly subjects or young females who possibly led sheltered lives (based on the examiner's clinical impression of the patient and family). These individuals appeared overly conventional, rigid, moralistic, and socially conforming on the other MMPI scales as well. In contrast, all of the low *L* scorers at the time of initial assessment were in their 20's and most had minor head injuries (71%). Only two high *L* scorers (i.e., possibly defensive) were diagnosed with PTSD at initial

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assessment, both according to a variant of DSM-III. Only one was available at follow-up and she was also PTSD-positive at that time, according to Braverman (2) and Lidvall (2). At initial assessment, two of the seven low scorers (i.e., possibly indicating frankness) were diagnosed with PTSD, but only according to a variant of DSM-III criteria. All three of the low scorers at follow-up were PTSD-positive, regardless of criteria and had moderate to severe head injuries. There was a suggestion at initial assessment that if a person had an extreme *L* score and had PTSD, he or she was most likely to meet DSM-III criteria. This tendency did not hold up at follow-up.

Elevations on the *F*-scale were obtained in this study at initial assessment by those identified as having PTSD by variants of Braverman and Lidvall criteria but not by DSM-III/III-R criteria. This finding supports the validity of alternative criteria. Several researchers (e.g., Fairbank et al., 1983; Keane et al., 1984) have found that veterans with PTSD, in comparison with normal control subjects, have elevated scores on the *F*-scale. At midway and follow-up, all PTSD groups had scores either lower or equivalent to those obtained by the corresponding non-PTSD group. The endorsement of numerous symptoms of psychopathology (high *F*) correlated highly with Recent Life Events and Psychiatric History at initial assessment but not at follow-up. The high levels of maladjustment apparent in some of the PTSD groups at initial assessment may have been related to pretraumatic events and not just to the recent accident. However, the turmoil or maladjustment suggested by these high *F* scores (as well as high scores on all the clinical scales) would likely have an adverse affect on the ability to cope with the recent head injury; as has been found in studies of other forms of trauma (e.g., Ruch & Chandler, 1983).

A review of the MMPI literature on differentiating brain-damaged from other psychiatric groups (Farr & Martin, 1988) suggests that the *F*-scale holds the greatest potential of the three validity scales, with the average effect size difference between brain damaged and schizophrenic groups being 0.7; the schizophrenic group scoring the higher scores. In this study, four men had *F* scale scores so extreme that the scores suggested the possibility of an exaggeration of problems (as a plea for help), serious psychopathology, or brain damage. The two highest scores (*T*-score = 95) were from patients with right frontal lobe damage, of at least moderate severity. Brain damage may have accounted partly for the extreme scores; at least one was known to have damage localized to the anterior portion of the brain. However, these two patients also had a history of other stressful events or maladjustment (either extreme scores on Recent Life Events or Psychiatric History). Of the four people who obtained extreme *F* scores, three had PTSD; most frequently according to a variant of Braverman or Lidvall. Another 15 subjects also obtained high scores on

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the F scale (indicative of either severe neuroses or extreme emotional lability) and a third of them were PTSD-positive. All three sets of diagnostic criteria and all three levels of head injury were equally represented by these people.

In this research, there appeared to be a slight tendency for the more serious injuries to be over-represented among the high *K* scores, contrary to the results of Doehring and Reitan (1960). There was no association between the likelihood of receiving a PTSD diagnosis and an extreme *K* score, however, a qualitative analysis revealed that high *K* scorers who had PTSD were more likely to have met a variant of DSM-III criteria, while low *K* scorers who had PTSD were more likely to have met a variant of Braverman or Lidvall criteria. At follow-up, high *K* scores did not experience any form of PTSD. The low *K* scorers, were 60% PTSD-positive, equally according to all three sets of criteria.

Neurotic Scales (*Hs*, *D*, *Hy*)

A mean neurotic scales score for all the groups at all assessments was presented in Appendix M. Differences on these scales between PTSD and non-PTSD groups at initial assessment were minimal to non-existent when variants of DSM-III criteria were used. Subjects who had PTSD at initial assessment, according to variants of Braverman or Lidvall criteria, were symptomatic on the *Hs* (Hypochondriasis) and *Hy* (Hysteria) scales, indicating somatization and psychophysiological reactivity. High scorers on these scales may be characterized by excessive bodily concern; these individuals may react to stress by developing physical symptoms (Graham, 1977). Research among combat veterans (Archibald & Tuddenham, 1965; Fairbank et al., 1983; Miller et al., 1989; Ursano et al., 1981) has found that significantly higher scores on *Hs* and *Hy* are obtained among those who have PTSD or who received the most exposure to the stressor.

All PTSD groups in this study were slightly more depressed than non-PTSD groups, with a differences reaching significance when diagnoses were made according to DSM-III and Braverman (2) criteria. This reinforces other research that depression is an integral part of PTSD (e.g., Madakasira & O'Brien, 1987; McFarlane, 1988b), whether or not it is included as definitive criteria in DSM-III/III-R.

It was not possible to predict on the basis of neurotic scale scores at initial assessment who would have PTSD at midway, although there did seem to be a slight tendency for individuals with higher 'neurotic' scores to complain more of DSM-III criterion symptoms at midway. People who were PTSD-positive at midway according to DSM-III criteria were also more likely to have slightly

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higher 'neurotic' scale scores at follow-up. In contrast, PTSD groups formed from variants of Braverman or Lidvall criteria at midway were less likely to appear neurotic at initial and follow-up assessments.

At the time of follow-up assessment, patients with high neurotic scores were slightly more likely to have met either DSM-III and Lidvall criteria (2) for PTSD. Depressed subjects were also more likely to have PTSD at follow-up, according to Lidvall (2) criteria. Individuals with higher MMPI *D* scores at follow-up also had higher pretraumatic Recent Life Events scores, more pre-traumatic psychiatric problems, and slightly more serious head injuries. According to Farr and Martin (1988), the most frequent two-point code types seen in brain damaged persons appear to involve some combination of Scale *D*; others have also noted that the common pattern of brain damage on the MMPI was essentially that of a "reactive depression" (Russell, 1975; Golden, Sweet, & Osman, 1979). Trifiletti (1982) reported that only clinically depressed people score higher than brain-damaged group. The mean score on the *D* scale for all subjects at initial assessment was 61.6 (standard deviation = 10.7) at initial assessment, and 60.1 (standard deviation = 9.4) at follow-up. This suggests that the entire group was mildly depressed. There was a tendency for the more severely injured patients to be overrepresented in the group scoring one to two standard deviations above the mean (T scores = 70 to 80), however, only 25% of the severely injured had elevated *D* scores. The people who had scored extreme values on *D* (over T = 80) tended to be less severely-injured. At follow-up, the severely injured patients who had high *D* scores and PTSD were equally likely to have received their diagnosis from either DSM-III criteria or Lidvall (2) criteria, or both.

When diagnoses of PTSD were made concurrently with the MMPI protocols, the best separation on the neurotic scales between PTSD and non-PTSD groups occurred when variants of Braverman or Lidvall criteria were used, thus suggesting greater concurrent validity for the Braverman or Lidvall criteria. When several months separated the assessment of PTSD and the administration of the MMPI, the best retrospective prediction of PTSD on the basis of MMPI scores occurred when DSM-III (1) criteria was used. For example, at midway the highest association between PTSD diagnosis and neurotic scale scores from either previous or later administrations of the MMPI occurred when the diagnoses of PTSD were made according to DSM-III (1). Either the prediction of a DSM-III diagnoses of PTSD from earlier and later MMPI protocols is spurious, or there is some complex temporal interaction between DSM-III PTSD phenomena and distress variables.

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Examination of the correlations between these three scales and other predictor variables revealed that high *Hs* scores came from people with a higher Recent Life Event scores. The *Hs* scale failed to correlate significantly with either indices of severity of head injury or neuropsychological/cognitive test scores. The higher the *D* score, the more likely the subject was to be male, or to have numerous recent life events. Depression also was associated with lower WAIS-R Comprehension scores, implying impaired decision-making in the depressed. High scores on the *Hy* scale correlated significantly with Recent Life Events and with many of the other MMPI scales, but not with any other predictor variables.

Psychotic Scales (*Pa*, *Sc*, *Ma*)

A mean psychotic scales score for all the groups at all assessments was presented in Appendix M. As with the neurotic scales, scores on the so-called psychotic scales differentiated significantly between PTSD and non-PTSD groups (at the initial assessment) when diagnoses were made according to variants of Braverman and Lidvall but not when variants of DSM-III criteria were used. It was only when PTSD was defined on the basis of alternative diagnostic criteria that mean scores for PTSD groups corresponded to the results obtained in other research of traumatized survivors (e.g., Fairbank et al., 1983; Foy et al., 1984; Roberts et al., 1982; Vanderploeg et al., 1987). There was a possible three-way interaction in the acute stage of recovery, among pretraumatic events, psychopathology (as assessed by these scales), and increased risk of PTSD, when defined by variants of Braverman or Lidvall. This three-way interaction failed to occur at later assessments. People who met any set of criteria for PTSD at midway were slightly less likely than non-PTSD patients to have obtained high psychotic scale scores at initial assessment. There was generally good association between the occurrence of PTSD at midway and multivariate MMPI scores at follow-up, however. The midway PTSD patients still had slightly lower psychotic scale scores than the non-PTSD groups. Individuals who still had PTSD at follow-up, or who had just become PTSD-positive, had mean scores at follow-up that were indicative of turmoil; this was most apparent for patients meeting Braverman (2) criteria. They were quite anxious with higher MMPI *Pt* and *PTSD* mean scores.

People who scored high on the psychotic scales tended to be young, male and have many pretraumatic recent life events. Any suggestion of psychosis among these patients may be ruled out, as no individual displayed evidence of cognitive disorganization or thought disorder on the neuropsychology and cognitive tests.

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High scores occurred frequently on the *Sc* and *Ma* scales and these scales appeared together as the most frequently occurring two-point codes (provided in Appendix M). In addition, each appeared frequently in other two-point combinations. For example 20% of the people who had ever been diagnosed with PTSD according to any criteria had an 89/98 code at initial assessment, while 60% of the patients who ever had PTSD obtained their highest score on the *Sc* or *Ma* scale. In comparison, only 3% of the non-PTSD subjects had an 89/98 code. Individuals with the 89/98 code are described as being rather self-centred, demanding, socially withdrawn, and emotionally labile (Graham, 1977). Feelings of inadequacy, inferiority, and low self-esteem predominate, while there is a high need to achieve. These people are unlikely to be aware of their need for help and may have difficulty concentrating and thinking. This makes for poor intrapersonal and interpersonal coping; possibly leading to a serious psychological disorder, such as PTSD. The most frequently occurring codes among the non-PTSD subjects were the 24/42 and 49/94 two-point codes. Together they accounted for 37% of non-PTSD patients. According to Graham (1977), persons with 24/42 or 49/94 codes are likely to use acting-out and antisocial behaviour to deal with stress in order to counteract negative feelings. Furthermore, he suggests that when not in trouble, these individuals tend to be energetic, sociable, outgoing, and to present a facade of self-confidence and security; all the while being self-centred, impulsive, and incapable of deep emotional ties.

Elevations on the *Ma* scale and 89/98 code types are reported to occur frequently among brain damaged persons, although the *D* scale may appear most often in code types (Farr & Martin, 1988). Combinations inclusive of the *Pd* scale (4) or *Ma* scale (9) have also been reported among the brain damaged. In this research, the MMPI scores that had the highest mean scores for all subjects were the *Pd* scale and the *Ma* scale; the severely injured were more likely than others to obtain high *Ma* scores. The majority of the elevated *Ma* scores were not extreme, however; and the three levels of severity of head injury were all equally represented among the high *Ma* scorers. Extremely low scores on MMPI *Ma* were obtained by two women who had been recently released from a chronic care hospital. The hospitalization process may have explained the listlessness and low level of activity apparent on the *Ma* scale. Ten of the high *Ma* scorers obtained PTSD diagnoses but the extremely-low *Ma* scorers were also PTSD-positive. The three sets of diagnostic criteria were all equally represented among the PTSD patients who had extreme *Ma* scores.

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Anxiety Scale (MMPI *Pt*). The set of diagnostic criteria that had the highest association (and only significant relationship) with *Pt* in this study was Braverman (2) criteria. Group separation on the basis of this scale was disappointing when other sets of criteria were used. This finding supports the validity of Braverman (2) criteria in the identification of PTSD. The *Pt* scale had high intercorrelations with other MMPI clinical scales. High *Pt* scorers were also inclined to have had more Recent Life Events and evidence of cognitive inflexibility. As expected, higher scores on this scale were associated with frequent endorsement of PTSD symptoms, including sleep problems, nightmares, obsessive thoughts, alienation, dysphoria, cognitive dysfunction, nervousness, apprehension, and guilt. The label 'obsessive-compulsive' seems to best describe these people. The *Pt* scale was originally developed to measure the general pattern of symptoms labelled psychasthenia, which is considered by some to have a symptom presentation identical to PTSD. According to Graham (1977), high *Pt* scorers tend to be anxious, tense, fearful, agitated, and report difficulties in concentration and decision making. They are also likely to overreact to stressful situations. The label 'obsessive-compulsive' seems to best describe these people. This scale, considered a good index of psychological discomfort and anxiety, includes items dealing with intrusive thoughts, fears, jumpiness, apprehension, somatic complaints, cognitive impairment, and social withdrawal or alienation. Thus, it appears as a comprehensive measure of the full range of symptoms used to define PTSD by several sets of diagnostic criteria, including DSM-III; Fairbank et al. (1983) and Foy et al. (1984) found it to be highly useful in multivariate discriminant analyses to correctly identify cases of PTSD.

Personality Scales (MMPI *Pd*, *Mf*, and *Si*). There was moderate group separation on the basis of these scales and differences tended to be consistent. These scales frequently appeared in optimal sets of predictors as suppressor variables, for they correlated more highly with other predictor variables than with the criterion variable. These scales identified personality characteristics that distinguished between PTSD groups, diagnosed according to variants of DSM criteria and those identified by variants of Braverman or Lidvall criteria, and some didn't. At initial assessment, there was no relationship between MMPI *Pd* and group formation, except as an occasional suppressor variable, however, at midway and follow-up, *Pd* scores did make a substantial contribution to group discrimination. When groups were formed according to variants of Braverman or Lidvall criteria, they scored significantly lower *Pd* scores. In contrast, the groups of patients identified with PTSD by variants of DSM-III criteria had *Pd* scores 6 to 16 T-score points

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higher than the groups identified by variants of Braverman or Lidvall PTSD criteria. According to Graham (1977), these higher *Pd* scores (obtained by the DSM-III groups) may indicate greater flexibility and self-confidence, a wider range of interests and, possibly, lack of deep emotional responsiveness. Thus, high *Pd* scores may represent a form of protection against the distress associated with post-trauma recovery. Low *Pd* scorers tend to be passive, dependent and, unassertive, self-critical and dissatisfied with themselves, afraid to accept responsibility for their own behaviour and therapy. They are perceived as moralistic and rigid, neither creative nor spontaneous in their approach to problems.

Although other studies have found PTSD patients to be indistinguishable from other clinical groups on *Mf* scores (Vanderploeg et al., 1987), group differences on the *Mf* scale in this study contributed significantly to multivariate group separation. Low scorers were more likely to be diagnosed with PTSD according to any set of criteria and at any time, but especially at follow-up. In this study, individuals with low *Mf* scores were significantly less likely to endorse symptoms of psychopathology on the MMPI, either because of denial or from receiving protection against psychological turmoil by their conventionality. Low scores, for both men and women indicate stereotyped gender roles; men present themselves as extremely masculine, aggressive, and inflexible, while women tend to be overly passive, submissive and constricted (Graham, 1977). Rejection of the traditional role (i.e., high *Mf* scores) was associated with greater discomfort, anxiety, and depression on the MMPI but not with being diagnosed as PTSD-positive. High *Mf* scorers also obtained higher scores on the WAIS-R, significant on WAIS-R Object Assembly, which (according to Zimmerman and Woo-Sam, 1973) indicates cognitive flexibility and psychological differentiation. There was no qualitative difference in the type of PTSD symptoms experienced (at initial or midway assessment) between high and low *Mf* scorers, but at follow-up low *Mf* scorers (i.e., traditional gender role) were more likely to be depressed, to lose interest in sex, and to have difficulty making decisions.

The patients who met Braverman or Lidvall criteria at all assessments for PTSD were more introverted (i.e., higher MMPI *Si* scores), with the univariate differences reaching significance in some cases. High *Si* scorers were more likely to endorse symptoms of irritability, nightmares, obsessive thoughts, and depression on the Symptom Checklist. There was no relationship between *Si* scores and DSM-III criteria. According to Graham (1977), higher *Si* scores reflect a lack of security and self-confidence, together with cognitive rigidity and inflexibility. High scorers may also be moody, irritable, depressed, and anxious. Roberts et al. (1982) found PTSD substance-

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abusing combat veterans to have significantly higher *Si* scores than equivalent groups of veterans without PTSD; while Vanderploeg et al. (1987) found that PTSD veterans obtained *Si* scores identical to other clinical groups of combat veterans. In this study, high *Si* scores correlated significantly with Anger and poorer cognitive performance (e.g., WAIS-R Comprehension, Similarities, Object Assembly). There was a significant inverse relationship with severity of injury, with the extroverts receiving the more serious injuries.

Keane et al. Decision Rules and Content Scale for PTSD. The diagnoses of PTSD made according to DSM-III, Braverman and Lidvall et al., were also compared with results from the MMPI decision rule and content scale for PTSD, developed by Keane et al. (1984). To review, the Keane et al. (1984) decision rule utilizes scores of 66 on the MMPI F-scale, 78 on the D scale and 79 on the Sc scale, as cutoffs for diagnosing PTSD. This rule was developed from MMPI profiles of in-patient and out-patient psychiatric patients who had been combatants in Vietnam and were classified as either PTSD-positive or PTSD-negative on the basis of DSM-III criteria. Modest hit rates, exceeding those of chance, have been obtained for the Keane decision rule (Blanchard et al., 1988; Cannon et al., 1987; Hyer et al., 1986; Keane et al., 1984). In this study, there was little or no significant diagnostic agreement between MMPI-derived diagnoses of PTSD and those arrived at by DSM-III or alternative diagnostic criteria.

There was a patient who had extreme scores on both the PTSD content scale and the F-D-Sc decision rule at both assessments but never met PTSD criteria, although he did endorse a few symptoms. He was extremely backward, mildly retarded, and lived in the backwoods. He received a severe head injury causing an intradural hematoma to the left hemisphere. Pre-traumatic demographic and intellectual factors but not the head injury may have accounted for the elevated MMPI scores. It is possible that he lacked the skills to perceive symptoms of stress because of either his limited intellectual capacity or his severe head injury.

Results on the Keane et al. (1984) content scale for PTSD were more impressive. Although the agreement between this MMPI content scale and variants of DSM-III criteria was zero, diagnostic agreement between variants of Braverman or Lidvall criteria and the PTSD content scale (with a cutoff of one standard deviation from the mean) approached significance at initial assessment, but not at follow-up. This scale was developed to provide differential diagnoses of PTSD and has been endorsed by the U.S. Veterans Administration (see Blanchard et al., 1984). It has yielded relatively good rates for correctly classifying PTSD and non-PTSD patients among ex-

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servicemen, albeit not always with the same cutoff among groups of subjects (Cannon et al., 1987; Hyer et al., 1986; Keane et al., 1984; Query et al., 1986; Watson et al., 1986). According to Moody and Kish (1989), however, it is simply measuring the same factor as does the Welsh A scale (Welsh, 1956) -- i.e., general psychological maladjustment and dysphoria -- rather than any specifiable syndrome.

Univariate group mean differences on the PTSD content scale between PTSD and non-PTSD groups, formed according to various sets of semiological criteria were significant and impressive. The PTSD groups formed from DSM-III (1) criteria endorsed fewer items on the PTSD content scale than the corresponding non-PTSD groups (e.g., $X = 12.2, 7.3, ES = -1.18$). In contrast, the PTSD groups formed from all variants of Braverman and Lidvall criteria endorsed more items on the PTSD content scale than did the corresponding non-PTSD groups (e.g., $X = 17.3, 10.6, ES = .61, p < .01$).

In summary, group mean scores on the PTSD content scale discriminated significantly between PTSD and non-PTSD groups, in both univariate and multivariate analyses. At initial and midway assessments, it was the DSM-III (1) PTSD group that received the lowest mean score on the PTSD scale ($X = 7.3$ at initial assessment) thus indicating a lack of distress among that group. The PTSD groups formed from variants Braverman and Lidvall, however, obtained the highest mean scores ($15.8 \leq X \leq 17.3$). The mean difference between groups that were formed from other variants of DSM-III were in the same direction as those from DSM-III (1), although the mean differences were smaller. The separation between the PTSD and non-PTSD groups, formed from variants of Braverman or Lidvall criteria, was highly significant at initial assessment (PTSD group higher). At follow-up, PTSD groups formed from variants of DSM-III criteria had slightly higher mean PTSD scores than the corresponding non-PTSD groups had. The difference in scores on the PTSD content scale between the PTSD groups formed from Braverman or Lidvall and the non-PTSD groups was greater than it had been from DSM-III criteria, however.

Demographic/Psychosocial Variables

Age. In general, the mean ages of the PTSD groups were younger than corresponding non-PTSD groups, mostly because no person in the over-60 age group met PTSD criteria even though they made up 8% of the sample. The 44 to 60 year age group had more cases of PTSD than was expected from chance. In the other two age groups, the number of PTSD cases was proportional to their representation in the entire subject population. Of the PTSD patients in the

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age group 15 to 25 years, most were under 19 years of age. Therefore, cases of PTSD were overrepresented in the age groups under-18 and 44 to 60. These results agree with results from other studies of trauma survivors (Green, Grace, & Gleser, 1985; Leopold & Dillon, 1963; Levav et al., 1978). It is possible that the reason for the subjects over 60 not reporting significant stress, is that age had a very significant relationship with the willingness to endorse items of pathology (i.e., MMPI validity scales *L* and *F*). Age was significantly related to scores at the time of initial assessment on the MMPI scales *Pd*, *Pt*, *Sc*, *Ma*, and the *PTSD* content scale, with the younger members endorsing more the items of distress and maladjustment. The MMPI profiles of the older subjects tended to border on being invalid, because of "faking good". The relationship between age and response set was only significant, however, for the more obvious items (of "faking good") contained in the *L* scale and not for the more subtle items of the *K* scale. This suggests the use of repression and denial; therefore, the lack of PTSD symptom endorsement among the elderly subjects may simply reflect a denial of symptoms, not an absence of the disorder. While seemingly reluctant to endorse MMPI items that would make them look maladjusted, older people were willing to acknowledge somatic discomfort, however.

Age was positively related to recent life events and negatively related to socioeconomic status. There was no relationship between age and severity of head injury, but the older subjects did perform significantly poorer than the younger subjects on all of the Halstead-Reitan battery, except for Finger Tapping and Aphasia-Spatial deficits. Age also adversely affected scores on the WAIS-R Arithmetic, Similarities, Picture Arrangement, Digit Symbol, and Performance IQ but not Verbal IQ or Full Scale IQ. These test results conform to those of others (e.g., Heaton, Grant, & Matthews, 1986; Reed & Reitan, 1963; Reitan, 1955).

Sex. In all PTSD groups, regardless of diagnostic criteria, there tended to be a slight over representation of females. This reached significance only once (i.e., Braverman (2) at follow-up). Gender was included in the optimal subsets of some discriminant analyses, but prediction was poor and multivariate group separation was small and non-significant. Analyses in which gender was a suppressor variable were significant. In these, the propensity for males to have a greater history of psychiatric maladjustment was suppressed; thus, highlighting the predictive relationship between this variable and PTSD as diagnosed according to variants of Braverman and Lidvall criteria (at least at initial assessment).

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Even though the females were more likely to endorse PTSD diagnostic symptoms, it was the males who appeared less well adjusted and had evidence of greater psychological turmoil and distress on the MMPI. Males were more likely to produce the higher scores at initial assessment on MMPI *F*, *D*, *Pd*, *Ma*, and *PTSD*. At follow-up, the only MMPI scale on which the males had elevated scores was the *Ma* scale, but the correlation was quite significant ($r = -.47, p < .001$).

The men in this study had less social assets than the women, but performed better on the tests of motor and perceptual skills (Finger Tapping, Trail Making, & WAIS-R Performance IQ). The women had better social acculturation and judgment (WAIS-R Comprehension). These results are compatible with those of Heaton et al. (1986).

Socio-economic Status. Socioeconomic status was not a significant predictor in multivariate group discrimination; yet, all of the PTSD groups (regardless of diagnostic criteria) had lower mean scores at initial assessment than the corresponding non-PTSD groups. Individuals with the highest SES were least likely to experience early PTSD symptoms; possibly because their social and economic assets provided them with some protection from stress. People with lower SES experienced more distress and turmoil shortly after the accident than those with higher status, as evidenced by the significant negative correlation between SES and both MMPI *F* and *PTSD*. There was also a significant positive correlation between status and the appearance of adjustment or control (i.e., MMPI *K*). This agrees with research from other traumatized groups (Green et al., 1985; Levav et al., 1979). At follow-up, this trend was generally reversed: The PTSD groups appeared to have higher socioeconomic status than the non-PTSD groups, and there was no relationship between SES and MMPI scores. This may represent a delayed stress reaction in individuals with higher SES. These patients may have received support and coping resources because of their status in the acute stages, but this could not protect them from eventually experiencing PTSD. To the adage "every man has his breaking point", may be added the words "sooner or later".

People with higher SES tended to (a) have fewer Recent Life Events, (b) less likelihood of pretraumatic psychiatric problems, (c) superior verbal and non-verbal scores of neuropsychological and cognitive tests, as would be expected from the results of others (e.g., Heaton et al., 1986; Matarazzo, 1972; Reitan and Davison, 1974), and (d) have less severe head injuries than expected (e.g., Kerr et al., 1971; Selecki, Hoy & Ness, 1968). While the correlations between social class and most medical/neurological variables were highly significant, those between SES and duration

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of hospitalization were not. There was a tendency for a hastier release from hospital of patients with lower status than of those who had a higher SES and equivalent injuries. It is not known whether release was determined primarily by the medical staff or the patient. This is an interesting observation because of the interaction of good mental functioning (i.e., low MMPI scores, high neuropsychological and cognitive test scores), membership in a DSM-III PTSD group, and duration of hospitalization. The mean hospital stay was longer for individuals endorsing DSM-III criteria than for those who did not, despite lack of differences in GCS scores at admission or global severity.

Recent Life Events and Psychiatric History. These two variables are examined together because they followed the same patterns and trends with respect to group formation. While they correlated moderately ($r = .41$, $p = .001$) with each other, they were not interchangeable. Although they tended to correlate significantly with the same variables, there were exceptions. For example, Recent Life Events correlated highly with most of the medical/neurological variables while Psychiatric History had no relationship to severity of head injury. Both Recent Life Events and Psychiatric History were significant contributors to univariate and multivariate group separation. The PTSD groups generally had the higher mean score on these variables, except when formed according to DSM-III criteria, then the differences were negligible. Otherwise, correlations between these predictor variables and PTSD group membership at initial assessment ranged from a low of .14 to a high of .47 (the latter value is that between Recent Life Events and Braverman (2) criteria). While subjects with several pretraumatic DSM-III diagnoses were more likely to be PTSD-positive, there were also several subjects with no known psychiatric disability who were diagnosed with PTSD. This suggested that a stress reaction to an injurious accident is increased by excessive pretraumatic events and psychiatric disturbance. Correlations at follow-up were considerably reduced, but were in the same direction; the highest correlation occurred at that time when Lidvall (2) criteria were used for diagnosis. These results conform to those of other research in the field of trauma (e.g., Brill, 1967; Davidson et al., 1985; Green & Berlin, 1987; Green et al., 1985; Helzer et al. 1987) in which pre-existing psychopathology has been shown to predispose one to PTSD. A qualitative analysis of the Recent Life Event scores in this study revealed that the relationship with PTSD was linear: moderate to high scores on this variable were related to development of PTSD while lower scores were not.

Pre-traumatic psychiatric disability correlated significantly with lower SES, being male, and appearing maladjusted on MMPI *F*, *K*, *Ma*, and *PTSD*. Subjects with many stressful events in the

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year up to the accident were more likely to be young, have lower SES, and have received more severe head injuries. This suggested that there is either a causal connection between pretraumatic stressful events and serious head injuries; or that some people are just more prone to have numerous stressful events happen to them, including serious injurious accidents. Significant correlations occurred between 'Recent Life Events' and numerous MMPI scales *F, K, Hs, D, Hy, Pa, Pt, Sc, Ma*, and *PTSD* (.22 to .48). The variable Recent Life Events was more strongly associated with MMPI measures of psychological distress than PTSD had been. Elevated MMPI scores were produced by individuals with many recent aversive events; of which, the accident and its consequent injuries were just one. The interrelationship of Recent Life Events, psychological distress or maladjustment, and post-traumatic stress disorder may be explained according to the theory of learned helplessness discussed in the literature review. To review, it is known that previous uncontrollable aversive situations can lead to impaired problem solving, inadequate coping behaviour and a perception of the self as helpless, incompetent and weak (Wortman & Brehm, 1975). Such personality configurations, together with increased expectations (e.g., surviving the trauma and its consequences) and to reduced support (e.g., lower SES) are, according to Hirschfeld and Behan (1963), essential to the "disability process". This association among 'Recent Life Events', 'Psychiatric History', SES, and PTSD was greatest when PTSD diagnoses were made according to a variant of Braverman or Lidvall criteria.

Severity of Head Injury. Although global severity of head injury failed to discriminate between PTSD and non-PTSD groups, other medical indices of severity did in univariate analyses: duration of both impaired consciousness and hospitalization. Multivariate separation on the basis of these variables was small and in all but two cases not significant, perhaps partly because of the small effect size and the relatively small sample size. Consciousness was impaired for a longer period and hospitalization was longer for PTSD patients who had been diagnosed on the basis of a variant of DSM-III criteria. Significance was reached for DSM-III (2) and DSM-III (4). In comparison, differences between groups were less obvious (or in the opposite direction) when variants of Braverman or Lidvall were used for diagnosis of PTSD. These PTSD groups were hospitalized for a slightly shorter time and consciousness was impaired for about one-third of the time as it was for the non-PTSD groups. When admission Glasgow Coma Scale scores and Halstead-Reitan Impairment Index scores were examined, the PTSD groups were generally inseparable from corresponding non-PTSD groups. The PTSD groups from initial assessment were somewhat less likely to have

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received a skull fracture and little more likely to have received a hematoma. There is some evidence in the neurological literature that a skull fracture obviates more serious brain damage, since the skull takes the brunt of the impact (see Bond, 1986).

At follow-up, the PTSD groups formed according to a variant of DSM-III criteria or Lidvall criteria were slightly more seriously injured and had longer periods of impaired consciousness and hospitalization. The PTSD and non-PTSD groups formed from Braverman (2) criteria at follow-up were equivalent on medical/neurological variables.

In general, scores on the medical variables (indicative of increasingly severe head injury) were significantly correlated with lower SES scores, more Recent Life Events, social extroversion, and impaired neuropsychological and cognitive function. There was no significant association with Age, Sex, or distress variables, except that people who had a longer duration of impaired consciousness were more likely to deny distress (e.g., MMPI K scale) at initial assessment. This suggests that either (a) patients with longer impaired consciousness had blunted affect at the time of initial assessment, or (b) that people who were more defensive (e.g., on the MMPI) were slower to attain normal consciousness. At follow-up, blunted affect from the neurological insult to the brain should have cleared, but there was still a relationship between denial (on the L-scale) and severity of injury. Thus, the more severely injured patients were either not aware of distress or they actually experienced less distress.

There is some suggestion in the literature that more severely injured patients do experience less psychological turmoil; possibly because of greater support from family and medical personnel, and a longer period of hospitalization and convalescence in which to 'come to terms' with the trauma and its implications. There is also a greater opportunity for these people to acquire information from medical personnel as part of problem-focused coping, as well as less pressure from self and others to "get back on one's feet" (Kelly, 1975; Long et al. 1984; Mahan & Elger, 1989; Minderhoud et al., 1980). This may account for the higher incidence of PTSD symptoms reported among mild to moderate injured patients than among those with severe injuries. The risk of PTSD symptom formation appears to increase after acute care ends (Long et al., 1984) and when the patient resumes normal activities (Gronwall & Wrightson, 1974; Wrightson & Gronwall, 1981).

An interesting three-way interaction occurred, involving PTSD status (according to different sets of diagnostic criteria), medical indices, and neuropsychological-cognitive functioning. The PTSD groups formed on the basis of DSM-III criteria had longer periods of impaired

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consciousness and longer hospital stays, compared to other groups of PTSD patients and non-PTSD patients, despite lack of evidence of having received a more severe injury (i.e., overall severity, GCS scores upon admission, Impairment Index). The DSM-III PTSD groups also had generally superior neuropsychological and cognitive function, less turmoil and distress, and were better adjusted psychologically. It seems plausible that the longer hospital stay aided coping endeavours. This offers further support for the contention in this research that the endorsement of DSM-III criteria indicates the process of adaptation and the process of coping with the trauma.

Neuropsychological Variables. Test scores from the Halstead-Reitan Battery were modest at predicting who would have a diagnosis of PTSD. People who had greater neuropsychological impairment (i.e., TPT, Trail Making, Sensory Deficits) at initial assessment were likely to have received a concurrent diagnosis of PTSD according to a variant of Braverman or Lidvall criteria. Those who showed the least impairment, especially on psychomotor speed (i.e., TPT-Time, Finger Tapping) and verbal perception (Speech Perception) were more likely to be diagnosed with PTSD by DSM-III.

Improvement on Halstead-Reitan test scores over the period of recovery in this study was comparable to that of Dikmen et al. (1983) who assessed a similar group of 45 head injured patients; at approximately the same length of time following injury. This study had a marginally higher number (7%) of moderate to severe head injuries (compared to Dikmen et al.) and this was reflected in slightly higher Impairment Index ratings at both assessments. There was an improvement on the Impairment Index of almost 35%, and this together with the improvement found on most of the individual subtests was almost identical to those found in Dikmen et al. (1983), with a few exceptions. Subjects in this study were more impaired initially, compared with the Dikmen et al., on Category (although the number was small, because of the equipment failure) but less impaired at follow-up. This discrepancy was reversed on Trail-Making, however. If one assumes that both of these tests measure abstraction, then the net result is that the improvement in abstraction and reasoning skills was equivalent in both head injured samples. The Dikmen et al. patients were more impaired on Speech Perception than the subjects in this study, at both initial and follow-up sessions, and the improvement in the Dikmen et al. study was considerably greater because of the greater deficit. It appeared that the subjects in this study were quite proficient in their verbal and auditory facility. Impaired performance, relatively soon after injury, was found in (a)

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reasoning and concept attainment, (b) flexibility of thought processes, (c) adaptation to tasks with unique requirements, and (d) psychomotor problem-solving speed and skills. These findings were similar to those of Dikmen et al. (1983). In both studies improvement over time occurred for both simple and complex tasks.

Cognitive Variables. Certain WAIS-R subtests showed tremendous ability in this study to separate between PTSD and non-PTSD groups, either alone or in multivariate analyses, despite the reduction in sample size from 60 to 41 subjects. In DSM-III, a mental disorder is considered to be typically associated with either distress or impairment in one or more important areas of functioning. Not only did the PTSD groups formed according to variants of DSM-III criteria not show evidence of suffering distress and neuropsychological impairment, but compared with corresponding non-PTSD groups, they displayed intellectual curiosity and motivation, good verbal comprehension, and superior ability to acquire general knowledge and information necessary for effective behaviour (i.e., on WAIS-R Information, Comprehension, and Object Assembly). Saunders (1960) suggested that high scores on these scales indicate an individual who strives to create a new and independent self-image.

Information. The PTSD groups formed at initial assessment according to variants of DSM-III criteria scored up to one point higher than the corresponding non-PTSD groups on INFORMATION. In contrast, PTSD groups formed according to variants of Braverman or Lidvall criteria scored approximately two points lower than corresponding non-PTSD groups and up to three points lower than the DSM-III PTSD group at initial assessment. Groups formed at follow-up exhibited no differences on this task at initial assessment. In this study, all WAIS-R scores correlated significantly with other variables so that high scorers on the WAIS-R subtests reflected psychological health (e.g., on MMPI validity scales), more social and demographic assets, less severe head injuries, and good neuropsychological and cognitive abilities. This subtest measures the information the individual has absorbed from the environment. High scores require good verbal comprehension and remote memory, while chronic anxiety, cultural deprivation or limited education can cause scores on this test to be lower than the overall mean (Zimmerman & Woo-Sam, 1973). This subtest is not known to be affected by brain damage and it requires the least difference between groups to be significant.

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Similarities. The PTSD group formed according to variants of DSM-III had scores on this test that were higher than corresponding non-PTSD groups (by up to a standard deviation), other PTSD groups (up to two standard deviations), and even slightly higher than their own overall mean on all subtests. In contrast, the PTSD groups formed according to Braverman-Lidvall criteria had poorer scores on this task than corresponding non-PTSD groups (approximately by two scaled points) and slightly lower scores than overall mean scores on all subtests. Poor scores on this task were somewhat predictive of PTSD at follow-up. This subtest assesses the ability to generalize, to be abstract, and to find relationships that are not obvious. Good verbal comprehension, memory, perceptual organization, and a capacity for associative thinking are required for high scores. High scores are also likely to indicate precise judgment, emotional control and psychological mindedness, and sophistication (Zimmerman & Woo-Sam, 1973). Psychiatric patients who scored high on this test were found to be released earlier from hospital than other patients (McKeever, May, & Tuma, 1965).

Digit Span. In this study, PTSD groups formed according to variants of Braverman or Lidvall criteria were very significantly impaired on this task (as well as on Arithmetic, a measure of concentration and resistance to distraction). The PTSD groups formed by DSM-III/III-R criteria were slightly superior to other groups. Scores on Digit-Span and Arithmetic were also very significant predictors of PTSD status throughout the first year. This subtest is least influenced by general intellectual ability. It is believed to measure attention, concentration, and freedom from distraction. This recall task of immediate auditory memory is most disrupted by anxiety (Matarazzo, 1972; Rapaport et al., 1968; Zimmerman & Woo-Sam, 1972), in particular, state anxiety (Hodges & Spielberger, 1969). Russell (1972) has also noted that Digit Span may be significantly impaired by left-hemisphere brain damage. In this study, no member of a Braverman or Lidvall PTSD group who was impaired on this test had localized left-hemisphere damage; they were more likely to have localized damage to the right hemisphere. The corresponding non-PTSD groups, which contained all of the left-hemisphere cases, obtained scores superior to those of the PTSD group.

Arithmetic. The DSM-III group of PTSD patients was superior to all other groups on this test, while those diagnosed by Braverman-Lidvall criteria were inferior to all other groups (by up to two standard deviations). On the ARITHMETIC subtest, long considered a measure of concentration (Rapaport et al., 1968; Zimmerman & Woo-Sam, 1972), poor scores suggest anxiety

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and temporary inability to resist distraction, due to a "transient emotional state" (Knox & Grippaldi, 1970).

The Digit Span and Arithmetic tests, both of which assess attention and concentration, correlated very significantly with each other and with other neuropsychological and cognitive variables. Moderate correlations were also obtained with some demographic factors and indices of severity of head injury. Although these two tests correlated poorly with MMPI scales (especially *Pt*, and *PTSD*), there was a three-way interaction when PTSD group formation was considered. The PTSD groups formed from most variants of DSM-III criteria had relatively high mean scores on Digit Span and Arithmetic (suggestive of low anxiety), and low mean scores on MMPI *Pt*, and *PTSD*, (also suggestive of low anxiety). In contrast, the PTSD groups formed from variants of Braverman and Lidvall criteria had significantly lower scores on WAIS-R *DS* and *A*, together with significantly higher scores on MMPI *Pt*, and *PTSD* (all scores indicating high anxiety).

Vocabulary and Comprehension. There was little mean difference between groups on the Vocabulary and Comprehension but the trend seen among other verbal subtests remained the same. For example, high mean scores were obtained by DSM-III PTSD groups and low mean scores by Braverman or Lidvall PTSD groups. While neither of these tests are considered to be affected by stress they do assess social acculturation. The Comprehension test may also tap into coping ability, that is, active mastery versus passive dependency (Zimmerman & Woo-Sam, 1973).

Summary of the Verbal subtests. At the time of initial assessment, the PTSD groups formed from DSM-III criteria and to some extent by other variants of DSM-III criteria, were clearly superior on all verbal subtests, especially Comprehension and Similarities. This indicates good judgment, emotional control, attention and concentration, and psychological sophistication; as well as the ability to perceive abstractions, to analyze, and to resist distraction. In contrast, the PTSD groups formed from variants of Braverman or Lidvall criteria were clearly inferior on most verbal subtests. Their poorer scores on Information and Similarities suggest a lack of psychological sophistication and less cognitive ability to analyze, generalize, abstract, and absorb information from the environment (possibly due to cultural deprivation). These PTSD groups (alternative criteria) also seemed anxious and distracted, resulting in poor attention and concentration.

Subjective complaints of poor attention and concentration on the Symptom Checklist correlated moderately well with an objective assessment (WAIS-R *DS* and *A*) in the range of $r = -.14$

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to -.33. Subjective complaints recorded on the Diagnostic Interview Schedule also correlated with Digit Span and Arithmetic, but in the opposite direction. Persons who endorsed symptoms of impaired concentration on the DIS had higher than average scores on the WAIS-R DS and A.

At midway and follow-up, there was no longer the same degree of univariate group separation between initial WAIS-R scores as there had been when groups were formed soon after the head injury. Possibly, the reduction in group size contributed to this; as well as the fact that WAIS-R scores were not concurrent. Multivariate group separation on the basis of initial WAIS-R scores was, however, as significant at midway and follow-up as it had been initially. At these latter times, the relative contribution of WAIS-R subtests to discrimination increased in complexity. It was no longer so clear that the intellectually bright subjects met DSM-III criteria for PTSD and the less-bright subjects met Braverman or Lidvall criteria for PTSD. What did remain constant was that anxious people (poor DS and A scores) at initial assessment were still most likely to meet Braverman or Lidvall criteria for PTSD and not any variant of DSM-III criteria. Bright people who had PTSD at midway and follow-up were equally likely to meet any set of diagnostic criteria.

Picture Arrangement. A good example of the role that intelligence and social acculturation played in the occurrence of PTSD throughout the first year is best provided by the PICTURE ARRANGEMENT subtest. Persons who met DSM-III (1) and DSM-III (3) diagnostic criteria for PTSD at initial assessment had very significantly higher scores on this subtest than all other groups, while there was little separation between PTSD and non-PTSD groups formed according to alternative diagnostic criteria. According to Zimmerman and Woo-Sam (1973), good performance on this test relative to overall scores requires the ability (a) to perceive cause and effect relationships, (b) to comprehend or to size up a total situation, and (c) to construct underlying themes. Various studies (listed in Matarazzo, 1972; Rapaport et al., 1968; Zimmerman & Woo-Sam, 1973) have indicated that scores are positively influenced by interest in others, foresight, planning, social skills, social awareness, ability to monitor one's own behaviour, and the use of humour as a coping device. Scores can be adversely affected by emotional problems. All PTSD groups formed at midway and follow-up had higher mean scores on this subtest during the initial assessment. Obviously the coping resources represented by this and other verbal subtests did not protect the individual from eventually having a stress reaction. This does not change the contention made earlier about the invalidity of using evidence of coping as diagnostic criteria for PTSD, because evidence of coping resources does not imply there will be no distress experienced (Lazarus & Folkman, 1984). It is the

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distress that is experienced following trauma that makes the traumatic response qualify as a disorder. Coping behaviour is not a disorder.

Other Performance subtests. Mean scores on DIGIT SYMBOL were generally the lowest scores ($X = 7.1$) while the BLOCK DESIGN mean was the highest ($X = 8.8$) of all WAIS-R subtests. While brain injury may have contributed to the low *DSy* scores, this subtest is also known to be affected by situational stress or distraction. For example, Moon and Lair (1970) noted a significant lowering of *DSy* scores among subjects who viewed a stressful film prior to taking the test. There were no differences between PTSD and non-PTSD groups (and no trends observed at any time) on the subtests PICTURE COMPLETION, a measure of perceptual skill (Zimmerman & Woo-Sam, 1973), or OBJECT ASSEMBLY, possibly a measure of coping ability (Gaines, Smith, & Skolnick, 1977) and "field dependence" (Witkin, Goodenough, & Oltman, 1979).

Summary. The intellectual superiority of the persons who met DSM-III (1) criteria, and to some extent DSM-III (3) criteria, for PTSD at initial assessment was clear from the WAIS-R scores. When retrospective cases were included (i.e., DSM-II (2) and DSM-III (3)), or when PTSD was diagnosed at a later time according to variants of DSM-III/III-R, the mean WAIS-R scores for the PTSD groups decreased on tests such as Similarities, Information, and Picture Arrangement. This probably relates to the addition of PTSD patients who were not as perceptive and analytical as the original PTSD group and who have used the extra time to think about, or reappraise, their situation; they finally made the causal connection between their recent head injury and their distress. The method of retrospective recall gave the less-perceptive or less-analytical people extra time to appraise their situation. Despite this, individuals who endorsed any variant of DSM-III criteria for PTSD at any time were less distressed, less anxious, and less impaired than those who met Braverman or Lidvall criteria. This evidence suggests that the DSM-III PTSD group had the greatest capacity for cognitive manipulation and symbolic reasoning. These cognitive abilities are important functions for adaptation and coping.

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Appendix A

Cross-Catastrophe Comparison of Trauma

Individual Experiences

Post-traumatic stress disorder has been reported to follow diverse types of trauma that are experienced individually. Besides motor vehicle accidents, these may include exposure to toxic or nuclear substances, accidental or occupational contact with high voltage electrical wiring, criminal assault, shooting someone in the line of duty, and even awakening paralyzed during surgery (Blacher, 1975; Hooshmand, Radfar, & Beckner, 1989; Peebles, 1989). Yet the issue of whether these incidents qualify as traumatic stressors is contentious. For example, Schottenfeld and Cullen (1985) described recurrent symptoms of distress that followed repeated occupational exposure to toxic organic substances in 20% of exposed people who were referred to an occupational medicine program. These patients considered themselves severely disabled by symptoms that they attributed to toxic exposure but for which no physiological basis could be found. Almost half of these people met full or partial (e.g., two of three primary symptoms) DSM-III criteria for PTSD. All of the patients were either receiving some form of medical disability income or were suing to receive such benefits. This study was criticized by Feder (1985) who suggested that "secondary gain" was involved and that occupational toxic exposure did not qualify as a PTSD stressor, citing as examples of PTSD stressors the more extreme ones listed in DSM-III (e.g., combat, death camps and airplane crashes). Schottenfeld and Cullen replied that the toxic exposure was quite terrifying to these individuals and caused them to believe that they were extremely sick, dying, or going crazy; thus constituting a serious threat to either life or physical integrity. Studies of local reaction to the Three Mile Island nuclear accident and Love Canal suggested that persons exposed to environmental contaminants may exhibit emotional, behavioural, and physiological effects of chronic stress up to five years later (Baum, Gatchel, & Schaeffer, 1983; Davidson & Baum, 1985; Kasl, Chrisholm, & Eskinazi, 1981). This issue will become increasingly important as society contends with our increasingly polluted planet and the ramifications of pollution on the individual.

Burns. Being burned in a fire is an intensely traumatic experience which is not only catastrophic and life-threatening but it also painful, disfiguring, debilitating and often involves a long hospital stay and a length of separation from home, family, friends, and work. Studies of adults by Andreasen, Norris, and Hartford (1971), Courtemanche and Robinow (1989), and White (1982)

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and of children by Stoddard, Norman, and Murphy (1989) show that as many as two-thirds of burn patients have PTSD symptoms during their recovery. Up to half of all burn patients have symptoms one year after their accident. While no relationship appeared between the location of the burns and incidence or severity of psychological sequelae, White (1982) found that predictive factors for poor psychological recovery included severity of injury, duration of hospital stay, as well as age and family size. White compared burn patients with survivors of accidents who had acquired non-burn injuries and found no differences between the two groups in terms of incidence, severity, or predictive factors of PTSD.

Assault. Criminal assault is a traumatic event that can produce major and sometimes lasting psychological impact on victims. Post-traumatic stress disorder has been noted in victims of assault and robbery (Bloch, 1978; Davis & Friedman, 1985), individuals who were shot at by a crazed gunman (Creamer, 1990; various news accounts of the survivors of the Montreal massacre), families of homicide victims (Ryneerson, 1984), and in victims of rape (Atkeson, Calhoun, Resick, & Ellis, 1981; Burgess & Holmstrom, 1974; Coons & Milstein, 1984; DiVasto, 1985; Frank, Turner, & Stewart, 1980; Kilpatrick, Veronen, & Best, 1985; Ruch & Chandler, 1983). The families of victims have to face their own trauma – the threatened death or disability of their loved one. Post-traumatic stress disorder symptoms may occur in relatives during the complicated process of understanding, accepting and adjusting. Studies show that at least 25% of relatives of trauma victims continue to experience PTSD symptoms, six to eight months later, possibly maintained by self-blame and guilt (Brodland & Andreasen, 1977; Cella, Perry, Kulchycky, & Goodwin, 1988; Hodgkinson, 1989; Lindemann, 1944).

Davis and Friedman (1985) found a high incidence of PTSD symptoms in robbery victims during the first few weeks after being robbed. Emotional reactions stemmed from the feeling of having one's personal space violated, rather than the actual loss per se. Most symptoms had declined substantially within four months. The effects of bodily assault may not be ameliorated so quickly. Bloch (1978) assessed 253 inner-city school teachers who were either assaulted (28%) or threatened with assault (72%). Some of the physical injuries received as a result of the classroom assaults were lacerations, bruises, and head injuries leading to seizures and deafness. At least half of the teachers suffered PTSD symptoms from two to ten years later. Symptoms of PTSD may also occur in law enforcement personnel involved in shooting someone. One study (by Stratton, Parker, & Snibbe, 1984) reported that a sample of 100 officers could be roughly divided into three

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equivalently-sized groups reflecting the emotional affect of the shooting. Reactions included anger, isolation, crying, depression, flashbacks, sleep problems, and fear of legal entanglements.

Studies of children who have experienced traumatic stressors show that they too suffer from PTSD (Wolfe, Gentile, & Wolfe, 1989), although it is uncertain whether PTSD is manifested in exactly the same way as it is in adults. Terr (1981, 1983) reported on symptoms that were still present in 25 children who, four years previously, had been kidnapped at gunpoint and buried alive for 16 hours in a school bus. She concluded that there are significant long-term differences in response to trauma between children and adults, including no evidence of avoidance/numbness or intrusive recall, although posttraumatic play and reenactment and traumatic dreams were frequently observed in the children. Particularly striking was that many of the children held a view of the future that was limited. In contrast, Wolfe et al. (1989) reported that sexually abused children did experience intrusive thoughts, sex-associated fears, and other PTSD-specific symptoms, as well as global adjustment problems.

Rape. Threat to life and integrity is an integral part of the experience of rape. Kilpatrick et al. (1985) reported that 64% of the victims they studied had felt so threatened. As well, victims may be plagued by repercussions of the physical violence (e.g., injuries) and of the rape itself (e.g., pregnancy, disease). Studies indicate that rape victims have significantly higher levels of anxiety, fear, depression, and sexual dysfunction and lower levels of self-esteem than do non-victims. Although no study was found that directly used all of DSM-III criteria to assess PTSD following rape, Kilpatrick et al. (1985) suggested there is ample evidence that most victims of rape would meet DSM-III criteria. Dahl (1989) used the Impact of Event Scale to assess intrusive recall and avoidance following rape. Of the victims, 77% experienced high levels of intrusive recall and 57% experienced high levels of avoidance (the remaining 43% reported a medium level of avoidance). While victims often show substantial improvement after three to four months, suffering is still evident 12 months later. Even years later, many still experience flashbacks, phobias, anxieties, and recurrent dreams (Atkeson et al., 1981; Burgess & Holmstrom, 1974; Kilpatrick et al., 1985). The relationship between psychological response and situational aspects of the rape is uncertain. While Burgess and Holmstrom (1974) reported a direct relationship, Frank et al. (1980) and Ruch and Chandler (1983) found almost no relationship between aspects of the rape situation and the psychological response. For example, an entire set of assault variable in the latter study only accounted for 2% of the variance .

Collective Experiences

There have been many studies that have investigated PTSD in circumstances that are collective, such as disasters or war-associated experiences. Among the disasters extensively researched are the Australian bushfire devastation (McFarlane, 1986a, 1988b; McFarlane & Raphael, 1984), the Beverly Hills Supper Club fire (Green, Grace, & Gleser, 1985; Green, Grace, Lindy, Titchener, & Lindy, 1983), the Boston Cocoanut Grove Nightclub fire (Adler, 1943; Cobb & Lindemann, 1943); the Hyatt Regency Hotel skywalk collapse (Wilkinson, 1983); IRA bombings (Sims, White, & Murphy, 1979); Mount St. Helens volcanic eruption (Adams & Adams, 1984), floods (Erikson, 1976; Lifton & Olson, 1976; Melick, 1978; Titchener, 1985; Titchener & Kapp, 1976), tornadoes (Brownstone, Penick, Larson, Powell, & Nord, 1977; Madakasira & O'Brien, 1987; Penick, Powell, & Sieck, 1976; Robins, Smith, Cottler, Fischback, & Goldring, 1985; Zarle, Hartsough, & Ottinger, 1974), as well as train, airplane, and ship crashes (Boman, 1979; Leopold & Dillon, 1963; Moshansky, 1991). In addition to the survivors of such disasters, rescuers and those who recover and sort human remains also may suffer PTSD as an after-effect of exposure to the dead and to mutilated bodies (Ersland, Weisaeth, & Sund, 1989; Jones, 1985; Marchant, Guemsey, & Yoshida, 1989; Wilkinson 1983). In calamities that occur away from the home, from half to all of the survivors complain of psychiatric symptoms, poor health, deterioration in marital and family status, and a significant decrease in work capacity, up to a year later. Distress is attributed to the threat of death or physical injury, to bereavement, to the absence of any chance to protect oneself, and to the grotesque sights of dead or mutilated bodies.

According to Erikson (1976) and McFarlane and Raphael (1984), psychological morbidity in community disasters is determined not only by the experience of the disaster and personal losses but also by the effects of evacuation, relocation, and loss of the community and its support. One study (cited in Quarantelli, 1985, p. 199) of tornado survivors found that those who had lost the most had more signs of distress than other survivors who sustained minor losses. All survivors still had more PTSD symptoms than a non-disaster control group at six and eighteen months post-disaster. Erikson (1976) and others (Golec, 1983; Hall & Landreth, 1975) believe that inequities and inefficiencies in post-disaster relief and recovery services also generate anger, concern, worry, and anxiety leading to so-called secondary disasters.

There are reports that PTSD also follows air, train, and ship crashes. In a federal inquiry into the Dryden, Ontario airplane crash of March 10, 1989, survivors revealed to the court the emotional

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horror they have been living with since the crash (Moshansky, 1991). Boman (1979) also found a high number of PTSD symptoms in survivors of a train crash in Granville, Australia 18 months after the event. Leopold and Dillon (1963) examined 35 experienced seamen who survived a marine disaster in which two ships collided causing the loss of 10 fellow crewmen and the sinking of one ship. Early examinations revealed that 78% of the men described distressing psychologic symptoms, predominantly anxiety, tension, and gastrointestinal upset. Other common complaints were insomnia, depression, and excessive preoccupation with details of the accident. Four years later, an assessment of these survivors revealed that 35% had required hospitalization and 90% had sought professional help for their psychiatric complaints. Somatic symptoms, restlessness, depression, and phobic reactions were more frequent at follow-up than they had been initially. At least 65% of the surviving crew of seasoned sailors were unable to return to full-time marine employment.

Reports of PTSD symptoms among investigators and workers who removed charred bodies and combed through the debris of the Gander, Newfoundland crash of U.S. servicemen were given during a federal inquiry into the health of the workers (Marchant et al., 1989). Nine months following an off-shore oil rig disaster, Ersland et al. (1989) reported that 24% of the oil-rig rescuers had poor mental health condition due to the disaster experience, while 50% experienced intrusive recall and 39% experienced avoidance. Rescuers who were professionals reported stress reactions less frequently than did the non-professionals; probably due to an interaction of training, experience and selection of professionals on the basis of personality traits (e.g., risk-takers).

Variations In Methodology and Their Effect on Incidence Rates

Epidemiology figures for the occurrence of PTSD following disasters vary between 5% and 50%. Variability not only depends on the situation, degree of exposure, and personal appraisal but also the data-gathering design, theoretical orientation of the researchers, and the operational definition used to diagnose PTSD. For example, Solomon and Canino (1990) reported that disaster victims, with apparently high levels of distress following exposure, reported symptoms of avoidance/numbness infrequently. This suggests that highly traumatized disaster victims may be going undiagnosed for PTSD if psychiatric criteria, as it stands now in DSM-III-R, is used to make the diagnoses.

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Data-gathering design. There is little consistency in how contact is made with traumatized individuals. Some studies lean towards self-selection (i.e., survivors who search out therapy or who are involved in litigation). Other studies use population surveys, drawing random samples if possible. Malt (1988) has suggested that the majority of studies into the validity of DSM-III criteria have been with treatment-seeking survivors. This emphasis on health care seeking behaviour as a diagnostic criteria may cause a social, sexual, or racial bias in DSM-III diagnoses. Furthermore, when DSM-III is applied to patients who have never been in contact with psychiatric services the validity of DSM-III may be reduced. Lindy, Green, Grace, and Titchener (1983) saw 28 survivors of the Beverly Hills Supper Club fire who had presented themselves for psychotherapy. Nineteen patients (68%) had PTSD according to DSM-III criteria, which was assessed in interview/therapy sessions; at least half of these patients also met criteria for major depression. Individuals diagnosed as not having PTSD received diagnoses of either major depression or adjustment disorder. These patients were part of a larger group of 117 survivors who responded to an extensive outreach program (e.g., newspaper advertisements, posters, and word-of-mouth). Assessment by diagnostic interview and questionnaires revealed that, in contrast to the therapy patients, the remaining subjects suffered only mild levels of stress and psychopathology. At the time of assessment, which was 6 to 12 months after the fire, the scores of the larger group fell midway between normal and those from psychiatric outpatients (Lindy, Grace, & Green 1981; Green, Grace, & Gleser 1985). The authors of these studies warned, however, that many survivors at risk of Post Traumatic Stress Disorder refuse to participate in trauma studies because they want to forget about the trauma and resist any intervention that would reactivate the trauma psychically.

Using a probability sample of 15% of the total impact population, research following the effects of a tornado in Xenia, Ohio found that after 18 months most people reported positive reactions to the disaster (cited in Quarantelli, 1985, p. 190). This included pleasure with themselves over how they handled the crisis and met the challenge. There were extremely low rates of severe mental illness among this group: 3% reported worsening marital or social relationships and 28% reported an improvement to their life. This is not to say, however, that the early reactions may not have been more disabling. In a study by Madakasira and O'Brien (1987), DSM-III symptoms of PTSD were frequently reported five months after a series of tornadoes in 82% of a group of 279 survivors.

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Theoretical/professional orientation of the researchers. Epidemiology figures may also be affected by the theoretical or professional orientation of the researchers, (e.g., a medical/psychological approach vs. a sociological approach). For example, using psychoanalytically-oriented interviews, analyses of dreams, and observations of family interaction, Titchener and Kapp (1976) assessed 90% of the survivors of Buffalo Creek as disabled. In contrast, a symptom checklist was used to assess victims of another flood (i.e., in Wilkes-Barre, Pennsylvania). It yielded scores similar to those of a non-flood control group, scores that were indicative of positive mental health. However, respondents did report their health to be significantly worse after the flood (Melik, 1978).

Sociological measures that are used to measure dysfunctionality among survivors include the number of attempted or actual suicides, the rate of juvenile delinquency, the number of citations for driving while intoxicated, the number of automobile accidents, the rates for physical illness, the number of tranquilizer prescriptions, and the utilization of community mental health centre services. Using these measures, Hall and Landreth (1975) reported no evidence of dysfunction among survivors of a flash flood in Rapid City, Iowa. The same could not be said for the survivors of the Mount St. Helens' volcanic eruption. Adams and Adams (1984) reported substantial increases in rates of physical illness, alcohol abuse, family violence, assault, vandalism, psychiatric investigations, mental health appointments, and crisis line calls. The factor of recovery time may explain these disparate results. While the former study was conducted 18 months after the flood, the latter study reported on the first 7 months that followed the volcanic eruption.

There are four views on what effect disasters have on an individual's mental health. As outlined by Warheit (1986), one view suggests that disasters produce widespread psychological distress and social disruptions among the affected population. Individuals may experience a continuing state of post-disaster stress and/or psychological disorders because of the psychic trauma. Another view is that disasters may function to produce a strong sense of personal and social stability. According to a third view, disasters produce only brief and self-limiting psychological stress and few, if any, cases of chronic psychological or psychiatric disorder. This leads to the fourth view: If disaster-related trauma produces long-term gross pathologies, it does so in persons with prior histories of psychiatric illness or psychological vulnerability.

Combat Stress Reaction, the Paradigm of PTSD

During World War I, a constellation of psychological symptoms including daze, fear, trembling, nightmares, and inability to function was observed among combatants. Called shell shock, it was believed to be caused by brain damage from concussion caused by exploding shells. These symptoms were also found to follow trauma where physical injury was not a factor. The research into PTSD following periods of international conflict (e.g., World War I and II, Korean War, Vietnam War, Arab-Israeli conflict) on military personnel and the survivors of death and prisoner-of-war camps has been voluminous. Chodoff (1963) suggested that the combat stress reaction is the paradigm of PTSD. However, in comparison to motor vehicle accidents and peacetime disasters which are sudden, acute, and unexpected, wartime stressors represent both acute and chronic trauma. Horrendous war experiences include extreme fatigue and prolonged exposure to battle conditions, continual threat to life, exposure to grotesque sights, abusive violence, isolation from home, family and community, repeated contact with death and wounding of comrades, friends, or family. Furthermore, adjustment to postwar life is also problematic. These experiences would seem to create a much greater potential for causing PTSD.

While it appears that the symptoms following both war and civilian trauma show some similarity across events, what seems to distinguish stress reactions to very severe forms of trauma are the complex unfolding and the persistence of the disorder. Research by Archibald and Tuddenham (1965), Chodoff (1963), Christenson, Walker, Ross, and Maltbie (1981), Dobbs and Wilson (1960), Kadushin, Boulanger, and Martin (1981), Leopold and Dillon (1963), Miller, Martin, and Spiro (1989), Speed, Engdahl, Schwartz, and Eberly (1989), Ursano, Boydston, and Wheatley (1981) and Van Dyke, Zilberg, and McKinnon (1985) suggest that symptoms may be reactivated at any time (even decades later) by an event that psychically simulates the original trauma. Stress reactions may increase in severity over time or they may only appear after many years. Almost all survivors of death camps continue most of their lives to have PTSD symptoms that may even be passed onto succeeding generations (Eaton, Sigal, & Weinfeld, 1982; Eitinger 1969; Krystal, 1985; Shoshan, 1989; Sigal, DiNicola, & Buonvino, 1988; Solomon, Kotler, & Mikulincer, 1988).

Studies have shown that prisoners-of-war who had been exposed to the most torture, received the poorest treatment, and lost the most body weight suffered the most distress, as measured on at least three dimensions including adaptational problems, severity of PTSD symptoms, and degree of pathology on the MMPI (Miller et al., 1989; Speed et al., 1989; Ursano et al., 1981). When German-held POWs from WWII were compared with Japanese-held POWs 40

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years after the end of the war, the latter had more severe PTSD symptomatology and higher elevations on almost all of the clinical scales of the MMPI and the Millon Clinical Multiaxial Inventory. These results are consistent with the fact that conditions for Japanese-held prisoners were generally more adverse, according to both survival rate and physical health at the time of release. As an example of the complex temporal aspects of PTSD following severe stressors, the disparity between the two groups is only now apparent, 40 years later. Severity of symptomatology did not differentiate the two groups within the first year of repatriation.

Psychological reasons accounted for between 10 and 23% of all evacuations of disabled combat personnel during WWII. According to U.S. estimates, this figure dropped to 6 or 7% in Korea and to 1.2% during Vietnam although Boman (1982) takes issue with this estimate and suggests that U.S. casualty figures in Vietnam were underreported and should be closer to the Australian figure of 6%. Boman (1982) and Figley (1978) suggest that most combat-related psychopathology was concealed by labelling these problems as administrative disciplinary disorders, character or conduct disorders, or secondary gain issues (e.g., removal from battle). If the Vietnam war did produce less casualties than WWII did, the reasons usually offered were shorter tours of duty, greater opportunities for R and R, less time on the battlefield, better training, on-site treatment, and expectations among medical personnel and officers that the soldiers would return to duty as soon as possible (Figley, 1983).

As war intensified in both WWII and Korea, incidence rates of psychiatric disability increased. As the war wore down, the number of stress disorders decreased. Comparable trends did not materialize in Vietnam. The incidence of psychiatric disorders grew rapidly as the war was coming to an end and continued well into the post-war period. According to Figley (1983), Goodwin (1980, 1987), Renner (1973), and Stretch (1985) the reasons are varied and include lack of companionship, emotional support, and fidelity to the unit or its leader (probably caused by the rotational 12 month tour of duty). The nature of the war was also a contributing factor: the confusing ideological and political conflict over the war effort, the lack of clear identification of the enemy, the unclear demarcation of enemy territory, and difficulty in coping with women and children combatants. The opposition to the war at home was influential, as was the brief transition period from battleground to home and the return to an unsympathetic society. The anti-war sentiment that pervaded the U.S. in the later years of the Vietnam conflict is thought to have contributed to the increased rates of PTSD symptoms seen after the war. Laufer, Yager, Frey-Wouters, Donnellan, Gallops, and Stenbeck (1981) found that men who came home after 1968

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reported having more symptoms of stress than did veterans with similar backgrounds who served earlier. Fantasies of home coming, together with the use of licit and illicit drugs, may have promoted longer periods of denial and numbing and helped many to hold on through their tour of duty, thus postponing PTSD (Figley, 1983).

Comparative research between WWII and Vietnam servicemen does not answer the question of whether there was a difference between the two wars in terms of delayed suffering. Just as Vietnam produced psychologic disorders that seemed more pronounced after the war, so too a sample of 57 WWII combat veterans reported increased symptoms 15 years after WWII ended. Archibald, Long, Miller, and Tuddenham (1963) reported that on a questionnaire containing 24 PTSD symptoms, 21 of the symptoms were reported more frequently in 1960 than they had been reported during combat or upon discharge, according to service records. The only symptoms reported less frequently in the long term were combat dreams, nail biting, and alcohol abuse. Conversely, Davidson, Kudler, Saunders, and Smith (1990) reported that a sample of Vietnam veterans exhibited more severe PTSD symptoms than a group of WWII veterans, comparable in terms of socioeconomic and combat measures, age of onset, and sequential emergence of PTSD. The Vietnam veterans also reported more depression, hostility, psychoticism, impairment of work and interests, derealization, and suicidal tendencies. Pretraumatic factors, such as a greater lifetime frequency of panic disorder and an earlier age of onset for alcoholism among the Vietnam veterans may have been influential.

During service in the Vietnam war and for up to one year afterwards, Vietnam veterans were eight times as likely to be stressed as were civilian Americans, according to the "Legacies of Vietnam" study (Kadushin et al., 1981). Combatants suffered PTSD at three times the frequency rate of non-combatant service personnel. Non-white veterans were more likely to be stressed than whites. This may not reflect racial differences but an interaction of race and combat intensity: Non-whites were more likely to have been assigned to heavy combat and PTSD appears to be more prevalent among those who saw heavy combat. The prevalence of PTSD among Vietnam veterans since the war's end has been estimated anywhere between 18% and 54% for veterans who have left the service and 12% for those still on active duty (Stretch, 1985). The reasons for this disparity include differences in peer social support and the likelihood that those with coping difficulties left voluntarily or were discharged.

As the primary factors in the incidence and severity of PTSD reactions to war-related experiences, the literature generally points to the degree of exposure to and participation in

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combat, atrocities, or both (Atkinson, Sparr, Sheff, White, & Fitzsimmons, 1984; Belenky, Solomon, & Noy, 1985; Boulanger, 1981; Brett, & Mangine, 1985; Card, 1987; Carroll, Rueger, Foy, & Donahue, 1985; Fairbank, Keane, & Malloy, 1983; Foy, & Card, 1987; Foy, Carroll, & Donahue, 1987; Foy, Sipprelle, Rueger, & Carroll, 1984; Frye & Stockton, 1982; Green & Berlin, 1987; Helzer et al., 1987; Laufer, Brett, & Gallops, 1984; McFall, Smith, Roszell, Tawer & Malas, 1990; Palinkas & Coben, 1987; Penk, Robinowitz, Roberts, Patterson, Dolan, & Atkins, 1981; Silver & Iacono, 1984; Soloman, Mikulincer, & Hobfoll, 1987; Stretch, 1985; Watson, Kucala, & Manifold, 1986; Wilson et al., 1985; Yager, Laufer, & Gallops, 1984). Post-traumatic stress disorder may also be related to internal perception of combat effectiveness (Belenky, 1987).

Mention must also be made of reports that psychiatric casualty rates may have been at least twice as high among support troops as among combat troops (Boman, 1972; Futterman & Pumpian-Mindlin, 1951; Levav, Greenfield, & Baruch, 1979; Panzarella, Mantell, & Bridenbaugh, 1983). The reasons offered for this paradox include the fact that support personnel were also under constant threat and danger at base camps never considered safe, yet, they were seldom given the opportunity to retaliate against the omnipresent enemy. As well, support staff were often given the most boring jobs. The camaraderie that developed within the combat troops failed to occur among the base staff. Fleming (1985) also suggests that the rear echelon may also have experienced guilt about avoiding the rigors of the field.

Some suggest that the whole question of PTSD reactions to combat are overblown; that for the majority of Vietnam veterans the war did not have a long term negative effect on their personal development (Nace, O'Brien, Mintz, Ream & Meyers, 1978; Van Putten & Yager, 1984; Worthington, 1977). It is proposed that premilitary factors and postmilitary social factors are more strongly related to PTSD than combat experiences. It is further suggested that patients with PTSD have a co-existing psychiatric disorder, in particular, affective disorder, anxiety disorder, substance abuse, or personality disorder. Whether these coexisting disorders were triggered by unusual stress or whether a predisposition to such disorders render certain people more susceptible to PTSD is a matter in need of further research.

Using the data accumulated in the "Legacies of Vietnam" study, Boulanger (1981) argues that combat exposure and stress syndromes are related only when researchers define the syndromes on the basis of specific symptoms. More general indices of psychological dysfunction (e.g., those that measure depression) may not bear such a relationship with combat service, as Helzer, Robins, Wish, and Hesselbrock (1979) found. Boulanger obtained a direct relationship

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between exposure and stress using the Stress Scale, which contained items that had been observed in previous trauma studies.

Summary

Exposure to various trauma, whether alone or in the company of others, gives rise to similar subsets of symptoms usually considered indicative of PTSD. Between studies, there are slight differences in the symptoms that are considered most pervasive, depending on what the trauma is, how long ago it occurred, and whether the survivor is an adult or a child. Secondary trauma may occur during or after the catastrophes, including (a) personal injury and medical procedures, (b) loss of home, property, community, or societal support, and (c) the wounding or death of friends or loved ones. Information in the research literature on the epidemiology and symptomatology of PTSD is affected by methodological and theoretical differences between researchers. Combat trauma, considered by some to be the paradigm of PTSD, differs from civilian trauma in that it represents more intense acute and chronic stressors. Survivors of the most severe stressors (i.e., concentration and POW camps) experience symptoms similar to those experienced by survivors of other traumatic stressors but the unfolding of the stress reaction is more complex and the effects much more persistent following a severe stressor. Several studies, but by no means all, have reported a direct relationship between the intensity of trauma and the incidence of PTSD. Traumatic reactions to accidents, disasters, and wartime stressors are dependent on situational factors and pretrauma and posttrauma psychosocial factors. There is controversy over the apparent disparity between the incidence of PTSD following WWII combat and that following Vietnam combat. Is the reported increase in PTSD following the return from Vietnam due to increased sensitivity on the part of the authorities, with greater opportunity for compensation? Or is it due to secondary stressors such as the nature of the war and the attitude of American society?

Appendix B

Galveston Orientation and Amnesia Test (GOAT)

This test consists of a schedule of questions used to measure amnesia and orientation after head injury. The questionnaire takes only a few minutes to administer. A score below 75 out of 100 is considered a defective score.

The GOAT was developed by Levin, O'Donnell and Grossman (1979) who standardized it on a group of 50 adults (median age 23) who had recovered from closed head injuries and had no obvious signs of confusion at the time of testing. This group was selected because it was demographically representative of closed head injuries in the two cities (Houston and Galveston) used for the study. Split test reliability coefficients were .99, consistently. In a validity study of 52 closed head-injured patients, the duration of impaired GOAT scores was closely related to the acute neurosurgical ratings on the Glasgow Coma Scale (for eye opening, $\chi^2 = 21.09$; for motor response, $\chi^2 = 19.53$; all highly significant at $p < .00001$). Duration of post traumatic amnesia, as defined by the persistence of defective GOAT scores, was longer in patients with computed tomographic evidence of diffuse or bilateral brain injury as compared to cases with focal unilateral lesions. This association was significant according to Fisher's exact method ($p = .02$). The relationship between the interval of impaired GOAT performance and long term outcome was highly significant at $p < .0001$. A copy of the test form follows.

Appendix B

GALVESTON ORIENTATION AND AMNESIA TEST

Name: _____

Chart #: _____

INSTRUCTIONS: Error points (shown in parentheses after each question) are scored for incorrect answers and are entered in the right hand columns. Answers are either correct or incorrect; no part marks are given. Enter the total error points accrued for the 10 items in the lower right hand corner of the test form. The GOAT score equals 100 minus the total error points. The test should be administered daily until a minimum score of 76 is obtained and no error points are assigned in items 4 and 5. For items 4 and 5 record a summary of patient responses, including date and time, if given. If the answers are the same as given the previous day, simply use ditto marks. Space for recording the summary, plus detailed scoring instructions are given at bottom of form.

	Day	Month							
1. What is your name? (2)(must state both first and last names correctly)									
When were you born? (4)(must state entire date correctly)									
Where do you live? (4)(eg. city or county, street address not necessary)									
2. Where are you now? (5)(must state name of city; 5 more points are deducted if patient fails to volunteer that he is in hospital, although mentioning name of hospital is unnecessary)									
3. On what date were you admitted to this hospital? (5)(must recall correct date of admission; prompt for year if necessary)									
How did you get here? (5)(must describe a plausibly accurate mode of transportation to the hospital)									
4. What is the first event you can remember after the injury? (5)(see *)									
Can you describe in detail, for example date, time, companions, the first event you can recall after injury? (5)(see *)									
5. Can you describe the last event you can remember before the injury? (5)*									
Can you describe in detail, for example date, time, companions, the last event you can recall before the injury? (5)(see *)									
6. What time is it now? (score 1 error point for each half hour that the patient's response deviates from the correct time, up to maximum of 5)									
7. What day of the week is it? (score 1 error point for each day that the patient's response deviates from the correct day)									
8. What day of the month is it? (score 1 error point for each day removed from the correct one, up to a maximum of 5)									
9. What is the month? (score 5 error points for each month removed from the correct month, up to a maximum of 15)									
10. What is the year? (score 10 error points for each year removed from the correct one, up to a maximum of 30)									
Total Error Points									
Total GOAT Score (100 - Error points)									

* For pre- and post-traumatic events, patient must recall a plausible event, eg. swerving to avoid the accident, leaving the house before the accident, receiving assistance after the accident, waking up in hospital; the event does not have to be verified nor does it have to be the absolute first or last thing that happened to the patient, just the first and last thing remembered; a further 5 points is given if the patient cannot recall details, cannot recall an event or, in your opinion, has confabulated an event.

ITEM 4

ITEM 5

Appendix C

PSYCHOLOGICAL EFFECTS OF HEAD INJURY

Patient Consent Form

I hereby consent to participate in an investigation conducted at the Ottawa Civic Hospital, examining the effects of head injury on psychological and psychosocial functioning following my injury. I understand that my involvement in this study is entirely voluntary.

My participation in this study will consist of the completion of a series of tasks which comprise a battery of neuropsychological and psychological assessment techniques including some questionnaires. These tests and questionnaires will require a maximum of 9 - 11 hours of testing. A maximum of 5 to 6 hours of testing will be required at a follow-up session, six months later.

I understand that my participation will not interfere with my treatment at the Civic Hospital nor will it include the administration of painful stimuli. The study is under the direction of Dr. R. Trites, Consultant to the Civic Hospital.

Individual assessment results will be regarded as confidential information.

Witness

Patient

Appendix D
PSYCHOLOGICAL EFFECTS OF HEAD INJURY

Name: _____

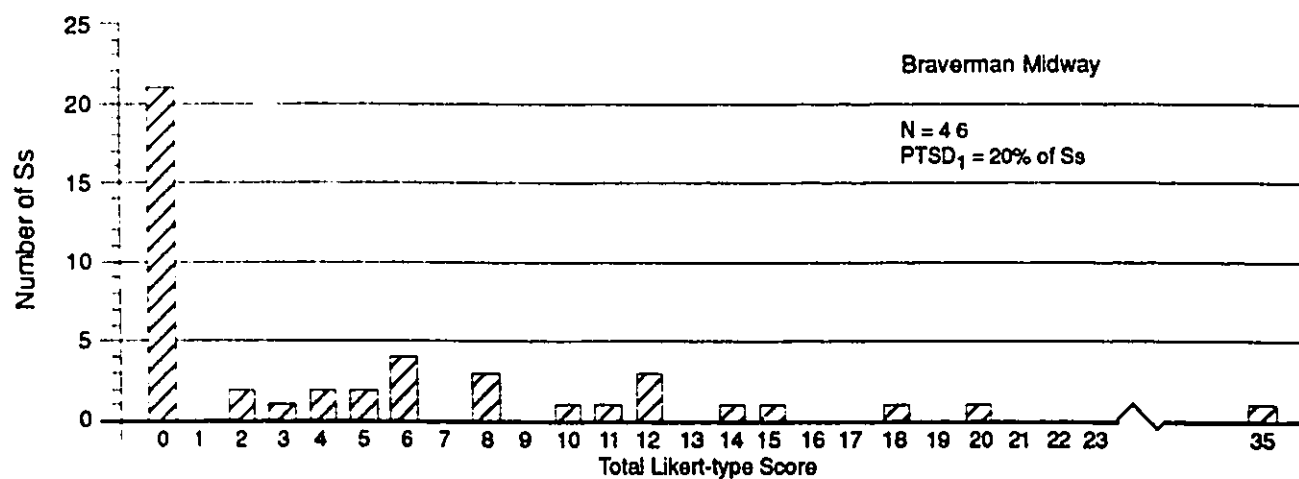
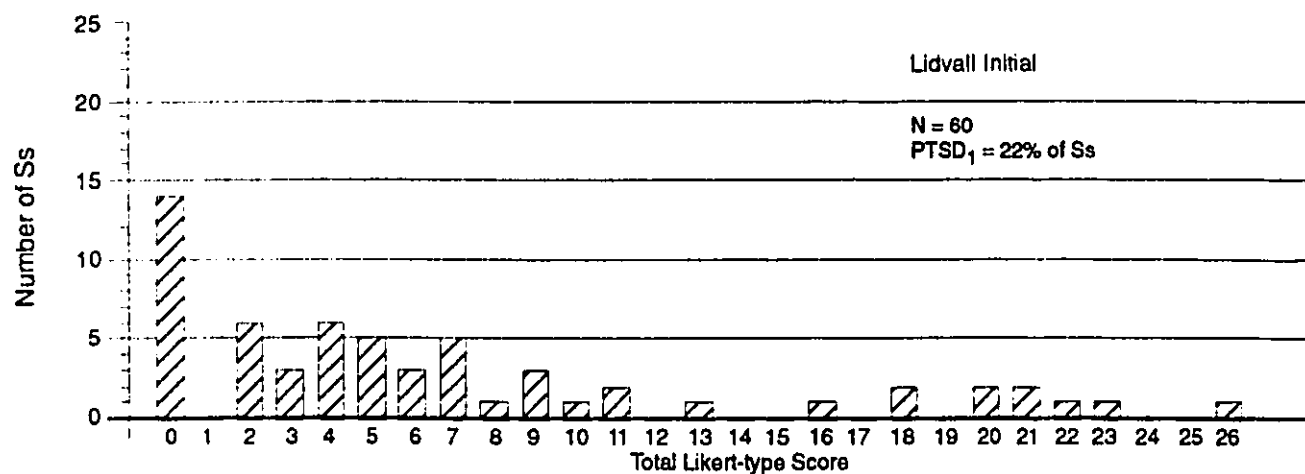
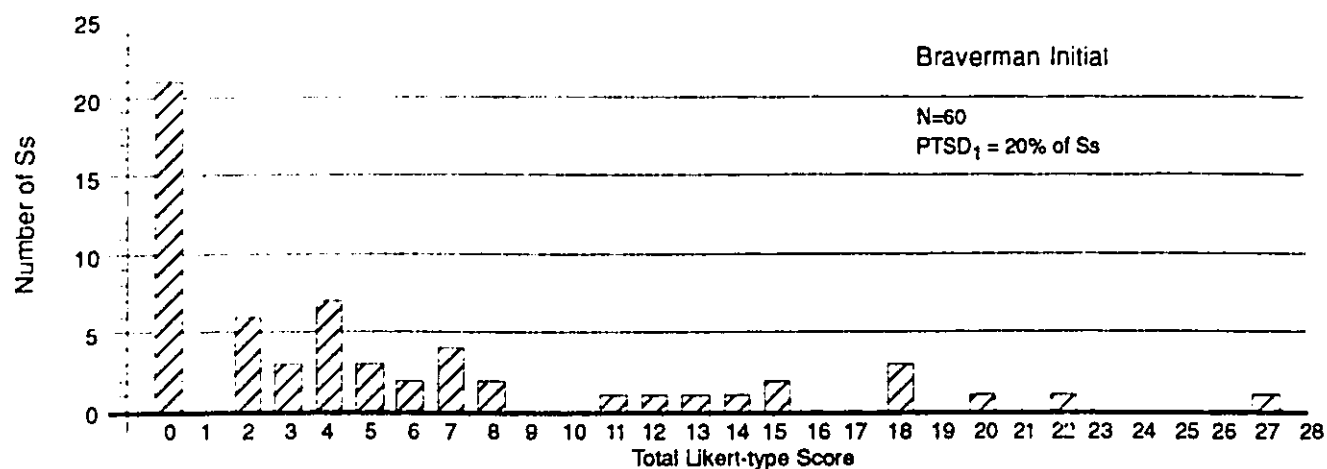
SYMPTOM CHECKLIST

I.D.: _____

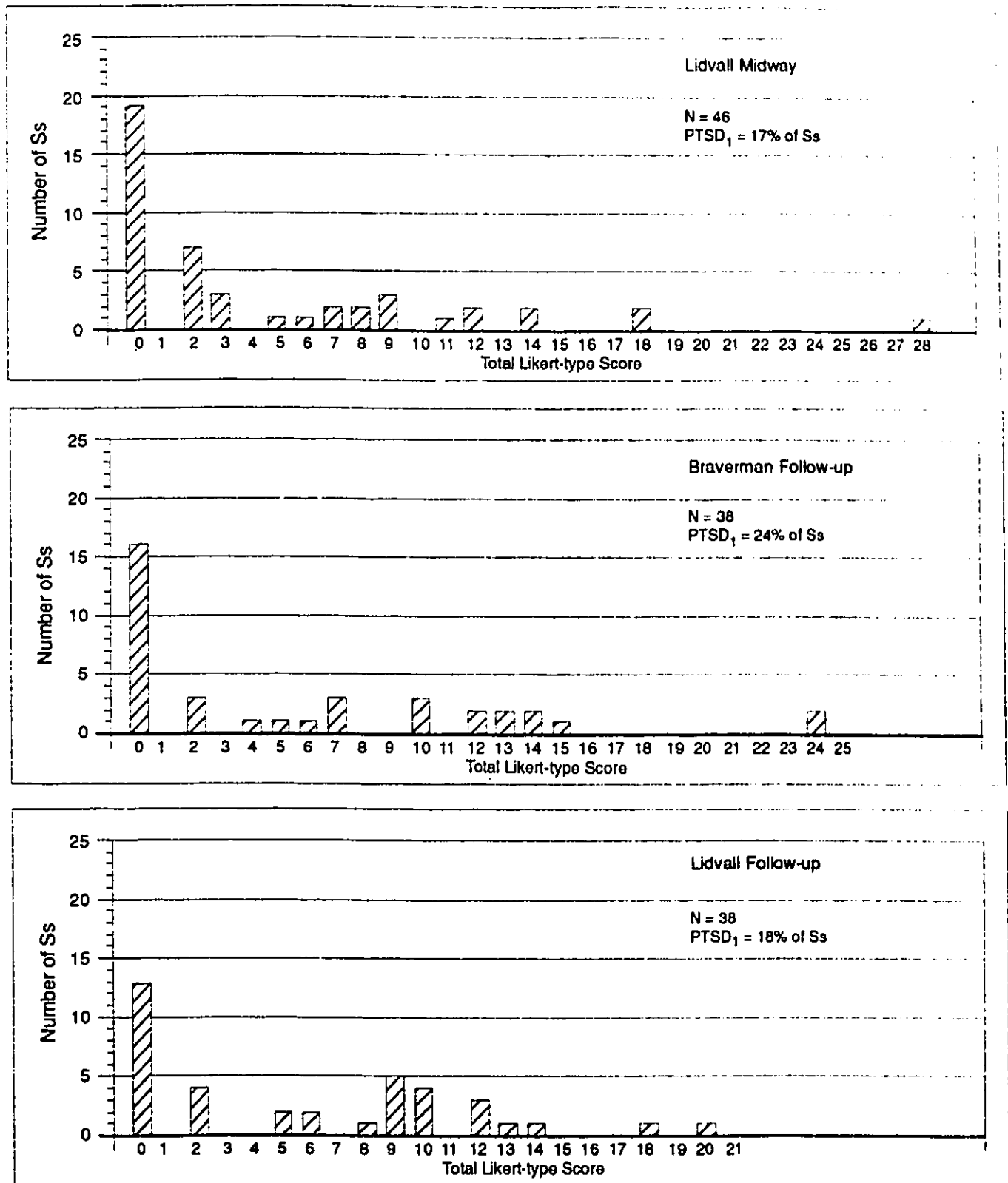
Below is a list of problems and complaints that people sometimes have after receiving an injury to the head. For each symptom that you have had since your injury, please check the appropriate column that best describes how much discomfort that problem has caused you.

	Not at all	A little bit	Moderately	Quite a bit	Extremely
1. Headaches	___	___	___	___	___
2. Poor appetite	___	___	___	___	___
3. Hypersensitive to light	___	___	___	___	___
4. Hypersensitive to sound	___	___	___	___	___
5. Heart pounding or racing	___	___	___	___	___
6. Trouble falling asleep	___	___	___	___	___
7. Dizziness or faintness	___	___	___	___	___
8. Fatigue or feeling low in energy	___	___	___	___	___
9. Feeling easily annoyed or irritated	___	___	___	___	___
10. Nightmares or disturbing dreams	___	___	___	___	___
11. Repeated unpleasant thoughts that won't leave your mind	___	___	___	___	___
12. Trouble concentrating	___	___	___	___	___
13. Trouble remembering things	___	___	___	___	___
14. Difficulty making decisions	___	___	___	___	___
15. Absentmindedness	___	___	___	___	___
16. Crying easily	___	___	___	___	___
17. Not wanting to socialize with people or feeling no interest in things	___	___	___	___	___
18. Feeling depressed or blue	___	___	___	___	___
19. Thoughts of death or dying	___	___	___	___	___
20. Loss of sexual interest or pleasure	___	___	___	___	___
21. Nervousness or anxiety	___	___	___	___	___
22. The feeling that something bad is going to happen to you	___	___	___	___	___

Appendix E Frequency of Likert-Type Scores Reported on the Symptom Checklist



Appendix E (continued)



Note. The PTSD group is formed of individuals who received a distress score of 11 or more.

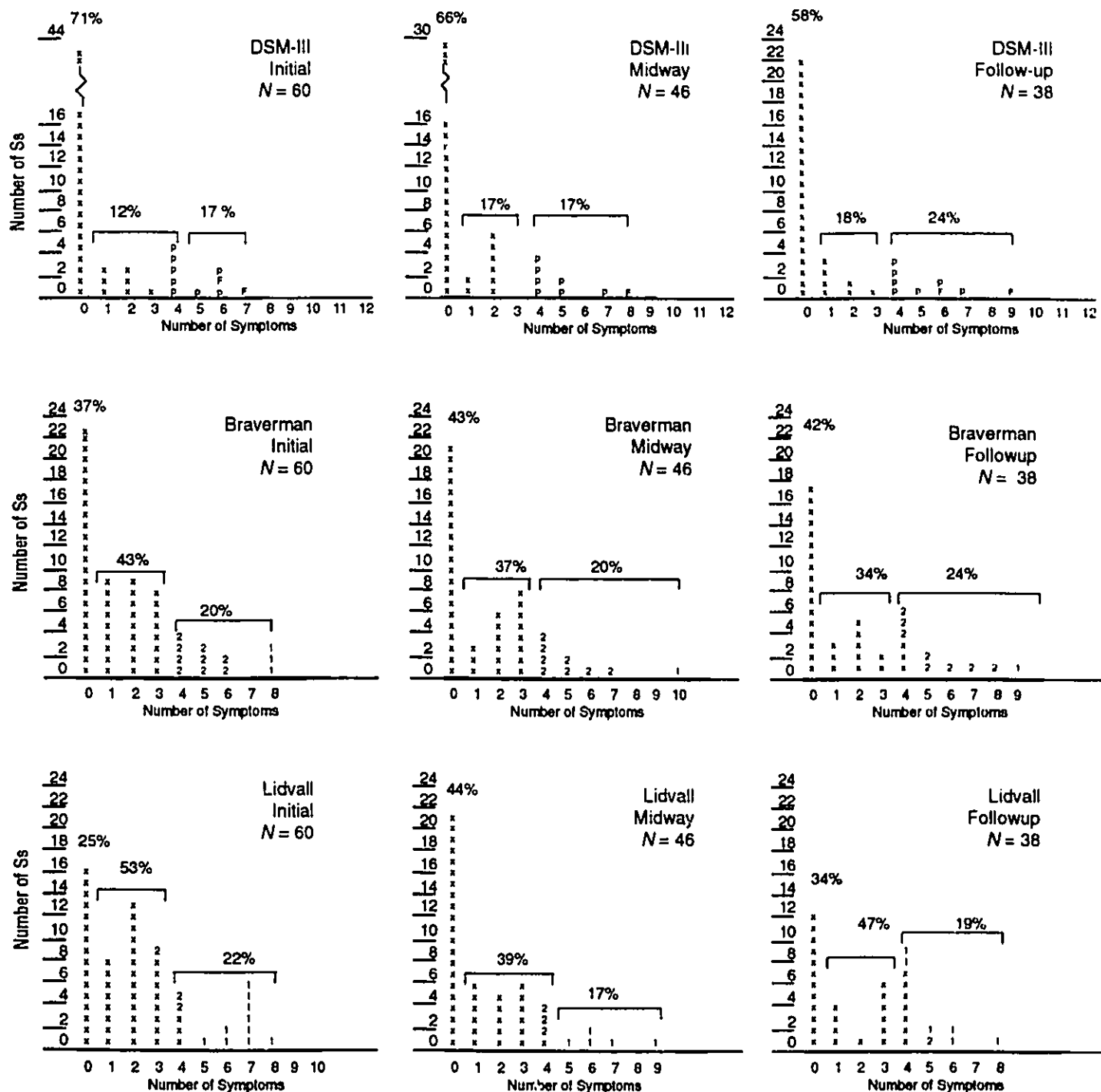
Appendix F

Number of Symptoms Reported by PTSD and Non - PTSD Subjects

The frequency of reporting at each assessment, one, two, three, four, or more symptoms of DSM-III criteria, Braverman and Lidvall criteria is presented here in Appendix F. For all sets of criteria it appeared that the minimum number of symptoms needed to receive a diagnosis of PTSD was four. The sample of 60 subjects could be divided into three groups, those with no symptoms, those with a few symptoms but not enough to meet criteria, and those who endorsed enough symptoms to meet criteria for PTSD. The percentage of subjects at each assessment who fell into one of these three groups is displayed on the next page.

Appendix F

Number of Symptoms Reported by PTSD and non-PTSD Subjects



Legend

- x reported symptoms but does not meet criteria for PTSD
- p reported symptoms that meet partial criteria for variants of DSM-III (i.e., 2 of 3 primary criteria)
- F reported symptoms that meet full criteria for DSM-III (i.e., 3 primary criteria)
- 1 meets Braverman (1), Braverman (2), Lidvall (1), and Lidvall (2)
- 2 meets Braverman (2) and Lidvall (2) but not Braverman (1) nor Lidvall (1)

The percentages given are for (a) subjects who reported no symptoms, (b) subjects who reported a few symptoms but not enough to meet criteria for PTSD, and (c) subjects who met criteria for PTSD.

Appendix G
PSYCHOLOGICAL EFFECTS OF HEAD INJURY

Name: _____

I.D.: _____

Anger Inventory

For each of the following items, please rate the degree to which the incident described by the item would anger or provoke you by using the following scale:

1	2	3	4	5
not at all	a little	some, not much	much	very much

Use the same scale for all of the items. Please score your responses to the items in the answer space provided. Try to imagine the incident actually happening to you, and then indicate the extent it would have made you angry by scoring your answer.

ANSWER

1. On your way to go somewhere, you discover that you have lost the keys to your car. _____
2. Going for a haircut and getting more cut off than you wanted. _____
3. Being overcharged by a repairman who has you over a barrel. _____
4. Being singled out for correction, when the actions of others go unnoticed. _____
5. You are walking along, minding your own business, when someone comes rushing past, knocking you out of his way. _____
6. Being called a liar. _____
7. You are in the midst of a dispute, and the other person calls you a "stupid jerk". _____
8. Hearing that a person has been deprived of his constitutional rights. _____
9. Someone borrows your car, consumes one-third of a tank of gas, and doesn't replace it or compensate you for it. _____
10. People who think that they are always right. _____
11. You unpack an appliance that you have just bought, plug it in, and discover that it doesn't work. _____
12. You are waiting to be served at a restaurant. Fifteen minutes have gone by, and you still haven't even received a glass of water. _____
13. Struggling to carry four cups of coffee to your table at a cafeteria, someone bumps into you, spilling the coffee. _____
14. Getting your car stuck in the mud or snow. _____
15. You are typing a term paper, hurrying to make the deadline, and the typewriter jams. _____

1 2 3 4 5
 not at all a little some, not much much very much

ANSWER

16. Employers who take advantage of their employees' need for work by demanding more than they have a right to. _____
17. Watching someone bully another person who is physically smaller than he is. _____
18. Professors who refuse to listen to your point of view. _____
19. You have hung up your clothes, but someone knocks them to the floor and fails to pick them up. _____
20. Being stood-up for a date. _____
21. Someone sneaks into your room and takes your wallet. _____
22. You are driving to pick up a friend at the airport and are forced to wait for a long freight train. _____
23. You are driving along at 45 mph, and the guy behind you is right on your bumper. _____
24. You are talking to someone, and he doesn't answer you. _____
25. Hitting your finger with a hammer. _____
26. Newspapers slanting the news against a man in political office to make him look bad to the public. _____
27. You have made arrangements to go somewhere with a person who backs off at the last minute and leaves you hanging. _____
28. People asking personal questions of you just for their own curiosity. _____
29. Your car is stalled at a traffic light, and the guy behind you keeps blowing his horn. _____
30. Watching someone berate another person to excess. _____
31. Being pushed or shoved by someone in an argument. _____
32. You accidentally make the wrong kind of a turn in a parking lot. As you get out of your car someone yells at you, "Where did you learn to drive?" _____
33. Someone who pretends to be something that he is not. _____
34. You walk out to the parking lot, and you discover that your car has been towed away by the police. _____
35. Working hard on a project and getting a poor grade. _____
36. Someone makes a mistake and blames it on you. _____
37. You get in your car to drive to work, and the car won't start. _____

not at all a little some, not much much very much

ANSWER

38. Being hounded by a salesman from the moment that you walk in to a store. _____
39. Being given an unnecessarily difficult exam when you need a good grade. _____
40. You are deprived of a promotion to which you are entitled because you haven't played up enough to the right people. _____
41. Someone who tries to make you feel guilty. _____
42. You are trying to concentrate, and a person near you is tapping his foot. _____
43. Someone else's dog routinely defecating in your front yard. _____
44. When you are criticized in front of others for something that you have done. _____
45. You lend someone an important book and they fail to return it. _____
46. In the parking lot where you have left your car, the person whose car is next to yours swings open his door, chipping the paint from your car. _____
47. Getting cold soup or vegetables in a restaurant. _____
48. Someone who is always trying to get "one-up" on you. _____
49. It's a cold morning and you have an 8 o'clock class. Begrudgingly, you get there on time, but the prof arrives 15 minutes late and announces that he is cancelling the class. _____
50. You are sitting next to someone who is smoking, and he is letting the smoke drift right into your face. _____
51. People who constantly brag about themselves. _____
52. Being thrown into a swimming pool with your clothes on. _____
53. Being joked about or teased. _____
54. Banging your shins against a piece of furniture. _____
55. Being on the receiving end of a practical joke. _____
56. Being forced to do something that you don't want to do. _____
57. You are in a discussion with someone who persists in arguing about a topic he knows very little about. _____
58. Losing a game that you wanted to win. _____
59. Being told to "go to hell." _____

1 2 3 4 5
 not at all a little some, not much much very much

ANSWER

60. Someone making fun of the clothes that you are wearing. _____
61. Someone sticking their nose into an argument between you and someone else. _____
62. Being forced to participate in psychological experiments. _____
63. You are walking along on a rainy day, and a car drives past, splashing you with water from the street. _____
64. Acts of prejudice against a minority or ethnic group. _____
65. Someone spits at you. _____
66. You need to get somewhere quickly but a car in front of you is going 25 mph in a 40 mph zone, and you can't pass. _____
67. Being talked about behind your back. _____
68. Stepping on a gob of chewing gum. _____
69. Hearing that a very wealthy man has paid zero income tax. _____
70. You have just cleaned up an area and organized the things in it, but someone comes along and messes it up. _____
71. Getting hit in the back of the head with a snowball. _____
72. You are involved in watching a TV program, and someone comes along and switches the channel. _____
73. Being told by an employer or professor that you have done poor work. _____
74. You are in a ball game, and one of your opponents is unnecessarily rough. _____
75. Being mocked by a small group of people as you pass them. _____
76. Acts of economic exploitation whereby businessmen take advantage of need and demand an excessive profit. _____
77. Being punished for saying what you really believe. _____
78. You are in a theatre ticket line, and someone cuts in front of you. _____
79. Being forced to do something in a way that someone else thinks that it should be done. _____
80. You use your last 10¢ to make a phone call, and you are disconnected before you finish dialing. _____
81. In a hurry to get somewhere, you tear a good pair of slacks on a sharp object. _____
82. Being misled or deceived by a man holding political office. _____
83. You are out on a date with someone who subtly or indirectly conveys

Appendix G continued

1	2	3	4	5
not at all	a little	some, not much	much	very much

ANSWER

84. You are at a shopping centre, and two evangelistic people stop you and want to convert you to their religious ideas.

85. While washing your favourite cup, you drop it and it breaks.

86. Getting punched in the mouth.

87. Being falsely accused of cheating.

88. Someone ripping off your automobile antenna.

89. Discovering that you were deliberately sold defective merchandise.

90. People who are cruel to animals.

Appendix H

Name _____ Date _____ Examiner _____ No. _____

SPEECH PERCEPTION TEST ADULT

Directions: Underline the syllable which you hear.

Score _____

SERIES A

1. theeks zeeks theets zeets
2. weech yeech weej yeej
3. leeg bleeg leeng bleeng
4. peez peest teez teest
5. freeb fleeb freep fleep
6. pleeb preeb pleed preed
7. seek seech sheek sheech
8. neek neenk meek meenk
9. wheech heech wheesh heesh
10. preet preekt peet peekt

SERIES D

1. heep heet wheep wheet
2. keev keem feev feem
3. neck neeg meck meeg
4. cheem cheen sheem sheen
5. feep theep feet theet
6. heeld weeld heel weel
7. deed teed deend teend
8. teesh peesh teez peez
9. weef veef weev veev
10. leen heen leeng heeng

SERIES B

1. peem beem peen been
2. theez theerz feez feerz
3. sheesh sheez zeesh zeez
4. veef weef veeth weeth
5. theel feel theeld feeld
6. peet peent beet beent
7. treep treeb teep teeb
8. steets speets steeks speaks
9. beert beard peert peerd
10. sheed zæd sheend zeend

SERIES E

1. seeng sheeng seen sheen
2. geerd keerd geer keer
3. keen geen keem geem
4. ween weeng heen heeng
5. teed teet peed peet
6. keets keez teets teez
7. theet theent zeet zeent
8. beep peep beet peet
9. tee pee teer peer
10. beeb beed deeb deed

SERIES C

1. deeld deel beeld beel
2. weev heev weef heef
3. thee fee theer fear
4. neeld neel meeld meel
5. seed zeed seet zeet
6. yeeg yeek heeg heek
7. meen meem neen neem
8. theerd theer teerd teer
9. heez wheez heev wheev
10. neep teep neet teet

SERIES F

1. yeem yeen heem heen
2. leern thern leer theer
3. feeth fees theeth thees
4. reeg treeg reek treek
5. yeed yeet weed weet
6. meep meet deep deet
7. deez dees beez bees
8. teeld teel peeld peel
9. meel meer feel fear
10. ween when weem wheem

Appendix H Continued

Name _____ Date _____ Examiner _____ No. _____

APHASIA SCREENING TEST

1	Copy CIRCLE	22.	Describe DRUM
2	Name CIRCLE	23.	Describe BOOK
3	Copy DIAMOND	24.	Demonstrate BOOK
4	Copy CROSS	25.	Name BOOK
5	Name CROSS	26.	Read 7 SIX 2
6	Copy TRIANGLE	27.	Read M G W
7	Name KEY	28.	Write SQUARE
8	Demonstrate KEY	29.	Read SEVEN
9	Name BABY	30.	Repeat SEVEN
10	Write CLOCK	31.	Write: a. HE SHOUTED THE WARNING b. I SEE THE DOG
11	Name FORK	32.	Compute: a. $85 \div 27 =$ b. $12 \div 8 =$
12	Describe FORK	33.	Compute: a. $17 \times 3 =$ b. $4 \times 3 =$
13	Demonstrate FORK	34.	Visual Dysgnosia Sentence Test error score:
14	Demonstrate PEN	35.	Auditory Dysgnosia Sentence Test error score:
15	Describe PEN	36.	Oral Spelling Test error score:
16	Name PEN	37.	Written Spelling Test error score:
17	Name GUN	38.	Articulation Test error score:
18	Demonstrate GUN	39.	Picture-Word Reading Test error score:
19	Describe GUN	40.	Word-Picture Reading Test error score:
20	Demonstrate DRUM	41.	Right-Left Discrimination Test error score:
21	Name DRUM		

Appendix H continued

34. Visual Dysnosia Sentence Test
- | | | | |
|--------------------------------------|---|---|----------|
| 1. We can see the news on T.V. | T | F | 34 _____ |
| 2. We buy bread at the bank. | T | F | |
| 3. A child is older than his mother. | T | F | |
| 4. July comes every year. | T | F | |
| 5. New York is in America. | T | F | |
| 6. We write with a fork. | T | F | |
35. Auditory Dysnosia Sentence Test
- | | | | |
|---|---|---|----------|
| 1. There are nine days in a week. | T | F | 35 _____ |
| 2. Trees need water to live. | T | F | |
| 3. Most people eat seven meals a day. | T | F | |
| 4. Boy scouts sometimes go to camp. | T | F | |
| 5. Some animals store up food for the winter. | T | F | |
| 6. Dogs never chase cats. | T | F | |
36. Oral Spelling
- MAN _____
- HAS _____
- RAIN _____
- WATCH _____
- YELLOW _____
- BUSINESS _____
37. Written Spelling
- | | |
|---|----------|
| 1. Man; an old man; spell man. | 36 _____ |
| 2. Has; he has a car; spell has. | 37 _____ |
| 3. Rain; it looks like rain; spell rain. | |
| 4. Watch; my watch is slow; spell watch. | |
| 5. Yellow; the leaves are yellow; spell yellow. | |
| 6. Business; business is good; spell business | |
38. Articulation Test
- | | | |
|-----------|-------------|----------|
| 1. people | 7. king | 38 _____ |
| 2. boat | 8. queen | |
| 3. my | 9. go | |
| 4. toe | 10. shoe | |
| 5. day | 11. please | |
| 6. none | 12. scratch | |
39. Picture-Word Reading Test (I)
Ex. points to picture
- | | | |
|-----------|---|----------|
| 1. boy | 40. Word-Picture Reading Test (II)
Ex. points to word. | |
| 2. rabbit | 1. bus | 39 _____ |
| 3. dog | 2. table | |
| 4. doll | 3. chair | |
| 5. train | 4. house | 40 _____ |
| 6. horse | 5. clock | |
| 7. bell | 6. bed | |
| 8. tree | | |
41. Right-Left Discrimination Test
- Examiner to subject: EYES OPEN
- | | | | |
|---------------------|---------------------|---------------------|----------|
| Show me your: | Point to the boy's: | Show me your: | |
| 1. left hand _____ | 5. right eye _____ | 9. right hand _____ | 41 _____ |
| 2. right eye _____ | 6. left leg _____ | 10. left leg _____ | |
| 3. left ear _____ | 7. left ear _____ | 11. right eye _____ | |
| 4. right hand _____ | 8. right hand _____ | 12. left ear _____ | |

OBSERVATIONAL RATING:

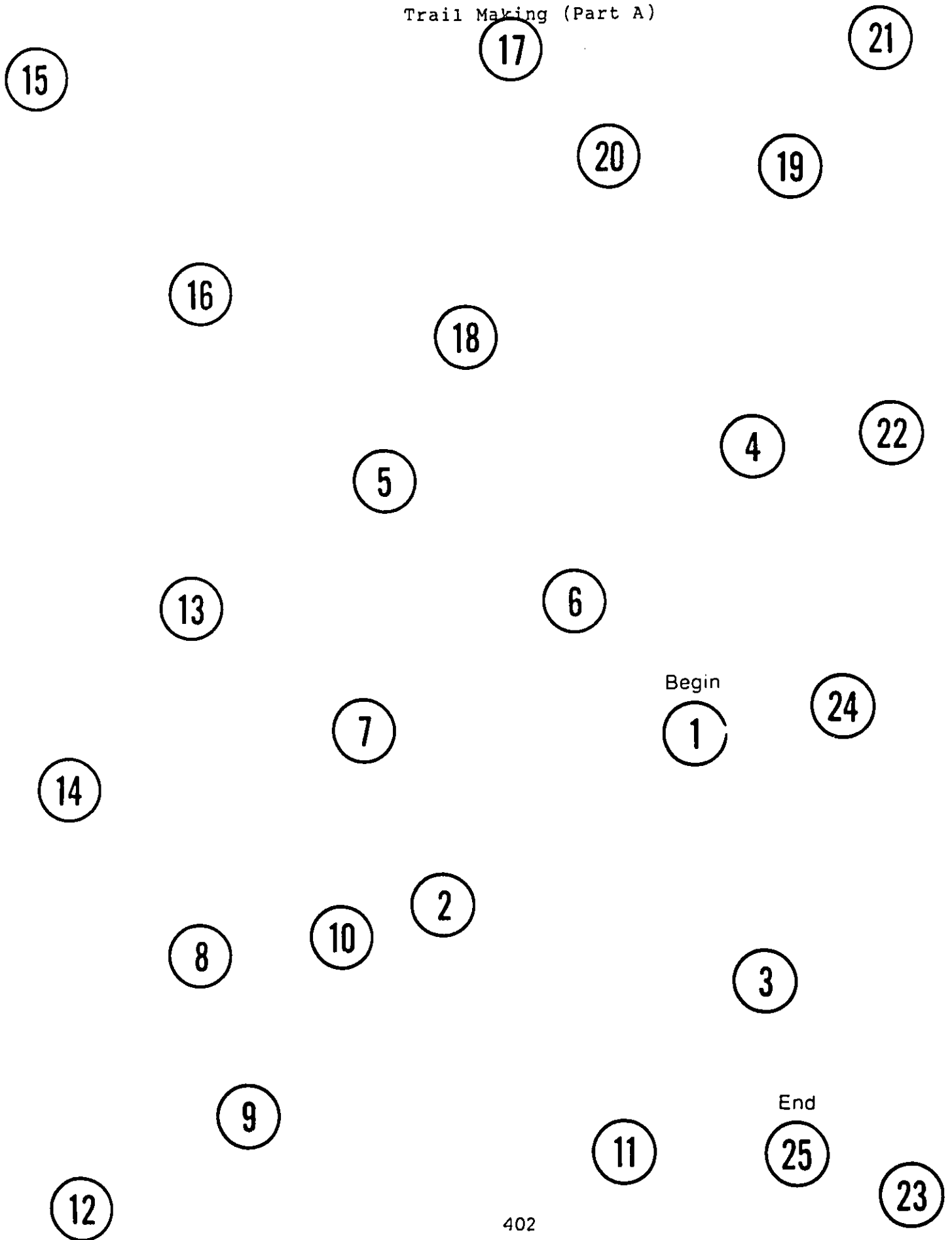
- a. subject makes prompt response to all items _____
- b. occasional hesitation (5" seconds, 1 - 3 items) _____
- c. 4 or more hesitations _____

WRITE YOUR FULL NAME

Preferred hand () _____ seconds

Non-Preferred hand () _____ seconds

Appendix H continued
Trail Making (Part A)



Appendix H continued

Trait Making (Part B)

End

13

10

8

9

I

D

B

4

3

Begin

7

1

5

H

C

12

G

A

J

2

6

L

E

F

11

K

PSYCHOLOGICAL EFFECTS OF HEAD INJURY

Name: _____

I.D.: _____

LIFE EVENTS INVENTORY

The following is a list of events that may occur in peoples' lives.
Please check those events that have happened to you IN THE LAST 12 MONTHS.

Unemployment (of head of household)	Immediate family member attempts suicide	Increase in the number of arguments with other immediate family members
Trouble with superiors at work	Immediate family member sent to prison	Trouble with other relatives
New job in same line of work	Death of immediate family member	Son or daughter left home
New job in new line of work	Death of a close friend	Children in care of others
Change in hours or conditions in present job	Immediate family member seriously ill	Trouble or behaviour problems in own children
Promotion or change of responsibilities at work	Gain of new family member	Death of spouse
Retirement	Problems related to alcohol or drugs	Divorce
Moving house	Serious restriction of social life	Marital separation
Purchasing own house	Period of homelessness (hostel or sleeping rough)	Extra-marital sexual affair
New neighbours	Serious physical illness or injury requiring hospital treatment	Break-up of affair
Quarrel with neighbours	Prolonged ill health requiring treatment by own doctor	Infidelity of spouse
Income increased substantially (25%)	Sudden and serious impairment of vision or hearing	Marital reconciliation
Income decreased substantially (25%)	Unwanted pregnancy	Wife begi.'s or stops work
Getting into debt beyond means of repayment	Miscarriage	Break-up with steady boy or girl friend
Going on holiday	Abortion	Problems related to sexual relationship
Conviction for minor violation (eg. speeding or drunkenness)	Sex difficulties	Increase in number of family arguments
Jail Sentence	Marriage	Break-up of family
Involvement in fight	Pregnancy (or of wife)	
Immediate family member starts drinking heavily	Increase in number of arguments with spouse	

Appendix J

Internal Reliability

Measures	Statistic	Initial N = 60	Midway N = 46	Follow-up N = 38
Diagnostic Interview Schedule (PTSD)	KR-20	.7897	.7830	.8246
Diagnostic Interview Schedule (Depression)	KR-20	.8964	n/a	n/a
Symptom Checklist (Braverman)	alpha	.8402	.8572	.8533
Symptom Checklist (Lidvall)	alpha	.8443	.8373	.8070
Symptom Checklist (All)	alpha	.9093	.9095	.9003
Anger Inventory	alpha	.9747	n/a	.9673
Life Events Inventory	KR-20	.9868	n/a	n/a
MMPI L	KR-20	.5860	n/a	.7218
MMPI F	KR-20	.8113	n/a	.8125
MMPI K	KR-20	.6587	n/a	.7775
MMPI Hs	KR-20	.8409	n/a	.7612
MMPI D	KR-20	.4681	n/a	.7784
MMPI Hy	KR-20	.5746	n/a	.7972
MMPI Pd	KR-20	.6370	n/a	.8487
MMPI Mf	KR-20	.7235	n/a	.8887
MMPI Pa	KR-20	.3988	n/a	.7918
MMPI Pt	KR-20	.8685	n/a	.8704
MMPI Sc	KR-20	.8260	n/a	.8553
MMPI Ma	KR-20	.6053	n/a	.7344
MMPI Si	KR-20	.6839	n/a	.6420
MMPI PTSD	KR-20	.8067	n/a	.9021

Note: KR-20 = Kuder-Richardson 20

alpha = Cronbach's alpha

n/a = not applicable, no data gathered at that time

Appendix J (Continued)

Internal Reliability

Measures		Statistic	Initial N = 60	Midway N = 46	Follow-up N = 38
WAIS-R	Information	KR-20	.8702	n/a	n/a
	Picture Completion	KR-20	.7814	n/a	n/a
	Digit Span	alpha	.8152	n/a	n/a
	Picture Arrangement	alpha	.8251	n/a	n/a
	Vocabulary	alpha	.9477	n/a	n/a
	Block Design	alpha	.8398	n/a	n/a
	Arithmetic	alpha	.7210	n/a	n/a
	Object Assembly	alpha	.7831	n/a	n/a
	Comprehension	alpha	.8237	n/a	n/a
	Digit Symbol	—	Speed test	n/a	n/a
	Similarities	alpha	.8673	n/a	n/a
Halstead-Reitan Subtests:					
	Category	KR-20	n/a	n/a	.8304
	TPT-Time	—	Speed test	n/a	
	-Location	KR-20	.8296	n/a	.7994
	-Memory	KR-20	.8054	n/a	.8125
	Seashore Rhythm	KR-20	.7461	n/a	.8096
	Speech Perception	KR-20	.8364	n/a	.7955
	Aphasia-Spatial	KR-20	.6105	n/a	.7370
	Finger Tapping	—	Speed Test	n/a	—
	Sensory Deficit	—	Qualitative	n/a	Qualitative
	Trail Making	—	Speed Test	n/a	—

Note: KR-20 = Kuder-Richardson 20

alpha = Cronbach's alpha

n/a = not applicable, no data gathered at that time

Appendix K

Univariate and Multivariate Statistical Analyses and Procedures, and Conformity to the Assumption of Discriminant Analysis

Missing data. There were no missing data for the set of variables measuring psychological distress, however one case had to be dropped from the analysis because of violation of the *F* validity scale of the MMPI. This subject scored a T-score of 120 on the *F* scale, which according to Fairbank et al. (1985), Graham (1987), Hyer et al. (1987), McCaffrey and Bellamy-Campbell (1989), and Moody and Kish (1989) indicates a "fake bad" profile. The entire MMPI profile of this subject also conformed to that of a "faking-bad" profile, with *L* and *K* scales below the mean. There were also simultaneous extreme values on *Pa* and *Sc*, even though the subject failed to meet any set of diagnostic criteria for PTSD or for a previous psychiatric disorder. Two other subjects also had high scores on the *F*-scale (T scores of 95 and 99) and a difference in raw score on scales *F* minus *K* of 9 and 14. According to H.G. Gough (1950) these scores also indicate "faking bad". It was decided, however, that these subjects were not trying to "fake bad" as one was a middle-aged nun and the other was a young man who met criteria for a PTSD diagnosis according to all eight sets of criteria, as well as for six pretraumatic psychiatric disorders. He also became so agitated and distraught during the follow-up administration of the MMPI that he threatened the examiner with physical violence if she continued asking him these "bad" questions.

In five cases a subtest score from the neuropsychological battery of tests was missing. These scores were randomly scattered throughout the data, however, so group means for that variable were substituted for the missing data. Due to equipment failure, scores on the Category subtest from the Halstead-Reitan battery were missing for approximately half of the subjects at the initial assessment. This variable was excluded from further analysis of initial data but was included for analysis of follow-up data.

For reasons discussed previously, the WAIS-R was not completed for 19 subjects. Therefore, discriminant analyses that contained WAIS-R data were restricted to those 41 subjects who completed the entire battery. Mean scores on all of the predictor variables were calculated for the entire sample ($N = 60$), and for those 41 individuals who completed the entire battery. The results were discussed in the Attrition Analyses and the means were shown in Table 10. To review, no variable showed significant differences between the entire group and this subgroup.

Univariate Differences on the Predictor Variables. Group means and univariate t-test values for the group mean differences on predictor variables are given in the Results. Significant results should be interpreted with caution since the Type I error rates are inflated due to multiple testing; and adjustment according to the Bonferroni Inequality was not possible because of the complex intercorrelations within sets of variables (Stevens, 1986). Also provided in the Results are the effect sizes for all predictor variables. The effect sizes were determined from the formula provided by Glass, McGaw, and Smith (1981). Cohen (1977) suggested that an effect size of 0.5 is moderate (i.e., group means are half a standard deviation apart) while effect sizes over 0.8 are large. In order to indicate what direction the group mean differences are in, a positive effect size was used to signal that the difference was in the expected direction. That means that the PTSD group had the greater distress or impairment (e.g., higher group mean score on MMPI clinical scales, lower group mean score on WAIS-R subtests, poorer performance on neuropsychology tests). A negative effect size signals that the PTSD group had less distress or impairment than the corresponding non-PTSD group. Positive effect sizes on other predictor variables, such as on demographic/psychosocial, medical/neurological and some of the MMPI validity and clinical scales signal that the differences are in a direction shown in the literature review to increase the likelihood of PTSD, although admittedly some of these call for a value judgment. A priori expectations were that PTSD patients as a group, in comparison with the corresponding group of non-PTSD subjects, would (a) have higher scores on *Anger*, MMPI *Hs*, *D*, *Hy*, *Pd*, *Pa*, *Pt*, *Sc*, *Ma*, and *PTSD*, (b) appear to be maladjusted, rigid, and stereotyped (high *L*, high *F*, low *K*, low *Mf*, high *Si*), (c) have lower scores on the WAIS-R subtests and IQ scores, (d) have poorer functioning on the Halstead-Reitan, (e) be younger, (f) be more likely female, (g) have lower SES, (h) have more recent life events, (i) have more previous psychiatric disorders, and (j) be more seriously injured, possibly with a longer hospital stay.

Outliers and influential cases. For each analysis, with a particular optimal subset of predictors, no cases were identified as influential cases according to Cook's distance. Cook's distance is a measure of the change in regression coefficients produced by leaving out a case; cases with scores larger than 1.00 are suspected of being outliers (Tabachnick & Fidell, 1989). Only one case could be considered an outlier, but only on the neuropsychological test results. Since the case belonged to the larger non-PTSD group and was not influential, it was retained.

Assumption of linearity. Pairwise linearity was checked using residual scatterplots through SPSSX MANOVA and interpreted as described in Tabachnick and Fidell (1989). The plots for all predictor variables were found to be satisfactory.

Assumption of normality. Normality was assessed using coefficients of skewness and kurtosis, as recommended by Stevens (1986). The majority of the predictor variables had skewness and kurtosis coefficients within the critical limits recommended by Stevens (1986). There were some exceptions, however. Several variables were found to be highly positively skewed. These included MMPI *F*, MMPI *Hs*, MMPI *Sc*, MMPI *PTSD*, Speech Perception, Finger Tapping, duration of hospitalization, duration of impaired consciousness, presence and severity of hematoma, psychiatric history, recent life events, and age. Significant leptokurtosis occurred on the variables MMPI *Sc*, Speech Perception, Finger Tapping, and psychiatric history. No variables were platykurtotic. In general, the F-test is considered robust to violations of normality due both to skewness, especially if significant skewness is always in the same direction, and to leptokurtosis (Stevens, 1986), thus providing little threat to multivariate analysis. Furthermore, according to Cliff (1987) and Tabachnick and Fidell (1989), classification makes fewer statistical demands than does inference so that if 95% accuracy is achieved in classification, the shape of distributions matters little. Discriminant analysis that used one or more of these non-normal variables were rerun with the offending variable dichotomized with dummy variable coding, but in all cases prediction was reduced, therefore the continuous data was retained for analyses. In addition, the jackknife procedure was used to cross-validate the classification, therefore negating any positive bias that may have been introduced by non-normality. In the jackknife procedure, the analysis is carried out n times, each time leaving out one of the observations. Group membership is predicted on the basis of the data from the $n - 1$ others. Then the comparison of the predicted and actual group membership for each observation can be carried out (Cliff, 1987). Further data transformation was not considered necessary because the normality assumptions that underlie discriminant analysis are usually not considered to be as important as they are to other statistical analysis (Cliff, 1987).

Considered more important to discriminant analysis is the assumption of homogeneity of variance, especially when group sizes are small. Homogeneity of variance was checked using the Bartlett-Box option in SPSSX MANOVA. In general, most group differences for variance were non-significant at $p = .05$. Exceptions are noted in the Results during presentation of the discriminant

PTSD

analyses, where speculation is made on whether the nominal alpha level is conservative or liberal (i.e., above or below the actual alpha), according to criteria provided by Stevens (1986). The Box's M test was also used to test for homogeneity of the variance-covariance matrices in each cell when possible (i.e., when the number of predictor variables did not exceed the number of cases in the smallest group). In no case was this test significant at $p < .01$, suggesting that robustness was guaranteed even though sample sizes were unequal (Tabachnick & Fidell, 1989).

Assumption of homogeneity. The BMDP computer programs used for these analyses automatically screen for multicollinearity and singularity through computation of pooled within-cell tolerance for each predictor. The only variable rejected for insufficient tolerance was the WAIS-R Performance score. It was dropped from all discriminant analyses.

Reduction of predictor variables. Each set of predictor variables contained complex intercorrelations between pairs of variables. These correlations are displayed in Appendix P. (correlations between predictor variables and the criterion variable according to each set of diagnostic criteria are in Appendix O). Since there is obvious redundancy among some variables the reduction of predictor variables in the discriminant function analyses was necessary. Tabachnick and Fidell (1989) have suggested that when there are complex intercorrelations and fewer than five cases for each predictor variable, setwise regression be used to find an optimal subset of predictor variables. The BMDP setwise regression program (BMDP9R) was used to compute separate regressions for all possible subsets of variables according to a "best" subset algorithm from Furnival and Wilson (1974). This algorithm identifies the best subsets while computing only a small fraction of all possible regressions, thus making it substantially more efficient than other algorithms (Frane, 1979). Two or three best subsets can be selected by assessing the pattern of the squared multiple correlation, R^2 , the adjusted R^2 , and Mallows' C_p as criteria, all three of which are related to one another (see Draper & Smith, 1981; Hocking, 1972). Mallows' C_p is calculated as $(RSS_p/\sigma^2) + 2p - n$, where RSS_p is the residual sum of squares for the p -variate regression, p is the number of predictor variables, σ^2 is a suitable estimate for the variance, and n is the group size. Small C_p values are derived from regressions that have little or no positive bias. The two or three subsets of variables that had a combination of largest values for R^2 and adjusted R^2 and smallest values for Mallows' C_p statistic were selected for further analysis in this study.

PTSD

Discriminant function analyses were run using each of the two or three best subsets selected from setwise regression. An optimal subset was then chosen for each set of predictor variables that gave maximum classification of cases (according to a particular set of diagnostic criteria) through the jackknife procedure (Lachenbruch, 1967). This procedure was used for cross-validation to reduce or eliminate positive bias or overfitting. It was described in a previous section (Assumption of Normality).

Prior probabilities. Unequal prior probabilities of .80 and .20 were used in the classification process because the majority of studies in the literature review suggest that the median value for the proportion of traumatized persons (especially of head injuries) who develop PTSD is 20% (e.g., Boulanger et al., 1986; Lidvall et al., 1974, Mahan & Elger, 1989; Malt, 1988). In this research the actual ratio of PTSD to non-PTSD cases ranged from 1 in 9 to 1 in 3. On average, 20% of the subjects in this study received a diagnosis of PTSD. According to Stevens (1986), if there is confidence that the different sample sizes result from differences in population sizes, then prior probabilities are justified. When the PTSD group was formed of patients who had received a diagnosis of PTSD according to any set of criteria, the likelihood of receiving a diagnosis of PTSD was much higher than if only one set of criteria was used. To account for this increased likelihood, equal probabilities of .5 were used in discriminant analysis when *any set of criteria* was used for diagnosing PTSD.

Multivariate group differences. Multivariate group differences were examined using Hotelling's T^2 statistic, Mahalanobis distance, D^2 , and the associated F-test for significance. In general, multivariate group differences were significant when there were significant univariate differences. Several other multivariate group differences were significant even if there were no significant univariate differences. The power of the multivariate function was estimated using Mahalanobis distance and values provided by Stevens (1986, p. 141). Values for the squared multiple correlation, R^2 , were adjusted for cross-validation shrinkage using the more stringent Herzberg formula for adjustment in small samples, rather than the Wherry formula used in BMDP (see Stevens, 1986, pp. 79-81).

Suppressor variables. In most discriminant analysis, suppressor variables were identified. These are variables that have low correlations with the criterion but high correlations with the other

PTSD

predictors. These variables increase, or highlight, the discrimination between groups by suppressing variance on the predictor variables that is irrelevant to the prediction of the criterion variable. These suppressor variables were identified according to criteria supplied by Conger (1972) and Tabachnick and Fidell (1988).

Appendix L

Scores for the Four Right-Frontal Cases

PTSD-positive according to	Mr. E.H. Not PTSD	Mrs. M.O. Braverman (2)	Mr. P.R. Braverman (2) Lidvall (1) Lidvall (2)	Mr. D.B. DSM-III (3) Braverman (1) Braverman (2) Lidvall (1) Lidvall (2)	Means and standard deviation for all subjects on the various measures	
					Mean	St. Dev.
Anger	376	340	387	389	311.3	59.9
MMPI L	50	50	46	46	52.7	7.8
	F	48	53	<u>95</u>	<u>95</u>	60.9 11.5
	K	64	57	38	44	53.3 9.4
	Hs	57	68	100	68	59.1 12.1
	D	69	71	82	72	61.6 10.6
	Hy	56	73	75	67	58.7 9.1
	Pd	69	53	83	82	64.5 11.9
	Mf	61	51	74	59	58.8 12.9
	Pa	50	59	<u>85</u>	<u>79</u>	58.1 10.0
	Pt	60	65	<u>87</u>	<u>79</u>	58.1 10.2
	Sc	59	69	<u>117</u>	<u>106</u>	63.6 14.7
	Ma	55	65	81	<u>92</u>	64.1 11.2
	Si	40	49	62	55	50.2 8.3
	PTS	4	9	<u>36</u>	<u>32</u>	11.7 7.5
Age		33	34	18	19	31.0 16.2
Sex		M	F	M	M	40M, 20F
SES		35	52	23	29	45.6 14.6
Recent Events	127	695	<u>1057</u>	727	316.3	235.8
Psych. Hx.	1	0	0	4	1.0	1.6
Severity	3	3	2	3	1.8	.8
GCS at adm.	<u>5</u>	<u>4</u>	9	<u>5</u>	11.9	3.3
Hosp. Durat. (Days)	<u>182</u>	<u>175</u>	6	54	34.8	56.9
Imp, Consc. (Hrs.)	<u>1056</u>	<u>902</u>	112	327	201.0	316.5
Hematoma	Subdural	No	No	Intradural	.6	1.1
Skull Fract.	No	No	No	No	.3	.4
Imp. Index	.90	.67	.67	1.00	.5	.3

Note. Scores that are more than two standard deviations from the mean are underlined.

(Appendix L continued)

PTSD-positive according to	Mr. E.H. Not PTSD	Mrs. M.O. Braverman (2)	Mr. P.R. Braverman (2) Lidvall (1) Lidvall (2)	Mr. D.B. DSM-III (3) Braverman (1) Braverman (2) Lidvall (1) Lidvall (2)	Means and standard deviation for all subjects on the various measures	
					Mean	St. Dev.
Category	<u>112</u>	<u>133</u>	—	—	71.0	23.5
TPI Time	30	31	23	22	16.4	7.5
TPT Mem.	1	7	6	4	6.5	2.3
TPT Loc.	<u>0</u>	<u>0</u>	<u>0</u>	<u>1</u>	3.8	2.6
Aphasia Spatial	3	2	1	1	1.6	1.5
Sens. Defic.	3	2	2	3	1.6	1.1
Finger Tapping	45	52	49	41	42.4	10.5
Speech Percep.	7	7	4	<u>27</u>	7.2	5.5
Rhythm	10	10	9	10	6.6	3.3
Trails	<u>2</u>	8	16	10	13.3	4.8
WAIS-R I	6	4	—	5	7.5	2.4
C	8	8	—	6	8.5	2.6
A	8	6	—	7	7.9	2.8
S	7	10	—	6	8.1	3.2
DS	8	5	—	5	8.0	2.7
V	7	7	—	5	8.3	2.6
PC	6	5	—	7	7.7	2.4
BD	5	5	—	8	8.8	2.9
PA	4	5	—	7	8.8	3.6
OA	6	4	—	8	7.6	2.9
DSy	<u>2</u>	4	—	5	7.1	2.4
VIQ	83	79	—	78	88.7	13.4
PIQ	68	68	—	81	88.0	12.9
IQ	75	73	—	78	89.2	13.1

Note. Scores that are more than two standard deviations from the mean are underlined

Appendix M

MMPI Group Means for PTSD and non-PTSD Groups on All Clinical Scales, Neurotic Scales, Psychotic Scales and PSD Decision Rule Scales

Group Means on MMPI Clinical Scales (Except Mf and Si)

	DSM-III (1)	DSM-III (2)	DSM-III (3)	DSM-III (4)	Braverman (2)	Lidvall (1)	Lidvall (2)	Any Criteria
Initial PTSD	61.6	61.1	62.3	60.6	66.8	65.9	65.1	62.3
non-PTSD	60.9	60.3	60.7	60.2	59.5	60.0	59.8	60.0
Midway PTSD	59.8	61.3	59.5	59.9	58.0	56.7	57.3	59.4
non-PTSD (init. MMPI data)	60.9	60.3	61.0	60.8	61.4	61.3	61.5	61.6
Midway PTSD	61.3	61.3	59.7	59.0	59.6	57.8	56.2	59.3
non-TPTSD (F.U. MMPI data)	59.5	59.2	59.8	60.2	59.8	60.1	60.6	60.2
Follow-up PTSD	61.0	—	58.6	—	59.5	56.7	60.8	61.0
non-PTSD	59.1	—	59.7	—	59.4	59.9	59.1	58.1

Group Means on Neurotic Scales (Hs, D, Hy)

Initial PTSD	62.8	61.1	60.6	59.5	66.3	64.4	64.6	61.6
non-PTSD	59.8	59.0	59.6	59.1	58.1	58.8	58.4	58.4
Midway PTSD	63.8	61.5	60.7	60.4	59.4	56.9	56.9	60.1
non-PTSD (Init. MMPI data)	59.7	59.0	60.1	59.2	60.4	60.6	60.2	60.3
Midway PTSD	65.4	62.9	62.4	60.1	63.1	60.6	58.3	61.4
non-PTSD (F.U. MMPI data)	58.3	58.1	58.5	58.9	58.3	59.1	59.6	57.4
Follow-up PTSD	61.2	—	58.5	—	57.3	55.8	63.8	61.3
non-PTSD	58.0	—	58.6	—	59.0	59.0	57.2	56.3

Group Means on Psychotic Scales (Pa, Sc, Ma)

Initial PTSD	59.4	60.1	63.9	61.9	69.0	69.8	67.8	64.0
non-PTSD	62.2	61.6	61.5	60.6	60.1	60.3	60.3	60.4
Midway PTSD	55.4	60.6	58.3	59.8	57.9	58.5	59.6	59.8
non-PTSD (Initial MMPI data)	62.0	61.6	61.9	62.1	62.1	61.6	61.6	62.1
Midway PTSD	55.5	58.5	56.3	57.5	57.3	56.0	54.6	57.6
non-PTSD (F.U. MMPI data)	59.8	59.4	60.0	60.2	59.7	59.7	60.2	60.6
Follow-up	59.7	—	58.2	—	60.6	57.3	58.2	60.7
non-PTSD	59.0	—	59.5	—	58.7	59.5	59.4	57.9

(Appendix M continued)

Group Means on Keane et al.	Decision Rules (F, D, Sc)							
	DSM-III (1)	DSM-III (2)	DSM-III (3)	DSM-III (4)	Braverman (2)	Lidvall (1)	Lidvall (2)	Any Criteria
Initial PTSD	62.1	61.4	63.9	61.5	68.3	67.0	65.9	63.4
non-PTSD	62.0	61.4	61.7	61.1	60.4	61.0	60.8	61.0
Midway PTSD	59.8	61.4	59.1	59.6	58.5	57.3	58.4	59.4
non-PTSD	61.8	61.4	62.1	62.4	62.3	62.1	62.3	62.9
(Initial MMPI Data)								
Midway PTSD	60.8	60.2	58.7	58.8	60.8	57.6	55.2	59.4
non-PTSD	59.8	59.8	60.3	60.5	59.7	60.3	61.0	60.4
(F.U. MMPI Data)								
Follow-up PTSD	59.5	—	58.2	—	61.6	56.6	61.6	62.5
non-PTSD	59.8	—	60.2	—	59.2	60.3	59.3	57.5

Note. Init = Initial Assessment; F.U. = Follow-up assessment

(Appendix M continued)

MMPI Two Point Codes for Subjects Who Ever Had PTSD
and for Subjects Who Never Had PTSD

Subjects who were ever PTSD-positive		Assessment at which the PTSD subjects tested positive			Subjects who were never PTSD-positive	
Initial	Follow Up	Initial	Midway	Follow-up	Initial	Follow-Up
69/96	59/95		x		24/42	—
24/42	78/87		x		12/21	—
69/96	26/62	x	x		89/98	49/94
89/98	79/97	x	x	x	14/41	19/91
89/98	Invalid	x		x	78/87	—
89/98	—	x	x	x	Invalid	—
34/43	—	x	—	—	24/42	—
89/98	—	x	—	—	28/82	34/43
24/42	—	x		—	16/61	14/41
48/84	49/94	x	x	x	46/64	78/87
12/21	12/21	x	x		49/94	89/98
29/92	--	x	—	49/94	59/95	
19/91	—	x	—	—	49/94	—
48/84	34/43	x	x	x	24/42	—
49/94	29/92	x	x	x	24/42	—
26/62	26/62	x	x	x	29/92	—
13/31	24/42	x	x	x	49/94	—
19/91	—	x	—	—	38/83	59/95
89/98	—	x	x		18/81	—
48/84	49/94			x	78/87	59/95
23/32	—	x		—	48/84	47/74
48/84	—	x		—	13/31	19/91
18/81	—	x	—	—	49/94	—
89/98	—	x	—	—	29/92	—
24/42	—	x	x	x	46/64	46/64
39/93	—	x		—	26/62	34/43
14/41	24/42	x	x	x	49/94	—
37/73	37/73	x	x	x	24/42	—
14/41	12/21		x	x	18/81	—
36/63	34/43	x	x	x	38/83	34/43

Appendix N

Pearson Correlation Coefficients Between Sets of Diagnostic Criteria & Criterion Symptoms

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAY(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
Intrusion Initial	1.0000 (60) P= .	.7211 (36) P= .000	.7454 (60) P= .000	.5040 (37) P= .001	.1111 (60) P= .199	.0000 (60) P= .500	.0944 (60) P= .237	.3944 (60) P= .001
Worsening Initial	.1336 (60) P= .154	.2618 (36) P= .061	.4183 (60) P= .000	.3989 (37) P= .007	.0334 (60) P= .400	.0598 (60) P= .325	.0216 (60) P= .435	.3162 (60) P= .007
Numbing Initial	.5571 (60) P= .000	.3911 (36) P= .009	.4152 (60) P= .000	.2739 (37) P= .050	.1393 (60) P= .144	-.0830 (60) P= .264	.1277 (60) P= .165	.2197 (60) P= .046
Avoidance Initial	.3595 (60) P= .002	.3221 (36) P= .028	.7455 (60) P= .000	.4692 (37) P= .002	.1716 (60) P= .095	.0877 (60) P= .253	.2698 (60) P= .019	.3646 (60) P= .002
Jumpy Initial	.4444 (60) P= .000	.4682 (36) P= .002	.5963 (60) P= .000	.4529 (37) P= .002	.1111 (60) P= .199	.1491 (60) P= .128	.2292 (60) P= .039	.3944 (60) P= .001
Insomnia Initial	.6864 (60) P= .000	.7211 (36) P= .000	.6139 (60) P= .000	.5040 (37) P= .001	.0490 (60) P= .355	.0877 (60) P= .253	.0317 (60) P= .405	.3646 (60) P= .002
Conc/Mem Initial	.6338 (60) P= .000	.5846 (36) P= .000	.5247 (60) P= .000	.5744 (37) P= .000	.1416 (60) P= .140	.0903 (60) P= .246	.2144 (60) P= .050	.4582 (60) P= .000
Guilt Initial	-.0765 (60) P= .281	-.1048 (36) P= .271	.3078 (60) P= .008	.2739 (37) P= .050	.2677 (60) P= .019	.3078 (60) P= .008	.2506 (60) P= .027	.2714 (60) P= .018
Night- mares Initial	.1495 (60) P= .127	.0596 (36) P= .365	.2086 (60) P= .062	.2763 (37) P= .049	.4246 (60) P= .000	.3296 (60) P= .005	.4693 (60) P= .000	.2816 (60) P= .015
Social with- drawal Initial	.0242 (60) P= .427	-.0937 (36) P= .293	.1297 (60) P= .162	.2355 (37) P= .080	.4441 (60) P= .000	.5188 (60) P= .000	.5001 (60) P= .000	.3002 (60) P= .010
Sexual Dis- interest Initial	.4933 (60) P= .000	.4114 (36) P= .006	.3237 (60) P= .006	.4160 (37) P= .005	.4095 (60) P= .001	.1193 (60) P= .182	.2882 (60) P= .013	.3799 (60) P= .001
Depres- sion Initial	.0570 (60) P= .333	.0658 (36) P= .352	.1182 (60) P= .184	.3970 (37) P= .007	.4741 (60) P= .000	.2850 (60) P= .014	.2786 (60) P= .016	.4283 (60) P= .000
Impaired Concen- tration Initial	.0926 (60) P= .241	.2692 (36) P= .056	.0124 (60) P= .462	.2695 (37) P= .053	.6252 (60) P= .000	.6089 (60) P= .000	.5003 (60) P= .000	.5308 (60) P= .000
Impaired Memory Initial	.2256 (60) P= .042	.2578 (36) P= .065	.1085 (60) P= .205	.3082 (37) P= .032	.7854 (60) P= .000	.6568 (60) P= .000	.6608 (60) P= .000	.5937 (60) P= .000
Absent- minded Initial	.0499 (60) P= .352	.1315 (36) P= .222	.0670 (60) P= .306	.2151 (37) P= .100	.7113 (60) P= .000	.6295 (60) P= .000	.5149 (60) P= .000	.4910 (60) P= .000
Anxiety Initial	.1736 (60) P= .092	.2895 (36) P= .043	.1087 (60) P= .204	.3351 (37) P= .021	.3471 (60) P= .003	.2949 (60) P= .011	.3511 (60) P= .003	.2934 (60) P= .011
Irrit- ability Initial	.1560 (60) P= .117	.1894 (36) P= .134	.1700 (60) P= .097	.3261 (37) P= .024	.4899 (60) P= .000	.5232 (60) P= .000	.5478 (60) P= .000	.3213 (60) P= .006
Hypersen- sitivity to Light Initial	-.0684 (60) P= .302	-.1269 (36) P= .230	.0306 (60) P= .408	.0966 (37) P= .285	.6245 (60) P= .000	.7193 (60) P= .000	.6257 (60) P= .000	.3355 (60) P= .004
Hypersen- sitivity to Sound Initial	.2011 (60) P= .057	.1720 (36) P= .158	.3784 (60) P= .001	.4409 (37) P= .003	.3906 (60) P= .001	.3784 (60) P= .001	.5557 (60) P= .000	.3851 (60) P= .001
Headache Initial	-.1068 (60) P= .208	-.1194 (36) P= .244	.0441 (60) P= .369	.1909 (37) P= .129	.3636 (60) P= .002	.5401 (60) P= .000	.5843 (60) P= .000	.3833 (60) P= .001
Dizziness Initial	.0434 (60) P= .371	-.1761 (36) P= .152	.1019 (60) P= .219	.1342 (37) P= .214	.4719 (60) P= .000	.4949 (60) P= .000	.5425 (60) P= .000	.3741 (60) P= .002
Fatigue Initial	.0695 (60) P= .299	-.0053 (36) P= .488	.1152 (60) P= .190	.2053 (37) P= .111	.4721 (60) P= .000	.4771 (60) P= .000	.5015 (60) P= .000	.4539 (60) P= .000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix N continued

	SMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
Intrusion Initial	.7756 (46) P= .000	.6939 (35) P= .000	.7611 (46) P= .000	.5632 (35) P= .000	.3559 (46) P= .008	.3268 (46) P= .013	.3926 (46) P= .003	.5020 (46) P= .000
Worsening Initial	.1906 (46) P= .102	.2869 (35) P= .047	.1111 (46) P= .231	.2089 (35) P= .114	-.1303 (46) P= .194	-.0922 (46) P= .271	-.1212 (46) P= .211	.1919 (46) P= .101
Numbing Initial	.4269 (46) P= .002	.2915 (35) P= .045	.3249 (46) P= .014	.2374 (35) P= .085	.3023 (46) P= .021	-.0521 (46) P= .366	-.0684 (46) P= .326	.2143 (46) P= .076
Avoidance Initial	.2409 (46) P= .053	.3595 (35) P= .017	.4443 (46) P= .001	.2408 (35) P= .082	.2487 (46) P= .048	.2409 (46) P= .053	.2846 (46) P= .028	.2217 (46) P= .069
Jumpy Initial	.1401 (46) P= .177	.4051 (35) P= .008	.4690 (46) P= .001	.3081 (35) P= .036	.2368 (46) P= .057	.3880 (46) P= .004	.4690 (46) P= .001	.2791 (46) P= .030
Insomnia Initial	.4869 (46) P= .000	.6939 (35) P= .000	.6738 (46) P= .000	.5632 (35) P= .000	.1344 (46) P= .187	.2795 (46) P= .030	.3332 (46) P= .012	.4191 (46) P= .002
Conc/Mem Initial	.4933 (46) P= .000	.5513 (35) P= .000	.4534 (46) P= .001	.5391 (35) P= .000	.2715 (46) P= .034	.3239 (46) P= .014	.3144 (46) P= .017	.4204 (46) P= .002
Guilt Initial	-.0521 (46) P= .366	-.1009 (35) P= .282	-.0684 (46) P= .326	-.1239 (35) P= .239	-.0735 (46) P= .314	-.0521 (46) P= .366	-.0684 (46) P= .326	-.1037 (46) P= .246
Night- mares Initial	.2141 (46) P= .077	.0852 (35) P= .313	.0819 (46) P= .294	.1618 (35) P= .177	.0483 (46) P= .375	-.0557 (46) P= .356	-.0843 (46) P= .289	.1130 (46) P= .227
Social with- drawal Initial	.0836 (46) P= .290	-.0754 (35) P= .333	-.0086 (46) P= .477	.0943 (35) P= .295	.2187 (46) P= .072	.0836 (46) P= .290	.0572 (46) P= .333	.1665 (46) P= .134
Sexual Dis- interest Initial	.4684 (46) P= .001	.3599 (35) P= .017	.3153 (46) P= .016	.4643 (35) P= .002	.4584 (46) P= .001	.0877 (46) P= .281	.1277 (46) P= .199	.3769 (46) P= .005
Depres- sion Initial	-.0579 (46) P= .351	.0057 (35) P= .487	-.1177 (46) P= .218	.1905 (35) P= .136	.1471 (46) P= .165	-.1213 (46) P= .211	-.0656 (46) P= .332	.0952 (46) P= .265
Impaired Concen- tration Initial	.1172 (46) P= .219	.2784 (35) P= .053	.0634 (46) P= .338	.2615 (35) P= .065	.0982 (46) P= .258	.3009 (46) P= .021	.2143 (46) P= .076	.1114 (46) P= .231
Impaired Memory Initial	.1880 (46) P= .103	.2740 (35) P= .056	.2012 (46) P= .090	.3364 (35) P= .024	.3092 (46) P= .018	.3553 (46) P= .008	.2928 (46) P= .024	.2263 (46) P= .065
Absent- minded Initial	.0056 (46) P= .485	.1161 (35) P= .253	-.0138 (46) P= .464	.0535 (35) P= .380	.0485 (46) P= .375	.2639 (46) P= .038	.1452 (46) P= .168	.0112 (46) P= .471
Anxiety Initial	.2776 (46) P= .031	.2680 (35) P= .060	.1228 (46) P= .208	.3028 (35) P= .039	-.0447 (46) P= .384	.0320 (46) P= .416	.0555 (46) P= .337	.1182 (46) P= .217
Irrit- ability Initial	.1546 (46) P= .152	.2361 (35) P= .086	.1927 (46) P= .100	.2359 (35) P= .086	.4874 (46) P= .000	.2181 (46) P= .073	.2970 (46) P= .023	.3501 (46) P= .009
Hypersens- to Light Initial	-.0936 (46) P= .268	-.1724 (35) P= .161	-.1622 (46) P= .141	-.1609 (35) P= .178	.1305 (46) P= .194	.0659 (46) P= .332	.1651 (46) P= .136	.0753 (46) P= .434
Hypersens- to Sound Initial	.4427 (46) P= .001	.2062 (35) P= .117	.3758 (46) P= .005	.2367 (35) P= .086	.3794 (46) P= .005	.3800 (46) P= .005	.2729 (46) P= .033	.2167 (46) P= .075
Headache Initial	-.0046 (46) P= .488	-.1149 (35) P= .256	.0549 (46) P= .359	.0418 (35) P= .406	.0018 (46) P= .495	.2605 (46) P= .040	.1855 (46) P= .109	.1316 (46) P= .192
Dizziness Initial	-.0439 (46) P= .386	-.2328 (35) P= .089	-.0791 (46) P= .301	-.0339 (35) P= .423	.1323 (46) P= .190	.3472 (46) P= .009	.2956 (46) P= .023	.0473 (46) P= .390
Fatigue Initial	.0852 (46) P= .287	.0171 (35) P= .461	.0261 (46) P= .432	.1587 (35) P= .181	.1204 (46) P= .213	.3466 (46) P= .009	.2837 (46) P= .028	.2739 (46) P= .033

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix N continued

	DSMIII(1) Follow-up	DSMIII(2) Follow-up	BRAY(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
Intrusion Initial	.6183 (38) P= .000	.5156 (38) P= .000	.1494 (38) P= .185	.1202 (38) P= .236	.0159 (38) P= .462	.3227 (38) P= .024
Worsening Initial	.3644 (38) P= .012	.2960 (38) P= .036	.0664 (38) P= .346	-.1004 (38) P= .274	.1126 (38) P= .250	.3625 (38) P= .013
Numbing Initial	.3460 (38) P= .017	.2951 (38) P= .036	-.0916 (38) P= .292	-.0564 (38) P= .368	-.0781 (38) P= .321	.2036 (38) P= .110
Avoidance Initial	.4747 (38) P= .001	.3740 (38) P= .010	.2143 (38) P= .098	.0582 (38) P= .364	.1244 (38) P= .228	.3107 (38) P= .029
Jumpy Initial	.5006 (38) P= .001	.4140 (38) P= .005	.2123 (38) P= .100	.1618 (38) P= .166	.0582 (38) P= .364	.2493 (38) P= .066
Insomnia Initial	.6183 (38) P= .000	.5156 (38) P= .000	.1494 (38) P= .185	.1202 (38) P= .236	.0159 (38) P= .462	.3227 (38) P= .024
Conc/Mem Initial	.5336 (38) P= .000	.5632 (38) P= .000	.1264 (38) P= .225	.2123 (38) P= .100	.0546 (38) P= .372	.3099 (38) P= .029
Guilt Initial	-.0781 (38) P= .321	-.0916 (38) P= .292	.2951 (38) P= .036	-.0564 (38) P= .368	.3460 (38) P= .017	.2036 (38) P= .110
Night- mares Initial	.1122 (38) P= .251	.2269 (38) P= .085	.2269 (38) P= .085	-.0753 (38) P= .327	.1788 (38) P= .141	.4170 (38) P= .005
Social with- drawal Initial	.0038 (38) P= .491	.2124 (38) P= .100	.4770 (38) P= .001	.3039 (38) P= .032	.5117 (38) P= .001	.3846 (38) P= .009
Sexual Dis- interest Initial	.4561 (38) P= .002	.5861 (38) P= .000	.1550 (38) P= .176	.3719 (38) P= .011	.2198 (38) P= .092	.3914 (38) P= .008
Depres- sion Initial	.0965 (38) P= .282	.3205 (38) P= .025	.3205 (38) P= .025	.2945 (38) P= .036	.4426 (38) P= .003	.3366 (38) P= .019
Impaired Concen- tration Initial	.1186 (38) P= .239	.1212 (38) P= .234	.4947 (38) P= .001	.3812 (38) P= .009	.3916 (38) P= .008	.4103 (38) P= .005
Impaired Memory Initial	.3405 (38) P= .018	.3047 (38) P= .031	.3598 (38) P= .013	.3658 (38) P= .012	.2801 (38) P= .044	.4417 (38) P= .003
Absent- minded Initial	.1506 (38) P= .183	.0557 (38) P= .370	.6200 (38) P= .000	.3600 (38) P= .013	.4601 (38) P= .002	.5102 (38) P= .001
Anxiety Initial	.2941 (38) P= .037	.3448 (38) P= .017	-.1648 (38) P= .161	.0106 (38) P= .475	-.0252 (38) P= .440	.1200 (38) P= .237
Irrit- ability Initial	.3640 (38) P= .012	.2906 (38) P= .038	.4027 (38) P= .006	.3515 (38) P= .015	.4254 (38) P= .004	.4862 (38) P= .001
Hypersens to light Initial	-.1229 (38) P= .231	-.0867 (38) P= .302	.3150 (38) P= .027	.1816 (38) P= .138	.4939 (38) P= .001	.2005 (38) P= .114
Hypersens to sound Initial	.1485 (38) P= .187	.1216 (38) P= .234	.3840 (38) P= .009	.1072 (38) P= .261	.4363 (38) P= .003	.3436 (38) P= .017
Headache Initial	-.1611 (38) P= .167	-.0672 (38) P= .344	.1693 (38) P= .155	-.0414 (38) P= .403	.2540 (38) P= .062	.2317 (38) P= .081
Dizziness Initial	-.1181 (38) P= .240	.0239 (38) P= .443	.4219 (38) P= .004	.2860 (38) P= .041	.3183 (38) P= .026	.3149 (38) P= .027
Fatigue Initial	.1198 (38) P= .237	.2482 (38) P= .066	.2010 (38) P= .113	.3851 (38) P= .008	.3266 (38) P= .023	.3324 (38) P= .021

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix N continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAY(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
Intrusion Midway	.4735 (46) P= .000	.5204 (35) P= .001	.3434 (46) P= .010	.3750 (35) P= .013	.1111 (46) P= .231	.1591 (46) P= .145	.0917 (46) P= .272	.3149 (46) P= .017
Worsening Midway	.1906 (46) P= .102	.1368 (35) P= .217	.1111 (46) P= .231	.3015 (35) P= .039	.3434 (46) P= .010	.1591 (46) P= .145	.3136 (46) P= .017	.3149 (46) P= .017
Numbing Midway	.7564 (46) P= .000	.5204 (35) P= .001	.5757 (46) P= .000	.3750 (35) P= .013	.3434 (46) P= .010	.1591 (46) P= .145	.3136 (46) P= .017	.3149 (46) P= .017
Avoidance Midway	.4869 (46) P= .000	.4262 (35) P= .005	.5035 (46) P= .000	.2476 (35) P= .076	.1629 (46) P= .140	.0417 (46) P= .392	.1344 (46) P= .187	.1995 (46) P= .092
Jumpy Midway	.3268 (46) P= .013	.4051 (35) P= .008	.3926 (46) P= .003	.4399 (35) P= .004	.3926 (46) P= .003	.2795 (46) P= .030	.1799 (46) P= .116	.4163 (46) P= .002
Insomnia Midway	.6298 (46) P= .000	.6864 (35) P= .000	.6040 (46) P= .000	.6124 (35) P= .000	.1250 (46) P= .204	.0156 (46) P= .459	.0962 (46) P= .262	.5050 (46) P= .000
Conc/Hem Midway	.5344 (46) P= .000	.5391 (35) P= .000	.6037 (46) P= .000	.6389 (35) P= .000	.0941 (46) P= .267	.0436 (46) P= .387	.1773 (46) P= .119	.5521 (46) P= .000
Guilt Midway	.1906 (46) P= .102	.1368 (35) P= .217	.3434 (46) P= .010	.3015 (35) P= .039	.5757 (46) P= .000	.1591 (46) P= .145	.3136 (46) P= .017	.3149 (46) P= .017
Night- mares Midway	.2715 (46) P= .034	.2182 (35) P= .104	.1731 (46) P= .125	.1267 (35) P= .234	.3261 (46) P= .013	.4045 (46) P= .003	.2937 (46) P= .023	.1102 (46) P= .233
Social with- drawal	.1718 (46) P= .127	.0425 (35) P= .404	.1129 (46) P= .228	.1327 (35) P= .224	.2822 (46) P= .029	.1270 (46) P= .200	.0809 (46) P= .297	.1955 (46) P= .096
Sexual Dis- interest	.3780 (46) P= .005	.1868 (35) P= .141	.2409 (46) P= .053	.1878 (35) P= .140	.3475 (46) P= .009	.2034 (46) P= .088	.3099 (46) P= .018	.1944 (46) P= .098
Depres- sion Midway	.3134 (47) P= .016	.2698 (35) P= .059	.3127 (47) P= .016	.4691 (35) P= .002	.4892 (47) P= .000	.3800 (47) P= .004	.3363 (47) P= .010	.4818 (47) P= .000
Impaired Concen- tration	.3177 (46) P= .016	.4601 (35) P= .003	.3214 (46) P= .015	.4908 (35) P= .001	.2254 (46) P= .066	.4604 (46) P= .001	.3570 (46) P= .007	.3937 (46) P= .003
Impaired Memory Midway	.4941 (46) P= .000	.5163 (35) P= .001	.4270 (46) P= .002	.4786 (35) P= .002	.4270 (46) P= .002	.3480 (46) P= .009	.4431 (46) P= .001	.5370 (46) P= .000
Absent- minded Midway	.2389 (46) P= .055	.3887 (35) P= .011	.1557 (46) P= .151	.2677 (35) P= .060	.3884 (46) P= .004	.4325 (46) P= .001	.3285 (46) P= .013	.4235 (46) P= .002
Anxiety Midway	.4047 (46) P= .003	.2279 (35) P= .094	.5448 (46) P= .000	.3772 (35) P= .013	.4136 (46) P= .002	.4784 (46) P= .000	.4211 (46) P= .002	.3964 (46) P= .003
Irrit- ability Midway	.4622 (46) P= .001	.5625 (35) P= .000	.2973 (46) P= .022	.6305 (35) P= .000	.1150 (46) P= .223	.0714 (46) P= .319	.1998 (46) P= .092	.3593 (46) P= .007
Hypersens to Light Midway	.2103 (46) P= .080	.0960 (35) P= .292	.1226 (46) P= .209	.1199 (35) P= .246	.5069 (46) P= .000	.6082 (46) P= .000	.5908 (46) P= .000	.3474 (46) P= .009
Hypersens to Sound Midway	.3810 (46) P= .004	.2534 (35) P= .071	.5006 (46) P= .000	.3688 (35) P= .015	.3361 (46) P= .011	.2374 (46) P= .056	.5381 (46) P= .000	.2822 (46) P= .029
Headache Midway	.1968 (46) P= .095	.0630 (35) P= .360	.3531 (46) P= .008	.3060 (35) P= .037	.4391 (46) P= .001	.6246 (46) P= .000	.6311 (46) P= .000	.4595 (46) P= .001
Dizziness Midway	.0606 (46) P= .344	-.0034 (35) P= .317	.1629 (46) P= .140	-.0267 (35) P= .439	.0935 (46) P= .268	.1766 (46) P= .120	.2580 (46) P= .042	-.0360 (46) P= .406
Fatigue Midway	.2224 (46) P= .069	.1582 (35) P= .182	.2205 (46) P= .070	.2881 (35) P= .047	.3230 (46) P= .014	.4888 (46) P= .000	.4512 (46) P= .001	.4081 (46) P= .002

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
 The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below α is the significance level.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix N continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
Intrusion Midway	.7564 (46) P= .000	.5204 (35) P= .001	.5757 (46) P= .000	.4239 (35) P= .006	.3136 (46) P= .017	.1906 (46) P= .102	.1111 (46) P= .231	.3797 (46) P= .005
Worsening Midway	.1906 (46) P= .102	.1388 (35) P= .217	.3634 (46) P= .010	.3408 (35) P= .023	.3136 (46) P= .017	.1906 (46) P= .102	.1111 (46) P= .231	.1919 (46) P= .101
Numbing Midway	.7564 (46) P= .000	.5204 (35) P= .001	.5757 (46) P= .000	.4239 (35) P= .006	.3136 (46) P= .017	.4735 (46) P= .000	.5434 (46) P= .010	.3797 (46) P= .005
Avoidance Midway	.2795 (46) P= .030	.4262 (35) P= .005	.5035 (46) P= .000	.3103 (35) P= .035	.4598 (46) P= .001	.0721 (46) P= .317	.1629 (46) P= .140	.4191 (46) P= .002
Jumpy Midway	.3268 (46) P= .013	.4051 (35) P= .008	.3926 (46) P= .003	.3081 (35) P= .036	.3559 (46) P= .008	.1024 (46) P= .249	.2083 (46) P= .082	.2041 (46) P= .087
Insomnia Midway	.6243 (46) P= .000	.6864 (35) P= .000	.7637 (46) P= .000	.6922 (35) P= .000	.4013 (46) P= .003	.2409 (46) P= .053	.1250 (46) P= .204	.6090 (46) P= .000
Conc/Mem Midway	.5564 (46) P= .000	.5391 (35) P= .000	.7310 (46) P= .000	.6196 (35) P= .000	.5424 (46) P= .000	.4013 (46) P= .003	.3489 (46) P= .009	.5933 (46) P= .000
Guilt Midway	.1906 (46) P= .102	.1368 (35) P= .217	.1111 (46) P= .231	.0815 (35) P= .321	.0917 (46) P= .272	-.0922 (46) P= .271	-.1212 (46) P= .211	.0041 (46) P= .689
Night- mares Midway	.2715 (46) P= .034	.2182 (35) P= .104	.1731 (46) P= .125	.1588 (35) P= .181	.2957 (46) P= .023	.2715 (46) P= .034	.1731 (46) P= .125	.1695 (46) P= .130
Social with- drawal	.1718 (46) P= .127	.0425 (35) P= .404	.0564 (46) P= .355	.1351 (35) P= .219	.2427 (46) P= .052	.3093 (46) P= .018	.1693 (46) P= .130	.1141 (46) P= .225
Sexual Dis- interest	.3780 (46) P= .005	.1868 (35) P= .141	.2409 (46) P= .053	.2463 (35) P= .077	.6153 (46) P= .000	.2482 (46) P= .048	.1344 (46) P= .187	.4083 (46) P= .002
Depres- sion Midway	.2492 (46) P= .047	.2698 (35) P= .059	.2577 (46) P= .042	.3679 (35) P= .015	.3901 (46) P= .004	.2492 (46) P= .047	.3075 (46) P= .019	.2548 (46) P= .044
Impaired Concen- tration	.3177 (46) P= .016	.4601 (35) P= .003	.3695 (46) P= .006	.3890 (35) P= .010	.5863 (46) P= .000	.4931 (46) P= .000	.6095 (46) P= .000	.5164 (46) P= .000
Impaired Memory Midway	.4400 (46) P= .001	.5163 (35) P= .001	.5604 (46) P= .000	.4605 (35) P= .003	.6554 (46) P= .000	.4941 (46) P= .000	.5159 (46) P= .000	.5171 (46) P= .000
Absent- minded Midway	.2956 (46) P= .023	.3887 (35) P= .011	.2023 (46) P= .089	.2708 (35) P= .058	.4619 (46) P= .001	.2956 (46) P= .023	.3884 (46) P= .004	.4759 (46) P= .000
Anxiety Midway	.2449 (46) P= .050	.2279 (35) P= .094	.4136 (46) P= .002	.2171 (35) P= .105	.4838 (46) P= .000	.4047 (46) P= .003	.5448 (46) P= .000	.3817 (46) P= .004
Irrit- ability Midway	.5178 (46) P= .000	.5625 (35) P= .000	.4797 (46) P= .000	.6906 (35) P= .000	.6354 (46) P= .000	.3512 (46) P= .008	.4341 (46) P= .001	.5890 (46) P= .000
Hypersens- to Light Midway	.2103 (46) P= .080	.0960 (35) P= .292	.1226 (46) P= .209	.1591 (35) P= .181	.3460 (46) P= .009	.5223 (46) P= .000	.3788 (46) P= .005	.3153 (46) P= .016
Hypersens- to Sound Midway	.3810 (46) P= .004	.2534 (35) P= .071	.2539 (46) P= .044	.1790 (35) P= .152	.3024 (46) P= .021	.4812 (46) P= .000	.4184 (46) P= .002	.1605 (46) P= .143
Headache Midway	.2491 (46) P= .047	.0630 (35) P= .360	.1812 (46) P= .114	.0774 (35) P= .329	.0562 (46) P= .355	.5631 (46) P= .000	.5250 (46) P= .000	.0793 (46) P= .300
Dizziness Midway	.0606 (46) P= .344	-.0834 (35) P= .317	-.0453 (46) P= .383	-.1714 (35) P= .163	.1917 (46) P= .101	.3987 (46) P= .003	.5794 (46) P= .000	.0085 (46) P= .478
Fatigue Midway	.2848 (46) P= .028	.1582 (35) P= .182	.2205 (46) P= .070	.1942 (35) P= .132	.1085 (46) P= .236	.6591 (46) P= .000	.5791 (46) P= .000	.1945 (46) P= .098

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix N continued

	DSMIII(1) Follow-up	DSMIII(2) Follow-up	BRAY(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
Intrusion	.3572	.2869	.2869	.2108	.3572	.3536
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .018	P= .047	P= .047	P= .112	P= .018	P= .019
Worreening	.1846	.1368	.1368	-.0884	-.1231	.2843
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .144	P= .217	P= .217	P= .307	P= .241	P= .049
Numbing	.3572	.2869	.0534	.2108	.1021	.1473
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .018	P= .047	P= .380	P= .112	P= .280	P= .199
Avoidance	.5307	.4262	.0793	.0749	.1516	.2188
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .001	P= .005	P= .325	P= .334	P= .192	P= .103
Jumpy	.2694	.1996	.6105	.1532	.4939	.4148
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .059	P= .125	P= .000	P= .190	P= .001	P= .007
Insomnia	.4643	.5230	.1961	.2694	.2857	.4330
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .002	P= .001	P= .129	P= .059	P= .048	P= .005
Conc/Mem	.3913	.4014	.2636	.1189	.2408	.3475
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .010	P= .008	P= .063	P= .248	P= .082	P= .020
Guilt	.1846	.1368	.1368	-.0884	.1846	.2843
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .144	P= .217	P= .217	P= .307	P= .144	P= .049
Night-	.2717	.2182	.2182	.4043	.4657	.1120
mares	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .057	P= .104	P= .104	P= .008	P= .002	P= .261
Social	.0443	.1777	.3128	.5624	.4136	.1023
with-	(35)	(35)	(35)	(35)	(35)	(35)
drawal	P= .400	P= .154	P= .034	P= .000	P= .007	P= .279
Sexual	.2663	.3529	.2422	.5283	.5084	.2586
Dis-	(35)	(35)	(35)	(35)	(35)	(35)
interest	P= .061	P= .019	P= .081	P= .001	P= .001	P= .067
Depres-	.3526	.3893	.5686	.5934	.5485	.5202
sion	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .019	P= .010	P= .000	P= .000	P= .000	P= .001
Impaired	.3006	.1736	.5747	.4296	.6137	.4411
Concen-	(35)	(35)	(35)	(35)	(35)	(35)
tration	P= .040	P= .159	P= .000	P= .005	P= .000	P= .004
Impaired	.4216	.2810	.3751	.1644	.2674	.3859
Memory	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .006	P= .051	P= .013	P= .173	P= .060	P= .011
Absent-	.3052	.2335	.2853	.4427	.6444	.3133
mind	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .037	P= .088	P= .048	P= .004	P= .000	P= .033
Anxiety	.3427	.2279	.4325	.2328	.4172	.3957
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .022	P= .094	P= .005	P= .089	P= .006	P= .009
Irrit-	.3555	.4503	.4503	.4205	.3555	.5308
ability	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .018	P= .003	P= .003	P= .006	P= .018	P= .001
Hypersens	.1468	.2303	.3647	.6328	.4404	.3390
to Light	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .200	P= .092	P= .016	P= .000	P= .004	P= .023
Hypersens	.3199	.2534	.0812	.2467	.1317	.1195
to Sound	(35)	(35)	(35)	(35)	(35)	(35)
Midway	P= .031	P= .071	P= .321	P= .077	P= .225	P= .247
Headache	-.0535	-.0840	.2100	.1731	.2142	.0927
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .380	P= .316	P= .113	P= .160	P= .108	P= .298
Dizziness	-.0164	-.0834	.0663	.2233	.1472	-.1228
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .463	P= .317	P= .353	P= .099	P= .199	P= .241
Fatigue	-.0126	-.0725	.1005	.2286	.1744	.0291
Midway	(35)	(35)	(35)	(35)	(35)	(35)
	P= .471	P= .339	P= .283	P= .093	P= .155	P= .434

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

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Appendix N continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
Intrusion Follow-Up	.6275 (38) P= .000	.6105 (35) P= .000	.4539 (38) P= .002	.4399 (35) P= .004	.1618 (38) P= .166	.1618 (38) P= .166	.0582 (38) P= .364	.4247 (38) P= .004
Worrening Follow-Up	.3091 (38) P= .029	.3203 (35) P= .030	.3719 (38) P= .011	.5000 (35) P= .001	.1202 (38) P= .236	.1202 (38) P= .236	.2167 (38) P= .096	.4820 (38) P= .001
Numbng Follow-Up	.3091 (38) P= .029	.4939 (35) P= .000	.3719 (38) P= .011	.5000 (35) P= .001	.3738 (38) P= .010	.1202 (38) P= .236	.2167 (38) P= .096	.4820 (38) P= .001
Avoidance Follow-Up	.4719 (38) P= .001	.4242 (35) P= .005	.3075 (38) P= .030	.4023 (35) P= .008	.3218 (38) P= .024	.0866 (38) P= .303	.3327 (38) P= .015	.3885 (38) P= .008
Jumpy Follow-Up	.4719 (38) P= .001	.4242 (35) P= .005	.4845 (38) P= .001	.4023 (35) P= .008	.3218 (38) P= .024	.0866 (38) P= .303	.3327 (38) P= .015	.3885 (38) P= .008
Insomnia Follow-Up	.4745 (38) P= .001	.6408 (35) P= .000	.5709 (38) P= .000	.7746 (35) P= .000	.3792 (38) P= .009	.1845 (38) P= .134	.3327 (38) P= .021	.7600 (38) P= .000
Conc/Mem Follow-Up	.6098 (38) P= .000	.7282 (35) P= .000	.3820 (38) P= .009	.4523 (35) P= .003	.1592 (38) P= .170	-.0299 (38) P= .429	-.0039 (38) P= .491	.4342 (38) P= .003
Guilt Follow-Up	. (38) P= .	. (35) P= .	. (38) P= .	. (35) P= .	. (38) P= .	. (38) P= .	. (38) P= .	. (38) P= .
Night- mares Follow-Up	.2005 (38) P= .114	.3333 (35) P= .025	.1803 (38) P= .139	.1500 (35) P= .195	.1198 (38) P= .237	-.0225 (38) P= .447	-.0030 (38) P= .493	.1480 (38) P= .188
Social with- drawal	.0584 (38) P= .364	-.0071 (35) P= .484	.0267 (38) P= .437	.2552 (35) P= .070	.1862 (38) P= .132	.2704 (38) P= .050	.1912 (38) P= .125	.2268 (38) P= .085
Sexual Dis- interest	.1413 (38) P= .199	.0126 (35) P= .471	.0516 (38) P= .379	.3682 (35) P= .015	.1846 (38) P= .134	.2849 (38) P= .042	.3153 (38) P= .027	.3560 (38) P= .014
Depres- sion Follow-Up	.2617 (38) P= .056	.0565 (35) P= .374	.3029 (38) P= .032	.3725 (35) P= .014	.4217 (38) P= .004	.5687 (38) P= .000	.3660 (38) P= .012	.4506 (38) P= .002
Impaired Concen- tration	.4759 (38) P= .001	.5561 (35) P= .000	.2785 (38) P= .045	.4880 (35) P= .001	.2687 (38) P= .051	.1850 (38) P= .133	.1569 (38) P= .173	.5669 (38) P= .000
Impaired Memory Follow-Up	.3052 (37) P= .033	.3687 (34) P= .016	.2148 (37) P= .101	.3903 (34) P= .011	.4936 (37) P= .001	.4234 (37) P= .005	.3507 (37) P= .017	.5043 (37) P= .001
Absent- minded Follow-Up	.1793 (38) P= .141	.2580 (35) P= .067	.1964 (38) P= .119	.3426 (35) P= .022	.4057 (38) P= .006	.5434 (38) P= .000	.3169 (38) P= .026	.4583 (38) P= .002
Anxiety Follow-Up	.1025 (38) P= .270	.0116 (35) P= .474	-.0131 (38) P= .469	.2179 (35) P= .104	.2664 (38) P= .053	.4865 (38) P= .001	.3691 (38) P= .011	.3509 (38) P= .015
Irrit- ability Follow-Up	.2503 (38) P= .065	.3538 (35) P= .019	.2362 (38) P= .077	.5212 (35) P= .001	.3595 (38) P= .013	.4174 (38) P= .005	.3147 (38) P= .027	.5920 (38) P= .000
Hypersens to Light Follow-Up	.1163 (38) P= .243	.1961 (35) P= .129	.2542 (38) P= .062	.1750 (35) P= .157	.7218 (38) P= .000	.6112 (38) P= .000	.4747 (38) P= .001	.3801 (38) P= .009
Hypersens to Sound Follow-Up	.1447 (38) P= .193	.2643 (35) P= .063	.0400 (38) P= .406	.1189 (35) P= .248	.1948 (38) P= .121	.1948 (38) P= .121	.0701 (38) P= .338	.1594 (38) P= .170
Headache Follow-Up	.4361 (38) P= .003	.3567 (35) P= .018	.2129 (38) P= .100	.2833 (35) P= .050	.2518 (38) P= .044	.1046 (38) P= .266	.2177 (38) P= .095	.3502 (38) P= .016
Dizziness Follow-Up	-.1442 (38) P= .194	-.1362 (35) P= .218	-.2353 (38) P= .077	-.0387 (35) P= .413	-.0102 (38) P= .476	.1845 (38) P= .134	.1014 (38) P= .272	.0064 (38) P= .485
Fatigue Follow-Up	.2292 (38) P= .083	.1291 (35) P= .230	.2078 (38) P= .105	.2317 (35) P= .090	.3299 (38) P= .022	.3938 (38) P= .007	.2292 (38) P= .083	.3149 (38) P= .027

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
 The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix N continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
Intrusion	.3666	.6105	.4461	.4973	.2322	.1100	.2694	.4399
Follow-Up	(35) P= .015	(35) P= .000	(35) P= .004	(35) P= .001	(35) P= .090	(35) P= .265	(35) P= .059	(35) P= .004
Worsening	.0667	.3203	.3611	.3652	.3611	.0667	.2041	.3000
Follow-Up	(35) P= .352	(35) P= .030	(35) P= .017	(35) P= .000	(35) P= .017	(35) P= .352	(35) P= .120	(35) P= .001
Numbing	.3000	.6939	.3611	.3652	.1667	.0667	.0000	.3000
Follow-Up	(35) P= .040	(35) P= .000	(35) P= .017	(35) P= .000	(35) P= .169	(35) P= .352	(35) P= .500	(35) P= .001
Avoidance	.2476	.4262	.2940	.4700	.2940	.0309	.1516	.4023
Follow-Up	(35) P= .076	(35) P= .005	(35) P= .043	(35) P= .002	(35) P= .043	(35) P= .430	(35) P= .192	(35) P= .008
Jumpy	.2476	.4262	.4746	.4700	.2940	.0309	.1516	.4023
Follow-Up	(35) P= .076	(35) P= .005	(35) P= .002	(35) P= .002	(35) P= .043	(35) P= .430	(35) P= .192	(35) P= .008
Insomnia	.4648	.6408	.5594	.7424	.4088	-.0775	.0000	.6455
Follow-Up	(35) P= .002	(35) P= .000	(35) P= .000	(35) P= .000	(35) P= .067	(35) P= .329	(35) P= .500	(35) P= .000
Conc/Mem	.6030	.7282	.5109	.5483	.3643	.0754	.1231	.5779
Follow-Up	(35) P= .000	(35) P= .000	(35) P= .001	(35) P= .000	(35) P= .016	(35) P= .333	(35) P= .241	(35) P= .000
Guilt								
Follow-Up	(35) P= .	(35) P= .	(35) P= .	(35) P= .	(35) P= .	(35) P= .	(35) P= .	(35) P= .
Night-	.1075	.3333	.1625	.2157	.0531	-.0750	-.1378	.2438
mares	(35) P= .140	(35) P= .025	(35) P= .175	(35) P= .107	(35) P= .381	(35) P= .334	(35) P= .215	(35) P= .079
Social	.0555	-.0071	.0222	.2585	.2811	.1331	.0544	.1997
with-	(35) P= .376	(35) P= .484	(35) P= .450	(35) P= .067	(35) P= .051	(35) P= .223	(35) P= .378	(35) P= .125
drawal								
Sexual	.1315	.0126	.1140	.4226	.4975	.2235	.1449	.4339
Dis-	(35) P= .226	(35) P= .471	(35) P= .257	(35) P= .006	(35) P= .001	(35) P= .098	(35) P= .203	(35) P= .005
interest								
Depres-	.1078	.0565	.1667	.2718	.3382	.1765	.1681	.2745
sion	(35) P= .269	(35) P= .374	(35) P= .169	(35) P= .057	(35) P= .023	(35) P= .155	(35) P= .167	(35) P= .055
Follow-Up								
Impaired	.4653	.5561	.4483	.5656	.6469	.2270	.3336	.7150
Concen-	(35) P= .002	(35) P= .000	(35) P= .003	(35) P= .000	(35) P= .000	(35) P= .095	(35) P= .025	(35) P= .000
tration								
Impaired	.2851	.3687	.2909	.3873	.6281	.1504	.1491	.5356
Memory	(34) P= .051	(34) P= .016	(34) P= .048	(34) P= .012	(34) P= .000	(34) P= .198	(34) P= .200	(34) P= .001
Follow-Up								
Absent-	.1574	.2580	.3287	.3167	.6528	.2870	.3515	.4815
mind-	(35) P= .183	(35) P= .067	(35) P= .027	(35) P= .032	(35) P= .000	(35) P= .047	(35) P= .019	(35) P= .002
Follow-Up								
Anxiety	.0871	.0116	.1331	.2891	.4721	.3922	.2668	.4357
Follow-Up	(35) P= .309	(35) P= .474	(35) P= .223	(35) P= .046	(35) P= .002	(35) P= .010	(35) P= .061	(35) P= .004
Irrit-	.3423	.3538	.3475	.5012	.3929	.2334	.1524	.4823
ability	(35) P= .022	(35) P= .019	(35) P= .020	(35) P= .001	(35) P= .010	(35) P= .089	(35) P= .191	(35) P= .002
Follow-Up								
Hypersens	.1021	.1961	.0680	.0903	.3232	.3062	.1964	.3208
to Light	(35) P= .280	(35) P= .129	(35) P= .349	(35) P= .303	(35) P= .029	(35) P= .037	(35) P= .129	(35) P= .030
Follow-Up								
Hypersens	.1487	.2643	.0421	.1710	.0421	.1487	.1639	.1931
to Sound	(35) P= .197	(35) P= .063	(35) P= .405	(35) P= .163	(35) P= .405	(35) P= .197	(35) P= .173	(35) P= .133
Follow-Up								
Headache	.5667	.3567	.3680	.3875	.2540	.2247	.3231	.4299
Follow-Up	(35) P= .000	(35) P= .018	(35) P= .015	(35) P= .111	(35) P= .070	(35) P= .097	(35) P= .029	(35) P= .005
Dizziness	-.1546	-.1362	-.1009	.0323	.2749	.1160	.2525	.2190
Follow-Up	(35) P= .188	(35) P= .218	(35) P= .282	(35) P= .427	(35) P= .055	(35) P= .254	(35) P= .072	(35) P= .103
Fatigue	.1630	.1291	.0972	.2176	.2474	.1630	.1681	.3604
Follow-Up	(35) P= .175	(35) P= .230	(35) P= .289	(35) P= .105	(35) P= .076	(35) P= .175	(35) P= .167	(35) P= .017

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix N continued

	DSMIII(1) Follow-up	DSMIII(2) Follow-up	BRAY(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
Interruption	.7214 (38) P= .000	.4157 (38) P= .000	.2123 (38) P= .100	.4412 (38) P= .003	.2794 (38) P= .045	.4247 (38) P= .004
Worsening	.4175 (38) P= .005	.6987 (38) P= .000	.3325 (38) P= .021	.3738 (38) P= .010	.2167 (38) P= .096	.4400 (38) P= .001
Humbling	.8191 (38) P= .000	.6987 (38) P= .000	-.0337 (38) P= .420	.3738 (38) P= .010	.2167 (38) P= .096	.4400 (38) P= .001
Avoidance	.5389 (38) P= .000	.6075 (38) P= .000	.0983 (38) P= .279	.0866 (38) P= .303	-.0196 (38) P= .454	.3885 (38) P= .008
Jumpy	.5389 (38) P= .000	.6075 (38) P= .000	.0983 (38) P= .279	.0866 (38) P= .303	-.0196 (38) P= .454	.3885 (38) P= .008
Insomnia	.4410 (38) P= .000	.7916 (38) P= .000	.3699 (38) P= .011	.3792 (38) P= .009	.4868 (38) P= .001	.7400 (38) P= .000
Conc/Mem	.5948 (38) P= .000	.4633 (38) P= .002	.0539 (38) P= .374	.1592 (38) P= .170	.2954 (38) P= .036	.3155 (38) P= .027
Guilt	. (38) P= .	. (38) P= .	. (38) P= .	. (38) P= .	. (38) P= .	. (38) P= .
Nightmare	.4474 (38) P= .002	.3485 (38) P= .016	.0405 (38) P= .405	.2620 (38) P= .056	.2222 (38) P= .090	.3266 (38) P= .023
Social withdrawal	.0579 (38) P= .365	.3024 (38) P= .033	.5455 (38) P= .000	.4388 (38) P= .003	.3246 (38) P= .023	.4383 (38) P= .003
Sexual disinterest	.0773 (38) P= .327	.4626 (38) P= .002	.3903 (38) P= .008	.5855 (38) P= .000	.4740 (38) P= .001	.3560 (38) P= .014
Depression	.1914 (38) P= .125	.3533 (38) P= .015	.6717 (38) P= .000	.4217 (38) P= .004	.4242 (38) P= .004	.5890 (38) P= .000
Impaired concentration	.3557 (38) P= .014	.3911 (38) P= .008	.5119 (38) P= .001	.3524 (38) P= .015	.5544 (38) P= .000	.5669 (38) P= .000
Impaired Memory	.3507 (38) P= .017	.3462 (38) P= .018	.5496 (38) P= .000	.3531 (38) P= .016	.5735 (38) P= .000	.5931 (38) P= .000
Absent- minded	.2079 (38) P= .105	.1870 (38) P= .130	.6938 (38) P= .000	.2681 (38) P= .052	.5349 (38) P= .000	.5448 (38) P= .000
Anxiety	.1077 (38) P= .260	.2738 (38) P= .048	.3532 (38) P= .015	.4865 (38) P= .001	.3691 (38) P= .011	.3509 (38) P= .015
Irritability	.2231 (38) P= .089	.3332 (38) P= .020	.7092 (38) P= .000	.4753 (38) P= .001	.5439 (38) P= .000	.7374 (38) P= .000
Hypersens to light	.2995 (38) P= .034	.2143 (38) P= .098	.2941 (38) P= .037	.3900 (38) P= .008	.4747 (38) P= .001	.3801 (38) P= .009
Hypersens to sound	.3365 (38) P= .019	.2557 (38) P= .061	.0128 (38) P= .470	.1948 (38) P= .121	.0701 (38) P= .338	.1594 (38) P= .170
Headache	.2177 (38) P= .095	.2629 (38) P= .055	.0503 (38) P= .382	.2518 (38) P= .064	.2177 (38) P= .095	.2578 (38) P= .059
Dizziness	-.0527 (38) P= .377	.0185 (38) P= .476	.1591 (38) P= .170	.2818 (38) P= .043	.3327 (38) P= .021	.1287 (38) P= .221
Fatigue	.2292 (38) P= .083	.3280 (38) P= .022	.5127 (38) P= .000	.4578 (38) P= .002	.4823 (38) P= .001	.5558 (38) P= .000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix O

Pearson Correlation Coefficients Between Pairs of Collection Systems

	Intrusion Initial	Norwegian Initial	Wandering Initial	Avoidance Initial	Jump Initial	Incapable Initial	Conc/Ree Initial	Quilt Initial
Intrusion Initial	1.0000 (60) P= .	.1236 (60) P= .134	-.5571 (60) P= .000	.3595 (60) P= .002	.4444 (60) P= .000	.6864 (60) P= .000	.6338 (60) P= .000	-.0765 (60) P= .281
Norwegian Initial	.1236 (60) P= .134	1.0000 (60) P= .	-.0496 (60) P= .352	.2883 (60) P= .012	-.0891 (60) P= .249	.2917 (60) P= .243	-.1838 (60) P= .080	.5518 (60) P= .000
Wandering Initial	-.5571 (60) P= .000	-.0496 (60) P= .352	1.0000 (60) P= .	.2003 (60) P= .062	.2476 (60) P= .028	.2003 (60) P= .082	.3531 (60) P= .002	-.0426 (60) P= .273
Avoidance Initial	.3595 (60) P= .002	.2883 (60) P= .012	.2003 (60) P= .062	1.0000 (60) P= .	.5230 (60) P= .000	.2788 (60) P= .015	.3888 (60) P= .001	.3589 (60) P= .002
Jump Initial	.4444 (60) P= .000	-.0891 (60) P= .249	.2476 (60) P= .028	.5230 (60) P= .000	1.0000 (60) P= .	.6864 (60) P= .000	.4990 (60) P= .000	.1784 (60) P= .086
Incapable Initial	.6864 (60) P= .000	.2917 (60) P= .243	.2003 (60) P= .062	.2788 (60) P= .015	.6864 (60) P= .000	1.0000 (60) P= .	.6338 (60) P= .000	.1350 (60) P= .132
Conc/Ree Initial	.6338 (60) P= .000	-.1838 (60) P= .080	.3531 (60) P= .002	.3888 (60) P= .001	.4990 (60) P= .000	.6338 (60) P= .000	1.0000 (60) P= .	.0430 (60) P= .311
Quilt Initial	-.0765 (60) P= .281	.5518 (60) P= .000	-.0426 (60) P= .273	.3589 (60) P= .002	.1784 (60) P= .086	.1350 (60) P= .132	.0850 (60) P= .311	1.0000 (60) P= .
Sight- saves Initial	.1495 (60) P= .127	.1841 (60) P= .080	.1728 (60) P= .094	.1760 (60) P= .089	-.0641 (60) P= .213	.0817 (60) P= .247	.0804 (60) P= .271	.2489 (60) P= .027
Social with- drawn Initial	.0242 (60) P= .427	.1647 (60) P= .104	-.0875 (60) P= .232	.1884 (60) P= .075	.0846 (60) P= .260	.0284 (60) P= .415	.0601 (60) P= .324	.3077 (60) P= .008
Sexual Dis- interest Initial	.4953 (60) P= .000	-.0356 (60) P= .393	.3589 (60) P= .000	.2278 (60) P= .040	.1778 (60) P= .087	.1718 (60) P= .095	.3344 (60) P= .005	-.2961 (60) P= .032
Depres- sion Initial	.0370 (60) P= .332	.1703 (60) P= .097	.1183 (60) P= .184	.1128 (60) P= .195	.1088 (60) P= .204	.0471 (60) P= .305	.2408 (60) P= .032	.2532 (60) P= .025
Impaired Concen- tration Initial	.0826 (60) P= .341	.0186 (60) P= .444	-.1032 (60) P= .218	-.0345 (60) P= .340	.1388 (60) P= .145	.2725 (60) P= .018	.2979 (60) P= .010	.1594 (60) P= .112
Impaired Memory Initial	.2256 (60) P= .042	-.0268 (60) P= .479	.1731 (60) P= .092	.1403 (60) P= .143	.1405 (60) P= .142	.1403 (60) P= .143	.3308 (60) P= .003	.1240 (60) P= .149
Assent- minded Initial	.0499 (60) P= .352	.1000 (60) P= .223	-.0556 (60) P= .337	.0587 (60) P= .328	.1497 (60) P= .127	.1468 (60) P= .131	.2241 (60) P= .043	.2453 (60) P= .032
Anxiety Initial	.1726 (60) P= .082	.1673 (60) P= .108	.0645 (60) P= .212	-.0170 (60) P= .449	.0579 (60) P= .320	.1381 (60) P= .130	.1404 (60) P= .142	.0000 (60) P= .300
Irrita- bility Initial	.1540 (60) P= .117	.1251 (60) P= .171	.1684 (60) P= .099	.2266 (60) P= .041	.0087 (60) P= .471	.0115 (60) P= .463	.1574 (60) P= .115	.1409 (60) P= .141
Hypersens- to light Initial	-.0684 (60) P= .302	.1280 (60) P= .165	-.0064 (60) P= .481	.0348 (60) P= .390	.1027 (60) P= .218	.0111 (60) P= .	.0443 (60) P= .368	.4239 (60) P= .000
Hypersens- to sound Initial	.2061 (60) P= .057	.1218 (60) P= .177	.1752 (60) P= .080	.4460 (60) P= .000	.2604 (60) P= .022	.0351 (60) P= .395	.2396 (60) P= .023	.2539 (60) P= .025
Headache Initial	-.1068 (60) P= .308	.0461 (60) P= .363	-.1053 (60) P= .212	-.0048 (60) P= .485	.0575 (60) P= .321	.0048 (60) P= .485	-.0738 (60) P= .388	.1809 (60) P= .082
Dizziness Initial	.0434 (60) P= .371	.0348 (60) P= .396	.0242 (60) P= .427	.0989 (60) P= .226	.2061 (60) P= .057	.1468 (60) P= .131	.1475 (60) P= .130	.1782 (60) P= .085
Fatigue Initial	.0495 (60) P= .389	.0885 (60) P= .231	-.1434 (60) P= .127	.0938 (60) P= .238	.1104 (60) P= .201	.1299 (60) P= .161	.2039 (60) P= .059	.0187 (60) P= .441

Note: (I) = data collected at initial assessment; (F) = data collected at follow-up.

The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below α is the significance level. The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix O continued

	Night- mares	Social with- drawal	Sexual Dis- interest	Depres- sion	Impaired Concen- tration	Impaired Memory	Absent- minded	Anxiety	Irrit- ability	Hypersens- to Light	Hypersens- to Sound	Headache	Dizziness	Fatigue
	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial
Intuition	.1495	.0242	.4953	.0570	.0926	.2234	.0499	.1724	.1340	-.0644	.2061	-.1048	.0434	.0695
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.137	.427	.000	.333	.241	.042	.352	.092	.117	.302	.057	.200	.371	.299
Worshipping	.1841	.1647	-.0356	.1702	.0186	-.0068	.1000	.1622	.1251	.1280	.1218	.0461	.0348	.0885
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.080	.104	.393	.097	.444	.479	.223	.108	.171	.163	.177	.363	.396	.231
Munching	.1726	-.0875	.5589	.1183	-.1032	.1731	-.0556	.0645	.1684	-.0064	.1753	-.1053	.0242	-.1434
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.094	.253	.000	.184	.218	.093	.337	.312	.099	.481	.090	.212	.427	.127
Avoidance	.1760	.1884	.2279	.1128	-.0543	.1403	.0587	-.0170	.2266	.0269	.4660	-.0048	.0989	.0928
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.089	.075	.040	.193	.340	.143	.328	.449	.041	.390	.000	.483	.226	.228
Jump	-.0641	.0846	.1778	.1088	.1289	.1405	.1497	.0579	.0097	.1027	.2604	.0575	.2061	.1204
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.312	.250	.087	.204	.145	.142	.137	.330	.471	.218	.022	.331	.057	.201
Insomnia	.0817	.0284	.1718	.0671	.2725	.1403	.1468	.1261	.0113	.0269	.0351	-.0048	.1468	.1299
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.267	.415	.093	.305	.018	.143	.131	.130	.465	.290	.393	.483	.131	.161
Conc/Hem	.0804	.0401	.3344	.2408	.2979	.3508	.2241	.1404	.1374	.0443	.2396	-.0738	.1475	.2039
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.271	.224	.003	.032	.010	.003	.042	.142	.115	.268	.023	.288	.130	.059
Guilt	.2499	.1077	-.0941	.2532	.1594	.1260	.0000	.0000	.1409	.4239	.2329	.1809	.1792	.0197
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.027	.008	.232	.025	.112	.169	.032	.300	.141	.000	.023	.082	.085	.441
Night- mares	1.0000	.5599	.3711	.4911	.1823	.2813	.3259	.3448	.4508	.3278	.3118	.4083	.4422	.2169
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.	.000	.002	.000	.081	.015	.004	.003	.000	.005	.008	.001	.000	.048
Social with- drawal	.5599	1.0000	.3618	.5201	.1914	.3171	.2860	.2937	.4750	.4862	.4271	.3234	.4861	.4494
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.000	.	.002	.000	.071	.048	.020	.011	.000	.000	.000	.006	.000	.000
Sexual Dis- interest	.3711	.3618	1.0000	.3914	.0847	.2469	.0970	.3637	.3298	.0443	.3397	-.0826	.2034	.2228
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.002	.002	.	.001	.260	.003	.231	.002	.005	.368	.004	.265	.060	.044
Depres- sion	.4911	.5201	.3914	1.0000	.2829	.3249	.4213	.3129	.3905	.4127	.1953	.1601	.4928	.3779
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.000	.000	.001	.	.014	.004	.000	.007	.001	.001	.067	.111	.000	.001
Impaired Concen- tration	.1823	.1914	.0847	.2829	1.0000	.7683	.4574	.1929	.2434	.5272	.1583	.3527	.3980	.4601
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.081	.071	.260	.014	.	.000	.000	.070	.003	.000	.114	.003	.001	.000
Impaired Memory	.2813	.3171	.3469	.3249	.7683	1.0000	.7210	.3083	.4994	.5104	.3985	.3727	.4647	.4947
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.013	.048	.003	.004	.000	.	.000	.053	.000	.000	.010	.002	.000	.000
Absent- minded	.3259	.2860	.0970	.4213	.4574	.7210	1.0000	.1975	.2635	.5729	.2288	.4392	.5069	.4682
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.004	.020	.231	.000	.000	.000	.	.065	.002	.000	.033	.000	.000	.000
Anxiety	.3448	.2937	.3637	.3129	.1929	.2083	.1975	1.0000	.2235	.2791	.1977	.2609	.2429	.2171
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.003	.011	.002	.007	.070	.053	.065	.	.036	.015	.065	.022	.031	.048
Irrit- ability	.4508	.4750	.3298	.3905	.3434	.4994	.3635	.2235	1.0000	.4814	.3722	.2977	.2675	.3454
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.000	.000	.005	.001	.003	.000	.002	.036	.	.000	.002	.010	.019	.003
Hypersens- to Light	.3278	.4862	.4127	.5272	.5104	.5729	.2791	.4814	1.0000	.3497	.4867	.4555	.4960	.4960
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.003	.000	.366	.001	.000	.000	.013	.000	.	.003	.000	.000	.000	.000
Hypersens- to Sound	.3118	.4271	.3397	.1953	.1583	.2985	.2288	.1977	.3722	.3497	1.0000	.3065	.3697	.2682
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.008	.000	.004	.067	.114	.010	.023	.065	.002	.003	.	.009	.002	.019
Headache	.4083	.3226	-.0826	.1601	.3527	.3727	.4342	.2609	.2977	.4867	.3065	1.0000	.4589	.4088
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.001	.006	.363	.111	.003	.002	.000	.022	.010	.000	.009	.	.000	.001
Dizziness	.4427	.4861	.2034	.4928	.3980	.4647	.5069	.2429	.2675	.4555	.2697	.4589	1.0000	.6513
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.000	.000	.040	.000	.001	.000	.000	.021	.019	.000	.002	.000	.	.000
Fatigue	.2169	.4494	.2228	.3779	.4631	.4947	.4682	.2171	.3454	.4960	.2682	.4088	.6513	1.0000
Initial	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
P =	.048	.000	.044	.001	.000	.000	.000	.048	.003	.000	.019	.001	.000	.

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.

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The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix O continued

	Intrusion Midway	Worsening Midway	Humbling Midway	Avoidance Midway	Jumpy Midway	Insomnia Midway	Conc/Hum Midway	Guilt Midway
Intrusion Midway	1.0000 (.46) P=.	-.0698 (.46) P=.322	.2864 (.46) P=.027	.1591 (.46) P=.145	-.4735 (.46) P=.000	.6235 (.46) P=.000	.4208 (.46) P=.002	-.0698 (.46) P=.322
Worsening Midway	-.0698 (.46) P=.322	1.0000 (.46) P=.	.2864 (.46) P=.027	.1591 (.46) P=.145	.1906 (.46) P=.102	.1322 (.46) P=.189	.2232 (.46) P=.064	.6434 (.46) P=.000
Humbling Midway	.2864 (.46) P=.027	.2864 (.46) P=.027	1.0000 (.46) P=.	.4206 (.46) P=.002	.1906 (.46) P=.102	.6235 (.46) P=.000	.4208 (.46) P=.002	.2864 (.46) P=.027
Avoidance Midway	.1591 (.46) P=.145	.1591 (.46) P=.145	.4206 (.46) P=.002	1.0000 (.46) P=.	.2795 (.46) P=.030	.3750 (.46) P=.005	.6171 (.46) P=.000	.1591 (.46) P=.145
Jumpy Midway	-.4735 (.46) P=.000	.1906 (.46) P=.102	.1906 (.46) P=.102	.2795 (.46) P=.030	1.0000 (.46) P=.	.2409 (.46) P=.053	.2462 (.46) P=.050	.4735 (.46) P=.000
Insomnia Midway	.6235 (.46) P=.000	.1322 (.46) P=.189	.6235 (.46) P=.000	.3750 (.46) P=.005	.2409 (.46) P=.053	1.0000 (.46) P=.	.6750 (.46) P=.000	.1322 (.46) P=.189
Conc/Hum Midway	.4208 (.46) P=.002	.2232 (.46) P=.064	.4208 (.46) P=.002	.6171 (.46) P=.000	.2462 (.46) P=.050	.6750 (.46) P=.000	1.0000 (.46) P=.	.0299 (.46) P=.422
Guilt Midway	-.0698 (.46) P=.322	.6434 (.46) P=.000	.2864 (.46) P=.027	.1591 (.46) P=.145	.4735 (.46) P=.000	.1322 (.46) P=.189	.0299 (.46) P=.422	1.0000 (.46) P=.
Night- mares Midway	.2934 (.46) P=.003	-.0766 (.46) P=.306	.2924 (.46) P=.003	.4045 (.46) P=.003	.2715 (.46) P=.034	.2002 (.46) P=.091	.2045 (.46) P=.086	-.0766 (.46) P=.306
Social with- drawal Midway	.2164 (.46) P=.074	.2164 (.46) P=.074	.3033 (.46) P=.020	.1906 (.46) P=.102	.3780 (.46) P=.005	.2680 (.46) P=.036	.2138 (.46) P=.077	.2164 (.46) P=.074
Sexual Dis- interest Midway	.2205 (.46) P=.070	.2205 (.46) P=.070	.5476 (.46) P=.000	.5032 (.46) P=.000	.1185 (.46) P=.216	.4473 (.46) P=.001	.3744 (.46) P=.005	.2205 (.46) P=.070
Depres- sion Midway	.3109 (.46) P=.018	.3873 (.46) P=.004	.2344 (.46) P=.059	.1755 (.46) P=.122	.5525 (.46) P=.000	.2708 (.46) P=.034	.2435 (.46) P=.038	.4638 (.46) P=.001
Impaired Concen- tration Midway	.2877 (.46) P=.004	-.0345 (.46) P=.360	.2403 (.46) P=.054	.2443 (.46) P=.051	.4347 (.46) P=.001	.1828 (.46) P=.112	.3288 (.46) P=.012	-.0545 (.46) P=.360
Impaired Memory Midway	.3055 (.46) P=.019	.3055 (.46) P=.019	.4420 (.46) P=.001	.5480 (.46) P=.000	.3318 (.46) P=.012	.3181 (.46) P=.016	.4637 (.46) P=.000	.1009 (.46) P=.232
Absent- minded Midway	.4378 (.46) P=.001	-.1325 (.46) P=.188	.1523 (.46) P=.156	.3278 (.46) P=.012	.3522 (.46) P=.008	.1622 (.46) P=.141	.2963 (.46) P=.023	-.0421 (.46) P=.341
Anxiety Midway	.3262 (.46) P=.013	.2255 (.46) P=.066	.2255 (.46) P=.066	.4045 (.46) P=.003	.4846 (.46) P=.000	.2002 (.46) P=.091	.4070 (.46) P=.002	.2262 (.46) P=.013
Irriti- ability Midway	.2936 (.46) P=.024	.2236 (.46) P=.068	.5036 (.46) P=.000	.2253 (.46) P=.066	.1847 (.46) P=.110	.5030 (.46) P=.001	.4547 (.46) P=.001	.0837 (.46) P=.290
Hypersens- to Light Midway	.2164 (.46) P=.016	-.0770 (.46) P=.306	.3164 (.46) P=.016	.1755 (.46) P=.122	.2103 (.46) P=.080	.1470 (.46) P=.165	.0328 (.46) P=.414	-.0770 (.46) P=.306
Hypersens- to Sound Midway	.2882 (.46) P=.026	.1619 (.46) P=.141	.5407 (.46) P=.000	.3300 (.46) P=.013	.1807 (.46) P=.113	.2887 (.46) P=.026	.3386 (.46) P=.011	.1619 (.46) P=.141
Headache Midway	.2280 (.46) P=.064	-.0359 (.46) P=.407	.2280 (.46) P=.064	-.1009 (.46) P=.252	.1445 (.46) P=.169	.1390 (.46) P=.178	.1801 (.46) P=.116	.0301 (.46) P=.421
Distress Midway	.1737 (.46) P=.124	-.1459 (.46) P=.124	.1737 (.46) P=.124	.1766 (.46) P=.120	.0606 (.46) P=.344	-.0143 (.46) P=.462	.1207 (.46) P=.212	-.1459 (.46) P=.124
Fatigue Midway	.2154 (.46) P=.075	.1268 (.46) P=.182	.2941 (.46) P=.024	-.1454 (.46) P=.167	.0976 (.46) P=.259	.1293 (.46) P=.196	.1649 (.46) P=.124	-.0203 (.46) P=.446

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
 The reason that no values are given for some of these symptoms is that no individual in that sub-sample endorsed them.

Appendix O continued

	Night- mares	Social with- drawal	Sexual Dis- interest	Depres- sion	Impaired Concen- tration	Impaired Memory	Absent- minded	Anxiety	Irrit- ability	Hypersens- to Light	Hypersens- to Sound	Headache	Dizziness	Fatigue
	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway
Intrusion	.3934	.2166	.2205	.3109	.2877	.3055	.4378	.3262	.2935	.3164	.3182	.2280	.1737	.2154
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.003	P=.074	P=.070	P=.018	P=.004	P=.019	P=.001	P=.012	P=.024	P=.016	P=.026	P=.064	P=.124	P=.075
Worrening	-.0766	.2166	.2205	.3873	-.0545	.3055	-.1335	.2255	.2236	-.0770	.1619	-.0359	-.1459	.1368
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.306	P=.074	P=.070	P=.004	P=.360	P=.019	P=.188	P=.066	P=.068	P=.306	P=.141	P=.407	P=.167	P=.182
Humbling	.3934	.3033	.3476	.2344	.2603	.4420	.1522	.2255	.3036	.3164	.3182	.2280	.1737	.2154
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.003	P=.020	P=.000	P=.058	P=.054	P=.001	P=.156	P=.066	P=.000	P=.016	P=.000	P=.064	P=.124	P=.075
Avoidance	.4045	.1909	.3033	.1755	.2642	.3490	.3278	.4045	.2253	.1755	.3300	-.1009	.1768	-.1454
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.003	P=.102	P=.000	P=.122	P=.031	P=.000	P=.013	P=.003	P=.066	P=.172	P=.012	P=.232	P=.120	P=.167
Jumpy	.2713	.3780	.1185	.5525	.4247	.3318	.3522	.4844	.1847	.2103	.1807	.1445	.0804	.0976
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.024	P=.005	P=.314	P=.000	P=.001	P=.012	P=.008	P=.000	P=.110	P=.080	P=.115	P=.169	P=.244	P=.259
Insomnia	.2002	.2680	.4473	.2708	.1828	.3181	.1632	.2002	.3030	.1470	.2687	.1290	-.0143	.1293
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.091	P=.036	P=.001	P=.024	P=.112	P=.016	P=.141	P=.091	P=.000	P=.165	P=.026	P=.178	P=.462	P=.196
Conc/Hes	.2045	.2138	.3744	.2635	.3286	.6627	.2962	.4070	.4547	.0328	.3386	.1801	.1207	.1669
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.086	P=.077	P=.005	P=.038	P=.013	P=.000	P=.022	P=.002	P=.001	P=.414	P=.011	P=.116	P=.212	P=.124
Cuilt	-.0744	.2166	.2205	.4638	-.0545	.3055	-.0621	.3262	.0837	-.0770	.1619	.0301	-.1459	-.0205
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.306	P=.074	P=.070	P=.001	P=.360	P=.019	P=.341	P=.013	P=.390	P=.306	P=.141	P=.421	P=.167	P=.446
Night- mares	1.0000	.4293	.4758	.2071	.5068	.3206	.4328	.4024	.1524	.5636	.3998	.2505	.4717	.2885
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.	P=.001	P=.000	P=.084	P=.000	P=.015	P=.001	P=.003	P=.134	P=.000	P=.003	P=.047	P=.000	P=.026
Social with- drawal	.4293	1.0000	.4372	.6225	.2328	.1492	.2092	.2255	.2286	.3245	.3221	.0561	.3234	.3249
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.001	P=.	P=.001	P=.000	P=.060	P=.161	P=.082	P=.040	P=.062	P=.012	P=.015	P=.356	P=.014	P=.014
Sexual Dis- interest	.4758	.4272	1.0000	.3760	.1984	.3994	.3091	.3757	.4245	.4237	.4986	.0158	.1923	.0949
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.000	P=.001	P=.000	P=.005	P=.093	P=.003	P=.018	P=.003	P=.000	P=.002	P=.000	P=.459	P=.100	P=.265
Depres- sion	.2071	.6225	.3760	1.0000	.3779	.3683	.4435	.3743	.3592	.2586	.3855	.3274	.2161	.3725
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.084	P=.000	P=.003	P=.	P=.005	P=.006	P=.001	P=.000	P=.007	P=.041	P=.004	P=.011	P=.075	P=.005
Impaired Concen- tration	.3068	.3228	.1984	.3779	1.0000	.5079	.6744	.3274	.5439	.4277	.3642	.3735	.4266	.4608
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.000	P=.060	P=.093	P=.005	P=.	P=.000	P=.000	P=.000	P=.002	P=.002	P=.006	P=.005	P=.001	P=.001
Impaired Memory	.3206	.1492	.3994	.3683	.5079	1.0000	.4060	.4482	.5292	.2994	.5325	.2930	.2517	.3055
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.015	P=.161	P=.003	P=.006	P=.000	P=.	P=.000	P=.001	P=.000	P=.022	P=.000	P=.024	P=.046	P=.019
Absent- minded	.4328	.2092	.3091	.4435	.6744	.4060	1.0000	.4876	.2785	.4820	.2902	.4452	.3609	.4280
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.001	P=.082	P=.018	P=.001	P=.000	P=.000	P=.	P=.000	P=.020	P=.000	P=.023	P=.001	P=.007	P=.002
Anxiety	.4024	.2255	.3757	.5743	.5276	.4683	.4876	1.0000	.2115	.3599	.3403	.4482	.4115	.3921
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.003	P=.040	P=.003	P=.000	P=.000	P=.001	P=.000	P=.	P=.018	P=.007	P=.010	P=.001	P=.002	P=.004
Irrit- ability	.1524	.2286	.4245	.3592	.5439	.5292	.3785	.3115	1.0000	.2081	.4390	.0847	.1750	.2510
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.134	P=.062	P=.000	P=.007	P=.000	P=.000	P=.020	P=.018	P=.	P=.083	P=.001	P=.288	P=.122	P=.046
Hypersens- to Light	.5636	.3245	.4237	.2586	.4277	.3994	.4820	.3599	.2081	1.0000	.3179	.3971	.3679	.4112
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.000	P=.012	P=.002	P=.041	P=.002	P=.022	P=.000	P=.001	P=.082	P=.	P=.016	P=.003	P=.006	P=.002
Hypersens- to Sound	.3998	.3221	.4986	.3855	.3642	.5325	.2902	.3403	.4390	.3179	1.0000	.3861	.3650	.3254
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.003	P=.015	P=.000	P=.004	P=.006	P=.000	P=.025	P=.010	P=.001	P=.016	P=.	P=.006	P=.000	P=.011
Headache	.2505	.0561	.0158	.3374	.3725	.3920	.4452	.4452	.0847	.3971	.3661	1.0000	.4572	.7072
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.047	P=.356	P=.459	P=.011	P=.005	P=.024	P=.001	P=.001	P=.288	P=.003	P=.006	P=.	P=.001	P=.000
Dizziness	.4717	.3234	.1923	.2161	.4566	.2517	.3609	.4115	.1750	.3679	.3650	.4572	1.0000	.4036
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.000	P=.014	P=.100	P=.075	P=.001	P=.046	P=.007	P=.002	P=.122	P=.006	P=.000	P=.001	P=.	P=.003
Fatigue	.3885	.3249	.0949	.3725	.4608	.3055	.4280	.3921	.2510	.4112	.3254	.7072	.4036	1.0000
Midway	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)	(.46)
	P=.026	P=.014	P=.265	P=.003	P=.001	P=.019	P=.002	P=.004	P=.046	P=.002	P=.011	P=.000	P=.003	P=.

Note. (I) = data collected at initial assessment; (P) = data collected at follow-up.

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix O continued

	Intrusion Follow-up	Worsening Follow-up	Humbling Follow-up	Avoidance Follow-up	Jumpy Follow-up	Insomnia Follow-up	Conc/Man Follow-up	Guilt Follow-up
Intrusion	1.0000	.3738	.3738	.3218	.3218	.5739	.5374	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .	P= .010	P= .010	P= .024	P= .024	P= .000	P= .000	P= .
Worsening	.3738	1.0000	.3091	.4719	.6854	.6513	.5549	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .010	P= .	P= .028	P= .001	P= .000	P= .000	P= .286	P= .
Humbling	.3738	.3091	1.0000	.4719	.4719	.4743	.4382	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .010	P= .028	P= .	P= .001	P= .001	P= .001	P= .003	P= .
Avoidance	.3218	.4719	.4719	1.0000	.6042	.3968	.5193	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .024	P= .001	P= .001	P= .	P= .000	P= .007	P= .000	P= .
Jumpy	.3218	.6854	.4719	.6042	1.0000	.5607	.2010	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .024	P= .000	P= .001	P= .000	P= .	P= .000	P= .113	P= .
Insomnia	.5739	.6513	.4743	.3968	.5607	1.0000	.4092	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .000	P= .000	P= .001	P= .007	P= .000	P= .	P= .003	P= .
Conc/Man	.5374	.5549	.4382	.5193	.2010	.4092	1.0000	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .000	P= .286	P= .003	P= .000	P= .113	P= .003	P= .	P= .
Guilt	.	.	.	.	.	.	.	1.0000
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .	P= .	P= .	P= .	P= .	P= .	P= .	P= .
Night-	.4042	.0714	.4587	.0215	.1512	.3078	.2710	.
mares	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
Follow-up	P= .006	P= .335	P= .002	P= .426	P= .182	P= .030	P= .030	P= .
Social	.1019	.4406	.1348	.1641	.0933	.2657	-.0525	.
with-	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
drewal	P= .271	P= .003	P= .210	P= .162	P= .289	P= .053	P= .377	P= .
Sexual	.1846	.6872	.1413	.2753	.2753	.4265	.0533	.
Dis-	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
interest	P= .124	P= .000	P= .199	P= .047	P= .047	P= .004	P= .271	P= .
Depres-	.3482	.3931	-.0053	.1921	.0684	.4530	.0511	.
sion	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
Follow-up	P= .016	P= .007	P= .487	P= .124	P= .342	P= .002	P= .380	P= .
Impaired	.3324	.2479	.2479	.3744	.1431	.4290	.7124	.
Concen-	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
tration	P= .015	P= .067	P= .067	P= .010	P= .164	P= .003	P= .000	P= .
Impaired	.3829	.1774	.3053	.4462	.2414	.4208	.5404	.
Memory	(37)	(37)	(37)	(37)	(37)	(37)	(37)	(37)
Follow-up	P= .045	P= .146	P= .033	P= .003	P= .075	P= .003	P= .000	P= .
Absent-	.1304	.2417	.1793	.2805	.1445	.2752	.2126	.
mind-	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
Follow-up	P= .218	P= .072	P= .141	P= .044	P= .162	P= .047	P= .028	P= .
Anxiety	.1544	.3023	.1025	.1511	.0585	.1574	.0490	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .174	P= .033	P= .270	P= .182	P= .364	P= .173	P= .385	P= .
Irrit-	.3016	.2503	.1978	.1128	.0641	.5457	.3144	.
ability	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
Follow-up	P= .033	P= .065	P= .117	P= .250	P= .331	P= .000	P= .026	P= .
Hypersens	.0582	.1163	.4175	.2597	.1866	.1785	.1457	.
to Light	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
Follow-up	P= .364	P= .243	P= .005	P= .058	P= .159	P= .142	P= .191	P= .
Hypersens	.1948	.0429	.3484	.2931	.0099	-.0123	.1917	.
to Sound	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
Follow-up	P= .121	P= .399	P= .016	P= .037	P= .476	P= .471	P= .124	P= .
Headache	.2518	.0352	.1888	.1011	.1011	.3105	.3067	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .064	P= .417	P= .155	P= .273	P= .273	P= .029	P= .031	P= .
Dissiness	.0871	.0326	.0326	-.0949	-.0949	-.0179	.0179	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .302	P= .423	P= .423	P= .285	P= .285	P= .458	P= .467	P= .
Fatigue	.2938	.2873	.1131	.0835	.0397	.3519	.1594	.
Follow-up	(38)	(38)	(38)	(38)	(38)	(38)	(38)	(38)
	P= .007	P= .040	P= .250	P= .288	P= .407	P= .015	P= .169	P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.
 The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix O continued

	Height- mares	Social with- drawal	Sexual Dis- interest	Depres- sion	Impaired Concen- tration	Impaired Memory	Absent- minded	Anxiety	Irrit- ability	Hypersen- sitive to light	Hypersen- sitive to sound	Headache	Dizziness	Fatigue
	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up
Intrusion	.4042	.1019	.1846	.3482	.3524	.2829	.1304	.1564	.3016	.0382	.1948	.2518	.0871	.2938
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .006	p = .271	p = .124	p = .016	p = .015	p = .045	p = .218	p = .174	p = .033	p = .264	p = .123	p = .044	p = .302	p = .007
Worri- ng	.0714	.4406	.6872	.2951	.2479	.1776	.2417	.3023	.2503	.1162	.0429	.0352	.0326	.2873
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .235	p = .003	p = .000	p = .007	p = .067	p = .146	p = .072	p = .033	p = .045	p = .243	p = .399	p = .417	p = .433	p = .040
Numb- ing	.4587	.1348	.1413	-.0053	.2479	.3052	.1793	.1025	.1978	.4175	.3484	.1688	.0326	.1121
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .002	p = .310	p = .199	p = .487	p = .067	p = .033	p = .141	p = .270	p = .117	p = .005	p = .016	p = .155	p = .423	p = .250
Avoidance	.0315	.1641	.2753	.1921	.3744	.4463	.2805	.1511	.1120	.2397	.2931	.1011	-.0949	.0933
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .426	p = .162	p = .047	p = .124	p = .010	p = .003	p = .044	p = .182	p = .230	p = .038	p = .037	p = .273	p = .285	p = .288
Jumpy	.1512	.0933	.2753	.0684	.1631	.2414	.1844	.0585	.0641	.1666	.0099	.1011	-.0949	.0297
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .182	p = .289	p = .047	p = .343	p = .164	p = .075	p = .182	p = .364	p = .331	p = .159	p = .476	p = .273	p = .285	p = .407
Insomnia	.3078	.2657	.4265	.4530	.4290	.4298	.2752	.1574	.5457	.1765	-.0123	.3105	-.0179	.3519
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .030	p = .053	p = .004	p = .002	p = .003	p = .005	p = .047	p = .173	p = .000	p = .142	p = .471	p = .029	p = .458	p = .015
Conc/Mem	.2710	-.0525	.0553	.0511	.7124	.5404	.3126	.0490	.3164	.1457	.1917	.3057	.0129	.1594
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .050	p = .277	p = .371	p = .380	p = .000	p = .000	p = .028	p = .393	p = .026	p = .191	p = .124	p = .031	p = .467	p = .169
Guilt														
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .	p = .
Height- mares	1.0000	.7406	.0416	.1132	.2376	.0832	-.1152	.3169	.3559	.0533	-.0270	.2431	.4069	.4780
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .	p = .057	p = .402	p = .249	p = .075	p = .312	p = .245	p = .026	p = .014	p = .275	p = .436	p = .017	p = .006	p = .001
Social with- drawal	.3606	1.0000	.6972	.6456	.1991	.2515	.2189	.3744	.5128	.1246	.1566	.0397	.2857	.5671
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .057	p = .	p = .000	p = .000	p = .115	p = .067	p = .093	p = .010	p = .000	p = .220	p = .174	p = .406	p = .053	p = .000
Sexual Dis- interest	.0416	.6972	1.0000	.9380	.2078	.2601	.2891	.5785	.3338	.1169	.1016	.1626	.2660	.4286
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .402	p = .000	p = .	p = .000	p = .040	p = .060	p = .039	p = .000	p = .020	p = .242	p = .272	p = .165	p = .040	p = .004
Depres- sion	.1132	.6456	.9380	1.0000	.3221	.5472	.5104	.5142	.6416	.3660	.2128	.0632	.0689	.6978
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .349	p = .000	p = .000	p = .	p = .024	p = .000	p = .001	p = .000	p = .000	p = .012	p = .100	p = .333	p = .341	p = .000
Impaired Concen- tration	.2376	.1991	.2078	.3221	1.0000	.7490	.6814	.3326	.6570	.2582	.0884	.4142	.2640	.4486
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .075	p = .115	p = .040	p = .024	p = .	p = .000	p = .000	p = .024	p = .000	p = .060	p = .299	p = .005	p = .055	p = .002
Impaired Memory	.0832	.2515	.2601	.5472	.7490	1.0000	.8251	.2592	.6274	.5456	.2845	.0881	.0770	.4190
Follow-up	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)	(.37) (.37)
	p = .312	p = .067	p = .060	p = .000	p = .000	p = .	p = .000	p = .061	p = .000	p = .000	p = .044	p = .302	p = .325	p = .005
Absent- minded	-.1152	.2189	.2891	.5104	.6814	.8251	1.0000	.3417	.5070	.5894	.3505	.0200	.1315	.4221
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .245	p = .093	p = .039	p = .001	p = .000	p = .000	p = .	p = .018	p = .001	p = .000	p = .015	p = .452	p = .216	p = .004
Anxiety	.3169	.3744	.5785	.5142	.3326	.2592	.3417	.4000	.3485	.3255	.2325	.3066	.3491	.4997
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .026	p = .010	p = .000	p = .000	p = .024	p = .061	p = .018	p = .	p = .016	p = .023	p = .080	p = .021	p = .016	p = .001
Irrit- ability	.3559	.5128	.3338	.6416	.6570	.6274	.5070	.3485	1.0000	.2221	-.0086	.3017	.1423	.5752
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .014	p = .000	p = .030	p = .000	p = .000	p = .000	p = .001	p = .016	p = .	p = .689	p = .680	p = .033	p = .197	p = .000
Hypersen- sitive to light	.0533	.1246	.1169	.3860	.2563	.5456	.3894	.3255	.2221	1.0000	.6473	.0429	.0243	.4064
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .375	p = .228	p = .243	p = .012	p = .060	p = .000	p = .000	p = .023	p = .089	p = .	p = .000	p = .399	p = .442	p = .006
Hypersen- sitive to sound	-.0270	.1566	.1016	.2128	.0884	.2845	.3305	.2325	-.0086	.6473	1.0000	.0669	-.0123	.3459
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .436	p = .174	p = .272	p = .100	p = .299	p = .044	p = .015	p = .080	p = .480	p = .000	p = .	p = .245	p = .471	p = .017
Headache	.3431	.0397	.1626	.0632	.4142	.0881	.0200	.3066	.3017	.0429	.0669	1.0000	.5157	.3174
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .017	p = .406	p = .165	p = .353	p = .005	p = .302	p = .452	p = .021	p = .033	p = .399	p = .345	p = .	p = .000	p = .026
Dizziness	.4069	.2657	.2660	.0689	.2640	.0770	.1313	.3491	.1423	.0243	-.0123	.3157	1.0000	.4187
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .006	p = .053	p = .040	p = .341	p = .055	p = .325	p = .216	p = .016	p = .197	p = .442	p = .471	p = .000	p = .	p = .004
Fatigue	.4780	.5671	.4286	.6978	.4486	.4190	.4221	.4997	.5752	.4064	.3459	.3174	.4187	1.0000
Follow-up	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.37) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)	(.38) (.38)
	p = .001	p = .000	p = .004	p = .000	p = .002	p = .005	p = .004	p = .001	p = .000	p = .006	p = .017	p = .026	p = .004	p = .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P

Pearson Correlation Coefficients Between Symptoms and Predictor Variables

	Intrusion Initial	Worsening Initial	Numbing Initial	Avoidance Initial	Jumpy Initial	Insomnia Initial	Conc/Mem Initial	Guilt Initial
ANXI (I)	.0498 (60) P= .353	-.0249 (60) P= .425	.0132 (60) P= .460	-.0241 (60) P= .427	.0489 (60) P= .355	.0625 (60) P= .318	.0914 (60) P= .244	-.0255 (60) P= .423
MDI L(I)	-.1536 (59) P= .123	-.0247 (59) P= .426	-.1136 (59) P= .196	-.0108 (59) P= .468	-.1536 (59) P= .123	-.1956 (59) P= .069	-.2593 (59) P= .024	-.0013 (59) P= .496
MDI F(I)	-.0966 (59) P= .233	.2268 (59) P= .042	-.0400 (59) P= .382	.0546 (59) P= .341	.1548 (59) P= .121	.0763 (59) P= .283	.0247 (59) P= .426	.4693 (59) P= .000
MDI K(I)	.2376 (59) P= .035	-.0580 (59) P= .331	.0653 (59) P= .312	.0423 (59) P= .375	-.0513 (59) P= .350	.1274 (59) P= .168	-.0540 (59) P= .342	-.2382 (59) P= .035
MDI Ha(I)	-.0257 (59) P= .423	.0206 (59) P= .439	-.0638 (59) P= .316	.0013 (59) P= .496	.0817 (59) P= .269	.1911 (59) P= .074	.1735 (59) P= .094	.2877 (59) P= .014
MDI D(I)	.1507 (59) P= .127	-.0739 (59) P= .289	.2474 (59) P= .029	-.0001 (59) P= .500	.0386 (59) P= .386	.1601 (59) P= .113	.1318 (59) P= .160	.1110 (59) P= .201
MDI Hy(I)	.1936 (59) P= .071	-.0123 (59) P= .463	.0800 (59) P= .273	.1416 (59) P= .142	.1874 (59) P= .078	.3234 (59) P= .006	.1975 (59) P= .067	.1289 (59) P= .165
MDI Pd(I)	.0614 (59) P= .322	.1081 (59) P= .208	.1819 (59) P= .084	.0374 (59) P= .389	.1040 (59) P= .217	.0834 (59) P= .265	-.0505 (59) P= .352	.1857 (59) P= .080
MDI Mf(I)	-.1214 (59) P= .180	-.0270 (59) P= .420	-.0847 (59) P= .262	-.0513 (59) P= .350	-.0907 (59) P= .247	-.0706 (59) P= .297	-.1508 (59) P= .127	.0825 (59) P= .267
MDI Pa(I)	-.0209 (59) P= .437	.0578 (59) P= .332	-.0399 (59) P= .382	.1197 (59) P= .183	.2272 (59) P= .042	.1048 (59) P= .215	.0183 (59) P= .445	.3308 (59) P= .005
MDI Pt(I)	.0408 (59) P= .379	.0371 (59) P= .390	.0166 (59) P= .450	.0253 (59) P= .425	.1402 (59) P= .145	.2155 (59) P= .051	.0390 (59) P= .385	.2865 (59) P= .014
MDI So(I)	-.0282 (59) P= .416	.1511 (59) P= .127	-.0776 (59) P= .279	.2083 (59) P= .057	.2441 (59) P= .031	.2219 (59) P= .046	.1363 (59) P= .152	.4925 (59) P= .000
MDI Ma(I)	-.1702 (59) P= .099	.2811 (59) P= .016	-.0863 (59) P= .258	.1507 (59) P= .127	.1117 (59) P= .200	-.0581 (59) P= .331	-.1056 (59) P= .213	.3503 (59) P= .003
MDI SI(I)	-.0212 (59) P= .437	-.1938 (59) P= .071	.0638 (59) P= .316	-.1827 (59) P= .083	.0331 (59) P= .402	.0809 (59) P= .271	.0029 (59) P= .491	.0135 (59) P= .460
MDI Pts(I)	-.1981 (59) P= .066	.1555 (59) P= .120	-.0809 (59) P= .271	.0819 (59) P= .269	.1639 (59) P= .107	.0486 (59) P= .357	.0041 (59) P= .488	.5070 (59) P= .000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.
The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for
alternative criterion symptoms.
The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Initial	Worsening Initial	Mumbling Initial	Avoidance Initial	Jumpy Initial	Insomnia Initial	Conc/Mem Initial	Guilt Initial
ANXIA (F)	.1236 (31) P= .254	.0343 (31) P= .427	. (31) P= .	.0691 (31) P= .356	.2467 (31) P= .090	.2041 (31) P= .135	.3393 (31) P= .031	-.1647 (31) P= .188
MMPI L (F)	-.0373 (29) P= .424	-.1839 (29) P= .170	. (29) P= .	-.1421 (29) P= .231	-.0859 (29) P= .329	-.0954 (29) P= .311	-.3100 (29) P= .051	. (29) P= .
MMPI L (F)	-.0768 (29) P= .346	.0399 (29) P= .419	. (29) P= .	-.1082 (29) P= .164	-.2157 (29) P= .131	-.1471 (29) P= .223	-.1916 (29) P= .160	. (29) P= .
MMPI K (F)	.0706 (29) P= .358	-.3404 (29) P= .035	. (29) P= .	.2688 (29) P= .079	.1889 (29) P= .163	.1415 (29) P= .232	-.0759 (29) P= .348	. (29) P= .
MMPI Ma (F)	.2237 (29) P= .122	.0784 (29) P= .343	. (29) P= .	.0532 (29) P= .392	.0491 (29) P= .400	.2013 (29) P= .148	.0495 (29) P= .399	. (29) P= .
MMPI D (F)	.2086 (29) P= .139	.2219 (29) P= .124	. (29) P= .	-.2386 (29) P= .106	-.2260 (29) P= .119	.0299 (29) P= .439	.2389 (29) P= .106	. (29) P= .
MMPI Sy (F)	.2521 (29) P= .094	.1080 (29) P= .289	. (29) P= .	.1699 (29) P= .189	.1503 (29) P= .218	.2727 (29) P= .076	.0703 (29) P= .359	. (29) P= .
MMPI Pd (F)	-.0579 (29) P= .383	.0266 (29) P= .445	. (29) P= .	.0284 (29) P= .442	.0497 (29) P= .399	-.0456 (29) P= .407	-.0726 (29) P= .354	. (29) P= .
MMPI Ma (F)	-.3918 (29) P= .018	-.1012 (29) P= .301	. (29) P= .	-.2007 (29) P= .148	-.1778 (29) P= .178	-.3363 (29) P= .037	-.3656 (29) P= .026	. (29) P= .
MMPI Pa (F)	-.0429 (29) P= .413	-.1636 (29) P= .198	. (29) P= .	-.2579 (29) P= .088	-.1451 (29) P= .226	-.0641 (29) P= .371	-.2031 (29) P= .145	. (29) P= .
MMPI Pt (F)	.2251 (29) P= .120	.1850 (29) P= .168	. (29) P= .	-.1459 (29) P= .225	-.1634 (29) P= .199	.0876 (29) P= .326	.1205 (29) P= .267	. (29) P= .
MMPI Sc (F)	-.0105 (29) P= .479	.1671 (29) P= .193	. (29) P= .	-.1340 (29) P= .244	-.0894 (29) P= .322	-.0222 (29) P= .454	-.0495 (29) P= .399	. (29) P= .
MMPI Ma (F)	-.3233 (29) P= .044	.2014 (29) P= .147	. (29) P= .	-.2419 (29) P= .103	-.0596 (29) P= .379	-.2395 (29) P= .105	-.3296 (29) P= .040	. (29) P= .
MMPI SI (F)	.2121 (29) P= .135	-.1077 (29) P= .289	. (29) P= .	-.1716 (29) P= .187	-.1821 (29) P= .172	.0603 (29) P= .378	.2073 (29) P= .140	. (29) P= .
MMPI PYS (F)	-.1923 (29) P= .159	.0874 (29) P= .326	. (29) P= .	-.3053 (29) P= .054	-.1842 (29) P= .169	-.2708 (29) P= .078	-.0767 (29) P= .346	. (29) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Initial	Worsening Initial	Numbing Initial	Avoidance Initial	Jumpy Initial	Insomnia Initial	Conc/Mem Initial	Guilt Initial
Age	-.0560 (60) P= .335	-.1586 (60) P= .113	-.1275 (60) P= .166	-.1107 (60) P= .200	-.0629 (60) P= .316	-.0893 (60) P= .249	-.1371 (60) P= .148	-.1671 (60) P= .101
Sex	.2357 (60) P= .035	-.0472 (60) P= .360	.0657 (60) P= .309	-.1733 (60) P= .093	.0000 (60) P= .500	.1387 (60) P= .145	.0572 (60) P= .332	-.1622 (60) P= .108
SES	-.0209 (60) P= .437	-.1155 (60) P= .190	-.1219 (60) P= .177	-.0304 (60) P= .409	-.0378 (60) P= .387	.1092 (60) P= .203	-.0560 (60) P= .335	-.1036 (60) P= .009
Recent Events	-.0007 (60) P= .498	.2582 (60) P= .023	.0391 (60) P= .384	.1760 (60) P= .089	.1891 (60) P= .074	.0701 (60) P= .297	.2500 (60) P= .027	.4935 (60) P= .000
Psych. Rx	-.0674 (60) P= .304	.3017 (60) P= .010	.0020 (60) P= .494	.2235 (60) P= .043	-.0319 (60) P= .404	-.1838 (60) P= .080	-.0202 (60) P= .439	.2467 (60) P= .029
Severity	-.0695 (60) P= .299	.3065 (60) P= .009	-.0774 (60) P= .278	.0818 (60) P= .267	-.0695 (60) P= .299	-.1022 (60) P= .218	.0590 (60) P= .327	.2392 (60) P= .033
OCS at Admit.	.0570 (60) P= .333	-.2767 (60) P= .016	.0597 (60) P= .325	-.0660 (60) P= .308	.0402 (60) P= .380	.1114 (60) P= .198	-.0260 (60) P= .422	-.2491 (60) P= .027
Resp. Duration	.1418 (60) P= .140	.1393 (60) P= .144	-.0834 (60) P= .263	.0672 (60) P= .305	-.0020 (60) P= .494	.0628 (60) P= .317	.2030 (60) P= .060	.0386 (60) P= .385
Resp. Conseq.	.0361 (60) P= .392	.2184 (60) P= .047	-.0231 (60) P= .431	.1042 (60) P= .214	-.0072 (60) P= .478	-.0640 (60) P= .314	.0395 (60) P= .382	.0887 (60) P= .250
Hematomas	.1606 (60) P= .110	.2068 (60) P= .056	-.1003 (60) P= .223	.0888 (60) P= .250	.0146 (60) P= .456	.0888 (60) P= .250	-.0006 (60) P= .498	.0770 (60) P= .279
Skull Fract.	-.1925 (60) P= .070	.0000 (60) P= .500	-.1072 (60) P= .207	.1132 (60) P= .195	-.0642 (60) P= .313	-.2265 (60) P= .041	-.1168 (60) P= .187	.0442 (60) P= .369
Resp. Index	-.0163 (60) P= .451	.2492 (60) P= .027	.0353 (60) P= .395	.0795 (60) P= .273	-.0921 (60) P= .242	-.1447 (60) P= .135	-.0513 (60) P= .349	.1463 (60) P= .066

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

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The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Initial	Worsening Initial	Numbing Initial	Avoidance Initial	Jumpy Initial	Insomnia Initial	Conc/Mem Initial	Guilt Initial
TPT Time(I)	-.1580 (55) P= .125	.1228 (55) P= .186	-.1046 (55) P= .224	-.0904 (55) P= .256	-.0012 (55) P= .496	-.1221 (55) P= .187	-.1143 (55) P= .203	.1196 (55) P= .192
TPT Mem(I)	-.0087 (56) P= .475	-.1167 (56) P= .196	.0447 (56) P= .372	-.0379 (56) P= .391	.0554 (56) P= .342	.0878 (56) P= .260	.1024 (56) P= .226	-.0823 (56) P= .273
TPT Loc(I)	.0219 (56) P= .436	-.2005 (56) P= .069	.0134 (56) P= .461	-.1910 (56) P= .079	.0468 (56) P= .366	.0264 (56) P= .423	-.0827 (56) P= .272	-.2005 (56) P= .069
Finger Tap(I)	.1221 (56) P= .185	-.0153 (56) P= .455	.0517 (56) P= .352	-.0713 (56) P= .301	.1003 (56) P= .231	.1234 (56) P= .182	-.0052 (56) P= .485	.0411 (56) P= .382
Speech Pers(I)	-.1769 (60) P= .088	.2723 (60) P= .018	-.0758 (60) P= .282	.0746 (60) P= .285	-.2179 (60) P= .047	-.1601 (60) P= .111	-.1699 (60) P= .097	.2865 (60) P= .013
Rhythm(I)	.0453 (60) P= .366	.2379 (60) P= .034	.1373 (60) P= .148	-.0207 (60) P= .438	-.0050 (60) P= .485	-.0947 (60) P= .236	-.1117 (60) P= .198	.2158 (60) P= .049
Sens. Defic(I)	.0597 (57) P= .330	.1643 (57) P= .111	-.1076 (57) P= .213	-.0369 (57) P= .393	-.1394 (57) P= .150	-.1100 (57) P= .208	-.0471 (57) P= .364	.1643 (57) P= .111
Aph. Spat(I)	-.1545 (59) P= .121	.0125 (59) P= .463	-.0481 (59) P= .359	.0183 (59) P= .445	-.0184 (59) P= .445	-.2219 (59) P= .046	-.0622 (59) P= .320	.0809 (59) P= .271
Trail Making(I)	-.1600 (60) P= .111	-.0721 (60) P= .262	-.0306 (60) P= .408	-.0543 (60) P= .340	.0619 (60) P= .319	.0076 (60) P= .477	-.0143 (60) P= .457	-.0137 (60) P= .459
Category (I)	-.1483 (26) P= .235	-.0975 (26) P= .318	.	-.1650 (26) P= .210	-.1483 (26) P= .235	-.2076 (26) P= .154	-.2865 (26) P= .078	-.0374 (26) P= .428
TPT Time(F)	.2122 (30) P= .130	.3034 (30) P= .052	.	-.0053 (30) P= .489	-.1184 (30) P= .267	.1170 (30) P= .269	-.0162 (30) P= .466	.3017 (30) P= .053
TPT Mem(F)	-.0721 (30) P= .352	-.0206 (30) P= .457	.	.2031 (30) P= .141	.1074 (30) P= .286	.0212 (30) P= .456	.0850 (30) P= .328	-.0115 (30) P= .476
TPT Loc(F)	-.0077 (30) P= .484	-.0461 (30) P= .404	.	.2847 (30) P= .064	.1478 (30) P= .218	.0474 (30) P= .402	.0173 (30) P= .464	.1668 (30) P= .189
Finger Tap(F)	-.0407 (31) P= .414	-.2124 (31) P= .126	.	.0797 (31) P= .335	.1428 (31) P= .222	.0003 (31) P= .499	.0106 (31) P= .478	-.1185 (31) P= .263
Speech Pers(F)	-.1958 (31) P= .146	.0801 (31) P= .334	.	.0942 (31) P= .307	-.0187 (31) P= .460	-.1086 (31) P= .280	-.2586 (31) P= .080	.3140 (31) P= .043
Rhythm(F)	-.1407 (31) P= .225	.0854 (31) P= .324	.	-.1369 (31) P= .231	-.1906 (31) P= .152	-.1939 (31) P= .140	-.3072 (31) P= .046	.2459 (31) P= .091
Sens. Defic(F)	-.0091 (30) P= .481	.0823 (30) P= .333	.	.1775 (30) P= .174	.0660 (30) P= .365	-.0646 (30) P= .367	-.1509 (30) P= .213	.3515 (30) P= .028
Aph. Spat(F)	-.1839 (30) P= .165	-.0525 (30) P= .391	.	-.1005 (30) P= .299	-.1474 (30) P= .218	-.2164 (30) P= .125	-.2758 (30) P= .070	.1171 (30) P= .269
Trail Making(F)	.0134 (34) P= .470	.1170 (34) P= .255	.	.1133 (34) P= .262	.0291 (34) P= .435	.0953 (34) P= .296	.1466 (34) P= .204	.0517 (34) P= .386

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Initial	Worsening Initial	Numbing Initial	Avoidance Initial	Jumpy Initial	Insomnia Initial	Conc/Mem Initial	Guilt Initial
WAIS-R I (I)	.1432 (41) P= .186	-.2022 (41) P= .102	.2350 (41) P= .070	-.0413 (41) P= .399	.1814 (41) P= .128	.2383 (41) P= .067	.2145 (41) P= .089	-.2344 (41) P= .070
WAIS-R C (I)	.1910 (41) P= .116	.0605 (41) P= .354	.2174 (41) P= .086	.0094 (41) P= .477	.0145 (41) P= .464	.1583 (41) P= .161	.1883 (41) P= .119	.0417 (41) P= .398
WAIS-R A (I)	.1635 (41) P= .153	-.1000 (41) P= .267	.1772 (41) P= .134	-.0337 (41) P= .417	.0480 (41) P= .383	.1937 (41) P= .113	.2011 (41) P= .104	-.1495 (41) P= .175
WAIS-R S (I)	.2477 (41) P= .059	.1175 (41) P= .232	.2945 (41) P= .031	.1745 (41) P= .138	.1078 (41) P= .251	.2245 (41) P= .079	.3320 (41) P= .017	.0989 (41) P= .269
WAIS-R DS (I)	.1518 (41) P= .172	-.0959 (41) P= .275	.1177 (41) P= .232	-.0315 (41) P= .422	.1385 (41) P= .194	.2561 (41) P= .053	.1578 (41) P= .162	-.2153 (41) P= .088
WAIS-R V (I)	.0861 (41) P= .296	-.1345 (41) P= .201	.1020 (41) P= .263	-.2454 (41) P= .061	-.0701 (41) P= .332	.0820 (41) P= .305	.1289 (41) P= .211	-.2880 (41) P= .034
WAIS-R PC (I)	.1076 (41) P= .252	-.1025 (41) P= .262	.0854 (41) P= .298	.3600 (41) P= .010	.3113 (41) P= .024	.2824 (41) P= .037	.1873 (41) P= .120	.1223 (41) P= .223
WAIS-R BD (I)	.1099 (41) P= .247	.0249 (41) P= .439	.2845 (41) P= .036	.3108 (41) P= .024	.2150 (41) P= .089	.2216 (41) P= .082	.3131 (41) P= .023	.1342 (41) P= .201
WAIS-R PA (I)	.4167 (41) P= .003	-.0006 (41) P= .499	.2784 (41) P= .039	.1307 (41) P= .208	.2570 (41) P= .052	.4371 (41) P= .002	.3636 (41) P= .010	-.0483 (41) P= .382
WAIS-R OA (I)	.0727 (41) P= .326	.0159 (41) P= .461	.2397 (41) P= .066	.3334 (41) P= .017	.2319 (41) P= .072	.0081 (41) P= .480	.1939 (41) P= .112	.1478 (41) P= .178
WAIS-R DSY (I)	.0165 (41) P= .459	-.0799 (41) P= .310	.1161 (41) P= .235	-.0178 (41) P= .456	-.0134 (41) P= .467	.0612 (41) P= .352	.0487 (41) P= .381	-.0550 (41) P= .366
WAIS-R VIQ (I)	.2009 (41) P= .104	-.0395 (41) P= .403	.2057 (41) P= .099	-.0012 (41) P= .497	.0993 (41) P= .268	.2617 (41) P= .049	.2289 (41) P= .075	-.1597 (41) P= .159
WAIS-R PIQ (I)	.1450 (41) P= .183	-.0980 (41) P= .271	.2654 (41) P= .047	.2054 (41) P= .099	.2269 (41) P= .077	.2348 (41) P= .070	.2129 (41) P= .091	.0065 (41) P= .484
WAIS-R IQ (I)	.1805 (41) P= .129	-.0808 (41) P= .308	.2554 (41) P= .054	.1164 (41) P= .234	.1779 (41) P= .133	.2674 (41) P= .045	.2369 (41) P= .068	-.0820 (41) P= .305

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Midway	Worsening Midway	Humbling Midway	Avoidance Midway	Jumpy Midway	Insomnia Midway	Conc/Mem Midway	Guilt Midway
ANXI (I)	.1223 (46) P= .209	.1746 (46) P= .123	.2100 (46) P= .081	.1918 (46) P= .101	.2390 (46) P= .055	.1969 (46) P= .095	.2069 (46) P= .084	.2469 (46) P= .049
ANXI L(I)	.1882 (46) P= .105	.0350 (46) P= .409	.0350 (46) P= .409	-.0530 (46) P= .363	.0549 (46) P= .358	.1012 (46) P= .252	-.0909 (46) P= .274	-.0088 (46) P= .477
ANXI F(I)	-.0925 (46) P= .270	-.0842 (46) P= .289	-.1340 (46) P= .187	-.1174 (46) P= .219	.2725 (46) P= .033	-.2339 (46) P= .059	-.2562 (46) P= .043	.3057 (46) P= .019
ANXI K(I)	.2462 (46) P= .050	-.0762 (46) P= .307	.2764 (46) P= .031	.0951 (46) P= .265	-.1008 (46) P= .253	.2448 (46) P= .051	.0343 (46) P= .410	-.1266 (46) P= .201
ANXI Ho(I)	.0551 (46) P= .358	-.1234 (46) P= .207	.0891 (46) P= .278	.1804 (46) P= .115	-.0665 (46) P= .330	-.0539 (46) P= .361	.0314 (46) P= .418	.0126 (46) P= .467
ANXI D(I)	-.1052 (46) P= .243	.2333 (46) P= .059	.2829 (46) P= .028	.1242 (46) P= .205	.0880 (46) P= .280	.0489 (46) P= .374	-.0311 (46) P= .419	.4232 (46) P= .002
ANXI Sy(I)	.2336 (46) P= .059	-.1266 (46) P= .201	.1409 (46) P= .175	.3198 (46) P= .015	.1455 (46) P= .167	.1199 (46) P= .214	.1543 (46) P= .153	.0586 (46) P= .346
ANXI Pd(I)	-.0694 (46) P= .323	.0537 (46) P= .362	.0030 (46) P= .492	.1212 (46) P= .211	.1035 (46) P= .247	-.1561 (46) P= .150	-.2444 (46) P= .051	.2637 (46) P= .038
ANXI ME(I)	-.0843 (46) P= .289	-.0340 (46) P= .411	-.1059 (46) P= .242	-.0392 (46) P= .398	.1302 (46) P= .194	-.1518 (46) P= .157	-.2767 (46) P= .031	.0956 (46) P= .264
ANXI Pa(I)	-.1360 (46) P= .184	-.1087 (46) P= .236	.0279 (46) P= .427	.0209 (46) P= .445	.0297 (46) P= .422	-.1430 (46) P= .171	-.1284 (46) P= .197	.1008 (46) P= .253
ANXI Pt(I)	.0394 (46) P= .397	.0016 (46) P= .496	.0394 (46) P= .397	.0370 (46) P= .404	.1944 (46) P= .098	.0372 (46) P= .403	-.0461 (46) P= .380	.3132 (46) P= .017
ANXI So(I)	-.0787 (46) P= .302	-.1268 (46) P= .201	-.0718 (46) P= .318	.1113 (46) P= .231	.2520 (46) P= .046	-.1514 (46) P= .158	-.0489 (46) P= .373	.2511 (46) P= .046
ANXI Ma(I)	-.1278 (46) P= .199	.0830 (46) P= .292	-.1845 (46) P= .110	.0563 (46) P= .355	.1998 (46) P= .092	-.2235 (46) P= .068	-.1939 (46) P= .098	.3424 (46) P= .010
ANXI SI(I)	.0008 (46) P= .498	.3031 (46) P= .020	.0124 (46) P= .467	-.1353 (46) P= .185	.1486 (46) P= .162	.0012 (46) P= .497	.0018 (46) P= .495	.2915 (46) P= .025
ANXI Pts(I)	-.1969 (46) P= .095	-.0504 (46) P= .370	-.1569 (46) P= .149	-.0446 (46) P= .384	.2292 (46) P= .063	-.2639 (46) P= .038	-.2073 (46) P= .083	.3225 (46) P= .014

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Midway	Worsening Midway	Numbing Midway	Avoidance Midway	Jumpy Midway	Insomnia Midway	Conc/Mem Midway	Guilt Midway
ANXOR (F)	.1438 (29) P= .228	.1648 (29) P= .196	.1364 (29) P= .240	.1791 (29) P= .176	.0399 (29) P= .419	.3740 (29) P= .023	.3945 (29) P= .017	-.1818 (29) P= .173
MDXI L(F)	.1940 (27) P= .166	-.0614 (27) P= .381	-.0463 (27) P= .409	-.1616 (27) P= .210	.2349 (27) P= .119	-.0522 (27) P= .398	-.1432 (27) P= .238	. (27) P= .
MDXI L(F)	-.0489 (27) P= .404	-.0612 (27) P= .381	-.1744 (27) P= .192	-.0034 (27) P= .493	-.1498 (27) P= .228	-.2443 (27) P= .110	-.1252 (27) P= .267	. (27) P= .
MDXI K(F)	-.0565 (27) P= .390	-.1882 (27) P= .174	.2443 (27) P= .110	.2701 (27) P= .086	.0950 (27) P= .319	.0256 (27) P= .449	.0452 (27) P= .411	. (27) P= .
MDXI Ma(F)	.0782 (27) P= .349	-.0589 (27) P= .385	.1966 (27) P= .163	.4381 (27) P= .011	.0357 (27) P= .430	.0106 (27) P= .479	.2960 (27) P= .067	. (27) P= .
MDXI D(F)	.1711 (27) P= .197	.0080 (27) P= .484	.1682 (27) P= .201	.0633 (27) P= .377	.1369 (27) P= .248	.1304 (27) P= .258	.3074 (27) P= .059	. (27) P= .
MDXI My(F)	.2331 (27) P= .121	-.0696 (27) P= .365	.1546 (27) P= .221	.4511 (27) P= .009	.1387 (27) P= .245	.1015 (27) P= .307	.3245 (27) P= .049	. (27) P= .
MDXI Pd(F)	.0758 (27) P= .354	-.3722 (27) P= .028	-.0433 (27) P= .415	.0223 (27) P= .456	.1385 (27) P= .245	-.0654 (27) P= .373	-.2164 (27) P= .139	. (27) P= .
MDXI ME(F)	-.3121 (27) P= .056	-.3035 (27) P= .062	-.2766 (27) P= .081	-.2692 (27) P= .087	-.1826 (27) P= .181	-.3619 (27) P= .032	-.5497 (27) P= .001	. (27) P= .
MDXI Pa(F)	-.0195 (27) P= .461	-.0986 (27) P= .312	-.0789 (27) P= .348	-.4276 (27) P= .013	-.0156 (27) P= .469	.0236 (27) P= .453	-.2384 (27) P= .116	. (27) P= .
MDXI Pt(F)	.1362 (27) P= .249	.0415 (27) P= .418	.1334 (27) P= .253	-.0309 (27) P= .439	.0158 (27) P= .469	.0206 (27) P= .459	.1089 (27) P= .294	. (27) P= .
MDXI So(F)	-.0532 (27) P= .396	-.1073 (27) P= .297	-.0706 (27) P= .263	.0922 (27) P= .324	-.1126 (27) P= .288	-.1246 (27) P= .268	-.0286 (27) P= .444	. (27) P= .
MDXI Ma(F)	-.1939 (27) P= .166	-.0097 (27) P= .481	-.3482 (27) P= .038	-.2260 (27) P= .129	-.2034 (27) P= .154	-.3352 (27) P= .044	-.4435 (27) P= .010	. (27) P= .
MDXI Si(F)	-.0587 (27) P= .386	.3104 (27) P= .058	.2931 (27) P= .069	-.0920 (27) P= .324	-.0469 (27) P= .408	.1547 (27) P= .221	.2948 (27) P= .068	. (27) P= .
MDXI PYS(F)	-.1366 (27) P= .248	.1866 (27) P= .176	-.1396 (27) P= .244	-.2560 (27) P= .099	-.0715 (27) P= .362	-.1780 (27) P= .187	-.1724 (27) P= .195	. (27) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Midway	Worsening Midway	Numbing Midway	Avoidance Midway	Jumpy Midway	Insomnia Midway	Conc/Mem Midway	Guilt Midway
Age	-.0357 (46) P= .407	-.0623 (46) P= .340	.0653 (46) P= .333	-.0212 (46) P= .444	-.1020 (46) P= .250	-.1705 (46) P= .129	-.0965 (46) P= .262	-.1952 (46) P= .097
Sex	.3294 (46) P= .013	-.0314 (46) P= .418	.1490 (46) P= .161	-.1783 (46) P= .118	.0062 (46) P= .484	.2804 (46) P= .030	.1893 (46) P= .104	-.2118 (46) P= .079
SES	.1412 (46) P= .175	-.1284 (46) P= .198	.0013 (46) P= .497	.0628 (46) P= .339	-.1885 (46) P= .105	.1063 (46) P= .241	.0214 (46) P= .444	-.2920 (46) P= .024
Recent Events	.0088 (46) P= .477	.2620 (46) P= .039	.1658 (46) P= .135	.0197 (46) P= .448	.3285 (46) P= .013	.0238 (46) P= .438	.1098 (46) P= .234	.4494 (46) P= .001
Psych. Hx	-.0277 (46) P= .428	.4350 (46) P= .001	.0302 (46) P= .421	.0442 (46) P= .385	.4528 (46) P= .001	-.0709 (46) P= .320	.0400 (46) P= .396	.7242 (46) P= .000
Severity	.0516 (46) P= .367	-.0614 (46) P= .343	-.1744 (46) P= .123	-.0900 (46) P= .276	.2474 (46) P= .049	-.0726 (46) P= .316	-.0013 (46) P= .496	.1646 (46) P= .137
QCS at Admit.	.0406 (46) P= .394	.0406 (46) P= .394	.1429 (46) P= .172	.0783 (46) P= .303	-.2236 (46) P= .068	.1471 (46) P= .165	.0497 (46) P= .371	-.2152 (46) P= .076
Noap. Duration	.0460 (46) P= .381	-.1330 (46) P= .189	.0691 (46) P= .324	.0131 (46) P= .465	.2481 (46) P= .048	.0610 (46) P= .343	.1964 (46) P= .095	-.0497 (46) P= .372
Emp. Conseq.	.1174 (46) P= .219	-.0807 (46) P= .297	-.0850 (46) P= .287	.0171 (46) P= .455	.2670 (46) P= .036	.0123 (46) P= .468	.1146 (46) P= .224	.0061 (46) P= .484
Hemiparesis	.2014 (46) P= .090	-.1522 (46) P= .156	-.1522 (46) P= .156	.0879 (46) P= .281	.3036 (46) P= .020	-.0011 (46) P= .497	.0649 (46) P= .334	.0599 (46) P= .346
Skull Fract.	.0436 (46) P= .387	-.1569 (46) P= .149	-.1569 (46) P= .149	.0639 (46) P= .337	-.0484 (46) P= .375	-.1139 (46) P= .226	.0669 (46) P= .329	-.1569 (46) P= .149
Emp. Index	-.0210 (46) P= .445	.0640 (46) P= .336	-.0392 (46) P= .398	-.0508 (46) P= .369	-.0350 (46) P= .409	-.1401 (46) P= .177	-.0932 (46) P= .269	.1339 (46) P= .188

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Midway	Worsening Midway	Numbing Midway	Avoidance Midway	Jumpy Midway	Insomnia Midway	Conc/Mem Midway	Guilt Midway
TPT Time(I)	.0574 (44) P= .356	.0801 (44) P= .303	-.2198 (44) P= .076	-.2384 (44) P= .060	.0332 (44) P= .415	-.1448 (44) P= .174	.0480 (44) P= .378	-.0917 (44) P= .278
TPT Mem(I)	.1032 (44) P= .253	-.0784 (44) P= .306	-.0784 (44) P= .306	-.0326 (44) P= .417	.0352 (44) P= .410	.0225 (44) P= .442	.0560 (44) P= .359	-.0784 (44) P= .306
TPT Loc(I)	.1278 (44) P= .204	-.0320 (44) P= .418	.0061 (44) P= .484	-.1310 (44) P= .198	.0887 (44) P= .283	.0929 (44) P= .274	-.1588 (44) P= .152	-.0320 (44) P= .418
Finger Tap(I)	.1072 (44) P= .244	.1142 (44) P= .230	.1947 (44) P= .103	-.0547 (44) P= .362	.0939 (44) P= .272	.2641 (44) P= .042	-.0532 (44) P= .366	.0777 (44) P= .308
Speech Pers(I)	-.0641 (46) P= .336	-.0480 (46) P= .376	-.0963 (46) P= .262	-.1885 (46) P= .105	.1197 (46) P= .214	-.1914 (46) P= .101	-.2583 (46) P= .042	.2903 (46) P= .025
Rhythm(I)	.0380 (46) P= .401	.0380 (46) P= .401	-.1740 (46) P= .124	-.0803 (46) P= .298	.0082 (46) P= .478	-.1941 (46) P= .098	-.0259 (46) P= .432	.0180 (46) P= .401
Sens. Defic(I)	.0754 (45) P= .311	.0110 (45) P= .471	.2582 (45) P= .043	-.0444 (45) P= .386	-.0073 (45) P= .481	.0161 (45) P= .458	-.0682 (45) P= .328	.0110 (45) P= .471
Aph. Spat(I)	-.2196 (45) P= .074	-.1133 (45) P= .229	-.1133 (45) P= .229	-.0884 (45) P= .282	-.1218 (45) P= .213	-.2064 (45) P= .087	-.1350 (45) P= .187	-.0071 (45) P= .482
Trail Making(I)	-.2173 (46) P= .073	-.0525 (46) P= .364	-.2539 (46) P= .044	-.0099 (46) P= .474	-.1566 (46) P= .149	-.0843 (46) P= .289	.0258 (46) P= .433	-.0708 (46) P= .320
Category (F)	-.1011 (23) P= .323	.3149 (23) P= .072	-.1666 (23) P= .224	-.1954 (23) P= .186	-.0538 (23) P= .404	-.3219 (23) P= .067	-.1900 (23) P= .193	.0508 (23) P= .409
TPT Time(F)	.1290 (28) P= .256	. (28) P= .	-.0056 (28) P= .489	-.2487 (28) P= .101	.0998 (28) P= .307	-.0015 (28) P= .497	-.1201 (28) P= .271	.1003 (28) P= .060
TPT Mem(F)	.0536 (28) P= .393	. (28) P= .	.0000 (28) P= .500	.2368 (28) P= .112	.1072 (28) P= .294	.1212 (28) P= .270	.2201 (28) P= .130	.0600 (28) P= .500
TPT Loc(F)	.0764 (28) P= .350	. (28) P= .	.1982 (28) P= .156	.2540 (28) P= .096	.3332 (28) P= .042	.1475 (28) P= .227	.2177 (28) P= .133	.2089 (28) P= .143
Finger Tap(F)	-.2135 (28) P= .134	-.0759 (28) P= .350	.0318 (28) P= .436	.3028 (28) P= .059	.0064 (28) P= .487	-.1125 (28) P= .284	.1781 (28) P= .146	-.0732 (28) P= .356
Speech Pers(F)	-.2778 (29) P= .072	.0130 (29) P= .473	-.1019 (29) P= .299	-.0390 (29) P= .420	.0485 (29) P= .401	-.2102 (29) P= .137	-.2017 (29) P= .147	.1481 (29) P= .052
Rhythm(F)	-.0422 (29) P= .414	-.0235 (29) P= .452	-.0747 (29) P= .350	-.1359 (29) P= .235	.1960 (29) P= .154	-.1914 (29) P= .160	-.1730 (29) P= .185	.2655 (29) P= .086
Sens. Defic(F)	-.0034 (28) P= .493	-.1065 (28) P= .295	.0727 (28) P= .357	-.0594 (28) P= .382	.2791 (28) P= .075	-.1479 (28) P= .228	-.2555 (28) P= .094	.1641 (28) P= .528
Aph. Spat(F)	-.1859 (28) P= .172	-.1033 (28) P= .301	-.1488 (28) P= .225	-.1011 (28) P= .304	-.0524 (28) P= .396	-.2802 (28) P= .074	-.2509 (28) P= .074	.1191 (28) P= .273
Trail Making(F)	-.0063 (31) P= .487	-.1808 (31) P= .165	.0636 (31) P= .367	.1750 (31) P= .173	-.1008 (31) P= .295	.1735 (31) P= .175	.1516 (31) P= .208	-.0177 (31) P= .464

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Midway	Worsening Midway	Numbing Midway	Avoidance Midway	Jumpy Midway	Insomnia Midway	Conc/Mem Midway	Guilt Midway
WAIS-R Z(I)	-.1743 (31) P= .174	.1985 (31) P= .142	.1985 (31) P= .142	.0815 (31) P= .331	-.2173 (31) P= .120	.0394 (31) P= .417	.0110 (31) P= .476	-.2011 (31) P= .139
WAIS-R C(I)	.2017 (31) P= .138	.1011 (31) P= .294	.1794 (31) P= .167	-.2411 (31) P= .096	-.0997 (31) P= .297	.1718 (31) P= .178	.0187 (31) P= .460	-.2123 (31) P= .126
WAIS-R A(I)	.0243 (31) P= .448	-.1138 (31) P= .271	.2129 (31) P= .125	.1044 (31) P= .288	-.1260 (31) P= .250	.1389 (31) P= .228	.0845 (31) P= .326	-.0485 (31) P= .398
WAIS-R S(I)	-.0147 (31) P= .469	-.0102 (31) P= .478	.1796 (31) P= .167	.1119 (31) P= .275	-.1317 (31) P= .240	.0118 (31) P= .475	.1859 (31) P= .158	-.1367 (31) P= .232
WAIS-R DS(I)	-.1274 (31) P= .247	-.3794 (31) P= .018	.1376 (31) P= .230	.2219 (31) P= .115	-.3326 (31) P= .034	.0857 (31) P= .323	-.0714 (31) P= .351	-.1855 (31) P= .159
WAIS-R V(I)	.0016 (31) P= .496	.2492 (31) P= .088	.1074 (31) P= .283	-.1843 (31) P= .160	-.3156 (31) P= .042	.0024 (31) P= .495	-.0374 (31) P= .421	-.2469 (31) P= .090
WAIS-R PC(I)	-.2798 (31) P= .064	.0261 (31) P= .445	.0996 (31) P= .297	.4426 (31) P= .006	.0907 (31) P= .314	-.0613 (31) P= .372	.1487 (31) P= .212	-.0474 (31) P= .400
WAIS-R BD(I)	-.0860 (31) P= .323	-.0261 (31) P= .445	.1762 (31) P= .172	.4069 (31) P= .012	-.0871 (31) P= .321	.1582 (31) P= .198	.2235 (31) P= .113	-.0261 (31) P= .445
WAIS-R PA(I)	.0137 (31) P= .471	.1571 (31) P= .199	.4031 (31) P= .012	.1238 (31) P= .253	-.1299 (31) P= .243	.3053 (31) P= .047	.2440 (31) P= .093	-.0889 (31) P= .317
WAIS-R OA(I)	-.1134 (31) P= .272	-.1467 (31) P= .215	-.0110 (31) P= .477	.4719 (31) P= .003	.1021 (31) P= .292	-.0231 (31) P= .451	.1466 (31) P= .216	.0569 (31) P= .380
WAIS-R Dsy(I)	.0815 (31) P= .331	-.0785 (31) P= .337	-.0109 (31) P= .477	.1195 (31) P= .261	-.1407 (31) P= .225	.0483 (31) P= .398	.0144 (31) P= .469	-.1461 (31) P= .216
WAIS-R VIQ(I)	.1211 (31) P= .258	-.0125 (31) P= .473	.1486 (31) P= .217	.0756 (31) P= .343	-.2438 (31) P= .093	.2199 (31) P= .117	.1005 (31) P= .295	-.2058 (31) P= .133
WAIS-R PIQ(I)	-.1211 (31) P= .258	.0170 (31) P= .464	.1653 (31) P= .187	.4125 (31) P= .011	-.1388 (31) P= .228	.1068 (31) P= .284	.2012 (31) P= .139	-.1044 (31) P= .288
WAIS-R IQ(I)	-.0204 (31) P= .457	.0010 (31) P= .498	.1680 (31) P= .183	.2662 (31) P= .074	-.2160 (31) P= .122	.1621 (31) P= .192	.1571 (31) P= .199	-.1660 (31) P= .186

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Follow-up	Worsening Follow-up	Numbing Follow-up	Avoidance Follow-up	Jumpy Follow-up	Insomnia Follow-up	Conc/Mem Follow-up	Guilt Follow-up
ANGER (I)	.0542 (38) P= .373	.1944 (38) P= .121	.3289 (38) P= .022	.3447 (38) P= .017	.2175 (38) P= .095	.3181 (38) P= .026	.2475 (38) P= .067	. (38) P= .
ANXI L(I)	-.0972 (38) P= .281	-.1336 (38) P= .212	.0154 (38) P= .463	-.2522 (38) P= .063	-.1054 (38) P= .264	-.0907 (38) P= .294	-.0038 (38) P= .491	. (38) P= .
ANXI F(I)	-.0067 (38) P= .484	-.2109 (38) P= .102	-.0294 (38) P= .430	-.1161 (38) P= .244	-.0825 (38) P= .311	-.0173 (38) P= .459	-.1532 (38) P= .179	. (38) P= .
ANXI K(I)	.2622 (38) P= .056	-.0317 (38) P= .425	.2629 (38) P= .055	.0097 (38) P= .477	.0178 (38) P= .458	.1309 (38) P= .217	.3394 (38) P= .019	. (38) P= .
ANXI Ma(I)	.1340 (38) P= .211	-.0136 (38) P= .468	.1405 (38) P= .200	.1621 (38) P= .165	.2049 (38) P= .109	.1507 (38) P= .183	.2695 (38) P= .051	. (38) P= .
ANXI D(I)	-.0383 (38) P= .410	.0032 (38) P= .492	.1827 (38) P= .136	.2046 (38) P= .109	.3044 (38) P= .032	.1482 (38) P= .187	.1294 (38) P= .219	. (38) P= .
ANXI My(I)	.3042 (38) P= .032	.2754 (38) P= .047	.1955 (38) P= .120	.3433 (38) P= .017	.4322 (38) P= .003	.4228 (38) P= .004	.2729 (38) P= .049	. (38) P= .
ANXI Pd(I)	.0804 (38) P= .316	-.1279 (38) P= .222	.2202 (38) P= .092	.1101 (38) P= .255	.1504 (38) P= .184	.0422 (38) P= .401	.0395 (38) P= .407	. (38) P= .
ANXI MF(I)	.0473 (38) P= .389	-.1235 (38) P= .230	.0373 (38) P= .412	.0735 (38) P= .330	-.0038 (38) P= .491	-.0250 (38) P= .441	-.0285 (38) P= .433	. (38) P= .
ANXI Pa(I)	.1739 (38) P= .148	.0924 (38) P= .290	.1624 (38) P= .165	.0250 (38) P= .441	.1547 (38) P= .177	.1181 (38) P= .240	-.1021 (38) P= .271	. (38) P= .
ANXI Pt(I)	.1292 (38) P= .220	.0104 (38) P= .475	.0517 (38) P= .379	-.0435 (38) P= .398	.1938 (38) P= .122	.1998 (38) P= .115	.0220 (38) P= .448	. (38) P= .
ANXI So(I)	.1484 (38) P= .187	.0348 (38) P= .418	.0292 (38) P= .431	.0961 (38) P= .283	.0961 (38) P= .283	.1700 (38) P= .154	.0277 (38) P= .434	. (38) P= .
ANXI Ma(I)	.0997 (38) P= .276	.0973 (38) P= .280	.2377 (38) P= .075	.1031 (38) P= .269	.2072 (38) P= .106	.1656 (38) P= .160	-.2212 (38) P= .091	. (38) P= .
ANXI GI(I)	-.1534 (38) P= .179	-.1626 (38) P= .165	-.2892 (38) P= .039	-.3217 (38) P= .024	-.0764 (38) P= .324	-.1172 (38) P= .242	-.2512 (38) P= .064	. (38) P= .
ANXI PTS(I)	-.1156 (38) P= .245	-.0221 (38) P= .448	-.0575 (38) P= .366	-.0311 (38) P= .426	.1221 (38) P= .233	.0114 (38) P= .473	-.2614 (38) P= .056	. (38) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Follow-up	Worsening Follow-up	Numbing Follow-up	Avoidance Follow-up	Jumpy Follow-up	Insomnia Follow-up	Conc/Mem Follow-up	Guilt Follow-up
ANXIA (F)	.0832 (31) P= .328	.4965 (31) P= .002	.2828 (31) P= .062	.2922 (31) P= .055	.3465 (31) P= .028	.3443 (31) P= .029	.1944 (31) P= .147	. (31) P= .
MMPI L(F)	-.0373 (29) P= .424	-.2291 (29) P= .116	-.2291 (29) P= .116	-.2291 (29) P= .116	-.1262 (29) P= .257	-.0703 (29) P= .359	.0949 (29) P= .312	. (29) P= .
MMPI L(F)	-.0059 (29) P= .488	-.3080 (29) P= .052	-.1828 (29) P= .171	-.1560 (29) P= .210	-.1471 (29) P= .223	-.2164 (29) P= .130	-.0450 (29) P= .408	. (29) P= .
MMPI R(F)	-.0725 (29) P= .354	-.0238 (29) P= .451	-.0044 (29) P= .491	-.0238 (29) P= .451	-.1113 (29) P= .283	-.1100 (29) P= .285	.1757 (29) P= .181	. (29) P= .
MMPI Ro(F)	.1019 (29) P= .299	-.1501 (29) P= .219	.0579 (29) P= .383	.0292 (29) P= .440	-.0497 (29) P= .399	-.0715 (29) P= .356	.5379 (29) P= .001	. (29) P= .
MMPI D(F)	.0471 (29) P= .404	-.1127 (29) P= .280	-.0579 (29) P= .383	.0738 (29) P= .352	-.2444 (29) P= .101	.0488 (29) P= .401	.5182 (29) P= .002	. (29) P= .
MMPI Hy(F)	.2638 (29) P= .083	-.0901 (29) P= .321	.1587 (29) P= .206	.0343 (29) P= .430	-.0071 (29) P= .485	.1068 (29) P= .291	.5596 (29) P= .001	. (29) P= .
MMPI Pd(F)	.1052 (29) P= .294	-.0540 (29) P= .390	.1747 (29) P= .182	.0476 (29) P= .403	-.0371 (29) P= .424	.0586 (29) P= .381	.1319 (29) P= .248	. (29) P= .
MMPI MC(F)	-.1051 (29) P= .294	-.2613 (29) P= .085	.1232 (29) P= .262	-.1488 (29) P= .221	-.1300 (29) P= .251	-.1720 (29) P= .186	-.2145 (29) P= .132	. (29) P= .
MMPI Pa(F)	-.0429 (29) P= .413	-.0641 (29) P= .371	-.1862 (29) P= .167	-.3218 (29) P= .044	-.1048 (29) P= .294	.0490 (29) P= .400	-.1757 (29) P= .181	. (29) P= .
MMPI Pt(F)	.0744 (29) P= .351	-.4142 (29) P= .013	-.1172 (29) P= .272	-.1992 (29) P= .150	-.3425 (29) P= .034	-.2561 (29) P= .090	.2079 (29) P= .140	. (29) P= .
MMPI So(F)	.0345 (29) P= .430	-.2306 (29) P= .114	.0671 (29) P= .365	-.1016 (29) P= .300	-.2008 (29) P= .148	-.1373 (29) P= .239	.1938 (29) P= .157	. (29) P= .
MMPI Ma(F)	-.1423 (29) P= .231	-.1596 (29) P= .204	.1202 (29) P= .267	-.0956 (29) P= .311	.0163 (29) P= .467	-.2105 (29) P= .136	-.4419 (29) P= .008	. (29) P= .
MMPI SI(F)	-.0602 (29) P= .378	-.0818 (29) P= .337	-.2239 (29) P= .121	-.1692 (29) P= .190	-.1911 (29) P= .160	-.1264 (29) P= .257	.1337 (29) P= .245	. (29) P= .
MMPI STS(F)	.0338 (29) P= .431	-.0379 (29) P= .423	.1285 (29) P= .253	-.0212 (29) P= .456	.0620 (29) P= .375	.0069 (29) P= .486	-.1193 (29) P= .269	. (29) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Follow-up	Worsening Follow-up	Numbing Follow-up	Avoidance Follow-up	Jumpy Follow-up	Insomnia Follow-up	Conc/Mem Follow-up	Guilt Follow-up
Age	-.0601 (38) P= .360	-.0820 (38) P= .312	-.0866 (38) P= .303	-.0631 (38) P= .353	-.0546 (38) P= .372	-.2949 (38) P= .036	.0078 (38) P= .481	. (38) P= .
Sex	.0936 (38) P= .288	.1869 (38) P= .131	-.1359 (38) P= .208	-.0315 (38) P= .426	-.0315 (38) P= .426	.1630 (38) P= .164	.1140 (38) P= .248	. (38) P= .
SES	.0933 (38) P= .289	.1687 (38) P= .156	.1682 (38) P= .156	.0204 (38) P= .452	-.0127 (38) P= .470	.0235 (38) P= .444	-.0711 (38) P= .336	. (38) P= .
Recent Events	.0517 (38) P= .379	.0519 (38) P= .379	.2784 (38) P= .045	.2206 (38) P= .092	.0430 (38) P= .399	.1815 (38) P= .138	.1108 (38) P= .254	. (38) P= .
Psych. Rx	-.0811 (38) P= .314	-.0629 (38) P= .354	.0537 (38) P= .374	.1138 (38) P= .248	.0057 (38) P= .486	.1720 (38) P= .151	.0011 (38) P= .497	. (38) P= .
Severity	.1796 (38) P= .140	-.0210 (38) P= .450	.0789 (38) P= .319	.0878 (38) P= .300	.0878 (38) P= .300	.2746 (38) P= .048	.2784 (38) P= .045	. (38) P= .
GCS at Admit.	-.2076 (38) P= .106	.0833 (38) P= .310	-.1620 (38) P= .166	-.1257 (38) P= .226	-.0347 (38) P= .418	-.2299 (38) P= .082	-.2767 (38) P= .046	. (38) P= .
Resp. Duration	.1571 (38) P= .173	.0819 (38) P= .312	.0090 (38) P= .479	.2142 (38) P= .098	.0859 (38) P= .304	.1475 (38) P= .188	.4718 (38) P= .001	. (38) P= .
Emp. Connec.	.2416 (38) P= .072	.0439 (38) P= .397	.2007 (38) P= .113	.2467 (38) P= .068	.1262 (38) P= .225	.2880 (38) P= .040	.4151 (38) P= .005	. (38) P= .
Neurotoma	.2437 (38) P= .070	.0545 (38) P= .373	-.2415 (38) P= .072	.0058 (38) P= .486	.1704 (38) P= .153	.2201 (38) P= .092	.2218 (38) P= .090	. (38) P= .
Skull Fract.	-.0666 (38) P= .346	-.1166 (38) P= .243	-.1166 (38) P= .243	-.0080 (38) P= .481	-.0080 (38) P= .481	-.0530 (38) P= .376	.0290 (38) P= .431	. (38) P= .
Emp. Index	.1176 (38) P= .241	-.1353 (38) P= .209	.1203 (38) P= .236	.1070 (38) P= .261	.1558 (38) P= .175	.1281 (38) P= .222	.1344 (38) P= .211	. (38) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below N is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Follow-up	Worsening Follow-up	Numbing Follow-up	Avoidance Follow-up	Jump Follow-up	Insomnia Follow-up	Conc/Mem Follow-up	Guilt Follow-up
TPT Time (I)	-.0392 (36) P= .410	-.1687 (36) P= .163	-.0844 (36) P= .312	-.1446 (36) P= .200	-.2142 (36) P= .105	-.0432 (36) P= .401	.0333 (36) P= .424	. (36) P= .
TPT Mem (I)	.0395 (36) P= .410	-.0277 (36) P= .436	-.0621 (36) P= .359	-.0372 (36) P= .415	-.1309 (36) P= .223	-.0069 (36) P= .484	-.0693 (36) P= .344	. (36) P= .
TPT Loc (I)	-.0756 (36) P= .331	.0144 (36) P= .467	-.1237 (36) P= .236	-.2724 (36) P= .054	-.0892 (36) P= .302	-.1448 (36) P= .200	-.3244 (36) P= .027	. (36) P= .
Finger Tap (I)	.0995 (36) P= .282	.1100 (36) P= .261	.1563 (36) P= .181	-.2064 (36) P= .114	.0772 (36) P= .327	.2086 (36) P= .111	-.0213 (36) P= .451	. (36) P= .
Speech Para (I)	-.1820 (38) P= .137	-.2797 (38) P= .044	-.1334 (38) P= .212	-.1805 (38) P= .139	-.0448 (38) P= .395	-.0414 (38) P= .403	-.2148 (38) P= .098	. (38) P= .
Rhythm (I)	.0788 (38) P= .319	-.1145 (38) P= .247	-.0919 (38) P= .292	.0785 (38) P= .320	.0995 (38) P= .276	.1026 (38) P= .270	.1298 (38) P= .219	. (38) P= .
Sens. Defic (I)	.2016 (37) P= .116	.0814 (37) P= .316	.1515 (37) P= .185	.1037 (37) P= .271	.1687 (37) P= .159	.1057 (37) P= .267	.1254 (37) P= .230	. (37) P= .
Aph. Spat (I)	-.0674 (38) P= .344	-.0280 (38) P= .434	-.0280 (38) P= .434	.0047 (38) P= .489	.1843 (38) P= .134	-.0430 (38) P= .399	-.1615 (38) P= .166	. (38) P= .
Trail Making (I)	-.3273 (38) P= .022	-.0470 (38) P= .390	-.2661 (38) P= .053	-.1866 (38) P= .131	-.1866 (38) P= .131	-.2145 (38) P= .098	-.2605 (38) P= .057	. (38) P= .
Category (F)	.0518 (25) P= .403	-.2486 (25) P= .115	-.1007 (25) P= .316	-.1641 (25) P= .217	-.1559 (25) P= .228	-.1246 (25) P= .276	-.1688 (25) P= .210	. (25) P= .
TPT Time (F)	.1429 (30) P= .226	-.1693 (30) P= .186	-.2050 (30) P= .139	-.2006 (30) P= .144	.0842 (30) P= .329	.0664 (30) P= .364	.0916 (30) P= .315	. (30) P= .
TPT Mem (F)	-.0206 (30) P= .457	.1122 (30) P= .278	.1577 (30) P= .203	.2031 (30) P= .141	-.1152 (30) P= .272	.1375 (30) P= .234	-.0067 (30) P= .486	. (30) P= .
TPT Loc (F)	-.1997 (30) P= .145	.0136 (30) P= .472	-.0203 (30) P= .458	.0813 (30) P= .335	-.0881 (30) P= .322	-.0313 (30) P= .435	-.0654 (30) P= .366	. (30) P= .
Finger Tap (F)	-.0668 (30) P= .363	.1586 (30) P= .201	.0564 (30) P= .384	.1968 (30) P= .149	.1688 (30) P= .186	-.0530 (30) P= .390	-.0092 (30) P= .481	. (30) P= .
Speech Para (F)	-.1958 (31) P= .146	-.1289 (31) P= .245	-.0072 (31) P= .485	-.1694 (31) P= .181	.0942 (31) P= .307	-.0887 (31) P= .318	-.2179 (31) P= .120	. (31) P= .
Rhythm (F)	-.2699 (31) P= .071	-.1939 (31) P= .148	-.2224 (31) P= .115	-.1084 (31) P= .281	.0625 (31) P= .369	-.1007 (31) P= .295	.0197 (31) P= .458	. (31) P= .
Sens. Defic (F)	.0823 (30) P= .333	-.0646 (30) P= .367	.0161 (30) P= .466	-.0646 (30) P= .367	.0968 (30) P= .305	.0248 (30) P= .448	-.1975 (30) P= .148	. (30) P= .
Aph. Spat (F)	-.0525 (30) P= .391	-.2164 (30) P= .125	-.1005 (30) P= .299	-.2164 (30) P= .125	.1314 (30) P= .244	-.1545 (30) P= .208	-.1892 (30) P= .158	. (30) P= .
Trail Making (F)	-.1247 (32) P= .248	.0735 (32) P= .345	.0799 (32) P= .332	.0502 (32) P= .392	-.0662 (32) P= .359	-.0135 (32) P= .471	-.0673 (32) P= .357	. (32) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Intrusion Follow-up	Worsening Follow-up	Numbing Follow-up	Avoidance Follow-up	Jumpy Follow-up	Insomnia Follow-up	Conc/Mem Follow-up	Guilt Follow-up
WAIS-R I(I)	-.1017 (26) P= .311	-.0466 (26) P= .411	.1187 (26) P= .282	.0263 (26) P= .449	-.1689 (26) P= .205	-.2503 (26) P= .109	-.0569 (26) P= .391	. (26) P= .
WAIS-R C(I)	.0953 (26) P= .322	-.1524 (26) P= .229	-.0038 (26) P= .493	.0101 (26) P= .480	-.2969 (26) P= .070	.0055 (26) P= .489	.0589 (26) P= .388	. (26) P= .
WAIS-R A(I)	-.0874 (26) P= .336	-.1287 (26) P= .266	-.0874 (26) P= .336	-.0056 (26) P= .489	-.1153 (26) P= .287	-.1567 (26) P= .222	.0181 (26) P= .465	. (26) P= .
WAIS-R S(I)	.0000 (26) P= .500	-.1605 (26) P= .217	-.0803 (26) P= .348	.2132 (26) P= .148	-.3553 (26) P= .037	-.2023 (26) P= .161	.1886 (26) P= .178	. (26) P= .
WAIS-R DS(I)	-.1139 (26) P= .290	.0130 (26) P= .475	-.0293 (26) P= .444	-.0346 (26) P= .433	-.0346 (26) P= .433	-.2929 (26) P= .073	-.0874 (26) P= .336	. (26) P= .
WAIS-R V(I)	-.1477 (26) P= .236	-.2488 (26) P= .110	-.1477 (26) P= .236	-.0551 (26) P= .395	-.4578 (26) P= .009	-.3696 (26) P= .032	-.0940 (26) P= .324	. (26) P= .
WAIS-R PC(I)	.1800 (26) P= .190	.4237 (26) P= .016	.1800 (26) P= .190	.2988 (26) P= .069	.2556 (26) P= .104	.1971 (26) P= .167	.1662 (26) P= .209	. (26) P= .
WAIS-R SD(I)	-.1949 (26) P= .170	.1136 (26) P= .290	.0695 (26) P= .368	.2251 (26) P= .134	-.0870 (26) P= .336	-.0525 (26) P= .399	.0216 (26) P= .458	. (26) P= .
WAIS-R PA(I)	.0200 (26) P= .461	.0848 (26) P= .340	-.0449 (26) P= .414	.0331 (26) P= .436	-.0530 (26) P= .399	-.0521 (26) P= .400	-.0687 (26) P= .369	. (26) P= .
WAIS-R OA(I)	-.1281 (26) P= .267	.2769 (26) P= .085	-.0381 (26) P= .427	.4198 (26) P= .016	.0613 (26) P= .383	.0548 (26) P= .395	.0442 (26) P= .415	. (26) P= .
WAIS-R Dsy(I)	-.1132 (26) P= .291	-.2603 (26) P= .099	-.1622 (26) P= .214	-.2205 (26) P= .140	-.3508 (26) P= .039	-.2609 (26) P= .099	-.1292 (26) P= .265	. (26) P= .
WAIS-R VIQ(I)	-.0431 (26) P= .417	-.0850 (26) P= .340	-.0431 (26) P= .417	.0171 (26) P= .467	-.2518 (26) P= .107	-.1378 (26) P= .251	.0538 (26) P= .397	. (26) P= .
WAIS-R PIQ(I)	-.1707 (26) P= .202	.1183 (26) P= .282	-.0495 (26) P= .405	.1149 (26) P= .288	-.0915 (26) P= .328	-.1302 (26) P= .263	.0631 (26) P= .380	. (26) P= .
WAIS-R IQ(I)	-.1175 (26) P= .284	-.0268 (26) P= .448	-.0469 (26) P= .410	.0398 (26) P= .423	-.2191 (26) P= .141	-.1830 (26) P= .186	.0544 (26) P= .396	. (26) P= .

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	High- nausea	Social withdrawal	Serol. dis- interest	Depres- sion	Repaired Cortisol treatment	Impaired Memory	Asym- metrized	Anxiety	Irri- tability	Symptoms to light	Exposure to sound	Headache	Dizziness	Fatigue
	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial
ANNOYANCE (2)	-.2044 (.64) p=.035	-.1801 (.65) p=.084	-.0817 (.65) p=.268	-.1083 (.65) p=.075	-.3147 (.65) p=.057	-.3323 (.65) p=.055	-.2952 (.65) p=.011	-.1947 (.65) p=.266	-.1837 (.65) p=.150	-.2444 (.65) p=.259	-.1823 (.65) p=.273	-.2456 (.65) p=.228	-.2981 (.65) p=.228	-.2957 (.65) p=.236
ANNOYANCE (2)	-.04403 (.59) p=.354	-.0002 (.59) p=.975	-.0636 (.59) p=.316	-.1438 (.59) p=.135	-.2688 (.59) p=.222	-.2504 (.59) p=.028	-.1262 (.59) p=.371	-.2170 (.59) p=.049	-.0884 (.59) p=.339	-.232 (.59) p=.329	-.0786 (.59) p=.276	-.2146 (.59) p=.051	-.1464 (.59) p=.137	-.1178 (.59) p=.187
ANNOYANCE (2)	-.2381 (.59) p=.005	-.2420 (.59) p=.023	-.0903 (.59) p=.273	-.3044 (.59) p=.009	-.1645 (.59) p=.101	-.0336 (.59) p=.401	-.1325 (.59) p=.158	-.1444 (.59) p=.129	-.1434 (.59) p=.139	-.3195 (.59) p=.007	-.3254 (.59) p=.127	-.0433 (.59) p=.387	-.3182 (.59) p=.128	-.0538 (.59) p=.483
ANNOYANCE (2)	-.2923 (.59) p=.015	-.2469 (.59) p=.019	-.0174 (.59) p=.448	-.4640 (.59) p=.000	-.1624 (.59) p=.169	-.1750 (.59) p=.092	-.2700 (.59) p=.031	-.2286 (.59) p=.041	-.2328 (.59) p=.027	-.2373 (.59) p=.011	-.0108 (.59) p=.488	-.2439 (.59) p=.022	-.1989 (.59) p=.046	-.0576 (.59) p=.477
ANNOYANCE (2)	-.2828 (.59) p=.015	-.2378 (.59) p=.025	-.0347 (.59) p=.310	-.1127 (.59) p=.190	-.1697 (.59) p=.002	-.2154 (.59) p=.007	-.2720 (.59) p=.018	-.2022 (.59) p=.001	-.1390 (.59) p=.165	-.0142 (.59) p=.601	-.3225 (.59) p=.053	-.3220 (.59) p=.006	-.3234 (.59) p=.010	-.3180 (.59) p=.007
ANNOYANCE (2)	-.4669 (.59) p=.000	-.1825 (.59) p=.003	-.2879 (.59) p=.014	-.3530 (.59) p=.003	-.2039 (.59) p=.033	-.1900 (.59) p=.075	-.1439 (.59) p=.118	-.1935 (.59) p=.080	-.2127 (.59) p=.053	-.1631 (.59) p=.140	-.1439 (.59) p=.103	-.1621 (.59) p=.221	-.3393 (.59) p=.028	-.3210 (.59) p=.181
ANNOYANCE (2)	-.2916 (.59) p=.013	-.2429 (.59) p=.022	-.1466 (.59) p=.134	-.1466 (.59) p=.134	-.2799 (.59) p=.001	-.3209 (.59) p=.007	-.2313 (.59) p=.027	-.2944 (.59) p=.012	-.1248 (.59) p=.154	-.2845 (.59) p=.016	-.2889 (.59) p=.013	-.2463 (.59) p=.030	-.3084 (.59) p=.003	-.2792 (.59) p=.002
ANNOYANCE (2)	-.1461 (.59) p=.133	-.0930 (.59) p=.242	-.0547 (.59) p=.340	-.0219 (.59) p=.435	-.0261 (.59) p=.422	-.0023 (.59) p=.967	-.0241 (.59) p=.399	-.0767 (.59) p=.282	-.0972 (.59) p=.232	-.1888 (.59) p=.160	-.0289 (.59) p=.382	-.1361 (.59) p=.152	-.0544 (.59) p=.336	-.1440 (.59) p=.120
ANNOYANCE (2)	-.0317 (.59) p=.486	-.0123 (.59) p=.640	-.1748 (.59) p=.093	-.0219 (.59) p=.435	-.0261 (.59) p=.422	-.1535 (.59) p=.120	-.0403 (.59) p=.364	-.1545 (.59) p=.118	-.0276 (.59) p=.418	-.0109 (.59) p=.467	-.0823 (.59) p=.288	-.1237 (.59) p=.177	-.0162 (.59) p=.452	-.1370 (.59) p=.098
ANNOYANCE (2)	-.2786 (.59) p=.019	-.3047 (.59) p=.001	-.1091 (.59) p=.205	-.2996 (.59) p=.011	-.2069 (.59) p=.036	-.1147 (.59) p=.193	-.1372 (.59) p=.117	-.2000 (.59) p=.010	-.2769 (.59) p=.042	-.2726 (.59) p=.002	-.2451 (.59) p=.031	-.1385 (.59) p=.148	-.2288 (.59) p=.041	-.2374 (.59) p=.035
ANNOYANCE (2)	-.2282 (.59) p=.087	-.2140 (.59) p=.025	-.1248 (.59) p=.174	-.3232 (.59) p=.003	-.2004 (.59) p=.018	-.1320 (.59) p=.140	-.1628 (.59) p=.109	-.2442 (.59) p=.020	-.1945 (.59) p=.010	-.2946 (.59) p=.025	-.1875 (.59) p=.057	-.0637 (.59) p=.311	-.2175 (.59) p=.048	-.1632 (.59) p=.108
ANNOYANCE (2)	-.2435 (.59) p=.084	-.2949 (.59) p=.012	-.0070 (.59) p=.479	-.2400 (.59) p=.004	-.2390 (.59) p=.004	-.1811 (.59) p=.045	-.2086 (.59) p=.056	-.1370 (.59) p=.169	-.1589 (.59) p=.115	-.2172 (.59) p=.005	-.2083 (.59) p=.051	-.1400 (.59) p=.165	-.2504 (.59) p=.028	-.1710 (.59) p=.098
ANNOYANCE (2)	-.1816 (.59) p=.083	-.2377 (.59) p=.004	-.0311 (.59) p=.408	-.2112 (.59) p=.014	-.2355 (.59) p=.025	-.2874 (.59) p=.014	-.2343 (.59) p=.035	-.1902 (.59) p=.015	-.2251 (.59) p=.008	-.2480 (.59) p=.003	-.1722 (.59) p=.058	-.2348 (.59) p=.033	-.2038 (.59) p=.042	-.1935 (.59) p=.011
ANNOYANCE (2)	-.2548 (.59) p=.083	-.1200 (.59) p=.183	-.1014 (.59) p=.213	-.0226 (.59) p=.900	-.1162 (.59) p=.190	-.0918 (.59) p=.240	-.1720 (.59) p=.084	-.1777 (.59) p=.089	-.2372 (.59) p=.023	-.1822 (.59) p=.004	-.0319 (.59) p=.403	-.0149 (.59) p=.453	-.1865 (.59) p=.079	-.0192 (.59) p=.443
ANNOYANCE (2)	-.4317 (.59) p=.040	-.2435 (.59) p=.004	-.0586 (.59) p=.310	-.0367 (.59) p=.600	-.2461 (.59) p=.004	-.2291 (.59) p=.040	-.2191 (.59) p=.007	-.2038 (.59) p=.010	-.2708 (.59) p=.015	-.4402 (.59) p=.000	-.1509 (.59) p=.127	-.2828 (.59) p=.012	-.2798 (.59) p=.016	-.0921 (.59) p=.244

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
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Appendix P continued

	Night- mares	Social with- drawal	Sexual Dis- interest	Depres- sion	Impaired Concen- tration	Impaired Memory	Absent- minded	Anxiety	Irrit- ability	Hypersen- sitive to Light	Headache	Dizziness	Fatigue
	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial
STP T10m(2)	-.1465 (.55) p=.143	-.1097 (.55) p=.213	-.0627 (.55) p=.322	-.0722 (.55) p=.300	-.0766 (.55) p=.304	-.0558 (.55) p=.343	-.0086 (.55) p=.475	-.0481 (.55) p=.344	-.0936 (.55) p=.248	-.0243 (.55) p=.430	-.0184 (.55) p=.390	-.1965 (.55) p=.075	-.2291 (.55) p=.046
STP 10m(2)	-.0792 (.56) p=.201	-.1310 (.56) p=.167	-.0151 (.56) p=.656	-.1468 (.56) p=.162	-.2990 (.56) p=.012	-.1102 (.56) p=.193	-.0862 (.56) p=.264	-.0889 (.56) p=.257	-.0838 (.56) p=.270	-.0573 (.56) p=.337	-.1403 (.56) p=.161	-.2332 (.56) p=.042	-.1929 (.56) p=.077
STP 20m(2)	-.1022 (.56) p=.227	-.0470 (.56) p=.345	-.1109 (.56) p=.208	-.0270 (.56) p=.405	-.1070 (.56) p=.216	-.0059 (.56) p=.483	-.0075 (.56) p=.478	-.0391 (.56) p=.387	-.0322 (.56) p=.247	-.0392 (.56) p=.322	-.0339 (.56) p=.408	-.1216 (.56) p=.186	-.1012 (.56) p=.229
Finger Tap(2)	-.0284 (.56) p=.410	-.1442 (.56) p=.113	-.0180 (.56) p=.448	-.0482 (.56) p=.362	-.0009 (.56) p=.497	-.0920 (.56) p=.255	-.2835 (.56) p=.017	-.0166 (.56) p=.452	-.2840 (.56) p=.016	-.0722 (.56) p=.259	-.1211 (.56) p=.187	-.0099 (.56) p=.674	-.0210 (.56) p=.426
Speech Pace(2)	-.2735 (.60) p=.016	-.2215 (.60) p=.045	-.1324 (.60) p=.157	-.0561 (.60) p=.325	-.1922 (.60) p=.071	-.1921 (.60) p=.071	-.0444 (.60) p=.362	-.0980 (.60) p=.228	-.0442 (.60) p=.269	-.0338 (.60) p=.262	-.1399 (.60) p=.111	-.0487 (.60) p=.356	-.1590 (.60) p=.064
Rhythm(2)	-.1180 (.60) p=.185	-.0126 (.60) p=.462	-.0224 (.60) p=.432	-.0785 (.60) p=.272	-.0510 (.60) p=.311	-.0179 (.60) p=.446	-.0429 (.60) p=.372	-.0167 (.60) p=.390	-.0481 (.60) p=.338	-.0692 (.60) p=.300	-.0119 (.60) p=.464	-.1748 (.60) p=.091	-.2115 (.60) p=.052
Scen. Recall(2)	-.1082 (.57) p=.076	-.2741 (.57) p=.020	-.1578 (.57) p=.121	-.0217 (.57) p=.476	-.0468 (.57) p=.285	-.1844 (.57) p=.085	-.1697 (.57) p=.104	-.1165 (.57) p=.194	-.1615 (.57) p=.115	-.1590 (.57) p=.119	-.0475 (.57) p=.377	-.0547 (.57) p=.343	-.0062 (.57) p=.481
Appl. Spent(2)	-.0378 (.59) p=.380	-.0774 (.59) p=.260	-.0133 (.59) p=.460	-.0472 (.59) p=.361	-.0467 (.59) p=.383	-.0157 (.59) p=.452	-.0244 (.59) p=.390	-.0421 (.59) p=.376	-.0848 (.59) p=.282	-.0676 (.59) p=.306	-.0813 (.59) p=.270	-.0638 (.59) p=.310	-.1148 (.59) p=.189
Trail Making(2)	-.0408 (.60) p=.322	-.0642 (.60) p=.260	-.1571 (.60) p=.115	-.1180 (.60) p=.185	-.1981 (.60) p=.067	-.0649 (.60) p=.311	-.0131 (.60) p=.460	-.0541 (.60) p=.482	-.0356 (.60) p=.394	-.0573 (.60) p=.332	-.2250 (.60) p=.056	-.1383 (.60) p=.154	-.1254 (.60) p=.170

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 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

Category (F)	Digit- score Initial	Social withdrawal Initial	Social interest Initial	Depres- sion Initial	Impaired Concen- tration Initial	Impaired Memory Initial	Assent- dressed Initial	Anxiety Initial	Inter- nal ability Initial	Spontane- ity to light Initial	Headache Initial	Distress Initial	Fatigue Initial
	.3969 (.26) P=.524	-.1715 (.26) P=.301	-.1723 (.26) P=.320	-.5382 (.26) P=.389	-.3058 (.26) P=.068	-.0161 (.26) P=.469	-.3434 (.26) P=.543	-.1593 (.26) P=.222	-.1574 (.26) P=.221	-.5469 (.26) P=.426	-.2346 (.26) P=.124	-.2452 (.26) P=.119	-.5717 (.26) P=.364
TRT Film (F)	.1034 (.26) P=.295	-.0895 (.26) P=.321	-.0492 (.26) P=.388	-.0479 (.26) P=.401	-.0639 (.26) P=.319	-.0534 (.26) P=.390	-.0337 (.26) P=.430	-.3297 (.26) P=.144	-.1832 (.26) P=.164	-.0702 (.26) P=.356	-.0794 (.26) P=.338	-.1671 (.26) P=.189	-.5870 (.26) P=.323
TRT Man (F)	-.0403 (.26) P=.376	-.1228 (.26) P=.259	-.0637 (.26) P=.357	-.0549 (.26) P=.400	-.1540 (.26) P=.208	-.1437 (.26) P=.224	-.0584 (.26) P=.379	-.0526 (.26) P=.391	-.1334 (.26) P=.238	-.1177 (.26) P=.246	-.3469 (.26) P=.010	-.1960 (.26) P=.150	-.2214 (.26) P=.143
TRT Leo (F)	-.0317 (.26) P=.430	-.0045 (.26) P=.491	-.0921 (.26) P=.322	-.0331 (.26) P=.431	-.2931 (.26) P=.061	-.2442 (.26) P=.079	-.2395 (.26) P=.101	-.1749 (.26) P=.178	-.0046 (.26) P=.490	-.2903 (.26) P=.060	-.3151 (.26) P=.045	-.2637 (.26) P=.078	-.0552 (.26) P=.489
Finger Tap (F)	-.0187 (.26) P=.418	-.0140 (.26) P=.387	-.0237 (.26) P=.443	-.0479 (.26) P=.348	-.1183 (.26) P=.261	-.1008 (.26) P=.295	-.0464 (.26) P=.402	-.0973 (.26) P=.301	-.0765 (.26) P=.341	-.1554 (.26) P=.202	-.1561 (.26) P=.201	-.0918 (.26) P=.312	-.1219 (.26) P=.357
Speech Pace (F)	.1916 (.26) P=.143	-.1450 (.26) P=.218	-.2606 (.26) P=.078	-.0061 (.26) P=.483	-.1289 (.26) P=.245	-.1236 (.26) P=.256	-.1090 (.26) P=.280	-.2132 (.26) P=.125	-.1387 (.26) P=.228	-.0896 (.26) P=.316	-.0469 (.26) P=.405	-.1578 (.26) P=.190	-.3265 (.26) P=.016
Rhythm (F)	.3819 (.26) P=.030	-.1952 (.26) P=.197	-.2794 (.26) P=.064	-.1020 (.26) P=.393	-.1455 (.26) P=.217	-.1488 (.26) P=.212	-.0351 (.26) P=.384	-.1187 (.26) P=.262	-.0266 (.26) P=.448	-.0757 (.26) P=.343	-.1548 (.26) P=.203	-.0850 (.26) P=.325	-.2322 (.26) P=.016
Reas. Block (F)	.0852 (.26) P=.003	-.4500 (.26) P=.006	-.0161 (.26) P=.466	-.2103 (.26) P=.132	-.0592 (.26) P=.358	-.0940 (.26) P=.311	-.4542 (.26) P=.004	-.0420 (.26) P=.372	-.2924 (.26) P=.059	-.2687 (.26) P=.137	-.0379 (.26) P=.421	-.3647 (.26) P=.024	-.1377 (.26) P=.234
App. Syst (F)	.0285 (.26) P=.420	-.0205 (.26) P=.457	-.1584 (.26) P=.303	-.0126 (.26) P=.474	-.1888 (.26) P=.159	-.1851 (.26) P=.164	-.2134 (.26) P=.129	-.0323 (.26) P=.392	-.3957 (.26) P=.015	-.2663 (.26) P=.137	-.0310 (.26) P=.395	-.0161 (.26) P=.466	-.0404 (.26) P=.416
Trail Making (F)	.0117 (.26) P=.451	-.0028 (.26) P=.494	-.1170 (.26) P=.255	-.2111 (.26) P=.115	-.2635 (.26) P=.066	-.1465 (.26) P=.204	-.0476 (.26) P=.332	-.2316 (.26) P=.094	-.0245 (.26) P=.445	-.2247 (.26) P=.101	-.2144 (.26) P=.112	-.2391 (.26) P=.087	-.3697 (.26) P=.016

Note. (F) = data collected at initial assessment; (F) = data collected as follow-up;
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 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Wright's I (2)	Wright's C (2)	Wright's A (2)	Wright's B (2)	Wright's Dd (2)	Wright's V (2)	Wright's PC (2)	Wright's MD (2)	Wright's DA (2)	Wright's OA (2)	Wright's Ddy (2)	Wright's VQ (2)	Wright's PQ (2)	Wright's IQ (2)
	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial	Initial
Wright's I (2)	-.2228 (.41) p = .071	-.0049 (.41) p = .468	-.0639 (.41) p = .346	-.0379 (.41) p = .407	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408	-.0469 (.41) p = .408
Wright's C (2)	-.2636 (.41) p = .067	-.0481 (.41) p = .382	-.0026 (.41) p = .494	-.1436 (.41) p = .182	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382	-.0481 (.41) p = .382
Wright's A (2)	-.2530 (.41) p = .034	-.1489 (.41) p = .176	-.1650 (.41) p = .151	-.1426 (.41) p = .187	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357	-.0591 (.41) p = .357
Wright's B (2)	-.2710 (.41) p = .043	-.2446 (.41) p = .036	-.0487 (.41) p = .381	-.1137 (.41) p = .239	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346	-.0545 (.41) p = .346
Wright's Dd (2)	-.2041 (.41) p = .100	-.1810 (.41) p = .128	-.3045 (.41) p = .027	-.2137 (.41) p = .090	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409	-.0371 (.41) p = .409
Wright's V (2)	-.2763 (.41) p = .040	-.2034 (.41) p = .101	-.0432 (.41) p = .394	-.0394 (.41) p = .403	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347	-.0632 (.41) p = .347
Wright's PC (2)	-.1136 (.41) p = .340	-.1046 (.41) p = .250	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412	-.0235 (.41) p = .412
Wright's MD (2)	-.1009 (.41) p = .365	-.0246 (.41) p = .410	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393	-.0437 (.41) p = .393
Wright's DA (2)	-.2077 (.41) p = .096	-.1075 (.41) p = .120	-.1948 (.41) p = .111	-.2512 (.41) p = .057	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464	-.0145 (.41) p = .464
Wright's OA (2)	-.1612 (.41) p = .157	-.0718 (.41) p = .325	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427	-.0212 (.41) p = .427
Wright's Ddy (2)	-.1944 (.41) p = .112	-.1461 (.41) p = .150	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472	-.0113 (.41) p = .472
Wright's VQ (2)	-.1923 (.41) p = .032	-.2197 (.41) p = .084	-.1333 (.41) p = .169	-.1333 (.41) p = .169	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477	-.0695 (.41) p = .477
Wright's PQ (2)	-.1205 (.41) p = .223	-.0762 (.41) p = .314	-.0187 (.41) p = .454	-.0187 (.41) p = .454	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360	-.0441 (.41) p = .360
Wright's IQ (2)	-.2182 (.41) p = .067	-.1403 (.41) p = .135	-.0572 (.41) p = .316	-.0572 (.41) p = .316	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374	-.0517 (.41) p = .374

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below a is the significance level.
 The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Night mazes	Social with drawn	Social interest	Severe dis-	Depres- sion	Impaired trailing	Trailing memory	Asym- metrized	Anxiety	Initial anxiety	Hypersens- sitivity to light	Resistant to stress	Extinction	Escape
	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway
ANX1 (2)	(.163) (.46) p=.139	(.1576) (.46) p=.238	(.2552) (.46) p=.047	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032	(.2729) (.47) p=.032
ANX2 L(1)	(.263) (.46) p=.316	(.2215) (.46) p=.212	(.1112) (.46) p=.231	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337	(.5628) (.47) p=.337
ANX2 R(1)	(.0688) (.46) p=.325	(.0574) (.46) p=.332	(.1959) (.46) p=.122	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317	(.2714) (.47) p=.317
ANX2 R(2)	(.0736) (.46) p=.308	(.0930) (.46) p=.265	(.1145) (.46) p=.224	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217	(.1167) (.47) p=.217
ANX2 R(3)	(.2256) (.46) p=.016	(.1425) (.46) p=.172	(.0342) (.46) p=.611	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167	(.1441) (.47) p=.167
ANX2 D(1)	(.0548) (.46) p=.354	(.1184) (.46) p=.217	(.1245) (.46) p=.253	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343	(.0656) (.47) p=.343
ANX2 D(2)	(.3108) (.46) p=.016	(.0225) (.46) p=.461	(.0408) (.46) p=.394	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407	(.0448) (.47) p=.407
ANX2 P(1)	(.0281) (.46) p=.401	(.1108) (.46) p=.216	(.0945) (.46) p=.266	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280	(.0828) (.47) p=.280
ANX2 M(1)	(.0206) (.46) p=.081	(.0448) (.46) p=.208	(.2730) (.46) p=.031	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415	(.0320) (.47) p=.415
ANX2 P(2)	(.0107) (.46) p=.420	(.0852) (.46) p=.287	(.0051) (.46) p=.487	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092	(.1975) (.47) p=.092
ANX2 P(3)	(.0114) (.46) p=.418	(.1950) (.46) p=.097	(.0187) (.46) p=.420	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054	(.2380) (.47) p=.054
ANX2 A(1)	(.0125) (.46) p=.467	(.0042) (.46) p=.489	(.1041) (.46) p=.266	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212	(.1193) (.47) p=.212
ANX2 A(2)	(.0177) (.46) p=.402	(.0420) (.46) p=.341	(.0677) (.46) p=.337	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334	(.0644) (.47) p=.334
ANX2 B(1)	(.0236) (.46) p=.438	(.2755) (.46) p=.032	(.0042) (.46) p=.489	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002	(.4229) (.47) p=.002
ANX2 B(2)	(.0763) (.46) p=.307	(.0744) (.46) p=.312	(.0862) (.46) p=.284	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154	(.1518) (.47) p=.154

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.
 The first half of this appendix contains correlations with predictor variables for DSM-III-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Wight- Mates	Social with- drawal	Sexual Dis- interest	Depres- sion	Impaired Circu- lation	Impaired Memory	Absent- minded	Anxiety	Irrit- ability	Hypersens- itivity to light	Hypersens- itivity to sound	Headache	Dizziness	Fatigue
	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway
Age	.2095 (.46) p=.081	-.0123 (.46) p=.468	.0893 (.46) p=.278	-.0156 (.47) p=.459	.0230 (.46) p=.440	.1242 (.46) p=.206	.1197 (.46) p=.214	.0258 (.46) p=.499	-.0556 (.46) p=.357	.0398 (.46) p=.396	.1795 (.46) p=.116	.0469 (.46) p=.379	.1636 (.46) p=.259	.0927 (.46) p=.275
Sex	.1241 (.46) p=.206	.1315 (.46) p=.192	.2141 (.46) p=.077	.2199 (.47) p=.069	.1329 (.46) p=.189	.1681 (.46) p=.132	.2089 (.46) p=.082	.0222 (.46) p=.442	.2560 (.46) p=.044	.3634 (.46) p=.057	.0444 (.46) p=.385	.2583 (.46) p=.062	.1195 (.46) p=.214	.3354 (.46) p=.031
SES	.1705 (.46) p=.129	.0601 (.46) p=.346	.1187 (.46) p=.216	.0596 (.47) p=.348	-.3951 (.46) p=.008	-.1085 (.46) p=.216	.0113 (.46) p=.470	.1447 (.46) p=.169	-.0974 (.46) p=.280	.2072 (.46) p=.084	-.0701 (.46) p=.447	.0527 (.46) p=.369	.0718 (.46) p=.156	.0826 (.46) p=.287
Recent Events	.0946 (.46) p=.266	.4345 (.46) p=.001	.2146 (.46) p=.076	.3172 (.47) p=.015	.1245 (.46) p=.201	.1050 (.46) p=.244	.0745 (.46) p=.307	.2271 (.46) p=.085	-.0958 (.46) p=.285	.0371 (.46) p=.412	.2122 (.46) p=.079	.1378 (.46) p=.181	.2527 (.46) p=.253	.3546 (.46) p=.052
Psych. Ex	.0331 (.46) p=.413	.3232 (.46) p=.016	.0594 (.46) p=.347	.3266 (.47) p=.013	.0634 (.46) p=.338	.0707 (.46) p=.320	.0771 (.46) p=.305	.3707 (.46) p=.016	-.1881 (.46) p=.237	-.0105 (.46) p=.420	.2235 (.46) p=.068	.1154 (.46) p=.223	.0977 (.46) p=.259	.3237 (.46) p=.056
Severity	-.1667 (.46) p=.136	-.1784 (.46) p=.118	-.0248 (.46) p=.435	.0175 (.47) p=.436	.0792 (.46) p=.300	.0243 (.46) p=.431	.1515 (.46) p=.153	.0673 (.46) p=.328	-.0545 (.46) p=.360	-.1101 (.46) p=.194	-.1331 (.46) p=.189	-.1059 (.46) p=.242	.1622 (.46) p=.141	-.1593 (.46) p=.145
OGS at Admit.	.2316 (.46) p=.037	.1937 (.46) p=.096	.1169 (.46) p=.220	-.0513 (.47) p=.366	-.0464 (.46) p=.380	-.0657 (.46) p=.332	-.1096 (.46) p=.234	-.0774 (.46) p=.325	.0673 (.46) p=.328	.1012 (.46) p=.252	.1372 (.46) p=.182	.1165 (.46) p=.220	.2071 (.46) p=.084	.3311 (.46) p=.058
Sleep. Disturb.	-.1661 (.46) p=.135	-.1884 (.46) p=.105	-.0695 (.46) p=.325	-.1251 (.47) p=.201	.0967 (.46) p=.261	.2544 (.46) p=.043	.0981 (.46) p=.280	-.0424 (.46) p=.395	.0979 (.46) p=.259	.1519 (.46) p=.157	-.1627 (.46) p=.140	.0764 (.46) p=.327	.2723 (.46) p=.035	.3125 (.46) p=.052
Imp. Consc.	-.1841 (.46) p=.108	-.2084 (.46) p=.082	-.0713 (.46) p=.319	-.1058 (.47) p=.405	.1023 (.46) p=.249	.2017 (.46) p=.089	.1089 (.46) p=.236	-.0581 (.46) p=.351	.0811 (.46) p=.296	-.1484 (.46) p=.132	.1152 (.46) p=.223	.1798 (.46) p=.121	.2636 (.46) p=.038	.2378 (.46) p=.056
Somnolence	-.0740 (.46) p=.313	-.0976 (.46) p=.272	.0917 (.46) p=.272	.2518 (.47) p=.365	.1881 (.46) p=.125	.0847 (.46) p=.288	.2894 (.46) p=.026	.3122 (.46) p=.017	-.2950 (.46) p=.245	.1251 (.46) p=.243	.1976 (.46) p=.094	.0395 (.46) p=.397	.1493 (.46) p=.161	.2759 (.46) p=.058
Skull Fract.	.0402 (.46) p=.375	.0487 (.46) p=.376	-.0108 (.46) p=.474	-.0633 (.47) p=.336	.1676 (.46) p=.133	.0352 (.46) p=.429	.3422 (.46) p=.010	-.0225 (.46) p=.484	-.0479 (.46) p=.376	.1587 (.46) p=.146	.2593 (.46) p=.076	.2161 (.46) p=.275	.2729 (.46) p=.034	.3865 (.46) p=.084
Imp. Index	-.1621 (.46) p=.171	-.3659 (.46) p=.006	-.0537 (.46) p=.362	-.0222 (.47) p=.441	-.2132 (.46) p=.071	.0549 (.46) p=.358	-.0118 (.46) p=.469	.0141 (.46) p=.458	-.1359 (.46) p=.284	-.2124 (.46) p=.078	.0802 (.46) p=.298	-.1347 (.46) p=.186	.1121 (.46) p=.233	.2446 (.46) p=.051

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.

The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation. Below is a 5% significance level.

The first half of the appendix contains correlations with predictor variables for DSM-III/II-R symptoms; the second half contains correlations for alternative criterion symptoms.

The means for all variables are given for each of these symptoms in that no individual in this subsample endorsed them.

Appendix P continued

	Night- mares	Social withdrawal	Sensit- ization	Depres- sion	Impaired Attention	Impaired Memory	Assess- ment	Anxiety	Initial Anxiety	Apparent to Night	Hyperac- tivity	Resistant	Disruptive	Environ-
	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway
TPP Time (1)	-.2274 (.44) p=.059	-.3365 (.44) p=.013	-.2093 (.44) p=.086	-.5462 (.44) p=.002	-.0137 (.44) p=.965	-.1623 (.44) p=.182	-.2261 (.44) p=.033	-.2298 (.44) p=.124	-.2947 (.44) p=.272	-.2627 (.44) p=.258	-.2188 (.44) p=.049	-.2662 (.44) p=.035	-.2136 (.44) p=.231	-.2125 (.44) p=.085
TPP Mem (1)	-.0787 (.44) p=.386	-.1705 (.44) p=.134	-.0713 (.44) p=.323	-.5428 (.44) p=.005	-.0422 (.44) p=.353	-.2945 (.44) p=.268	-.0412 (.44) p=.367	-.2086 (.44) p=.262	-.2352 (.44) p=.421	-.2097 (.44) p=.262	-.2665 (.44) p=.034	-.2591 (.44) p=.242	-.2624 (.44) p=.048	-.2427 (.44) p=.181
TPP Loc (1)	-.0485 (.44) p=.377	-.2024 (.44) p=.093	-.0111 (.44) p=.911	-.1275 (.44) p=.202	-.1625 (.44) p=.147	-.2149 (.44) p=.078	-.1471 (.44) p=.270	-.1726 (.44) p=.234	-.2084 (.44) p=.284	-.1538 (.44) p=.259	-.2526 (.44) p=.032	-.2292 (.44) p=.076	-.2923 (.44) p=.282	-.2843 (.44) p=.271
Fluor Top (1)	-.1023 (.44) p=.258	-.0276 (.44) p=.629	-.1714 (.44) p=.133	-.0145 (.44) p=.906	-.2203 (.44) p=.096	-.0655 (.44) p=.336	-.1284 (.44) p=.201	-.1188 (.44) p=.221	-.2635 (.44) p=.042	-.2395 (.44) p=.039	-.2238 (.44) p=.222	-.2232 (.44) p=.041	-.2124 (.44) p=.237	-.2845 (.44) p=.293
Speech Perc (1)	-.0482 (.44) p=.373	-.1781 (.44) p=.118	-.1841 (.44) p=.098	-.0559 (.44) p=.354	-.0256 (.44) p=.485	-.2207 (.44) p=.070	-.1347 (.44) p=.097	-.2373 (.44) p=.023	-.2151 (.44) p=.276	-.2573 (.44) p=.042	-.2775 (.44) p=.034	-.2786 (.44) p=.296	-.2148 (.44) p=.224	-.2285 (.44) p=.263
Rhythm (1)	-.2203 (.44) p=.071	-.0766 (.44) p=.008	-.1486 (.44) p=.147	-.1634 (.44) p=.136	-.0653 (.44) p=.333	-.1361 (.44) p=.184	-.0108 (.44) p=.971	-.0456 (.44) p=.382	-.1739 (.44) p=.124	-.2046 (.44) p=.084	-.2045 (.44) p=.095	-.2181 (.44) p=.105	-.2123 (.44) p=.212	-.2168 (.44) p=.274
Gen. Defic (1)	-.2113 (.44) p=.082	-.1868 (.44) p=.110	-.1430 (.44) p=.174	-.1224 (.44) p=.209	-.0427 (.44) p=.380	-.0004 (.44) p=.999	-.0854 (.44) p=.289	-.0373 (.44) p=.404	-.1315 (.44) p=.195	-.1031 (.44) p=.250	-.0629 (.44) p=.341	-.0464 (.44) p=.381	-.1745 (.44) p=.124	-.2442 (.44) p=.279
Imp. Spat (1)	-.1712 (.44) p=.110	-.0736 (.44) p=.316	-.0056 (.44) p=.486	-.0588 (.44) p=.349	-.0271 (.44) p=.439	-.0028 (.44) p=.993	-.0718 (.44) p=.320	-.0274 (.44) p=.429	-.1028 (.44) p=.251	-.0508 (.44) p=.370	-.0812 (.44) p=.276	-.0235 (.44) p=.491	-.0804 (.44) p=.299	-.2177 (.44) p=.454
Zeal Making (1)	-.0498 (.44) p=.372	-.0156 (.44) p=.407	-.1433 (.44) p=.171	-.1938 (.44) p=.096	-.0650 (.44) p=.334	-.1179 (.44) p=.216	-.1067 (.44) p=.240	-.0663 (.44) p=.331	-.0759 (.44) p=.308	-.0983 (.44) p=.258	-.1454 (.44) p=.134	-.0735 (.44) p=.314	-.2925 (.44) p=.270	-.2774 (.44) p=.315

Note: (1) = data collected at initial assessment; (P) = data collected at follow-up.
 The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.
 The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no individual in that subsample exhibited them.

Appendix P continued

	Wright's Midway	Social with- drawal Midway	Sexual Dis- interest Midway	Depres- sion Midway	Impaired Concen- tration Midway	Impaired Memory Midway	Absent- minded Midway	Anxiety Midway	Irrit- ability Midway	Hypersens- itivity to light Midway	Hypersens- itivity to sound Midway	Headache Midway	Dizziness Midway	Fatigue Midway
WASP-R 1(I)	-.0556 (.311) P=.383	-.2825 (.311) P=.062	-.0655 (.311) P=.486	-.0198 (.320) P=.457	-.0335 (.310) P=.429	-.1160 (.310) P=.267	-.1684 (.310) P=.183	-.0365 (.310) P=.423	-.2186 (.310) P=.064	-.0923 (.311) P=.311	-.1706 (.310) P=.179	-.0378 (.310) P=.420	-.0939 (.310) P=.358	-.2791 (.310) P=.064
WASP-R 2(I)	-.1926 (.310) P=.150	-.0021 (.310) P=.496	-.0290 (.310) P=.438	-.1237 (.320) P=.250	-.0483 (.310) P=.398	-.0705 (.310) P=.353	-.0705 (.310) P=.353	-.1814 (.310) P=.224	-.3832 (.310) P=.017	-.1019 (.310) P=.283	-.2017 (.310) P=.138	-.1256 (.310) P=.250	-.1024 (.310) P=.282	-.3211 (.310) P=.039
WASP-R 3(I)	-.1183 (.310) P=.263	-.3342 (.310) P=.033	-.0851 (.310) P=.324	-.1607 (.320) P=.190	-.1224 (.310) P=.256	-.2739 (.310) P=.066	-.2739 (.310) P=.066	-.1134 (.310) P=.272	-.0188 (.310) P=.460	-.2437 (.310) P=.093	-.2578 (.310) P=.081	-.1751 (.310) P=.173	-.1393 (.310) P=.227	-.0198 (.310) P=.458
WASP-R 4(I)	-.0743 (.310) P=.342	-.1440 (.310) P=.217	-.0936 (.310) P=.308	-.0021 (.320) P=.496	-.0509 (.310) P=.393	-.0367 (.310) P=.422	-.0588 (.310) P=.377	-.0220 (.310) P=.453	-.1899 (.310) P=.153	-.0712 (.310) P=.352	-.0602 (.310) P=.374	-.0371 (.310) P=.485	-.1930 (.310) P=.149	-.0960 (.310) P=.304
WASP-R 5(I)	-.1979 (.310) P=.143	-.4958 (.310) P=.006	-.1358 (.310) P=.233	-.3481 (.320) P=.025	-.2486 (.310) P=.089	-.3272 (.310) P=.036	-.2574 (.310) P=.081	-.1449 (.310) P=.218	-.2034 (.310) P=.136	-.0180 (.310) P=.462	-.2668 (.310) P=.073	-.3019 (.310) P=.049	-.1479 (.310) P=.214	-.1962 (.310) P=.145
WASP-R 6(I)	-.0493 (.310) P=.396	-.2372 (.310) P=.089	-.1893 (.310) P=.154	-.1291 (.320) P=.241	-.0886 (.310) P=.318	-.0398 (.310) P=.416	-.1381 (.310) P=.229	-.0462 (.310) P=.422	-.3619 (.310) P=.023	-.0497 (.310) P=.395	-.3075 (.310) P=.066	-.0927 (.310) P=.310	-.1286 (.310) P=.243	-.4088 (.310) P=.251
WASP-R 7(I)	-.3148 (.310) P=.025	-.1528 (.310) P=.204	-.0339 (.310) P=.387	-.0244 (.320) P=.447	-.3260 (.310) P=.037	-.1388 (.310) P=.228	-.1388 (.310) P=.228	-.1891 (.310) P=.154	-.2619 (.310) P=.077	-.1688 (.310) P=.182	-.0482 (.310) P=.358	-.0487 (.310) P=.387	-.0580 (.310) P=.318	-.0335 (.310) P=.429
WASP-R 8(I)	-.2048 (.310) P=.134	-.4663 (.310) P=.004	-.0080 (.310) P=.483	-.0402 (.320) P=.614	-.1726 (.310) P=.177	-.0647 (.310) P=.365	-.1740 (.310) P=.175	-.0696 (.310) P=.355	-.1550 (.310) P=.283	-.1479 (.310) P=.214	-.0109 (.310) P=.477	-.1492 (.310) P=.212	-.2722 (.310) P=.071	-.1944 (.310) P=.147
WASP-R 9(I)	-.0571 (.310) P=.380	-.2700 (.310) P=.071	-.0142 (.310) P=.470	-.0728 (.320) P=.346	-.2030 (.310) P=.137	-.0365 (.310) P=.423	-.0535 (.310) P=.388	-.2596 (.310) P=.079	-.3149 (.310) P=.042	-.3821 (.310) P=.035	-.1632 (.310) P=.190	-.3418 (.310) P=.030	-.1890 (.310) P=.154	-.4556 (.310) P=.225
WASP-R 10(I)	-.0158 (.310) P=.466	-.1194 (.310) P=.261	-.0241 (.310) P=.449	-.1270 (.320) P=.244	-.0546 (.310) P=.385	-.0393 (.310) P=.417	-.1363 (.310) P=.232	-.0370 (.310) P=.422	-.0167 (.310) P=.484	-.1698 (.310) P=.181	-.0158 (.310) P=.486	-.0722 (.310) P=.340	-.0585 (.310) P=.375	-.0927 (.310) P=.310
WASP-R 11(I)	-.3274 (.310) P=.109	-.2440 (.310) P=.088	-.1781 (.310) P=.168	-.0553 (.320) P=.382	-.0918 (.310) P=.312	-.1666 (.310) P=.284	-.0695 (.310) P=.355	-.0766 (.310) P=.341	-.1240 (.310) P=.250	-.1896 (.310) P=.141	-.1615 (.310) P=.193	-.0487 (.310) P=.387	-.2346 (.310) P=.112	-.0123 (.310) P=.418
WASP-R 12(I)	-.0284 (.310) P=.440	-.3814 (.310) P=.015	-.0538 (.310) P=.492	-.0534 (.320) P=.493	-.1158 (.310) P=.267	-.1775 (.310) P=.170	-.1840 (.310) P=.168	-.0933 (.310) P=.319	-.1329 (.310) P=.179	-.0827 (.310) P=.329	-.0516 (.310) P=.381	-.1077 (.310) P=.282	-.0586 (.310) P=.316	-.1592 (.310) P=.297
WASP-R 13(I)	-.3372 (.310) P=.022	-.4067 (.310) P=.012	-.1495 (.310) P=.211	-.0330 (.320) P=.387	-.1767 (.310) P=.171	-.1084 (.310) P=.279	-.2037 (.310) P=.136	-.1487 (.310) P=.212	-.2840 (.310) P=.135	-.2493 (.310) P=.088	-.0408 (.310) P=.458	-.1118 (.310) P=.275	-.2354 (.310) P=.106	-.1965 (.310) P=.145
WASP-R 14(I)	-.1540 (.310) P=.224	-.4540 (.310) P=.025	-.0482 (.310) P=.358	-.0403 (.320) P=.413	-.0251 (.310) P=.447	-.0406 (.310) P=.414	-.0249 (.310) P=.447	-.1188 (.310) P=.140	-.1849 (.310) P=.151	-.0426 (.310) P=.410	-.0560 (.310) P=.382	-.0735 (.310) P=.463	-.1439 (.310) P=.189	-.1752 (.310) P=.173

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.
 The first half of this appendix contains correlations with predictor variables for DSM-III/IV-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no individual in this subsample endorsed them.

покупатель и продавец

Asset	Social Media			Sentiment			Engagement			Conversion			Retention			Churn			LTV
	Midway	Highway	Lowway	Midway	Highway	Lowway	Midway	Highway	Lowway	Midway	Highway	Lowway	Midway	Highway	Lowway	Midway	Highway	Lowway	
ASSET A	125	260	395	132	267	402	139	272	407	146	277	412	153	282	417	160	287	422	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 185	P= 083	P= 019	P= 115	P= 095	P= 025	P= 145	P= 105	P= 035	P= 175	P= 125	P= 055	P= 205	P= 145	P= 075	P= 235	P= 175	P= 105	
ASSET B	135	270	405	142	275	412	149	280	417	156	285	422	163	290	427	170	295	432	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 195	P= 093	P= 029	P= 125	P= 105	P= 035	P= 155	P= 115	P= 045	P= 185	P= 135	P= 065	P= 215	P= 155	P= 085	P= 245	P= 185	P= 115	
ASSET C	145	280	415	152	285	422	159	290	427	166	295	432	173	300	437	180	305	442	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 205	P= 103	P= 039	P= 135	P= 115	P= 045	P= 165	P= 125	P= 055	P= 195	P= 145	P= 075	P= 225	P= 165	P= 095	P= 255	P= 195	P= 125	
ASSET D	155	290	425	162	295	432	169	300	437	176	305	442	183	310	447	190	315	452	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 215	P= 113	P= 049	P= 145	P= 125	P= 055	P= 175	P= 135	P= 065	P= 205	P= 155	P= 085	P= 235	P= 175	P= 105	P= 265	P= 205	P= 135	
ASSET E	165	300	435	172	305	442	179	310	447	186	315	452	193	320	457	200	325	462	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 225	P= 123	P= 059	P= 155	P= 135	P= 065	P= 185	P= 145	P= 075	P= 215	P= 165	P= 095	P= 245	P= 185	P= 115	P= 275	P= 215	P= 145	
ASSET F	175	310	445	182	315	452	189	320	457	196	325	462	203	330	467	210	335	472	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 235	P= 133	P= 069	P= 165	P= 145	P= 075	P= 195	P= 155	P= 085	P= 225	P= 175	P= 105	P= 255	P= 195	P= 125	P= 285	P= 225	P= 155	
ASSET G	185	320	455	192	325	462	199	330	467	206	335	472	213	340	477	220	345	482	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 245	P= 143	P= 079	P= 175	P= 155	P= 085	P= 205	P= 165	P= 095	P= 235	P= 185	P= 115	P= 265	P= 205	P= 135	P= 295	P= 235	P= 165	
ASSET H	195	330	465	202	335	472	209	340	477	216	345	482	223	350	487	230	355	492	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 255	P= 153	P= 089	P= 185	P= 165	P= 095	P= 215	P= 175	P= 105	P= 245	P= 195	P= 125	P= 275	P= 215	P= 145	P= 305	P= 245	P= 175	
ASSET I	205	340	475	212	345	482	219	350	487	226	355	492	233	360	497	240	365	502	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 265	P= 163	P= 099	P= 195	P= 175	P= 105	P= 225	P= 185	P= 115	P= 255	P= 205	P= 135	P= 285	P= 225	P= 155	P= 315	P= 255	P= 185	
ASSET J	215	350	485	222	355	492	229	360	497	236	365	502	243	370	507	250	375	512	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 275	P= 173	P= 109	P= 205	P= 185	P= 115	P= 235	P= 195	P= 125	P= 265	P= 215	P= 145	P= 295	P= 235	P= 165	P= 325	P= 265	P= 195	
ASSET K	225	360	495	232	365	502	239	370	507	246	375	512	253	380	517	260	385	522	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 285	P= 183	P= 119	P= 215	P= 195	P= 125	P= 245	P= 205	P= 135	P= 275	P= 225	P= 155	P= 305	P= 245	P= 175	P= 335	P= 275	P= 205	
ASSET L	235	370	505	242	375	512	249	380	517	256	385	522	263	390	527	270	395	532	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 295	P= 193	P= 129	P= 225	P= 205	P= 135	P= 255	P= 215	P= 145	P= 285	P= 235	P= 165	P= 315	P= 255	P= 185	P= 345	P= 285	P= 215	
ASSET M	245	380	515	252	385	522	259	390	527	266	395	532	273	400	537	280	405	542	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 305	P= 203	P= 139	P= 235	P= 215	P= 145	P= 265	P= 225	P= 155	P= 295	P= 245	P= 175	P= 325	P= 265	P= 195	P= 355	P= 295	P= 225	
ASSET N	255	390	525	262	395	532	269	400	537	276	405	542	283	410	547	290	415	552	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 315	P= 213	P= 149	P= 245	P= 225	P= 155	P= 275	P= 235	P= 165	P= 305	P= 255	P= 185	P= 335	P= 275	P= 205	P= 365	P= 305	P= 235	
ASSET O	265	400	535	272	405	542	279	410	547	286	415	552	293	420	557	300	425	562	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 325	P= 223	P= 159	P= 255	P= 235	P= 165	P= 285	P= 245	P= 175	P= 315	P= 265	P= 195	P= 345	P= 285	P= 215	P= 375	P= 315	P= 245	
ASSET P	275	410	545	282	415	552	289	420	557	296	425	562	303	430	567	310	435	572	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 335	P= 233	P= 169	P= 265	P= 245	P= 175	P= 295	P= 255	P= 185	P= 325	P= 275	P= 205	P= 355	P= 295	P= 225	P= 385	P= 325	P= 255	
ASSET Q	285	420	555	292	425	562	299	430	567	306	435	572	313	440	577	320	445	582	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 345	P= 243	P= 179	P= 275	P= 255	P= 185	P= 305	P= 265	P= 195	P= 335	P= 285	P= 215	P= 365	P= 305	P= 235	P= 395	P= 335	P= 265	
ASSET R	295	430	565	302	435	572	309	440	577	316	445	582	323	450	587	330	455	592	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 355	P= 253	P= 189	P= 285	P= 265	P= 195	P= 315	P= 275	P= 205	P= 345	P= 295	P= 225	P= 375	P= 315	P= 245	P= 405	P= 345	P= 275	
ASSET S	305	440	575	312	445	582	319	450	587	326	455	592	333	460	597	340	465	602	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 365	P= 263	P= 199	P= 295	P= 275	P= 205	P= 325	P= 285	P= 215	P= 355	P= 305	P= 235	P= 385	P= 325	P= 255	P= 415	P= 355	P= 285	
ASSET T	315	450	585	322	455	592	329	460	597	336	465	602	343	470	607	350	475	612	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 375	P= 273	P= 209	P= 305	P= 285	P= 215	P= 335	P= 295	P= 225	P= 365	P= 315	P= 245	P= 395	P= 335	P= 265	P= 425	P= 365	P= 295	
ASSET U	325	460	595	332	465	602	339	470	607	346	475	612	353	480	617	360	485	622	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 385	P= 283	P= 219	P= 315	P= 295	P= 225	P= 345	P= 305	P= 235	P= 375	P= 325	P= 255	P= 405	P= 345	P= 275	P= 435	P= 375	P= 305	
ASSET V	335	470	605	342	475	612	349	480	617	356	485	622	363	490	627	370	495	632	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 395	P= 293	P= 229	P= 325	P= 305	P= 235	P= 355	P= 315	P= 245	P= 385	P= 335	P= 265	P= 415	P= 355	P= 285	P= 445	P= 385	P= 315	
ASSET W	345	480	615	352	485	622	359	490	627	366	495	632	373	500	637	380	505	642	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 405	P= 303	P= 239	P= 335	P= 315	P= 245	P= 365	P= 325	P= 255	P= 395	P= 345	P= 275	P= 425	P= 365	P= 295	P= 455	P= 395	P= 325	
ASSET X	355	490	625	362	495	632	369	500	637	376	505	642	383	510	647	390	515	652	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 415	P= 313	P= 249	P= 345	P= 325	P= 255	P= 375	P= 335	P= 265	P= 405	P= 355	P= 285	P= 435	P= 375	P= 305	P= 465	P= 405	P= 335	
ASSET Y	365	500	635	372	505	642	379	510	647	386	515	652	393	520	657	400	525	662	
	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	(20)	
	P= 425	P= 323	P= 259	P= 355	P= 335	P= 265	P= 385	P= 345</											

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up. The number of subjects (*n*) used in the calculation of a correlation is given in brackets underneath the correlation; below α is the significance level. The first half of this symposium contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms. The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

Category (P)	Night- mares	Social with- drawal	Sexual Dis- interest	Depres- sion	Impaired Concen- tration	Impaired Memory	Absent- minded	Anxiety	Irrit- ability	Hypersens- itivity to Light	Hypersens- itivity to Sound	Headache	Dizziness	Fatigue
	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway	Midway
	-.0774 (.23) P=.363	-.1473 (.23) P=.51	-.1847 (.23) P=.199	-.0391 (.23) P=.930	-.0556 (.23) P=.401	-.0191 (.23) P=.866	-.1950 (.23) P=.186	.0230 (.23) P=.495	-.1376 (.23) P=.266	-.1339 (.23) P=.271	-.0774 (.23) P=.363	-.1552 (.23) P=.240	.0152 (.23) P=.475	-.0013 (.23) P=.498
TFT Time (P)	-.0852 (.28) P=.315	-.2327 (.28) P=.117	-.1705 (.28) P=.193	-.1182 (.28) P=.275	-.0802 (.28) P=.324	-.1981 (.28) P=.156	-.0570 (.28) P=.387	.1154 (.28) P=.279	-.2970 (.28) P=.062	-.1423 (.28) P=.235	-.0383 (.28) P=.423	-.0951 (.28) P=.315	-.2332 (.28) P=.116	-.1054 (.28) P=.287
TFT Mem (P)	.0000 (.28) P=.500	-.0189 (.28) P=.345	.0889 (.28) P=.326	.0280 (.28) P=.442	.1179 (.28) P=.275	.1939 (.28) P=.161	.2360 (.28) P=.113	.2031 (.28) P=.150	.2607 (.28) P=.090	.1540 (.28) P=.217	.0000 (.28) P=.500	.3439 (.28) P=.107	.2424 (.28) P=.107	.0752 (.28) P=.352
TFT Loc (P)	.1226 (.28) P=.267	.0160 (.28) P=.628	.0947 (.28) P=.316	.1181 (.28) P=.275	.3211 (.28) P=.048	.3910 (.28) P=.020	.3160 (.28) P=.051	.3765 (.28) P=.074	.3114 (.28) P=.053	.3110 (.28) P=.054	.1376 (.28) P=.243	.5314 (.28) P=.003	.3410 (.28) P=.038	.2162 (.28) P=.135
Fluor Tap (P)	.1129 (.28) P=.284	.1257 (.28) P=.262	.1592 (.28) P=.209	-.0147 (.28) P=.470	.0959 (.28) P=.314	.1176 (.28) P=.276	.2003 (.28) P=.153	.1333 (.28) P=.249	.0213 (.28) P=.457	.0733 (.28) P=.335	.0585 (.28) P=.483	.0231 (.28) P=.453	.3496 (.28) P=.034	.0248 (.28) P=.450
Speech Perc (P)	-.3154 (.29) P=.276	-.1772 (.29) P=.179	-.2542 (.29) P=.092	-.1647 (.29) P=.197	-.0711 (.29) P=.404	-.1905 (.29) P=.161	-.2346 (.29) P=.110	-.0722 (.29) P=.355	-.3561 (.29) P=.029	-.2373 (.29) P=.108	-.1546 (.29) P=.212	-.2415 (.29) P=.104	-.2573 (.29) P=.089	-.2166 (.29) P=.130
Rhythm (P)	-.0642 (.29) P=.487	-.3941 (.29) P=.053	-.1767 (.29) P=.180	-.3100 (.29) P=.031	.0483 (.29) P=.402	.0354 (.29) P=.428	-.0111 (.29) P=.477	-.0092 (.29) P=.526	-.2180 (.29) P=.127	-.1389 (.29) P=.237	-.1371 (.29) P=.239	-.1645 (.29) P=.195	-.3194 (.29) P=.046	-.1145 (.29) P=.343
Sens. Deficit (P)	.1399 (.29) P=.239	.0594 (.29) P=.382	.0651 (.29) P=.371	.1790 (.29) P=.181	.1379 (.29) P=.242	-.1080 (.29) P=.392	-.0872 (.29) P=.330	.1232 (.29) P=.266	-.1142 (.29) P=.281	.0329 (.29) P=.434	.2074 (.29) P=.145	.1524 (.29) P=.222	.2167 (.29) P=.134	-.0793 (.29) P=.344
Appt. (P)	-.0397 (.29) P=.421	-.0169 (.29) P=.466	.0546 (.29) P=.392	-.0182 (.29) P=.461	.1399 (.29) P=.180	-.0603 (.29) P=.365	.1259 (.29) P=.262	.0263 (.29) P=.447	-.1943 (.29) P=.161	.1288 (.29) P=.257	-.1533 (.29) P=.302	-.0970 (.29) P=.312	-.2587 (.29) P=.042	-.0340 (.29) P=.377
Troll Making (P)	.0508 (.31) P=.393	.2031 (.31) P=.136	.1828 (.31) P=.163	.0427 (.31) P=.369	.0425 (.31) P=.410	-.0274 (.31) P=.442	.2188 (.31) P=.119	.1776 (.31) P=.170	.1411 (.31) P=.224	.1392 (.31) P=.228	-.0172 (.31) P=.464	.3129 (.31) P=.043	.3198 (.31) P=.043	.2428 (.31) P=.095

Note: (P) = data collected at initial assessment; (P) = data collected at follow-up.

The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.

The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.

The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Right- handed	Social skills	Social skills drawal	Social skills interest	Complex drawing	Imagined emotion recognition	Imagined emotion recognition	Abstract drawing	Imagined emotion recognition	Imagined emotion recognition	Imagined emotion recognition	Imagined emotion recognition	Imagined emotion recognition
	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up
ADHD (1)	-.1042 (.30) p=.267	-.1895 (.30) p=.127	-.2741 (.30) p=.088	-.2778 (.30) p=.086	-.4021 (.30) p=.056	-.5643 (.30) p=.022	-.5775 (.30) p=.022	-.5223 (.30) p=.024	-.4886 (.30) p=.022	-.4886 (.30) p=.022	-.4886 (.30) p=.022	-.4886 (.30) p=.022	-.4886 (.30) p=.022
ADHD 2(1)	-.1788 (.30) p=.146	-.0555 (.30) p=.355	-.1778 (.30) p=.143	-.1778 (.30) p=.143	-.1525 (.30) p=.172	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258
ADHD 3(1)	-.0720 (.30) p=.334	-.1050 (.30) p=.265	-.1778 (.30) p=.143	-.1778 (.30) p=.143	-.1525 (.30) p=.172	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258	-.1154 (.30) p=.258
ADHD 4(1)	-.3552 (.30) p=.061	-.3578 (.30) p=.014	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135	-.1835 (.30) p=.135
ADHD 5(1)	-.3151 (.30) p=.087	-.1940 (.30) p=.117	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400	-.0424 (.30) p=.400
ADHD 6(1)	-.4274 (.30) p=.004	-.1023 (.30) p=.271	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488
ADHD 7(1)	-.2993 (.30) p=.034	-.0457 (.30) p=.347	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232	-.1226 (.30) p=.232
ADHD 8(1)	-.2841 (.30) p=.042	-.1122 (.30) p=.251	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488	-.0894 (.30) p=.488
ADHD 9(1)	-.1788 (.30) p=.141	-.0334 (.30) p=.421	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012	-.3640 (.30) p=.012
ADHD 10(1)	-.2674 (.30) p=.052	-.1943 (.30) p=.116	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348	-.0656 (.30) p=.348
ADHD 11(1)	-.2645 (.30) p=.053	-.0018 (.30) p=.401	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382	-.0503 (.30) p=.382
ADHD 12(1)	-.1544 (.30) p=.174	-.1438 (.30) p=.195	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287	-.0942 (.30) p=.287
ADHD 13(1)	-.0421 (.30) p=.401	-.0383 (.30) p=.410	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344	-.0674 (.30) p=.344
ADHD 14(1)	-.0548 (.30) p=.413	-.1931 (.30) p=.123	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428	-.0305 (.30) p=.428
ADHD 15(1)	-.0019 (.30) p=.495	-.1193 (.30) p=.238	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394	-.0453 (.30) p=.394

Note: (1) = data collected at initial assessment; (P) = data collected at follow-up; The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level. The first half of this appendix contains correlations with predictor variables for DSM-III-R symptoms; the second half contains correlations for alternative criterion symptoms. The reason that no values are given for some of these symptoms is that no individual in this subsample endorsed them.

Appendix 2 continued

	Nightmares	Social withdrawal	Sexual distress	Depression	Impaired concentration	Impaired memory	Absent-minded	Anxiety	Irregular ability	Hypersensitivity to light	Hypersensitivity to sound	Headache	Dizziness	Fatigue
	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up
Age	.0245 (.38) p=.437	.1322 (.38) p=.213	.0403 (.38) p=.359	-.0819 (.38) p=.314	-.1242 (.38) p=.229	-.0746 (.37) p=.419	-.0137 (.38) p=.468	-.0012 (.38) p=.497	-.1409 (.38) p=.199	.1568 (.38) p=.174	.3384 (.38) p=.019	-.1788 (.38) p=.143	.1242 (.38) p=.227	.0581 (.38) p=.385
Sex	-.0048 (.38) p=.449	.3610 (.38) p=.003	.3792 (.38) p=.009	.3077 (.38) p=.030	.1990 (.38) p=.116	.1167 (.37) p=.246	.0277 (.38) p=.435	.3132 (.38) p=.028	.3466 (.38) p=.014	-.0111 (.38) p=.474	-.0300 (.38) p=.429	.2095 (.38) p=.103	.0391 (.38) p=.408	.2056 (.38) p=.108
SES	.0850 (.38) p=.306	-.0016 (.38) p=.496	.1058 (.38) p=.264	.1117 (.38) p=.252	.0010 (.38) p=.491	.0297 (.37) p=.431	.0314 (.38) p=.428	.1666 (.38) p=.159	.1406 (.38) p=.187	.0817 (.38) p=.313	.2073 (.38) p=.106	.2061 (.38) p=.107	.1203 (.38) p=.221	.2736 (.38) p=.048
Recent Events	.0714 (.38) p=.335	.2443 (.38) p=.054	.1913 (.38) p=.125	.3771 (.38) p=.010	.1568 (.38) p=.176	.4526 (.37) p=.002	.2312 (.38) p=.081	.1387 (.38) p=.203	.2520 (.38) p=.063	.2356 (.38) p=.077	.0421 (.38) p=.356	-.0772 (.38) p=.323	.0749 (.38) p=.327	.5688 (.38) p=.345
Psych. Rx	-.0645 (.38) p=.350	.0800 (.38) p=.317	.0467 (.38) p=.380	.2148 (.38) p=.088	.0122 (.38) p=.471	.1857 (.37) p=.136	.1770 (.38) p=.144	-.0060 (.38) p=.486	.0151 (.38) p=.464	.2944 (.38) p=.036	.0570 (.38) p=.367	-.1359 (.38) p=.217	-.0518 (.38) p=.379	.1687 (.38) p=.156
Sensibility	-.1268 (.38) p=.226	-.1766 (.38) p=.145	-.0894 (.38) p=.297	-.0030 (.38) p=.495	.1074 (.38) p=.130	.2765 (.37) p=.049	.0856 (.38) p=.305	-.1574 (.38) p=.173	.0156 (.38) p=.463	.0528 (.38) p=.377	-.0488 (.38) p=.385	-.0473 (.38) p=.389	-.0323 (.38) p=.424	-.1950 (.38) p=.123
OCI at Admit.	.0945 (.38) p=.286	.1819 (.38) p=.123	.1926 (.38) p=.123	-.0181 (.38) p=.457	-.1468 (.38) p=.189	-.2333 (.37) p=.082	-.0927 (.38) p=.290	.1722 (.38) p=.151	-.0541 (.38) p=.374	-.1760 (.38) p=.154	-.0114 (.38) p=.473	.1645 (.38) p=.266	.0996 (.38) p=.276	.1407 (.38) p=.162
Resp. Disturb.	-.2250 (.38) p=.087	-.1390 (.38) p=.203	-.1568 (.38) p=.174	.0158 (.38) p=.465	.4235 (.38) p=.004	.3645 (.37) p=.013	.2375 (.38) p=.076	-.1826 (.38) p=.138	.1581 (.38) p=.172	-.0552 (.38) p=.408	.0326 (.38) p=.423	-.0435 (.38) p=.398	-.2472 (.38) p=.267	-.2219 (.38) p=.295
Imp. Conc.	-.0921 (.38) p=.312	-.1266 (.38) p=.224	-.1489 (.38) p=.186	-.0254 (.38) p=.440	.3187 (.38) p=.026	.3627 (.37) p=.014	.2130 (.38) p=.150	-.1494 (.38) p=.155	.1283 (.38) p=.221	.0536 (.38) p=.468	.0523 (.38) p=.382	-.0772 (.38) p=.322	.1710 (.38) p=.164	-.2467 (.38) p=.248
Headaches	-.1319 (.38) p=.215	-.1940 (.38) p=.122	-.1163 (.38) p=.243	.3524 (.38) p=.063	.2272 (.38) p=.085	.3775 (.37) p=.011	.2279 (.38) p=.094	-.0641 (.38) p=.406	.0828 (.38) p=.311	.1440 (.38) p=.194	-.0310 (.38) p=.332	-.0527 (.38) p=.475	-.0753 (.38) p=.327	.5866 (.38) p=.282
Skull Fract.	.1136 (.38) p=.248	-.0444 (.38) p=.396	-.0495 (.38) p=.384	-.1714 (.38) p=.152	.0812 (.37) p=.293	.0920 (.37) p=.286	.0293 (.38) p=.431	-.0825 (.38) p=.313	.0569 (.38) p=.404	.0646 (.38) p=.353	.0648 (.38) p=.388	.2556 (.38) p=.261	.5138 (.38) p=.059	.1355 (.38) p=.215
Imp. Index	.0597 (.38) p=.361	.0387 (.38) p=.408	-.1026 (.38) p=.270	.1121 (.38) p=.250	-.0585 (.38) p=.366	.2465 (.37) p=.072	.0521 (.38) p=.382	-.19.2 (.38) p=.224	.0278 (.38) p=.434	.2492 (.38) p=.186	.1533 (.38) p=.379	-.2147 (.38) p=.296	-.5673 (.38) p=.364	-.5285 (.38) p=.432

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
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 The first half of this appendix contains correlations with predictor variables for DSM-III / III-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix P continued

	Nightmares	Social withdrawal	Sexual interest	Depression	Impaired concentration	Impaired memory	Absent-minded	Anxiety	Irritability	Hypersens to light	Hypersens to sound	Headache	Dizziness	Fatigue
	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up
WALS-R I (I)	-.2483 (.26) p=.111	-.3192 (.26) p=.056	-.0952 (.26) p=.322	-.1970 (.26) p=.167	.0607 (.26) p=.384	-.0910 (.25) p=.353	.1748 (.26) p=.197	-.0051 (.26) p=.490	-.0482 (.26) p=.407	-.1472 (.26) p=.236	.0725 (.26) p=.362	-.0265 (.26) p=.445	-.1433 (.26) p=.243	-.0914 (.26) p=.315
WALS-R C (I)	-.3097 (.26) p=.062	-.3584 (.26) p=.016	-.0943 (.26) p=.320	-.1301 (.26) p=.263	.0652 (.26) p=.376	-.0556 (.25) p=.414	-.0299 (.26) p=.442	-.0722 (.26) p=.363	-.0802 (.26) p=.348	-.1869 (.26) p=.180	.1005 (.26) p=.313	-.2343 (.26) p=.123	-.2476 (.26) p=.111	-.1048 (.26) p=.302
WALS-R A (I)	-.1043 (.26) p=.306	-.3219 (.26) p=.054	-.1204 (.26) p=.275	-.1809 (.26) p=.188	-.2334 (.26) p=.126	-.2175 (.25) p=.196	-.2357 (.26) p=.086	-.0237 (.26) p=.454	-.3343 (.26) p=.086	-.2359 (.26) p=.086	-.0660 (.26) p=.374	-.0346 (.26) p=.433	-.2959 (.26) p=.071	-.3145 (.26) p=.059
WALS-R B (I)	-.2435 (.26) p=.095	-.4489 (.26) p=.011	-.1409 (.26) p=.246	-.1063 (.26) p=.303	.1124 (.26) p=.292	-.1143 (.25) p=.293	.0591 (.26) p=.387	.0408 (.26) p=.347	-.1437 (.26) p=.212	-.0820 (.26) p=.345	.1373 (.26) p=.252	-.1419 (.26) p=.245	-.2128 (.26) p=.148	-.1005 (.26) p=.313
WALS-R DS (I)	.0584 (.26) p=.308	-.2737 (.26) p=.096	-.2056 (.26) p=.157	-.1034 (.26) p=.308	-.2360 (.26) p=.123	-.2040 (.25) p=.159	-.2823 (.26) p=.074	.0590 (.26) p=.397	-.3829 (.26) p=.027	-.0532 (.26) p=.398	-.0127 (.26) p=.475	-.1473 (.26) p=.207	-.3322 (.26) p=.049	-.0904 (.26) p=.313
WALS-R V (I)	-.3788 (.26) p=.050	-.1947 (.26) p=.170	-.0437 (.26) p=.416	-.0011 (.26) p=.498	-.0351 (.26) p=.432	-.1487 (.25) p=.239	.0553 (.26) p=.394	.1754 (.26) p=.196	-.0816 (.26) p=.346	-.0779 (.26) p=.353	.2431 (.26) p=.116	.1872 (.26) p=.180	-.0825 (.26) p=.344	-.0049 (.26) p=.491
WALS-R PC (I)	.0018 (.26) p=.487	-.3856 (.26) p=.026	.2369 (.26) p=.122	-.1390 (.26) p=.249	.3782 (.26) p=.028	.1398 (.25) p=.253	.2770 (.26) p=.085	.1677 (.26) p=.206	.0958 (.26) p=.321	.0613 (.26) p=.383	-.1321 (.26) p=.229	.0571 (.26) p=.486	.0597 (.26) p=.366	.0798 (.26) p=.349
WALS-R MD (I)	-.0889 (.26) p=.333	-.2203 (.26) p=.140	.0857 (.26) p=.339	-.0723 (.26) p=.363	.0829 (.26) p=.326	-.0128 (.25) p=.476	.1294 (.26) p=.264	.1263 (.26) p=.269	-.0335 (.26) p=.435	.0832 (.26) p=.339	-.0075 (.26) p=.486	.0434 (.26) p=.417	-.0719 (.26) p=.364	.0785 (.26) p=.352
WALS-R PB (I)	-.1709 (.26) p=.202	-.3919 (.26) p=.024	.0035 (.26) p=.493	.0704 (.26) p=.366	.1126 (.26) p=.292	-.1180 (.25) p=.207	.1592 (.26) p=.298	.3448 (.26) p=.033	.0466 (.26) p=.411	.1570 (.26) p=.222	.0914 (.26) p=.329	.3610 (.26) p=.035	-.1223 (.26) p=.276	.1049 (.26) p=.375
WALS-R GA (I)	-.2446 (.26) p=.094	-.2779 (.26) p=.085	.2065 (.26) p=.156	-.1477 (.26) p=.236	.0916 (.26) p=.328	-.0423 (.25) p=.384	.1427 (.26) p=.243	-.0683 (.26) p=.370	-.2037 (.26) p=.159	.0820 (.26) p=.345	-.0507 (.26) p=.403	-.1318 (.26) p=.260	-.0872 (.26) p=.336	-.0087 (.26) p=.483
WALS-R DP (I)	.1177 (.26) p=.283	-.4256 (.26) p=.015	-.1040 (.26) p=.363	-.2245 (.26) p=.133	-.0317 (.26) p=.438	-.2275 (.25) p=.137	-.0824 (.26) p=.344	.3269 (.26) p=.052	-.1775 (.26) p=.193	.0015 (.26) p=.487	-.1291 (.26) p=.265	.1540 (.26) p=.226	.0113 (.26) p=.478	.0189 (.26) p=.464
WALS-R VIG (I)	-.2195 (.26) p=.141	-.3780 (.26) p=.031	-.1188 (.26) p=.282	-.0520 (.26) p=.400	-.0494 (.26) p=.405	-.1137 (.25) p=.294	-.0313 (.26) p=.440	.0024 (.26) p=.495	-.0893 (.26) p=.332	-.1941 (.26) p=.171	-.0293 (.26) p=.443	.0515 (.26) p=.401	-.3632 (.26) p=.034	-.0771 (.26) p=.354
WALS-R PIG (I)	-.0392 (.26) p=.424	-.3233 (.26) p=.054	.1435 (.26) p=.242	-.1199 (.26) p=.280	.1942 (.26) p=.171	-.0407 (.25) p=.409	.1560 (.26) p=.223	.2612 (.26) p=.099	-.0537 (.26) p=.493	.1070 (.26) p=.301	-.1111 (.26) p=.295	.0825 (.26) p=.344	.0114 (.26) p=.478	.1436 (.26) p=.242
WALS-R IO (I)	-.1332 (.26) p=.258	-.3618 (.26) p=.035	-.0604 (.26) p=.385	-.0841 (.26) p=.341	.0611 (.26) p=.383	-.0862 (.25) p=.341	.0732 (.26) p=.361	.1267 (.26) p=.312	-.2496 (.26) p=.025	-.0617 (.26) p=.382	-.0502 (.26) p=.424	.0378 (.26) p=.427	-.2144 (.26) p=.146	.0259 (.26) p=.452

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.
 The first half of this appendix contains correlations with predictor variables for DSM-III/III-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no subsample collected data.

Appendix P continued

	Height- males	Social with- drawal	Sexual dis- interest	Depres- sion	Impaired concer- tation	Impaired Memory	Assess- ment minded	Anxiety	Self- ability	Hypersens- itivity	Headache	Dizziness	Fatigue
	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up	Follow-up
DSM-IV	-.0920 (.29) p=.315	-.3336 (.29) p=.226	-.5081 (.29) p=.022	-.3511 (.29) p=.026	-.4766 (.29) p=.023	-.5549 (.29) p=.001	-.5682 (.29) p=.005	-.3247 (.29) p=.037	-.3823 (.29) p=.017	-.3326 (.29) p=.034	-.2455 (.29) p=.024	-.2714 (.29) p=.031	-.3732 (.29) p=.019
DSM-IV	-.1061 (.29) p=.282	-.1941 (.29) p=.156	-.2388 (.29) p=.156	-.3071 (.29) p=.055	-.2273 (.29) p=.118	-.1718 (.29) p=.191	-.2577 (.29) p=.089	-.3151 (.29) p=.140	-.1283 (.29) p=.254	-.2219 (.29) p=.435	-.2362 (.29) p=.426	-.1394 (.29) p=.235	-.3124 (.29) p=.044
DSM-IV	-.3626 (.29) p=.027	-.2178 (.29) p=.113	-.2324 (.29) p=.113	-.0230 (.29) p=.455	-.0524 (.29) p=.438	-.0459 (.29) p=.469	-.1132 (.29) p=.279	-.2519 (.29) p=.044	-.0492 (.29) p=.400	-.1387 (.29) p=.235	-.2175 (.29) p=.178	-.1452 (.29) p=.226	-.2433 (.29) p=.102
DSM-IV	-.2160 (.29) p=.130	-.2038 (.29) p=.144	-.1586 (.29) p=.206	-.3775 (.29) p=.022	-.0499 (.29) p=.359	-.3971 (.29) p=.016	-.3265 (.29) p=.037	-.0338 (.29) p=.214	-.1174 (.29) p=.272	-.1397 (.29) p=.149	-.0371 (.29) p=.424	-.0714 (.29) p=.356	-.1719 (.29) p=.186
DSM-IV	-.2787 (.29) p=.072	-.1925 (.29) p=.159	-.0805 (.29) p=.359	-.2161 (.29) p=.130	-.3515 (.29) p=.028	-.2778 (.29) p=.122	-.1325 (.29) p=.247	-.0185 (.29) p=.460	-.1236 (.29) p=.236	-.1678 (.29) p=.182	-.1238 (.29) p=.261	-.2428 (.29) p=.102	-.1379 (.29) p=.238
DSM-IV	-.2433 (.29) p=.102	-.2836 (.29) p=.068	-.1583 (.29) p=.206	-.2621 (.29) p=.035	-.7643 (.29) p=.000	-.6332 (.29) p=.000	-.4360 (.29) p=.011	-.3253 (.29) p=.120	-.4800 (.29) p=.004	-.0234 (.29) p=.321	-.3576 (.29) p=.089	-.2770 (.29) p=.073	-.4189 (.29) p=.012
DSM-IV	-.4632 (.29) p=.005	-.1427 (.29) p=.200	-.0942 (.29) p=.310	-.1573 (.29) p=.208	-.3713 (.29) p=.024	-.1210 (.29) p=.270	-.0187 (.29) p=.462	-.0836 (.29) p=.315	-.0337 (.29) p=.431	-.0616 (.29) p=.375	-.3152 (.29) p=.048	-.2690 (.29) p=.079	-.1772 (.29) p=.179
DSM-IV	-.2022 (.29) p=.146	-.0089 (.29) p=.231	-.1421 (.29) p=.013	-.1896 (.29) p=.150	-.0302 (.29) p=.438	-.0656 (.29) p=.370	-.1789 (.29) p=.177	-.3316 (.29) p=.039	-.0194 (.29) p=.460	-.0854 (.29) p=.330	-.1483 (.29) p=.221	-.2178 (.29) p=.128	-.0873 (.29) p=.308
DSM-IV	-.2710 (.29) p=.073	-.2183 (.29) p=.128	-.4123 (.29) p=.013	-.3185 (.29) p=.036	-.1687 (.29) p=.221	-.1977 (.29) p=.157	-.2602 (.29) p=.086	-.1756 (.29) p=.181	-.0574 (.29) p=.485	-.1791 (.29) p=.176	-.0298 (.29) p=.439	-.0181 (.29) p=.463	-.1822 (.29) p=.175
DSM-IV	-.3518 (.29) p=.092	-.2808 (.29) p=.070	-.0838 (.29) p=.335	-.0807 (.29) p=.320	-.0144 (.29) p=.471	-.0905 (.29) p=.324	-.1876 (.29) p=.165	-.1747 (.29) p=.182	-.4288 (.29) p=.010	-.3381 (.29) p=.036	-.0194 (.29) p=.460	-.1654 (.29) p=.196	-.1183 (.29) p=.271
DSM-IV	-.3080 (.29) p=.053	-.1529 (.29) p=.214	-.2131 (.29) p=.110	-.2351 (.29) p=.037	-.3043 (.29) p=.054	-.3241 (.29) p=.046	-.2031 (.29) p=.145	-.0787 (.29) p=.342	-.3464 (.29) p=.033	-.0286 (.29) p=.462	-.0382 (.29) p=.422	-.0800 (.29) p=.321	-.2407 (.29) p=.086
DSM-IV	-.3167 (.29) p=.047	-.1822 (.29) p=.132	-.1758 (.29) p=.181	-.0814 (.29) p=.337	-.2009 (.29) p=.148	-.3413 (.29) p=.038	-.1270 (.29) p=.256	-.1545 (.29) p=.212	-.2140 (.29) p=.132	-.0817 (.29) p=.318	-.3031 (.29) p=.055	-.0655 (.29) p=.368	-.1980 (.29) p=.152
DSM-IV	-.0981 (.29) p=.306	-.1664 (.29) p=.167	-.2484 (.29) p=.080	-.0711 (.29) p=.357	-.2185 (.29) p=.127	-.0299 (.29) p=.440	-.2004 (.29) p=.149	-.0052 (.29) p=.489	-.2029 (.29) p=.146	-.3638 (.29) p=.026	-.0316 (.29) p=.395	-.0385 (.29) p=.382	-.0107 (.29) p=.478
DSM-IV	-.1158 (.29) p=.275	-.3383 (.29) p=.036	-.2045 (.29) p=.144	-.3146 (.29) p=.038	-.3673 (.29) p=.025	-.3771 (.29) p=.024	-.3071 (.29) p=.053	-.0899 (.29) p=.303	-.4119 (.29) p=.013	-.1131 (.29) p=.280	-.0273 (.29) p=.444	-.1134 (.29) p=.279	-.2170 (.29) p=.129
DSM-IV	-.2120 (.29) p=.135	-.4554 (.29) p=.007	-.1327 (.29) p=.246	-.3158 (.29) p=.037	-.1890 (.29) p=.163	-.4849 (.29) p=.004	-.2802 (.29) p=.063	-.1271 (.29) p=.256	-.4200 (.29) p=.012	-.0658 (.29) p=.367	-.1162 (.29) p=.274	-.2029 (.29) p=.146	-.2346 (.29) p=.110

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below is the significance level.
 This first half of the appendix contains correlations with predictor variables for DSM-IV / III-R symptoms; the second half contains correlations for alternative criterion symptoms.
 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix Q

Pearson Correlation Coefficients Between Diagnostic Criteria and Predictor Variables

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
ANOS (I)	.0498 (60) P= .353	.2935 (36) P= .041	-.0510 (60) P= .349	.2879 (37) P= .042	.3299 (60) P= .005	.2989 (60) P= .010	.3025 (60) P= .009	.2497 (60) P= .027
ANOS L(I)	-.1536 (59) P= .123	-.1243 (36) P= .235	-.0821 (59) P= .268	-.2158 (37) P= .100	.0513 (59) P= .350	.0168 (59) P= .450	-.0171 (59) P= .449	-.0609 (59) P= .323
ANOS F(I)	-.0966 (59) P= .233	-.0511 (36) P= .384	.0503 (59) P= .352	-.0044 (37) P= .490	.2066 (59) P= .058	.2052 (59) P= .059	.1433 (59) P= .139	.0564 (59) P= .336
ANOS K(I)	.2376 (59) P= .035	.2708 (36) P= .055	.1331 (59) P= .157	-.0814 (37) P= .316	-.1584 (59) P= .115	-.2257 (59) P= .043	-.2076 (59) P= .057	-.0860 (59) P= .259
ANOS Ho(I)	-.0257 (59) P= .423	-.0203 (36) P= .453	-.0408 (59) P= .379	-.0670 (37) P= .347	.3614 (59) P= .002	.3545 (59) P= .003	.3507 (59) P= .003	.1712 (59) P= .097
ANOS D(I)	.1507 (59) P= .127	.1121 (36) P= .258	.0461 (59) P= .364	.0267 (37) P= .438	.2624 (59) P= .022	.0074 (59) P= .478	.1123 (59) P= .199	.0500 (59) P= .353
ANOS Hy(I)	.1936 (59) P= .071	.2066 (36) P= .113	.1226 (59) P= .177	.0984 (37) P= .281	.3142 (59) P= .008	.2181 (59) P= .049	.2612 (59) P= .023	.2384 (59) P= .034
ANOS Pd(I)	.0614 (59) P= .322	.1241 (36) P= .235	.0493 (59) P= .355	-.0685 (37) P= .344	.0103 (59) P= .469	-.0576 (59) P= .332	-.0643 (59) P= .314	-.1238 (59) P= .175
ANOS ME(I)	-.1214 (59) P= .180	.0398 (36) P= .409	-.1866 (59) P= .079	-.1873 (37) P= .133	-.0078 (59) P= .477	-.0735 (59) P= .290	-.1284 (59) P= .166	-.1489 (59) P= .130
ANOS Pa(I)	-.0209 (59) P= .437	-.0884 (36) P= .304	.0764 (59) P= .283	.0230 (37) P= .446	.1972 (59) P= .067	.2444 (59) P= .031	.2445 (59) P= .031	.0967 (59) P= .233
ANOS Pt(I)	.0408 (59) P= .379	.0479 (36) P= .391	.0533 (59) P= .344	-.0048 (37) P= .489	.2728 (59) P= .018	.1601 (59) P= .113	.0994 (59) P= .227	.0725 (59) P= .293
ANOS Ho(I)	-.0282 (59) P= .416	-.0497 (36) P= .387	.1032 (59) P= .218	.0237 (37) P= .445	.3032 (59) P= .010	.2917 (59) P= .012	.2314 (59) P= .039	.1666 (59) P= .104
ANOS Ma(I)	-.1702 (59) P= .099	-.0302 (36) P= .431	.0391 (59) P= .384	.1235 (37) P= .233	.3831 (59) P= .001	.3513 (59) P= .003	.3202 (59) P= .007	.1773 (59) P= .090
ANOS Si(I)	-.0212 (59) P= .437	-.1483 (36) P= .194	-.0922 (59) P= .244	-.0312 (37) P= .427	.1823 (59) P= .084	.1429 (59) P= .140	.1117 (59) P= .200	-.0277 (59) P= .418
ANOS PTS(I)	-.1961 (59) P= .066	-.1818 (36) P= .144	-.0007 (59) P= .498	.0517 (37) P= .380	.3424 (59) P= .004	.3395 (59) P= .004	.2956 (59) P= .012	.1209 (59) P= .181

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
Age	-.0560 (60) P= .335	-.2374 (36) P= .082	-.1373 (60) P= .148	-.2866 (37) P= .043	-.0373 (60) P= .388	.0464 (60) P= .362	.0140 (60) P= .458	-.2038 (60) P= .059
Sex	.2357 (60) P= .035	.1048 (36) P= .271	.0632 (60) P= .316	.1682 (37) P= .160	.0884 (60) P= .251	.1581 (60) P= .114	.1430 (60) P= .138	.2630 (60) P= .021
SIS	-.0209 (60) P= .437	-.0226 (36) P= .448	-.0772 (60) P= .279	-.1499 (37) P= .188	-.1908 (60) P= .072	-.1229 (60) P= .175	-.1348 (60) P= .152	-.1538 (60) P= .120
Recent Events	-.0007 (60) P= .498	.1107 (36) P= .260	.1417 (60) P= .140	.3338 (37) P= .022	.4726 (60) P= .000	.3169 (60) P= .007	.3264 (60) P= .005	.4191 (60) P= .000
Psych. Rx	-.0674 (60) P= .304	-.0705 (36) P= .342	.1762 (60) P= .089	.3502 (37) P= .017	.4046 (60) P= .001	.2619 (60) P= .022	.3675 (60) P= .002	.3114 (60) P= .008
Severity	-.0695 (60) P= .299	.1094 (36) P= .263	.0373 (60) P= .389	.1866 (37) P= .134	.0000 (60) P= .500	-.1306 (60) P= .160	-.0928 (60) P= .240	.1339 (60) P= .154
GCS at Admit.	.0570 (60) P= .333	-.1214 (36) P= .240	-.0045 (60) P= .486	-.1191 (37) P= .241	-.1282 (60) P= .165	.0360 (60) P= .393	.0472 (60) P= .360	-.1461 (60) P= .133
Resp. Duration	.1418 (60) P= .140	.3395 (36) P= .021	.1099 (60) P= .202	.2343 (37) P= .081	.0532 (60) P= .343	-.0438 (60) P= .370	-.0916 (60) P= .243	.2044 (60) P= .059
Imp. Conseq.	.0361 (60) P= .392	.3469 (36) P= .019	.0441 (60) P= .369	.2511 (37) P= .067	-.0558 (60) P= .336	-.1796 (60) P= .085	-.1886 (60) P= .074	.1404 (60) P= .142
Hematoma	.1606 (60) P= .110	.0180 (36) P= .458	.1502 (60) P= .126	-.0167 (37) P= .461	-.0146 (60) P= .456	.0326 (60) P= .402	-.0006 (60) P= .498	.0469 (60) P= .361
Skull Fract.	-.1925 (60) P= .070	-.1754 (36) P= .153	-.0516 (60) P= .348	-.0710 (37) P= .338	-.1925 (60) P= .070	-.1549 (60) P= .119	-.0234 (60) P= .430	-.0195 (60) P= .441
Imp. Index	-.0163 (60) P= .451	-.0622 (36) P= .359	.0346 (60) P= .396	.0342 (37) P= .420	.0221 (60) P= .432	.0361 (60) P= .392	.0978 (60) P= .229	-.0165 (60) P= .450

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
TPT Time(X)	-.1580 (55) P= .125	-.0695 (34) P= .348	-.1057 (55) P= .221	.1012 (35) P= .282	-.0854 (55) P= .484	.1175 (55) P= .196	.0498 (55) P= .359	.0763 (55) P= .290
TPT Mem(X)	-.0087 (56) P= .475	.1068 (34) P= .274	-.0248 (56) P= .428	.0595 (35) P= .367	.0081 (56) P= .476	-.0534 (56) P= .348	-.0557 (56) P= .347	.1073 (56) P= .216
TPT Loc(X)	.0219 (56) P= .436	.0608 (34) P= .366	-.0455 (56) P= .370	-.0949 (35) P= .294	-.0146 (56) P= .458	-.0221 (56) P= .436	-.0608 (56) P= .328	-.0383 (56) P= .390
Finger Tap(X)	.1221 (56) P= .185	.2812 (34) P= .054	.1321 (56) P= .166	.3299 (35) P= .026	-.0688 (56) P= .307	.0716 (56) P= .300	.1181 (56) P= .193	.0701 (56) P= .304
Speech Para(X)	-.1769 (60) P= .088	-.2794 (36) P= .049	.0151 (60) P= .454	-.1410 (37) P= .203	-.0430 (60) P= .372	-.0425 (60) P= .377	-.0359 (60) P= .393	-.2018 (60) P= .061
Rhythm(X)	.0453 (60) P= .366	-.0178 (36) P= .459	.0607 (60) P= .322	.0903 (37) P= .297	-.0453 (60) P= .366	-.0202 (60) P= .439	.0348 (60) P= .396	.0434 (60) P= .371
Sens. Defia(X)	.0597 (57) P= .330	-.0813 (35) P= .221	-.0168 (57) P= .451	.0422 (36) P= .403	.1971 (57) P= .071	.3069 (57) P= .010	.2470 (57) P= .032	.0566 (57) P= .338
Aph. Spat(X)	-.1545 (59) P= .121	-.2025 (36) P= .118	-.0613 (59) P= .322	-.0548 (37) P= .374	.0617 (59) P= .321	.0483 (59) P= .358	.1362 (59) P= .152	-.0035 (59) P= .489
Trail Making(X)	-.1600 (60) P= .111	-.1690 (36) P= .162	-.0548 (60) P= .339	-.0824 (37) P= .314	-.0736 (60) P= .288	-.0360 (60) P= .392	-.0058 (60) P= .482	-.0006 (60) P= .498

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
WAIS-R I(X)	.1432 (41) P= .186	.1232 (25) P= .279	.0206 (41) P= .449	-.0131 (26) P= .475	-.2918 (41) P= .032	-.1039 (41) P= .259	-.1386 (41) P= .194	-.1138 (41) P= .239
WAIS-R C(X)	.1910 (41) P= .116	.2189 (25) P= .147	.1349 (41) P= .220	.2004 (26) P= .163	-.1090 (41) P= .249	-.0498 (41) P= .379	-.0334 (41) P= .418	.2067 (41) P= .097
WAIS-R A(X)	.1635 (41) P= .153	.0303 (25) P= .443	.0467 (41) P= .386	-.1308 (26) P= .262	-.3523 (41) P= .012	-.3523 (41) P= .012	-.3471 (41) P= .013	-.2789 (41) P= .039
WAIS-R S(X)	.2477 (41) P= .059	.1186 (25) P= .286	.2084 (41) P= .096	.0471 (26) P= .410	-.1571 (41) P= .165	-.2033 (41) P= .101	-.2346 (41) P= .070	.0325 (41) P= .420
WAIS-R DS(X)	.1518 (41) P= .172	-.0658 (25) P= .377	.0691 (41) P= .334	-.3812 (26) P= .027	-.3403 (41) P= .015	-.4246 (41) P= .003	-.4197 (41) P= .003	-.4029 (41) P= .005
WAIS-R V(X)	.0861 (41) P= .296	-.0792 (25) P= .353	-.1297 (41) P= .209	-.1663 (26) P= .208	-.1596 (41) P= .159	-.0167 (41) P= .459	-.0503 (41) P= .377	-.1548 (41) P= .167
WAIS-R PC(X)	.1076 (41) P= .252	.1600 (25) P= .222	.2175 (41) P= .086	.2450 (26) P= .114	-.1479 (41) P= .178	-.0526 (41) P= .372	.0179 (41) P= .456	.1340 (41) P= .202
WAIS-R BD(X)	.1099 (41) P= .247	.1077 (25) P= .304	.2354 (41) P= .069	.1329 (26) P= .259	-.0232 (41) P= .443	.0539 (41) P= .369	.0789 (41) P= .312	.1467 (41) P= .180
WAIS-R PA(X)	.4167 (41) P= .003	.1815 (25) P= .193	.3602 (41) P= .010	.1553 (26) P= .224	-.0374 (41) P= .408	.1097 (41) P= .247	.1258 (41) P= .217	.2665 (41) P= .046
WAIS-R OA(X)	.0727 (41) P= .326	.0072 (25) P= .486	.1731 (41) P= .140	.0766 (26) P= .355	-.0013 (41) P= .497	.0245 (41) P= .440	.1035 (41) P= .260	.0906 (41) P= .287
WAIS-R DSY(X)	.0165 (41) P= .459	-.1842 (25) P= .189	-.0216 (41) P= .447	-.3659 (26) P= .033	-.1634 (41) P= .154	-.1052 (41) P= .256	-.1276 (41) P= .213	-.1358 (41) P= .199
WAIS-R VIQ(X)	.2009 (41) P= .104	.0925 (25) P= .330	.1025 (41) P= .262	-.0755 (26) P= .357	-.3127 (41) P= .023	-.2442 (41) P= .062	-.2459 (41) P= .061	-.1422 (41) P= .188
WAIS-R PIQ(X)	.1450 (41) P= .183	-.0047 (25) P= .491	.1823 (41) P= .127	-.0342 (26) P= .434	-.0867 (41) P= .295	.0260 (41) P= .436	.0498 (41) P= .379	.0503 (41) P= .377
WAIS-R IQ(X)	.1805 (41) P= .129	.0389 (25) P= .427	.1498 (41) P= .175	-.0954 (26) P= .322	-.2188 (41) P= .085	-.1263 (41) P= .216	-.1393 (41) P= .193	-.0804 (41) P= .309

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
ANOS (F)	.1236 (31) P= .254	.2670 (29) P= .081	.1069 (31) P= .284	.4543 (29) P= .007	.1321 (31) P= .239	.2059 (31) P= .133	.2931 (31) P= .055	.5465 (31) P= .001
MDI L(F)	-.0373 (29) P= .424	-.0759 (27) P= .353	-.0954 (29) P= .311	-.2172 (27) P= .138	-.0439 (29) P= .411	-.0723 (29) P= .355	-.0454 (29) P= .311	-.2248 (29) P= .121
MDI L(F)	-.0768 (29) P= .346	-.1553 (27) P= .220	-.1471 (29) P= .223	-.2728 (27) P= .084	-.2157 (29) P= .131	-.2185 (29) P= .127	-.2275 (29) P= .118	-.3335 (29) P= .039
MDI E(F)	.0706 (29) P= .358	.0000 (27) P= .500	.1415 (29) P= .232	-.1987 (27) P= .160	-.0493 (29) P= .400	-.1496 (29) P= .219	-.1794 (29) P= .176	-.2452 (29) P= .100
MDI NS(F)	.2237 (29) P= .122	.1569 (27) P= .214	.2013 (29) P= .148	-.0285 (27) P= .444	-.0289 (29) P= .441	-.0523 (29) P= .394	-.0712 (29) P= .357	-.0271 (29) P= .445
MDI D(F)	.2086 (29) P= .139	.1833 (27) P= .180	.0299 (29) P= .435	.2013 (27) P= .157	-.0021 (29) P= .496	.0099 (29) P= .480	.0299 (29) P= .439	.2358 (29) P= .109
MDI Hy(F)	.2521 (29) P= .094	.2758 (27) P= .082	.2727 (29) P= .076	.0390 (27) P= .423	-.0472 (29) P= .404	-.0647 (29) P= .369	-.1004 (29) P= .302	.0376 (29) P= .423
MDI P4(F)	-.0579 (29) P= .383	.1268 (27) P= .264	-.0456 (29) P= .407	-.1103 (27) P= .292	-.2961 (29) P= .059	-.4415 (29) P= .008	-.4098 (29) P= .014	-.2516 (29) P= .094
MDI M2(F)	-.3918 (29) P= .018	-.0327 (27) P= .436	-.3363 (29) P= .037	-.2401 (27) P= .114	-.2799 (29) P= .071	-.4131 (29) P= .013	-.3926 (29) P= .018	-.3107 (29) P= .050
MDI Pa(F)	-.0429 (29) P= .413	-.0958 (27) P= .317	-.0641 (29) P= .371	-.0996 (27) P= .311	-.2190 (29) P= .127	-.2272 (29) P= .118	-.1997 (29) P= .149	-.0987 (29) P= .305
MDI Pt(F)	.2251 (29) P= .120	.0902 (27) P= .327	.0876 (29) P= .326	-.1326 (27) P= .255	.0457 (29) P= .407	.0628 (29) P= .373	-.1582 (29) P= .206	-.0816 (29) P= .333
MDI No(F)	-.0105 (29) P= .479	.0617 (27) P= .380	-.0222 (29) P= .454	-.1154 (27) P= .283	-.1029 (29) P= .298	-.1453 (29) P= .226	-.2107 (29) P= .136	-.1087 (29) P= .287
MDI Ma(F)	-.3233 (29) P= .044	-.0892 (27) P= .329	-.2395 (29) P= .105	-.1649 (27) P= .206	.0926 (29) P= .316	.0658 (29) P= .367	.0482 (29) P= .402	-.0776 (29) P= .345
MDI SL(F)	.2121 (29) P= .135	-.0428 (27) P= .416	.0603 (29) P= .378	.1242 (27) P= .269	.1898 (29) P= .162	.3359 (29) P= .037	.2134 (29) P= .133	.2111 (29) P= .136
MDI P75(F)	-.1923 (29) P= .159	-.0206 (27) P= .459	-.2708 (29) P= .078	.1263 (27) P= .265	-.0258 (29) P= .447	.0903 (29) P= .321	.0952 (29) P= .312	.1329 (29) P= .246

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Initial	DSMIII(2) Initial	DSMIII(3) Initial	DSMIII(4) Initial	BRAV(2) Initial	LIDVALL(1) Initial	LIDVALL(2) Initial	ANY CRITERIA Initial
Category (F)	-.1483 (26) P= .235	-.1982 (23) P= .182	-.1936 (26) P= .177	-.1360 (24) P= .263	-.0622 (26) P= .381	.1126 (26) P= .292	.1126 (26) P= .292	-.1494 (26) P= .233
TVT Time(F)	.2122 (30) P= .130	-.0584 (28) P= .384	.2520 (30) P= .090	-.0029 (28) P= .494	.0855 (30) P= .327	.0855 (30) P= .327	.0454 (30) P= .406	-.0268 (30) P= .444
TVT Mem(F)	-.0721 (30) P= .352	.1914 (28) P= .163	.0138 (30) P= .471	.2075 (28) P= .145	.0825 (30) P= .332	.0825 (30) P= .332	.1122 (30) P= .278	.2096 (30) P= .133
TVT Loc(F)	-.0077 (30) P= .484	.0764 (28) P= .350	.1236 (30) P= .258	.0908 (28) P= .323	.3319 (30) P= .034	.3379 (30) P= .034	.2508 (30) P= .091	.1100 (30) P= .281
Finger Tap(F)	-.0407 (31) P= .414	-.0073 (28) P= .485	-.0694 (31) P= .355	-.0319 (29) P= .435	-.0580 (31) P= .378	-.0974 (31) P= .301	-.0172 (31) P= .463	-.0812 (31) P= .332
Speech Para(F)	-.1958 (31) P= .146	-.1220 (29) P= .264	.0519 (31) P= .391	-.0565 (29) P= .385	.0111 (31) P= .476	.0131 (31) P= .472	-.0221 (31) P= .453	-.1265 (31) P= .249
Rhythm(F)	-.1407 (31) P= .225	-.1428 (29) P= .230	-.0586 (31) P= .377	-.0759 (29) P= .348	-.0115 (31) P= .476	-.0230 (31) P= .451	.0452 (31) P= .405	-.1259 (31) P= .250
Sens. Defic(F)	-.0091 (30) P= .481	-.1177 (28) P= .275	.1104 (30) P= .281	-.0873 (28) P= .329	.2652 (30) P= .078	.1775 (30) P= .174	.1104 (30) P= .281	-.1344 (30) P= .239
Aph. Spat(F)	-.1839 (30) P= .165	-.2145 (28) P= .137	-.1410 (30) P= .229	-.2626 (28) P= .089	.2102 (30) P= .132	.1314 (30) P= .244	.0705 (30) P= .356	-.1287 (30) P= .249
Trail Making(F)	.0134 (34) P= .470	.0370 (30) P= .423	.1136 (34) P= .261	.0076 (31) P= .484	.0761 (34) P= .334	-.0280 (34) P= .437	.0011 (34) P= .498	.1324 (34) P= .228

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
ANCHER (I)	.1914 (46) P= .101	.3274 (35) P= .027	.1978 (46) P= .094	.4076 (35) P= .008	.1662 (46) P= .135	.1316 (46) P= .192	.0174 (46) P= .454	.2946 (46) P= .023
MDPI L(I)	.1157 (46) P= .222	-.0583 (35) P= .370	.0251 (46) P= .434	-.1601 (35) P= .179	.0244 (46) P= .436	-.0232 (46) P= .439	-.1888 (46) P= .104	-.0981 (46) P= .258
MDPI F(I)	-.1486 (46) P= .162	-.0619 (35) P= .362	-.1877 (46) P= .106	-.2407 (35) P= .082	-.1831 (46) P= .112	-.1881 (46) P= .105	-.0634 (46) P= .338	-.2131 (46) P= .078
MDPI K(I)	.3308 (46) P= .012	.3085 (35) P= .036	.2351 (46) P= .058	.1174 (35) P= .251	-.0733 (46) P= .314	.1070 (46) P= .240	-.0602 (46) P= .346	.0964 (46) P= .262
MDPI Ma(I)	.0683 (46) P= .326	.0310 (35) P= .430	-.0520 (46) P= .366	-.0347 (35) P= .421	-.0876 (46) P= .281	-.0935 (46) P= .268	-.1018 (46) P= .250	.0107 (46) P= .412
MDPI D(I)	.1338 (46) P= .188	.1074 (35) P= .270	-.0016 (46) P= .496	.0514 (35) P= .385	-.0011 (46) P= .497	-.1216 (46) P= .210	-.1952 (46) P= .097	.0144 (46) P= .462
MDPI Ny(I)	.1945 (46) P= .098	.2058 (35) P= .118	.1443 (46) P= .169	.1705 (35) P= .164	-.0251 (46) P= .434	-.1402 (46) P= .176	-.1641 (46) P= .138	.1164 (46) P= .221
MDPI Pd(I)	-.0516 (46) P= .367	.0875 (35) P= .309	-.0593 (46) P= .348	-.1021 (35) P= .280	-.2828 (46) P= .028	-.3445 (46) P= .010	-.3706 (46) P= .006	-.1904 (46) P= .102
MDPI Mf(I)	-.0810 (46) P= .296	.0982 (35) P= .287	-.0652 (46) P= .333	-.0761 (35) P= .332	-.2112 (46) P= .079	-.3380 (46) P= .011	-.1918 (46) P= .101	-.1690 (46) P= .131
MDPI Pa(I)	-.1582 (46) P= .147	-.0794 (35) P= .325	-.1295 (46) P= .196	-.0858 (35) P= .312	-.1689 (46) P= .131	-.0281 (46) P= .426	-.0049 (46) P= .487	-.0992 (46) P= .256
MDPI Pt(I)	.0371 (46) P= .403	.0355 (35) P= .420	-.0361 (46) P= .406	-.0690 (35) P= .347	-.1556 (46) P= .151	-.0977 (46) P= .259	-.1591 (46) P= .145	-.1100 (46) P= .233
MDPI So(I)	-.1350 (46) P= .186	-.0398 (35) P= .410	-.1084 (46) P= .237	-.1436 (35) P= .205	-.2026 (46) P= .088	-.0966 (46) P= .261	-.1308 (46) P= .193	-.1747 (46) P= .123
MDPI Ma(I)	-.2632 (46) P= .039	.0048 (35) P= .489	-.1357 (46) P= .184	-.0440 (35) P= .401	-.0670 (46) P= .329	-.1282 (46) P= .198	-.0512 (46) P= .368	-.0589 (46) P= .149
MDPI Si(I)	.0195 (46) P= .449	-.2189 (35) P= .103	-.0138 (46) P= .464	-.1246 (35) P= .238	.1172 (46) P= .219	.0748 (46) P= .311	.0998 (46) P= .255	-.0654 (46) P= .333
MDPI PPS(I)	-.2673 (46) P= .036	-.1981 (35) P= .127	-.2783 (46) P= .031	-.2372 (35) P= .085	-.1935 (46) P= .099	-.1405 (46) P= .176	-.1135 (46) P= .227	-.2589 (46) P= .041

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
Age	-.0725 (46) P= .316	-.2128 (35) P= .110	-.0967 (46) P= .261	-.2235 (35) P= .098	-.0237 (46) P= .438	.1130 (46) P= .227	.0626 (46) P= .340	-.1640 (46) P= .138
Sex	.2924 (46) P= .024	.0534 (35) P= .380	.2197 (46) P= .071	.2703 (35) P= .058	.1660 (46) P= .135	.2924 (46) P= .024	.1022 (46) P= .250	.2024 (46) P= .089
SES	.0193 (46) P= .449	.0217 (35) P= .451	.0841 (46) P= .289	.0652 (35) P= .355	-.1022 (46) P= .250	.0806 (46) P= .297	.0674 (46) P= .328	.0370 (46) P= .404
Recent Events	.0524 (46) P= .365	.1089 (35) P= .267	-.0354 (46) P= .408	.1256 (35) P= .236	.0482 (46) P= .375	.0955 (46) P= .264	.0243 (46) P= .436	.0705 (46) P= .321
Psych. Hx	-.0060 (46) P= .484	-.0462 (35) P= .396	-.0606 (46) P= .345	-.0116 (35) P= .474	.0203 (46) P= .447	.0858 (46) P= .285	.0147 (46) P= .461	.0185 (46) P= .451
Severity	-.0214 (46) P= .444	.1690 (35) P= .166	-.0576 (46) P= .352	.1052 (35) P= .274	.0963 (46) P= .262	-.2007 (46) P= .091	-.0576 (46) P= .352	.1358 (46) P= .184
OCS at Admit.	.0807 (46) P= .297	-.1754 (35) P= .157	.0927 (46) P= .270	-.0542 (35) P= .379	-.0516 (46) P= .367	.1821 (46) P= .113	.0427 (46) P= .389	-.0952 (46) P= .265
Hosp. Duration	.1355 (46) P= .185	.3862 (35) P= .011	.1975 (46) P= .094	.2644 (35) P= .062	.0849 (46) P= .287	-.0286 (46) P= .425	.1020 (46) P= .250	.1374 (46) P= .181
Imp. Conseq.	.0709 (46) P= .370	.3949 (35) P= .009	.1196 (46) P= .214	.2752 (35) P= .055	.1560 (46) P= .150	-.2025 (46) P= .089	-.0390 (46) P= .399	.1752 (46) P= .122
Neurotrans	.0793 (46) P= .300	.0499 (35) P= .388	.1502 (46) P= .160	-.0281 (35) P= .436	.1999 (46) P= .091	-.0329 (46) P= .414	.1041 (46) P= .246	.1579 (46) P= .147
Skull Fract.	-.0484 (46) P= .375	-.1495 (35) P= .196	-.1420 (46) P= .173	-.1413 (35) P= .209	.0814 (46) P= .295	.1106 (46) P= .232	.1193 (46) P= .215	.1148 (46) P= .224
Imp. Index	-.0205 (46) P= .446	-.0060 (35) P= .486	-.0167 (46) P= .456	-.0220 (35) P= .450	.0421 (46) P= .391	-.1698 (46) P= .130	-.0740 (46) P= .312	.0039 (46) P= .490

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAY(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
TFT Time(I)	-.0998 (44) P= .260	-.0556 (33) P= .379	.0514 (44) P= .370	.0518 (33) P= .387	.0741 (44) P= .316	.0350 (44) P= .411	.0878 (44) P= .285	-.0346 (44) P= .412
TFT Mem(I)	.0179 (44) P= .454	.0321 (33) P= .430	-.0917 (44) P= .277	.0092 (33) P= .480	-.1236 (44) P= .212	.0352 (44) P= .410	-.0958 (44) P= .268	-.0628 (44) P= .343
TFT Lec(I)	.0516 (44) P= .370	-.0210 (33) P= .454	-.0340 (44) P= .413	-.0733 (33) P= .343	-.1553 (44) P= .157	.0585 (44) P= .353	-.1222 (44) P= .215	-.1153 (44) P= .228
Finger Tap(I)	.2259 (44) P= .070	.3133 (33) P= .038	.2592 (44) P= .045	.3426 (33) P= .025	.2696 (44) P= .038	.1387 (44) P= .185	.2403 (44) P= .058	.3320 (44) P= .014
Speech Para(I)	-.0847 (46) P= .288	-.2411 (35) P= .081	-.1743 (46) P= .123	-.3271 (35) P= .028	-.1999 (46) P= .091	-.2125 (46) P= .078	-.2373 (46) P= .056	-.2876 (46) P= .026
Rhythm(I)	-.0338 (46) P= .412	-.0674 (35) P= .350	-.0030 (46) P= .492	-.0219 (35) P= .450	.0545 (46) P= .359	-.1810 (46) P= .114	-.1584 (46) P= .147	.0104 (46) P= .471
Sens. Defic(I)	.1092 (45) P= .238	-.0110 (34) P= .475	.0366 (45) P= .406	.1068 (34) P= .274	.0720 (45) P= .319	.0581 (45) P= .352	-.0526 (45) P= .366	.0572 (45) P= .354
Aph. Spat(I)	-.2061 (45) P= .087	-.1731 (35) P= .160	-.2434 (45) P= .054	-.1636 (35) P= .174	.0530 (45) P= .365	.0468 (45) P= .380	.1032 (45) P= .250	-.0187 (45) P= .451
Trail Making(I)	-.2147 (46) P= .076	-.2075 (35) P= .116	-.1390 (46) P= .179	-.1640 (35) P= .173	-.0981 (46) P= .258	-.0404 (46) P= .395	-.0436 (46) P= .387	-.0709 (46) P= .320

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
WALS-R I(X)	-.0262 (31) P= .444	.0382 (24) P= .430	.1038 (31) P= .289	.0686 (24) P= .275	-.0607 (31) P= .373	.2126 (31) P= .125	.2081 (31) P= .131	.0095 (31) P= .480
WALS-R C(X)	.2749 (31) P= .067	.1529 (24) P= .238	.1311 (31) P= .241	.1998 (24) P= .175	-.0583 (31) P= .378	.2280 (31) P= .109	.1675 (31) P= .184	.0635 (31) P= .367
WALS-R A(X)	.1474 (31) P= .214	-.0311 (24) P= .443	.0160 (31) P= .466	-.1169 (24) P= .293	-.2420 (31) P= .095	-.0869 (31) P= .321	-.1165 (31) P= .266	-.1246 (31) P= .252
WALS-R S(X)	.0951 (31) P= .305	.0125 (24) P= .477	.0009 (31) P= .498	-.0493 (24) P= .469	-.0853 (31) P= .324	.0951 (31) P= .305	.1274 (31) P= .247	-.0882 (31) P= .319
WALS-R DS(X)	-.0237 (31) P= .450	-.1072 (24) P= .309	-.1221 (31) P= .256	-.3164 (24) P= .066	-.2904 (31) P= .057	-.1395 (31) P= .227	-.1973 (31) P= .144	-.1332 (31) P= .238
WALS-R V(X)	.0656 (31) P= .363	-.1268 (24) P= .277	.0348 (31) P= .426	-.0357 (24) P= .434	-.0483 (31) P= .398	.2773 (31) P= .065	.2240 (31) P= .113	-.0870 (31) P= .321
WALS-R PC(X)	-.1729 (31) P= .176	.1373 (24) P= .261	.1029 (31) P= .291	.2148 (24) P= .157	.2393 (31) P= .097	.1347 (31) P= .235	.2393 (31) P= .097	.2961 (31) P= .053
WALS-R BD(X)	.0338 (31) P= .428	.0014 (24) P= .497	.0807 (31) P= .333	.0195 (24) P= .464	.0345 (31) P= .427	.1547 (31) P= .203	.0992 (31) P= .298	.1678 (31) P= .183
WALS-R PA(X)	.2523 (31) P= .085	.1080 (24) P= .308	.3336 (31) P= .033	.1690 (24) P= .215	.1411 (31) P= .225	.5758 (31) P= .000	.5192 (31) P= .001	.3476 (31) P= .020
WALS-R OA(X)	-.1008 (31) P= .295	-.0924 (24) P= .334	-.0294 (31) P= .438	-.0583 (24) P= .393	.1042 (31) P= .289	-.0602 (31) P= .374	.0389 (31) P= .418	.1310 (31) P= .241
WALS-R Dsy(X)	.0612 (31) P= .372	-.2244 (24) P= .146	-.0595 (31) P= .375	-.3286 (24) P= .058	.1362 (31) P= .233	.1016 (31) P= .293	.0063 (31) P= .487	.0556 (31) P= .383
WALS-R VIQ(X)	.1894 (31) P= .154	.0211 (24) P= .461	.1106 (31) P= .277	-.0223 (24) P= .459	-.1847 (31) P= .160	.0450 (31) P= .405	-.0377 (31) P= .420	-.0507 (31) P= .393
WALS-R PIQ(X)	-.0018 (31) P= .496	-.1148 (24) P= .297	.0817 (31) P= .331	-.0855 (24) P= .346	.1638 (31) P= .189	.2480 (31) P= .089	.1833 (31) P= .162	.1934 (31) P= .149
WALS-R IQ(X)	.0834 (31) P= .328	-.0599 (24) P= .391	.0909 (31) P= .313	-.1008 (24) P= .320	-.0341 (31) P= .428	.1469 (31) P= .215	.0680 (31) P= .358	.0264 (31) P= .444

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII (1) Midway	DSMIII (2) Midway	DSMIII (3) Midway	DSMIII (4) Midway	BRAY (2) Midway	LIDVALL (1) Midway	LIDVALL (2) Midway	ANY CRITERIA Midway
ANXIA (F)	.1439 (29) P= .228	.2670 (29) P= .081	.2760 (29) P= .074	.5336 (29) P= .001	.4869 (29) P= .004	.3039 (29) P= .054	.2377 (29) P= .107	.6206 (29) P= .000
MMPI L (F)	.1390 (27) P= .245	-.0759 (27) P= .353	.0364 (27) P= .428	-.2172 (27) P= .138	-.0522 (27) P= .398	-.0994 (27) P= .311	-.1208 (27) P= .274	-.2577 (27) P= .097
MMPI L (F)	-.0940 (27) P= .321	-.1553 (27) P= .220	-.1746 (27) P= .192	-.2728 (27) P= .084	-.1514 (27) P= .225	-.2389 (27) P= .115	-.2897 (27) P= .071	-.2080 (27) P= .149
MMPI K (F)	.0700 (27) P= .364	.0000 (27) P= .500	.0427 (27) P= .416	-.1987 (27) P= .160	-.1881 (27) P= .174	-.0200 (27) P= .461	-.0457 (27) P= .410	-.2432 (27) P= .111
MMPI Ma (F)	.1861 (27) P= .176	.1589 (27) P= .214	.1309 (27) P= .258	-.0285 (27) P= .444	.1436 (27) P= .238	.0527 (27) P= .397	-.0821 (27) P= .342	.2190 (27) P= .136
MMPI D (F)	.2942 (27) P= .068	.1833 (27) P= .180	.1107 (27) P= .291	.2013 (27) P= .157	.3770 (27) P= .026	.1325 (27) P= .255	.0407 (27) P= .420	.4163 (27) P= .015
MMPI Hy (F)	.2632 (27) P= .092	.2758 (27) P= .082	.2319 (27) P= .122	.0390 (27) P= .423	.0613 (27) P= .381	-.0427 (27) P= .417	-.0831 (27) P= .340	.1782 (27) P= .187
MMPI Pd (F)	.0032 (27) P= .494	.1268 (27) P= .264	-.1636 (27) P= .207	-.1103 (27) P= .292	-.3927 (27) P= .021	-.5138 (27) P= .003	-.5282 (27) P= .002	-.3080 (27) P= .059
MMPI MC (F)	-.3385 (27) P= .042	-.0327 (27) P= .436	-.4127 (27) P= .016	-.2401 (27) P= .114	-.4804 (27) P= .006	-.4276 (27) P= .013	-.3037 (27) P= .062	-.3508 (27) P= .036
MMPI Pa (F)	.0236 (27) P= .453	-.0958 (27) P= .317	-.0561 (27) P= .390	-.0996 (27) P= .311	-.2290 (27) P= .125	-.2098 (27) P= .147	-.2825 (27) P= .077	-.2719 (27) P= .085
MMPI Pt (F)	.2293 (27) P= .125	.0902 (27) P= .327	.1132 (27) P= .287	-.1326 (27) P= .255	.0854 (27) P= .336	.1642 (27) P= .207	.0018 (27) P= .496	-.0198 (27) P= .461
MMPI So (F)	-.0421 (27) P= .417	.0617 (27) P= .380	-.0981 (27) P= .313	-.1154 (27) P= .283	-.0275 (27) P= .446	-.1351 (27) P= .251	-.3741 (27) P= .027	.0279 (27) P= .445
MMPI Ma (F)	-.3409 (27) P= .041	-.0892 (27) P= .329	-.2510 (27) P= .103	-.1649 (27) P= .206	-.0967 (27) P= .316	-.0946 (27) P= .319	-.0687 (27) P= .367	-.0561 (27) P= .391
MMPI SI (F)	.1701 (27) P= .198	-.0428 (27) P= .416	.1742 (27) P= .192	.1242 (27) P= .269	.4176 (27) P= .015	.5347 (27) P= .002	.3898 (27) P= .022	.2751 (27) P= .082
MMPI PTD (F)	-.1890 (27) P= .172	-.0206 (27) P= .459	-.1637 (27) P= .207	.1263 (27) P= .265	.1366 (27) P= .248	.0118 (27) P= .477	-.0669 (27) P= .370	.1449 (27) P= .235

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Midway	DSMIII(2) Midway	DSMIII(3) Midway	DSMIII(4) Midway	BRAV(2) Midway	LIDVALL(1) Midway	LIDVALL(2) Midway	ANY CRITERIA Midway
Category (F)	-.1772 (23) P= .209	-.1982 (23) P= .182	-.0645 (23) P= .385	-.1359 (23) P= .268	-.0683 (23) P= .378	-.0124 (23) P= .478	-.0124 (23) P= .478	-.1776 (23) P= .209
TFT Time(F)	.1302 (28) P= .254	-.0584 (28) P= .384	.0504 (28) P= .400	-.1223 (28) P= .268	-.2472 (28) P= .102	-.0862 (28) P= .331	-.0524 (28) P= .396	-.2191 (28) P= .131
TFT Mem(F)	.0474 (28) P= .405	.1914 (28) P= .165	.1298 (28) P= .255	.2129 (28) P= .138	.1731 (28) P= .189	.1072 (28) P= .294	.2368 (28) P= .112	.2715 (28) P= .081
TFT Loc(F)	.1405 (28) P= .238	.0764 (28) P= .350	.1950 (28) P= .160	.0101 (28) P= .480	.2987 (28) P= .061	.3760 (28) P= .024	.4431 (28) P= .009	.1413 (28) P= .237
Finger Tap(F)	-.1697 (28) P= .194	-.0073 (28) P= .485	-.0551 (28) P= .390	.0127 (28) P= .474	.1005 (28) P= .305	-.0191 (28) P= .462	.2091 (28) P= .143	.1005 (28) P= .305
Speech Pers(F)	-.2385 (29) P= .106	-.1220 (29) P= .264	-.1347 (29) P= .243	-.1913 (29) P= .160	-.2290 (29) P= .116	-.1498 (29) P= .219	-.2114 (29) P= .135	-.2216 (29) P= .124
Rhythm(F)	-.0197 (29) P= .460	-.1428 (29) P= .230	-.0891 (29) P= .323	-.1774 (29) P= .179	-.0379 (29) P= .423	-.1399 (29) P= .235	-.2488 (29) P= .097	-.1255 (29) P= .258
Sens. Defic(F)	-.0594 (28) P= .382	-.1177 (28) P= .275	-.1470 (28) P= .228	-.2301 (28) P= .119	-.1470 (28) P= .228	-.0594 (28) P= .382	-.0594 (28) P= .382	-.3027 (28) P= .059
Aph. Spat(F)	-.2191 (28) P= .131	-.2145 (28) P= .137	-.2802 (28) P= .074	-.3138 (28) P= .052	.0216 (28) P= .457	.0169 (28) P= .466	-.0346 (28) P= .431	-.1311 (28) P= .253
Trail Making(F)	.0501 (31) P= .395	.0370 (30) P= .423	.0011 (31) P= .498	.0019 (30) P= .496	.0357 (31) P= .424	.0501 (31) P= .395	.1003 (31) P= .296	.1984 (31) P= .142

Note. (I) = data collected at initial assessments; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Follow-up	DSMIII(3) Follow-up	BRAY(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
ANCOB (I)	.2526 (38) P= .063	.3017 (38) P= .033	.3370 (38) P= .019	.1580 (38) P= .172	.3288 (38) P= .022	.5029 (38) P= .001
MMPI L(I)	-.1062 (38) P= .263	-.1838 (38) P= .135	-.0801 (38) P= .316	.0362 (38) P= .415	.0562 (38) P= .369	-.1741 (38) P= .148
MMPI F(I)	-.0220 (38) P= .448	-.1494 (38) P= .185	.0410 (38) P= .403	-.2066 (38) P= .107	.0540 (38) P= .374	-.0359 (38) P= .415
MMPI K(I)	.2575 (38) P= .059	.1227 (38) P= .231	-.2079 (38) P= .105	.1954 (38) P= .120	.0535 (38) P= .375	-.0118 (38) P= .472
MMPI Ma(I)	.1084 (38) P= .259	.0921 (38) P= .291	-.1592 (38) P= .170	-.0273 (38) P= .435	.2092 (38) P= .104	.0251 (38) P= .441
MMPI D(I)	.1191 (38) P= .238	.1290 (38) P= .220	.0548 (38) P= .372	-.0699 (38) P= .338	.0252 (38) P= .440	.1953 (38) P= .120
MMPI Hy(I)	.2665 (38) P= .053	.3052 (38) P= .031	.0448 (38) P= .395	.0667 (38) P= .345	.1969 (38) P= .118	.2675 (38) P= .052
MMPI Pd(I)	.2048 (38) P= .109	.0502 (38) P= .382	-.0388 (38) P= .409	-.2825 (38) P= .043	-.1367 (38) P= .207	.1112 (38) P= .242
MMPI Mf(I)	.0694 (38) P= .339	-.0309 (38) P= .427	.0543 (38) P= .373	-.1429 (38) P= .196	-.2058 (38) P= .108	.0731 (38) P= .331
MMPI Pa(I)	.1088 (38) P= .258	.1063 (38) P= .263	.1311 (38) P= .216	.0969 (38) P= .281	.0613 (38) P= .357	.1649 (38) P= .161
MMPI Pt(I)	.0819 (38) P= .313	.0425 (38) P= .400	.1410 (38) P= .199	.0838 (38) P= .309	.1755 (38) P= .146	.1701 (38) P= .154
MMPI Sc(I)	.0719 (38) P= .334	.0185 (38) P= .456	.1214 (38) P= .234	.0183 (38) P= .457	.1602 (38) P= .168	.0994 (38) P= .276
MMPI Ma(I)	.2620 (38) P= .056	.1940 (38) P= .122	.1215 (38) P= .234	.0069 (38) P= .484	.0968 (38) P= .282	.2650 (38) P= .054
MMPI SI(I)	-.2929 (38) P= .037	-.2858 (38) P= .041	.1442 (38) P= .194	-.1027 (38) P= .270	-.0219 (38) P= .448	-.0907 (38) P= .294
MMPI PTH(I)	-.1113 (38) P= .253	-.1104 (38) P= .255	.1336 (38) P= .212	-.1286 (38) P= .221	.1151 (38) P= .246	.0159 (38) P= .415

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Follow-up	DSMIII(3) Follow-up	BRAY(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
Age	-.1633 (38) P= .164	-.2180 (38) P= .094	-.0466 (38) P= .391	-.0702 (38) P= .338	-.0913 (38) P= .293	-.2367 (38) P= .076
Sex	-.0815 (38) P= .313	.0878 (38) P= .300	.3444 (38) P= .017	.2713 (38) P= .050	.2000 (38) P= .114	.2761 (38) P= .047
SES	.1100 (38) P= .255	.1196 (38) P= .237	.0601 (38) P= .360	.1687 (38) P= .156	-.0611 (38) P= .358	.1662 (38) P= .159
Recent Events	.1594 (38) P= .170	.1788 (38) P= .141	.0607 (38) P= .359	.1393 (38) P= .202	.2490 (38) P= .066	.1423 (38) P= .197
Psych. Hx	.0147 (38) P= .465	.0305 (38) P= .428	.0305 (38) P= .428	-.1454 (38) P= .192	.2181 (38) P= .094	.1114 (38) P= .253
Severity	.1835 (38) P= .135	.1924 (38) P= .124	.0335 (38) P= .421	.0695 (38) P= .339	.2706 (38) P= .050	.1637 (38) P= .163
GCS at Admit.	-.2449 (38) P= .069	-.1812 (38) P= .138	-.0447 (38) P= .395	-.0995 (38) P= .276	-.2449 (38) P= .069	-.1835 (38) P= .135
Resp. Duration	.1823 (38) P= .137	.1182 (38) P= .240	.1513 (38) P= .182	-.1134 (38) P= .240	.0318 (38) P= .425	.1165 (38) P= .243
Imp. Concs.	.3234 (38) P= .024	.2514 (38) P= .064	.1452 (38) P= .192	.0039 (38) P= .491	.1621 (38) P= .165	.2494 (38) P= .066
Headache	.0666 (38) P= .346	.0310 (38) P= .427	.2193 (38) P= .093	-.0172 (38) P= .459	.2214 (38) P= .091	.1541 (38) P= .178
Skull Fract.	-.1996 (38) P= .115	-.1408 (38) P= .200	-.0103 (38) P= .476	.1142 (38) P= .247	.2297 (38) P= .083	-.0149 (38) P= .465
Imp. Index	.1836 (38) P= .135	.1198 (38) P= .237	.0297 (38) P= .430	-.1494 (38) P= .185	-.0415 (38) P= .402	.1676 (38) P= .157

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Follow-up	DSMIII(3) Follow-up	BRAY(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
TPT Time(I)	-.0551 (36) P= .375	-.1267 (36) P= .231	.1500 (36) P= .191	-.1424 (36) P= .204	-.0057 (36) P= .487	.0521 (36) P= .381
TPT Mem(I)	-.1011 (36) P= .279	-.0540 (36) P= .377	-.0618 (36) P= .360	.1724 (36) P= .157	.1344 (36) P= .217	-.0746 (36) P= .333
TPT Len(I)	-.1763 (36) P= .152	-.1532 (36) P= .186	-.0896 (36) P= .302	.0507 (36) P= .385	-.0427 (36) P= .402	-.1919 (36) P= .131
Finger Tap(I)	.1702 (36) P= .161	.1794 (36) P= .148	.0809 (36) P= .320	.0774 (36) P= .327	.1125 (36) P= .257	.1642 (36) P= .169
Speech Para(I)	-.1884 (38) P= .129	-.2586 (38) P= .058	.0270 (38) P= .436	-.2993 (38) P= .034	-.0143 (38) P= .466	-.0651 (38) P= .349
Rhythm(I)	.0499 (38) P= .383	.0379 (38) P= .411	.1280 (38) P= .222	-.2707 (38) P= .050	-.0291 (38) P= .431	.2170 (38) P= .095
Sens. Defn(I)	.1037 (37) P= .271	.1431 (37) P= .199	.1615 (37) P= .170	.1335 (37) P= .215	.1240 (37) P= .232	.1509 (37) P= .186
Aph. Spat(I)	-.0511 (38) P= .380	.0061 (38) P= .486	.0061 (38) P= .486	.1460 (38) P= .191	.1178 (38) P= .241	.0088 (38) P= .479
Trail Making(I)	-.2513 (38) P= .064	-.1798 (38) P= .140	-.1396 (38) P= .202	-.2159 (38) P= .096	-.1338 (38) P= .212	-.1791 (38) P= .141

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Follow-up	DSMIII(3) Follow-up	BRAV(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
WAIS-R I(X)	-.0034 (26) P= .493	-.0707 (26) P= .366	-.0916 (26) P= .328	-.0152 (26) P= .171	-.2714 (26) P= .090	-.1195 (26) P= .280
WAIS-R C(X)	-.0185 (26) P= .464	-.0058 (26) P= .489	.0055 (26) P= .489	.2147 (26) P= .146	-.0587 (26) P= .388	.0537 (26) P= .397
WAIS-R B(X)	-.1069 (26) P= .302	-.1325 (26) P= .259	-.6029 (26) P= .001	-.2514 (26) P= .108	-.2408 (26) P= .118	-.5944 (26) P= .001
WAIS-R S(X)	-.0325 (26) P= .437	-.0913 (26) P= .329	-.2023 (26) P= .161	-.0481 (26) P= .408	-.1627 (26) P= .214	-.2572 (26) P= .102
WAIS-R DS(X)	-.0053 (26) P= .490	-.0444 (26) P= .415	-.5976 (26) P= .001	-.1755 (26) P= .196	-.3482 (26) P= .041	-.5359 (26) P= .002
WAIS-R V(X)	-.1450 (26) P= .240	-.1857 (26) P= .182	-.0420 (26) P= .419	-.0373 (26) P= .428	-.3088 (26) P= .062	-.1196 (26) P= .280
WAIS-R PC(X)	.1641 (26) P= .212	.2360 (26) P= .123	.0216 (26) P= .458	.2607 (26) P= .099	.1641 (26) P= .212	.0865 (26) P= .337
WAIS-R SO(X)	-.0728 (26) P= .362	-.0283 (26) P= .445	-.2112 (26) P= .150	.0203 (26) P= .461	-.0014 (26) P= .497	-.1608 (26) P= .216
WAIS-R PA(X)	.0182 (26) P= .465	.0303 (26) P= .442	-.0754 (26) P= .357	.2362 (26) P= .123	-.0869 (26) P= .336	-.0320 (26) P= .438
WAIS-R OA(X)	-.0757 (26) P= .357	.0446 (26) P= .414	-.1072 (26) P= .301	-.0664 (26) P= .374	.0337 (26) P= .435	-.0976 (26) P= .318
WAIS-R Dsy(X)	-.2325 (26) P= .127	-.2833 (26) P= .080	-.1902 (26) P= .176	.2036 (26) P= .159	.1254 (26) P= .271	-.3216 (26) P= .055
WAIS-R VIQ(X)	-.0101 (26) P= .480	-.0415 (26) P= .420	-.2962 (26) P= .071	-.1391 (26) P= .249	-.2903 (26) P= .075	-.2313 (26) P= .128
WAIS-R PIQ(X)	-.1349 (26) P= .256	-.0963 (26) P= .320	-.1167 (26) P= .285	.1058 (26) P= .304	.0390 (26) P= .425	-.1567 (26) P= .222
WAIS-R IQ(X)	-.0770 (26) P= .354	-.1094 (26) P= .287	-.2120 (26) P= .149	-.0335 (26) P= .436	-.1588 (26) P= .219	-.2301 (26) P= .129

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;

The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII(1) Follow-up	DSMIII(3) Follow-up	BRAV(2) Follow-up	LIDVALL(1) Follow-up	LIDVALL(2) Follow-up	ANY CRITERIA Follow-up
ANOS (F)	.2590 (31) P= .080	.4810 (31) P= .003	.3931 (31) P= .014	.3897 (31) P= .015	.3156 (31) P= .042	.5620 (31) P= .001
MDI L(F)	-.2098 (29) P= .137	-.3189 (29) P= .046	-.1200 (29) P= .268	-.1982 (29) P= .151	-.0474 (29) P= .404	-.2868 (29) P= .066
MDI L(F)	-.1086 (29) P= .287	-.2164 (29) P= .130	.0502 (29) P= .398	-.2633 (29) P= .084	-.1231 (29) P= .262	-.0084 (29) P= .483
MDI E(F)	-.1093 (29) P= .286	-.2275 (29) P= .118	-.2040 (29) P= .144	-.1599 (29) P= .204	-.1008 (29) P= .302	-.3359 (29) P= .037
MDI Ho(F)	.0955 (29) P= .311	-.0657 (29) P= .367	-.2102 (29) P= .137	-.1716 (29) P= .187	.1959 (29) P= .154	-.1496 (29) P= .219
MDI D(F)	-.0035 (29) P= .493	.0399 (29) P= .419	.2432 (29) P= .102	.0299 (29) P= .439	.3790 (29) P= .021	.2317 (29) P= .113
MDI Hy(F)	.2378 (29) P= .107	.0484 (29) P= .402	-.1520 (29) P= .216	-.1211 (29) P= .266	.1850 (29) P= .168	-.0223 (29) P= .454
MDI Y4(F)	.1336 (29) P= .245	.0450 (29) P= .408	-.1803 (29) P= .175	-.1980 (29) P= .152	-.1086 (29) P= .287	-.0898 (29) P= .322
MDI ME(F)	-.0156 (29) P= .468	-.1191 (29) P= .269	-.3005 (29) P= .057	-.1206 (29) P= .267	-.1900 (29) P= .162	-.1943 (29) P= .156
MDI Pa(F)	-.1691 (29) P= .190	-.1150 (29) P= .276	.2567 (29) P= .089	-.0777 (29) P= .344	-.0992 (29) P= .304	.1503 (29) P= .218
MDI Pt(F)	-.0122 (29) P= .475	-.2478 (29) P= .097	.2060 (29) P= .142	-.0763 (29) P= .347	.0421 (29) P= .414	.0267 (29) P= .446
MDI Sa(F)	.0946 (29) P= .313	-.0493 (29) P= .400	.0386 (29) P= .421	-.1115 (29) P= .282	.0687 (29) P= .362	.0853 (29) P= .330
MDI Ma(F)	.0860 (29) P= .329	-.0173 (29) P= .464	.0149 (29) P= .469	-.0477 (29) P= .403	-.1187 (29) P= .270	.1349 (29) P= .243
MDI S1(F)	-.2206 (29) P= .125	-.1528 (29) P= .214	.4198 (29) P= .012	.2461 (29) P= .099	.2352 (29) P= .110	.1420 (29) P= .231
MDI STS(F)	.0555 (29) P= .387	.1276 (29) P= .255	.2750 (29) P= .074	.1950 (29) P= .155	.1641 (29) P= .198	.3165 (29) P= .047

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix Q continued

	DSMIII (1) Follow-up	DSMIII (3) Follow-up	BRAY (2) Follow-up	LIDVALL (1) Follow-up	LIDVALL (2) Follow-up	ANY CRITERIA Follow-up
Category (F)	-.1007 (25) P= .316	-.1885 (25) P= .183	.1854 (25) P= .187	-.1204 (25) P= .283	-.1043 (25) P= .310	.1279 (25) P= .271
TFT Time(F)	-.0186 (30) P= .461	-.0826 (30) P= .332	-.1281 (30) P= .250	-.1782 (30) P= .173	-.1054 (30) P= .290	-.1341 (30) P= .240
TFT Mem(F)	.0968 (30) P= .305	.1121 (30) P= .278	.1121 (30) P= .278	.1122 (30) P= .278	.1486 (30) P= .217	.2020 (30) P= .142
TFT Lec(F)	-.1236 (30) P= .258	-.1852 (30) P= .164	.3050 (30) P= .051	.0474 (30) P= .402	.1689 (30) P= .186	.0988 (30) P= .302
Finger Tap(F)	-.0066 (30) P= .486	.0358 (30) P= .426	-.0294 (30) P= .439	-.0244 (30) P= .449	-.0066 (30) P= .486	-.0418 (30) P= .413
Speech Per(F)	-.0960 (31) P= .304	-.1767 (31) P= .171	-.0110 (31) P= .477	-.2302 (31) P= .106	-.0792 (31) P= .336	-.0538 (31) P= .387
Rhythm(F)	-.2664 (31) P= .074	-.2778 (31) P= .065	-.0352 (31) P= .425	-.3648 (31) P= .022	-.0037 (31) P= .492	-.1330 (31) P= .238
Sens. Defic(F)	-.0368 (30) P= .423	-.1232 (30) P= .258	.2729 (30) P= .072	.0161 (30) P= .466	.0713 (30) P= .354	.1052 (30) P= .290
Aph. Spat(F)	-.1410 (30) P= .229	-.2112 (30) P= .131	.0238 (30) P= .450	.1314 (30) P= .244	.1615 (30) P= .197	-.0848 (30) P= .328
Trail Making(F)	.0257 (32) P= .444	.0830 (32) P= .326	-.0888 (32) P= .315	.0799 (32) P= .332	.0658 (32) P= .360	.0245 (32) P= .447

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below α is the significance level.

Appendix R

Pearson Correlation Coefficients Between Pairs of Predictor Variables

	AUGER (1)	MOPI L(1)	MOPI F(1)	MOPI K(1)	MOPI H(1)	MOPI D(1)	MOPI Hy(1)	MOPI Pd(1)	MOPI M(1)	MOPI Pa(1)	MOPI Pt(1)	MOPI Sc(1)	MOPI Ma(1)	MOPI SI(1)	MOPI PYS(1)
AUGER (2)	1.0000 (.60) P=.001	-.3965 (.59) P=.329	.0590 (.59) P=.329	-.2135 (.59) P=.052	-.1006 (.59) P=.224	.1680 (.59) P=.102	.1284 (.59) P=.166	-.2691 (.59) P=.020	.0451 (.59) P=.367	-.1465 (.59) P=.134	-.2417 (.59) P=.033	.1196 (.59) P=.183	.1802 (.59) P=.066	.2280 (.59) P=.041	.2665 (.59) P=.021
MOPI L(2)	-.3965 (.59) P=.001	1.0000 (.59) P=.001	-.1987 (.59) P=.066	.3919 (.59) P=.001	-.0756 (.59) P=.285	-.1309 (.59) P=.161	-.1709 (.59) P=.098	-.1879 (.59) P=.066	.1066 (.59) P=.211	-.1024 (.59) P=.220	-.1696 (.59) P=.100	-.2147 (.59) P=.051	-.3088 (.59) P=.009	-.0736 (.59) P=.290	-.3131 (.59) P=.008
MOPI F(2)	.0590 (.59) P=.329	-.1987 (.59) P=.066	1.0000 (.59) P=.001	-.4475 (.59) P=.010	.3019 (.59) P=.010	.4084 (.59) P=.001	.1437 (.59) P=.139	.6005 (.59) P=.000	.2655 (.59) P=.021	.5745 (.59) P=.000	.5974 (.59) P=.000	.7367 (.59) P=.000	.5585 (.59) P=.000	.3555 (.59) P=.003	.7871 (.59) P=.000
MOPI K(2)	-.2135 (.59) P=.052	.3919 (.59) P=.001	-.4475 (.59) P=.010	1.0000 (.59) P=.000	-.0089 (.59) P=.473	-.0801 (.59) P=.273	.1941 (.59) P=.070	-.1240 (.59) P=.175	-.0777 (.59) P=.279	-.2147 (.59) P=.051	-.1637 (.59) P=.108	-.1861 (.59) P=.079	-.4048 (.59) P=.001	-.4908 (.59) P=.000	-.7241 (.59) P=.000
MOPI H(2)	.1680 (.59) P=.224	-.0756 (.59) P=.285	.3019 (.59) P=.010	.4084 (.59) P=.001	1.0000 (.59) P=.000	.4466 (.59) P=.000	.7533 (.59) P=.000	.2233 (.59) P=.045	.2002 (.59) P=.064	.3945 (.59) P=.001	.4719 (.59) P=.000	.5708 (.59) P=.000	.2172 (.59) P=.049	-.0313 (.59) P=.407	.3421 (.59) P=.004
MOPI Hy(2)	-.2691 (.59) P=.020	.1709 (.59) P=.098	-.1879 (.59) P=.066	.1066 (.59) P=.211	-.1309 (.59) P=.161	-.1709 (.59) P=.098	1.0000 (.59) P=.000	.2866 (.59) P=.014	.3959 (.59) P=.001	.5514 (.59) P=.000	.5347 (.59) P=.000	.5169 (.59) P=.000	.3736 (.59) P=.002	.3038 (.59) P=.217	.4908 (.59) P=.000
MOPI Pd(2)	.0451 (.59) P=.367	-.1465 (.59) P=.134	-.2417 (.59) P=.033	.1196 (.59) P=.183	.1802 (.59) P=.066	.2280 (.59) P=.041	.2665 (.59) P=.021	.7367 (.59) P=.000	.5585 (.59) P=.000	.3555 (.59) P=.003	.7871 (.59) P=.000	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021
MOPI Ma(2)	.1802 (.59) P=.066	.2280 (.59) P=.041	.2665 (.59) P=.021	.7367 (.59) P=.000	.5585 (.59) P=.000	.3555 (.59) P=.003	.7871 (.59) P=.000	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021
MOPI SI(2)	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2665 (.59) P=.021
MOPI PYS(2)	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021	.2280 (.59) P=.041	.2665 (.59) P=.021

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation. Below n is the significance level.

Appendix R continued

	ANZEC (1)	MPG1 L(1)	MPG2 F(1)	MPG1 K(1)	MPG1 Hb(1)	MPG1 D(1)	MPG1 Ry(1)	MPG1 Pd(1)	MPG1 Hr(1)	MPG1 Pa(1)	MPG1 Sc(1)	MPG1 Ma(1)	MPG1 Sl(1)	MPG1 P(1)
Age														
(.60)	-.0743	.4399	-.2821	.1408	.5566	-.0476	-.2038	-.2244	-.1500	-.1629	-.3259	-.3938	.0775	-.2588
P=	.286	P=.050	P=.015	P=.144	P=.482	P=.360	P=.061	P=.044	P=.226	P=.109	P=.556	P=.221	P=.280	P=.224
Sex														
(.60)	.1138	.1556	-.3010	.2187	-.1602	-.2352	.0270	-.2789	-.2174	-.0769	-.1743	-.3592	.0619	-.2756
P=	.193	P=.120	P=.010	P=.046	P=.113	P=.060	P=.420	P=.016	P=.049	P=.281	P=.593	P=.053	P=.321	P=.217
MS														
(.60)	-.0010	-.0392	-.2691	.3113	-.1090	-.0983	.0471	-.0411	-.0522	-.0539	-.1393	-.1152	-.1929	-.1221
P=	.497	P=.328	P=.020	P=.008	P=.206	P=.230	P=.362	P=.379	P=.347	P=.343	P=.146	P=.203	P=.074	P=.050
Recent Events														
(.60)	.1266	-.1177	.4607	-.2994	.3526	.2394	.2199	.1797	.0640	.3517	.4665	.4119	.0946	.4844
P=	.168	P=.187	P=.000	P=.011	P=.003	P=.034	P=.047	P=.087	P=.315	P=.003	P=.000	P=.001	P=.238	P=.000
Psych. Ex														
(.60)	.1165	-.0194	.2481	-.3608	.0916	.1744	-.0146	.0337	-.0219	.1538	.1656	.4235	.1682	.1681
P=	.192	P=.442	P=.029	P=.002	P=.245	P=.093	P=.457	P=.400	P=.435	P=.122	P=.110	P=.000	P=.101	P=.002
Severity														
(.60)	-.0576	.1953	.1624	.1306	.1873	-.0410	.1079	.0011	.1149	-.0489	.1321	.0721	-.2410	-.0178
P=	.331	P=.069	P=.110	P=.162	P=.078	P=.379	P=.208	P=.497	P=.193	P=.357	P=.159	P=.294	P=.033	P=.447
SES at Admit.														
(.60)	-.0259	-.1294	-.1515	-.1729	-.1706	-.0449	-.1553	-.0395	-.1529	.0165	-.1931	-.0686	.2024	.0504
P=	.422	P=.164	P=.126	P=.095	P=.098	P=.368	P=.120	P=.383	P=.124	P=.451	P=.069	P=.303	P=.062	P=.352
Supp. Deviation														
(.60)	.0496	.0962	-.0518	.1470	.0463	-.0741	.0612	-.0515	.0519	-.1348	.0055	-.0498	-.3039	-.1629
P=	.353	P=.234	P=.348	P=.133	P=.364	P=.288	P=.323	P=.369	P=.348	P=.154	P=.483	P=.249	P=.010	P=.109
Sup. Census.														
(.60)	.0542	.1691	.0382	.2157	-.0179	-.0795	.1116	.0288	.2058	-.0703	.0597	.0565	-.3417	-.1553
P=	.360	P=.100	P=.387	P=.050	P=.446	P=.275	P=.200	P=.411	P=.059	P=.298	P=.327	P=.335	P=.004	P=.120
Stomach														
(.60)	.0213	.0697	.0461	.1166	.0367	-.0719	.0929	.0227	-.0056	-.0006	.0861	.0543	-.1713	-.0166
P=	.436	P=.300	P=.365	P=.190	P=.391	P=.294	P=.242	P=.432	P=.483	P=.498	P=.258	P=.341	P=.097	P=.450
Small Fract.														
(.60)	-.0455	.0668	-.1052	-.1009	.1123	-.1346	.0166	-.2092	.0158	-.1308	-.1058	-.1141	-.1331	-.0695
P=	.365	P=.307	P=.214	P=.467	P=.199	P=.121	P=.450	P=.056	P=.453	P=.162	P=.213	P=.193	P=.157	P=.301
Sup. Index														
(.60)	.0486	.2136	.1701	.0119	.1695	.0629	-.0239	.1881	.0529	.1230	.0405	.0437	-.0021	.0269
P=	.356	P=.052	P=.099	P=.464	P=.100	P=.318	P=.429	P=.077	P=.345	P=.177	P=.380	P=.371	P=.494	P=.420

Note: (1) = data collected at initial assessment; (F) = data collected at follow-up;
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	ANGER (1)	MDPI L(1)	MDPI F(1)	MDPI K(1)	MDPI Hs(1)	MDPI D(1)	MDPI Hy(1)	MDPI Pa(1)	MDPI Pt(1)	MDPI Sc(1)	MDPI Ma(1)	MDPI SI(1)	MDPI PTS(1)		
TYPE Time(2)	.0299 (.55) P=.414	.2296 (.55) P=.046	-.0947 (.55) P=.246	.1306 (.55) P=.171	.1263 (.55) P=.179	-.2007 (.55) P=.071	-.1004 (.55) P=.215	-.1616 (.55) P=.119	-.0098 (.55) P=.472	-.0275 (.55) P=.421	-.1002 (.55) P=.233	-.0325 (.55) P=.407	-.1396 (.55) P=.155	-.0325 (.55) P=.407	-.1881 (.55) P=.085
TYPE Run(3)	-.0692 (.56) P=.306	-.3655 (.55) P=.003	.0873 (.55) P=.263	-.2017 (.55) P=.070	.0098 (.55) P=.472	.0738 (.55) P=.296	.1342 (.55) P=.130	.0155 (.55) P=.455	-.0540 (.55) P=.348	.0022 (.55) P=.494	.1086 (.55) P=.215	.1468 (.55) P=.142	.1096 (.55) P=.213	-.0115 (.55) P=.467	.2073 (.55) P=.064
TYPE Load(1)	-.1142 (.56) P=.201	-.1329 (.55) P=.167	.0786 (.55) P=.284	-.1480 (.55) P=.139	-.2334 (.55) P=.043	.0411 (.55) P=.383	-.1145 (.55) P=.203	.0499 (.55) P=.359	-.0362 (.55) P=.396	-.0996 (.55) P=.235	-.0150 (.55) P=.457	-.0873 (.55) P=.263	.1159 (.55) P=.200	.1151 (.55) P=.201	.1093 (.55) P=.213
Flanger Tap(2)	.0075 (.56) P=.478	-.1211 (.55) P=.189	.1203 (.55) P=.191	-.1413 (.55) P=.152	-.1200 (.55) P=.191	.0679 (.55) P=.311	-.2384 (.55) P=.040	-.0055 (.55) P=.484	-.0084 (.55) P=.476	.0619 (.55) P=.327	-.0487 (.55) P=.362	-.1344 (.55) P=.164	.2099 (.55) P=.062	.0518 (.55) P=.354	.0846 (.55) P=.269
Spacch Para(3)	.0081 (.60) P=.475	.2291 (.59) P=.040	.2847 (.59) P=.014	-.0634 (.59) P=.317	.0344 (.59) P=.398	.0885 (.59) P=.253	-.0654 (.59) P=.311	.1428 (.59) P=.140	.0643 (.59) P=.314	.0224 (.59) P=.433	.0275 (.59) P=.418	.0291 (.59) P=.413	.0536 (.59) P=.343	.1588 (.59) P=.115	.1518 (.59) P=.126
Rhythm(1)	.0803 (.60) P=.251	.0022 (.59) P=.493	.0139 (.59) P=.458	-.0920 (.59) P=.244	.0591 (.59) P=.328	.0443 (.59) P=.370	.0193 (.59) P=.442	.1771 (.59) P=.090	-.0635 (.59) P=.316	.0590 (.59) P=.329	-.0322 (.59) P=.404	-.0284 (.59) P=.415	.0230 (.59) P=.431	.0183 (.59) P=.445	.0629 (.59) P=.318
Sum. Delta(3)	.1224 (.57) P=.102	.0517 (.56) P=.353	-.0345 (.56) P=.450	-.0616 (.56) P=.326	.2072 (.56) P=.063	.0851 (.56) P=.266	.0802 (.56) P=.278	.0920 (.56) P=.250	-.0953 (.56) P=.242	.1311 (.56) P=.133	-.0463 (.56) P=.367	-.0106 (.56) P=.469	.0617 (.56) P=.326	-.1254 (.56) P=.179	.0555 (.56) P=.342
Appl. Spalt(2)	.0885 (.59) P=.252	-.0586 (.58) P=.331	.2929 (.58) P=.013	-.1979 (.58) P=.068	.1510 (.58) P=.129	.1436 (.58) P=.141	-.0355 (.58) P=.396	.0892 (.58) P=.253	.0214 (.58) P=.437	.1376 (.58) P=.152	.2111 (.58) P=.056	.1676 (.58) P=.104	.2086 (.58) P=.058	.0613 (.58) P=.324	.2242 (.58) P=.045
Trail Making(2)	-.0494 (.60) P=.354	-.4234 (.59) P=.000	.1641 (.59) P=.107	-.3827 (.59) P=.001	-.0499 (.59) P=.354	.0619 (.59) P=.321	-.0289 (.59) P=.414	.0660 (.59) P=.310	.0143 (.59) P=.457	.0321 (.59) P=.405	.0905 (.59) P=.248	.1275 (.59) P=.168	.2499 (.59) P=.028	.0809 (.59) P=.271	.3206 (.59) P=.007

Note. (1) = data collected at initial assessment. (F) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation, below n is the significance level.

Appendix R continued

	AM2R (2)	MD1 L (2)	MD2 F (2)	MD3 K (2)	MD4 Hs (2)	MD5 C (2)	MD6 Hy (2)	MD7 Pd (2)	MD8 Ms (2)	MD9 Pa (2)	MD10 Pc (2)	MD11 Sc (2)	MD12 Hs (2)	MD13 Si (2)	MD14 Pc (2)
WJIS-R Z (2)	.0084 (.41) P=.419	-.3783 (.40) P=.058	-.1617 (.40) P=.159	.0789 (.40) P=.314	-.1826 (.40) P=.130	-.0169 (.40) P=.459	-.0770 (.40) P=.318	.0760 (.40) P=.321	-.1121 (.40) P=.246	-.0166 (.40) P=.474	-.1111 (.40) P=.248	-.0768 (.40) P=.319	-.1381 (.40) P=.198	-.0254 (.40) P=.438	-.2247 (.40) P=.123
WJIS-R C (2)	-.1030 (.41) P=.261	-.1525 (.40) P=.174	-.2756 (.40) P=.043	.2768 (.40) P=.041	-.2203 (.40) P=.086	-.2767 (.40) P=.042	-.0534 (.40) P=.349	-.1392 (.40) P=.196	-.1383 (.40) P=.197	-.1271 (.40) P=.217	-.2611 (.40) P=.039	-.1326 (.40) P=.207	-.2418 (.40) P=.066	-.2720 (.40) P=.042	-.3587 (.40) P=.112
WJIS-R A (2)	-.2024 (.41) P=.102	-.2868 (.40) P=.036	-.0700 (.40) P=.334	.1163 (.40) P=.237	-.2284 (.40) P=.431	.0567 (.40) P=.364	.1210 (.40) P=.228	.0261 (.40) P=.437	-.0326 (.40) P=.374	-.0430 (.40) P=.396	.0319 (.40) P=.422	.0255 (.40) P=.487	-.1783 (.40) P=.135	-.0736 (.40) P=.326	-.2944 (.40) P=.273
WJIS-R S (2)	-.3036 (.41) P=.027	-.2792 (.40) P=.041	-.2414 (.40) P=.067	.2147 (.40) P=.092	-.0333 (.40) P=.419	-.1230 (.40) P=.225	.0921 (.40) P=.286	-.1713 (.40) P=.145	-.1428 (.40) P=.190	-.0973 (.40) P=.275	-.1024 (.40) P=.265	.0285 (.40) P=.431	-.1719 (.40) P=.144	-.2656 (.40) P=.049	-.2472 (.40) P=.062
WJIS-R DS (2)	-.2201 (.41) P=.083	-.1449 (.40) P=.186	.0067 (.40) P=.484	.0986 (.40) P=.270	-.1191 (.40) P=.234	.1583 (.40) P=.165	.0165 (.40) P=.460	.1941 (.40) P=.115	.0026 (.40) P=.494	.0612 (.40) P=.354	.1697 (.40) P=.148	.0766 (.40) P=.319	-.0164 (.40) P=.460	-.0400 (.40) P=.403	.0148 (.40) P=.464
WJIS-R V (2)	.0521 (.41) P=.373	-.2908 (.40) P=.034	-.3601 (.40) P=.011	.1968 (.40) P=.112	-.2258 (.40) P=.081	-.1746 (.40) P=.141	-.1714 (.40) P=.145	-.1733 (.40) P=.142	-.2112 (.40) P=.095	-.1796 (.40) P=.134	-.2544 (.40) P=.057	-.2712 (.40) P=.045	-.1778 (.40) P=.136	-.0431 (.40) P=.396	-.3994 (.40) P=.005
WJIS-R PC (2)	-.1707 (.41) P=.143	-.1911 (.40) P=.119	.0861 (.40) P=.299	.0793 (.40) P=.313	.0931 (.40) P=.284	.2242 (.40) P=.082	.2488 (.40) P=.061	.1304 (.40) P=.211	.0342 (.40) P=.417	.0486 (.40) P=.383	.0186 (.40) P=.455	.2330 (.40) P=.074	.0084 (.40) P=.480	-.1175 (.40) P=.235	.0366 (.40) P=.411
WJIS-R SD (2)	-.2090 (.41) P=.095	-.1808 (.40) P=.132	-.0688 (.40) P=.337	-.0872 (.40) P=.296	-.0156 (.40) P=.462	-.0483 (.40) P=.384	.0987 (.40) P=.272	.0030 (.40) P=.493	-.1633 (.40) P=.150	-.1302 (.40) P=.212	-.1661 (.40) P=.153	-.0056 (.40) P=.486	-.0983 (.40) P=.273	-.1005 (.40) P=.269	-.0272 (.40) P=.434
WJIS-R PA (2)	-.1940 (.41) P=.112	-.2857 (.40) P=.037	-.1616 (.40) P=.160	.2451 (.40) P=.064	-.0878 (.40) P=.295	-.0492 (.40) P=.381	.1172 (.40) P=.236	-.1686 (.40) P=.149	-.2188 (.40) P=.087	-.0741 (.40) P=.325	-.0304 (.40) P=.426	.0143 (.40) P=.465	-.1413 (.40) P=.192	-.1304 (.40) P=.211	-.2678 (.40) P=.047
WJIS-R CA (2)	-.1061 (.41) P=.255	-.2785 (.40) P=.041	-.1319 (.40) P=.209	-.1499 (.40) P=.178	-.1376 (.40) P=.198	-.1970 (.40) P=.112	.0449 (.40) P=.392	-.0161 (.40) P=.461	-.2796 (.40) P=.040	-.2713 (.40) P=.045	-.3475 (.40) P=.014	-.1630 (.40) P=.157	-.0164 (.40) P=.460	-.2887 (.40) P=.035	-.1169 (.40) P=.236
WJIS-R DOY (2)	-.3458 (.41) P=.013	-.0598 (.40) P=.357	-.0825 (.40) P=.306	.1217 (.40) P=.227	-.0831 (.40) P=.305	-.0270 (.40) P=.434	.0515 (.40) P=.376	-.1203 (.40) P=.230	-.1569 (.40) P=.167	-.0580 (.40) P=.361	-.0571 (.40) P=.363	-.0140 (.40) P=.466	-.1223 (.40) P=.226	.0132 (.40) P=.468	-.1246 (.40) P=.222
WJIS-R VTQ (2)	-.1335 (.41) P=.203	-.3110 (.40) P=.025	-.2453 (.40) P=.064	.2078 (.40) P=.099	-.1886 (.40) P=.122	-.0539 (.40) P=.371	.0324 (.40) P=.419	.0295 (.40) P=.428	-.1621 (.40) P=.159	-.0899 (.40) P=.291	-.0712 (.40) P=.331	-.0817 (.40) P=.308	-.1908 (.40) P=.119	-.1160 (.40) P=.238	-.2748 (.40) P=.042
WJIS-R PIQ (2)	-.1934 (.41) P=.113	-.1608 (.40) P=.161	-.1844 (.40) P=.127	.0510 (.40) P=.377	-.0669 (.40) P=.341	-.0294 (.40) P=.429	.0940 (.40) P=.282	-.0320 (.40) P=.422	-.2264 (.40) P=.080	-.1565 (.40) P=.167	-.1324 (.40) P=.174	-.0560 (.40) P=.366	-.2150 (.40) P=.091	-.0454 (.40) P=.391	-.1604 (.40) P=.161
WJIS-R IQ (2)	-.1767 (.41) P=.135	-.2630 (.40) P=.051	-.2157 (.40) P=.091	.1310 (.40) P=.210	-.1518 (.40) P=.175	-.0043 (.40) P=.489	.0569 (.40) P=.364	.0223 (.40) P=.446	-.1876 (.40) P=.123	-.1145 (.40) P=.241	-.1013 (.40) P=.267	-.0606 (.40) P=.355	-.2185 (.40) P=.088	-.0748 (.40) P=.323	-.2186 (.40) P=.088

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	AMCER (1)	MPPI L (1)	MPPI F (1)	MPPI K (1)	MPPI Hs (1)	MPPI D (1)	MPPI Hy (1)	MPPI Pd (1)	MPPI Mc (1)	MPPI Pa (1)	MPPI Pl (1)	MPPI Sc (1)	MPPI Ma (1)	MPPI Si (1)	MPPI PIS (1)
AMCER (7)	.6269 (.31) P=.000	-.3030 (.31) P=.049	-.2399 (.31) P=.037	-.2346 (.31) P=.102	-.0643 (.31) P=.365	.0371 (.31) P=.422	-.1029 (.31) P=.291	-.0761 (.31) P=.342	-.2988 (.31) P=.051	-.0279 (.31) P=.441	.0238 (.31) P=.450	-.1855 (.31) P=.159	.0418 (.31) P=.412	.1153 (.31) P=.268	.0355 (.31) P=.425
MPPI L (7)	-.4586 (.29) P=.006	.7319 (.29) P=.000	-.2594 (.29) P=.088	.4549 (.29) P=.007	-.0011 (.29) P=.498	-.2412 (.29) P=.104	-.0132 (.29) P=.473	-.3383 (.29) P=.036	.0368 (.29) P=.425	-.3522 (.29) P=.030	-.2895 (.29) P=.064	-.2886 (.29) P=.084	-.4361 (.29) P=.009	-.0196 (.29) P=.460	-.5199 (.29) P=.002
MPPI L (7)	-.1352 (.29) P=.242	.0026 (.29) P=.495	.3577 (.29) P=.028	-.4038 (.29) P=.015	.0025 (.29) P=.495	.3208 (.29) P=.045	-.1559 (.29) P=.210	.3696 (.29) P=.024	.2566 (.29) P=.090	.2402 (.29) P=.105	.1420 (.29) P=.231	-.0618 (.29) P=.375	.1246 (.29) P=.260	.4527 (.29) P=.007	.3869 (.29) P=.019
MPPI K (7)	-.4032 (.29) P=.015	.4348 (.29) P=.009	-.2132 (.29) P=.133	.5664 (.29) P=.001	.1201 (.29) P=.267	.1022 (.29) P=.299	.1962 (.29) P=.154	-.0519 (.29) P=.395	.0337 (.29) P=.431	-.1006 (.29) P=.302	-.1383 (.29) P=.237	.1083 (.29) P=.288	-.4308 (.29) P=.010	-.2641 (.29) P=.083	-.4042 (.29) P=.015
MPPI Mc (7)	-.0126 (.29) P=.474	.1067 (.29) P=.291	-.1349 (.29) P=.243	.2242 (.29) P=.121	.5558 (.29) P=.001	.3334 (.29) P=.039	.3198 (.29) P=.045	.1124 (.29) P=.281	-.2333 (.29) P=.112	-.1260 (.29) P=.257	-.0408 (.29) P=.417	.0424 (.29) P=.414	-.1506 (.29) P=.218	-.1222 (.29) P=.264	-.0908 (.29) P=.320
MPPI D (7)	.2367 (.29) P=.108	-.0197 (.29) P=.460	.0028 (.29) P=.494	-.1490 (.29) P=.320	.2472 (.29) P=.098	.3885 (.29) P=.019	.0901 (.29) P=.321	.1296 (.29) P=.251	.0120 (.29) P=.475	.0487 (.29) P=.401	.1129 (.29) P=.280	-.0274 (.29) P=.544	-.1903 (.29) P=.161	.0871 (.29) P=.327	.1156 (.29) P=.275
MPPI Hy (7)	-.1586 (.29) P=.206	.0035 (.29) P=.333	.0128 (.29) P=.474	.2951 (.29) P=.060	.6531 (.29) P=.000	.4072 (.29) P=.014	.5582 (.29) P=.001	.2697 (.29) P=.079	.0260 (.29) P=.447	.1070 (.29) P=.290	.1767 (.29) P=.180	.3130 (.29) P=.049	-.1099 (.29) P=.285	-.2445 (.29) P=.101	-.0158 (.29) P=.468
MPPI Pd (7)	-.2475 (.29) P=.098	.0426 (.29) P=.413	.4939 (.29) P=.003	-.0920 (.29) P=.318	.1739 (.29) P=.184	.4340 (.29) P=.011	.2256 (.29) P=.120	.6186 (.29) P=.003	.4948 (.29) P=.003	.4585 (.29) P=.006	.3646 (.29) P=.054	.3968 (.29) P=.017	.1240 (.29) P=.261	-.0186 (.29) P=.462	.3616 (.29) P=.035
MPPI Mc (7)	-.3281 (.29) P=.041	.0657 (.29) P=.368	.6888 (.29) P=.000	-.0343 (.29) P=.390	.1289 (.29) P=.253	.3789 (.29) P=.021	.0129 (.29) P=.473	.4976 (.29) P=.003	.7563 (.29) P=.000	.4699 (.29) P=.005	.4500 (.29) P=.007	.5297 (.29) P=.002	.3416 (.29) P=.035	.1064 (.29) P=.291	.4538 (.29) P=.007
MPPI Pa (7)	-.3127 (.29) P=.049	.1675 (.29) P=.193	.2000 (.29) P=.149	-.1211 (.29) P=.266	-.1266 (.29) P=.256	.4256 (.29) P=.011	.0145 (.29) P=.470	.2969 (.29) P=.059	.4631 (.29) P=.006	.3767 (.29) P=.024	.2764 (.29) P=.072	.1224 (.29) P=.263	-.1795 (.29) P=.176	.2600 (.29) P=.087	.1683 (.29) P=.191
MPPI Pl (7)	-.1137 (.29) P=.279	.6580 (.29) P=.382	.2988 (.29) P=.058	-.1523 (.29) P=.218	-.0634 (.29) P=.372	.4534 (.29) P=.007	-.1249 (.29) P=.276	.3576 (.29) P=.028	.2322 (.29) P=.113	.2417 (.29) P=.103	.3461 (.29) P=.019	.1823 (.29) P=.172	-.0151 (.29) P=.469	.3719 (.29) P=.023	.2702 (.29) P=.078
MPPI Ma (7)	.0221 (.29) P=.455	.1284 (.29) P=.253	.1394 (.29) P=.235	-.1322 (.29) P=.215	-.0326 (.29) P=.433	.3922 (.29) P=.018	-.0168 (.29) P=.466	.4205 (.29) P=.012	.1760 (.29) P=.181	.2284 (.29) P=.125	.1725 (.29) P=.195	.0165 (.29) P=.466	.0541 (.29) P=.395	.1375 (.29) P=.239	.2113 (.29) P=.136
MPPI Ma (7)	.2493 (.29) P=.096	-.2538 (.29) P=.092	.2700 (.29) P=.076	-.2855 (.29) P=.007	-.0159 (.29) P=.467	.1248 (.29) P=.360	-.0275 (.29) P=.444	.3286 (.29) P=.041	.2748 (.29) P=.075	.0596 (.29) P=.379	.1273 (.29) P=.290	.1037 (.29) P=.296	.2182 (.29) P=.055	-.2825 (.29) P=.471	.3728 (.29) P=.024
MPPI Si (7)	.2679 (.29) P=.083	-.2644 (.29) P=.370	-.1871 (.29) P=.166	-.1735 (.29) P=.184	-.2819 (.29) P=.269	-.0427 (.29) P=.373	-.1442 (.29) P=.228	-.2822 (.29) P=.070	-.2458 (.29) P=.099	-.1323 (.29) P=.247	-.1267 (.29) P=.445	.0165 (.29) P=.296	-.2812 (.29) P=.070	.5562 (.29) P=.053	-.6634 (.29) P=.372
MPPI PIS (7)	.1526 (.29) P=.215	-.1260 (.29) P=.257	.3217 (.29) P=.056	-.5726 (.29) P=.001	-.2870 (.29) P=.327	.3329 (.29) P=.044	-.1222 (.29) P=.147	.2423 (.29) P=.103	.2677 (.29) P=.080	.4244 (.29) P=.014	.2651 (.29) P=.082	.0234 (.29) P=.493	.2932 (.29) P=.051	.3196 (.29) P=.228	.1279 (.29) P=.022

Note. (1) = data collected at initial assessment; (7) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	Age	Sex	SES	Recent Events	Psych Hx	Severity	GCS at Admit.	Hosp. Duration	Imp. Consc.	Hezatosia	Skull Fract.	Imp. Index
ANNOX 11	-.0743 (.60) P=.286	.1130 (.60) P=.193	-.0010 (.60) P=.497	.1266 (.60) P=.168	.1145 (.60) P=.192	-.0576 (.60) P=.331	-.0259 (.60) P=.422	.0496 (.60) P=.353	.0542 (.60) P=.340	.0213 (.60) P=.436	-.0455 (.60) P=.365	.0426 (.60) P=.356
ANNOX 12	.4399 (.59) P=.000	.1556 (.59) P=.120	-.0592 (.59) P=.328	-.1177 (.59) P=.187	-.0194 (.59) P=.482	.1953 (.59) P=.069	-.1294 (.59) P=.184	.0962 (.59) P=.234	.1691 (.59) P=.100	.0697 (.59) P=.300	.0668 (.59) P=.307	.2136 (.59) P=.052
ANNOX 13	-.2821 (.59) P=.015	-.3010 (.59) P=.010	-.2691 (.59) P=.020	.4607 (.59) P=.000	.2481 (.59) P=.029	.1624 (.59) P=.110	-.1515 (.59) P=.126	-.0318 (.59) P=.348	.0382 (.59) P=.387	.0461 (.59) P=.363	-.1052 (.59) P=.214	.1701 (.59) P=.099
ANNOX 14	.1408 (.59) P=.144	.2187 (.59) P=.048	.3113 (.59) P=.008	-.2994 (.59) P=.011	-.3608 (.59) P=.082	.1306 (.59) P=.162	-.1729 (.59) P=.095	.1470 (.59) P=.133	.2157 (.59) P=.050	.1166 (.59) P=.190	-.0109 (.59) P=.467	.0119 (.59) P=.464
ANNOX 15	.0066 (.59) P=.480	-.1602 (.59) P=.113	-.1090 (.59) P=.206	.3526 (.59) P=.003	-.0916 (.59) P=.285	.1873 (.59) P=.078	-.1706 (.59) P=.098	.0463 (.59) P=.364	-.0179 (.59) P=.446	.0367 (.59) P=.391	.1123 (.59) P=.189	.1695 (.59) P=.100
ANNOX 16	-.0476 (.59) P=.360	-.2302 (.59) P=.040	-.0983 (.59) P=.230	.2394 (.59) P=.034	.1744 (.59) P=.093	-.0410 (.59) P=.379	-.0449 (.59) P=.368	-.0741 (.59) P=.288	-.0795 (.59) P=.275	-.0719 (.59) P=.294	-.1346 (.59) P=.121	.0629 (.59) P=.318
ANNOX 17	-.2038 (.59) P=.061	.0270 (.59) P=.420	.0471 (.59) P=.362	.2199 (.59) P=.047	-.0144 (.59) P=.457	.1079 (.59) P=.208	-.1553 (.59) P=.120	.0612 (.59) P=.323	.1116 (.59) P=.200	.0929 (.59) P=.242	.0166 (.59) P=.450	-.2239 (.59) P=.429
ANNOX 18	-.2246 (.59) P=.044	-.2789 (.59) P=.016	-.0411 (.59) P=.379	.1797 (.59) P=.087	.0337 (.59) P=.400	.0031 (.59) P=.497	-.0395 (.59) P=.393	-.0515 (.59) P=.349	.0298 (.59) P=.411	.0227 (.59) P=.432	-.2092 (.59) P=.056	.1881 (.59) P=.077
ANNOX 19	-.1000 (.59) P=.226	-.2174 (.59) P=.049	-.0522 (.59) P=.347	.0640 (.59) P=.315	-.0219 (.59) P=.435	.1149 (.59) P=.193	-.1529 (.59) P=.124	.0319 (.59) P=.348	.2038 (.59) P=.059	-.0056 (.59) P=.483	.0138 (.59) P=.453	.0529 (.59) P=.345
ANNOX 20	-.1629 (.59) P=.109	-.0769 (.59) P=.281	-.0539 (.59) P=.343	.3517 (.59) P=.023	.1538 (.59) P=.122	-.0489 (.59) P=.357	.0164 (.59) P=.451	-.1348 (.59) P=.154	-.0723 (.59) P=.298	-.0026 (.59) P=.490	-.1328 (.59) P=.162	.1230 (.59) P=.177
ANNOX 21	-.2904 (.59) P=.013	-.1165 (.59) P=.190	-.1297 (.59) P=.164	.3327 (.59) P=.005	.1656 (.59) P=.125	.0066 (.59) P=.480	-.0753 (.59) P=.285	-.1127 (.59) P=.198	-.0597 (.59) P=.327	.0620 (.59) P=.326	-.2586 (.59) P=.115	.0148 (.59) P=.456
ANNOX 22	-.3259 (.59) P=.006	-.1743 (.59) P=.093	-.1393 (.59) P=.146	.4665 (.59) P=.000	.1621 (.59) P=.110	.1321 (.59) P=.159	-.1951 (.59) P=.369	.0055 (.59) P=.483	.0597 (.59) P=.327	.0861 (.59) P=.250	-.1058 (.59) P=.223	.2405 (.59) P=.380
ANNOX 23	-.3938 (.59) P=.001	-.3590 (.59) P=.003	-.1122 (.59) P=.203	.4119 (.59) P=.002	.4235 (.59) P=.020	.0721 (.59) P=.284	-.0686 (.59) P=.303	-.0898 (.59) P=.249	-.0565 (.59) P=.335	.0543 (.59) P=.341	-.1141 (.59) P=.295	.0437 (.59) P=.371
ANNOX 24	-.2775 (.59) P=.200	-.0619 (.59) P=.321	-.1909 (.59) P=.074	.0946 (.59) P=.238	.1682 (.59) P=.101	-.2412 (.59) P=.033	.2224 (.59) P=.062	-.0339 (.59) P=.010	-.3417 (.59) P=.024	-.1723 (.59) P=.297	-.1331 (.59) P=.157	-.1222 (.59) P=.494
ANNOX 25	-.2588 (.59) P=.024	-.2746 (.59) P=.017	-.3221 (.59) P=.012	.4844 (.59) P=.000	.3682 (.59) P=.022	-.0178 (.59) P=.447	.2524 (.59) P=.352	-.1629 (.59) P=.109	-.1553 (.59) P=.122	-.0166 (.59) P=.450	-.2695 (.59) P=.301	.0249 (.59) P=.420

Note. (1) = data collected at initial assessment. (F) = data collected at follow-up.
The number of subjects (N) used in the calculation of a correlation is given in brackets underneath the correlation. Below .5 is the significance level.

Appendix R continued

	Age	Sex	SES	Recent Events	Psych Ex	Severity	OCs at Admit.	Resp. Duration	Imp. Conseq.	Remotoma	Small Fract.	Imp. Index
Age	1.0000 (.60) P=.168	.1262 (.60) P=.168	.2226 (.60) P=.044	-.2373 (.60) P=.034	-.1233 (.60) P=.174	-.0619 (.60) P=.319	-.0935 (.60) P=.240	-.0108 (.60) P=.467	-.1314 (.60) P=.158	.1356 (.60) P=.162	.0587 (.60) P=.328	-.3956 (.60) P=.001
Sex	.1262 (.60) P=.168	1.0000 (.60) P=.177	.2219 (.60) P=.177	-.0915 (.60) P=.243	-.2409 (.60) P=.032	-.0737 (.60) P=.288	.0782 (.60) P=.276	.1105 (.60) P=.200	.0359 (.60) P=.393	.1136 (.60) P=.294	-.0816 (.60) P=.268	-.0322 (.60) P=.454
SES	.2226 (.60) P=.044	.2219 (.60) P=.177	1.0000 (.60) P=.177	-.2378 (.60) P=.034	-.2708 (.60) P=.018	-.3220 (.60) P=.006	.1644 (.60) P=.002	-.1638 (.60) P=.106	-.2526 (.60) P=.026	.0127 (.60) P=.461	-.0446 (.60) P=.368	-.2727 (.60) P=.018
Recent Events	-.2373 (.60) P=.034	-.0915 (.60) P=.243	-.2378 (.60) P=.034	1.0000 (.60) P=.177	.4141 (.60) P=.001	.2664 (.60) P=.020	-.2535 (.60) P=.025	.2453 (.60) P=.029	.1626 (.60) P=.107	-.0147 (.60) P=.456	-.0877 (.60) P=.253	-.0223 (.60) P=.433
Psych. Ex	-.1233 (.60) P=.174	-.2409 (.60) P=.032	-.2708 (.60) P=.018	-.2378 (.60) P=.034	1.0000 (.60) P=.177	-.0022 (.60) P=.493	-.0163 (.60) P=.451	-.0902 (.60) P=.246	-.1343 (.60) P=.153	-.0129 (.60) P=.461	-.0922 (.60) P=.242	-.0593 (.60) P=.336
Severity	-.0619 (.60) P=.319	-.0619 (.60) P=.319	-.0619 (.60) P=.319	-.0619 (.60) P=.319	-.0619 (.60) P=.319	1.0000 (.60) P=.177	-.0845 (.60) P=.000	.6674 (.60) P=.000	.8106 (.60) P=.000	.5328 (.60) P=.000	.2167 (.60) P=.048	.5589 (.60) P=.000
OCs at Admit.	.0935 (.60) P=.240	.0935 (.60) P=.240	.0935 (.60) P=.240	.0935 (.60) P=.240	.0935 (.60) P=.240	.0935 (.60) P=.240	1.0000 (.60) P=.177	-.6353 (.60) P=.000	-.8175 (.60) P=.000	-.3810 (.60) P=.001	-.0696 (.60) P=.298	-.5303 (.60) P=.000
Resp. Duration	-.0108 (.60) P=.467	-.0108 (.60) P=.467	-.0108 (.60) P=.467	-.0108 (.60) P=.467	-.0108 (.60) P=.467	-.0108 (.60) P=.467	-.0108 (.60) P=.467	1.0000 (.60) P=.177	.7728 (.60) P=.000	.4805 (.60) P=.000	-.0781 (.60) P=.277	.2556 (.60) P=.024
Imp. Conseq.	-.1314 (.60) P=.158	-.1314 (.60) P=.158	-.1314 (.60) P=.158	-.1314 (.60) P=.158	-.1314 (.60) P=.158	-.1314 (.60) P=.158	-.1314 (.60) P=.158	.7728 (.60) P=.000	1.0000 (.60) P=.177	.3862 (.60) P=.001	.0713 (.60) P=.294	.4091 (.60) P=.001
Remotoma	.1356 (.60) P=.162	.1356 (.60) P=.162	.1356 (.60) P=.162	.1356 (.60) P=.162	.1356 (.60) P=.162	.1356 (.60) P=.162	.1356 (.60) P=.162	.7728 (.60) P=.000	.3862 (.60) P=.001	1.0000 (.60) P=.177	.0927 (.60) P=.241	.3386 (.60) P=.004
Small Fract.	.0587 (.60) P=.328	.0587 (.60) P=.328	.0587 (.60) P=.328	.0587 (.60) P=.328	.0587 (.60) P=.328	.0587 (.60) P=.328	.0587 (.60) P=.328	.7728 (.60) P=.000	.3862 (.60) P=.001	.0927 (.60) P=.241	1.0000 (.60) P=.177	.0814 (.60) P=.268
Imp. Index	-.3956 (.60) P=.001	-.3956 (.60) P=.001	-.3956 (.60) P=.001	-.3956 (.60) P=.001	-.3956 (.60) P=.001	-.3956 (.60) P=.001	-.3956 (.60) P=.001	.7728 (.60) P=.000	.3862 (.60) P=.001	.0927 (.60) P=.241	.0814 (.60) P=.268	1.0000 (.60) P=.177

Note. (1) = data collected at initial assessment; (2) = data collected at follow-up; The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	Age	Sex	SES	Recent Events	Psych Rx	Severity	GCS at Admit.	Hosp. Duration	Imp. Conc.	Hematoma	Skull Fract.	Imp. Index
WFF Time (I)												
	.4013	.1738	-.1067	-.0046	-.0688	.4397	-.4737	.3456	.4367	.2282	-.0852	.6272
	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)	(.55)
	P=.001	P=.100	P=.219	P=.487	P=.309	P=.000	P=.000	P=.005	P=.000	P=.047	P=.268	P=.000
WFF Mem (I)												
	-.4416	-.1385	.1341	.0993	.0914	-.4064	.4631	-.3593	-.4048	-.3098	.1162	-.7421
	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)
	P=.000	P=.154	P=.162	P=.233	P=.251	P=.001	P=.000	P=.003	P=.001	P=.010	P=.197	P=.000
WFF Loe (I)												
	-.2671	-.1164	.0336	.0209	.1335	-.4698	.4904	-.3009	-.4387	-.2026	-.1048	-.7957
	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)
	P=.023	P=.196	P=.403	P=.439	P=.163	P=.000	P=.000	P=.012	P=.000	P=.067	P=.221	P=.000
Flange Tap (I)												
	-.1946	-.2698	.0042	.0176	.2404	-.2169	.3006	-.1810	-.2504	-.0192	-.1463	-.2523
	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)	(.56)
	P=.075	P=.022	P=.488	P=.449	P=.037	P=.054	P=.012	P=.091	P=.031	P=.444	P=.141	P=.030
Speech Para (I)												
	.3022	-.1779	-.2337	.0179	.0436	.3692	-.3083	.0800	.2083	.1747	.2321	.6476
	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
	P=.009	P=.087	P=.036	P=.446	P=.371	P=.022	P=.008	P=.272	P=.055	P=.091	P=.037	P=.000
Rhythm (I)												
	.2420	.0640	-.3757	-.0497	-.0239	.3178	-.3501	.1603	.2760	.2560	.0668	.6801
	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
	P=.031	P=.314	P=.022	P=.353	P=.428	P=.007	P=.003	P=.111	P=.016	P=.025	P=.306	P=.000
Sum. Deficit (I)												
	.2675	.0451	-.2568	.1373	.0811	.1603	-.2348	.2085	.0999	.1142	-.1864	.4946
	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)	(.57)
	P=.022	P=.370	P=.027	P=.213	P=.274	P=.117	P=.039	P=.060	P=.230	P=.199	P=.082	P=.000
Apn. Spat (I)												
	-.0435	-.1551	-.4137	-.0014	.0131	.4632	-.4584	.1541	.3107	.1730	.3457	.5458
	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)	(.59)
	P=.372	P=.120	P=.031	P=.496	P=.461	P=.003	P=.000	P=.122	P=.008	P=.095	P=.004	P=.000
Trail Making (I)												
	-.3594	-.2205	.1824	.0297	.1909	-.5529	.5674	-.4442	-.5249	-.2593	-.0425	-.6492
	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)	(.60)
	P=.002	P=.045	P=.082	P=.411	P=.072	P=.003	P=.000	P=.000	P=.000	P=.023	P=.374	P=.000

Note: (I) = data collected at initial assessment; (F) = data collected at follow-up.
 The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation, below n is the significance level.

Appendix R continued

	Age	Sex	SES	Percent Events	Paych Hx	Severely Adm.	Resp. Duration	Imp. Conse.	Hematoma	Sev. Fract.	Imp. Index
WJLB-R I(1)	-.1014 (.41) P=.264	-.0628 (.41) P=.348	-.6122 (.42) P=.522	-.3728 (.42) P=.243	-.1025 (.42) P=.266	-.5254 (.42) P=.222	-.3332 (.42) P=.020	-.4377 (.42) P=.222	-.3622 (.42) P=.222	-.3255 (.42) P=.226	-.6194 (.42) P=.000
WJLB-R C(1)	-.1521 (.41) P=.171	-.2804 (.42) P=.038	-.5179 (.42) P=.520	-.5657 (.42) P=.342	-.1136 (.42) P=.240	-.2632 (.42) P=.043	-.0432 (.42) P=.394	-.1248 (.42) P=.228	-.1497 (.42) P=.125	-.1270 (.42) P=.196	-.4649 (.42) P=.000
WJLB-R A(1)	-.2926 (.41) P=.032	-.2490 (.41) P=.058	-.2204 (.41) P=.583	-.5189 (.41) P=.453	-.0473 (.41) P=.384	-.2677 (.41) P=.245	-.1647 (.41) P=.152	-.2163 (.41) P=.087	-.1621 (.41) P=.156	-.2147 (.41) P=.289	-.4556 (.41) P=.022
WJLB-R B(1)	-.4054 (.41) P=.001	-.0614 (.41) P=.351	-.2637 (.41) P=.548	-.0678 (.41) P=.383	-.0430 (.41) P=.395	-.1654 (.41) P=.037	-.1475 (.41) P=.179	-.1935 (.41) P=.113	-.4003 (.41) P=.025	-.1777 (.41) P=.233	-.6249 (.41) P=.000
WJLB-R DO(1)	-.1930 (.41) P=.113	-.2168 (.41) P=.087	-.2792 (.41) P=.539	-.0097 (.41) P=.476	-.0352 (.41) P=.413	-.3756 (.41) P=.008	-.2121 (.41) P=.092	-.3465 (.41) P=.014	-.0420 (.41) P=.297	-.3288 (.41) P=.025	-.4569 (.41) P=.001
WJLB-R V(1)	.0895 (.41) P=.289	.2377 (.41) P=.067	.7025 (.41) P=.000	-.2225 (.41) P=.081	-.1079 (.41) P=.251	-.5510 (.41) P=.000	-.2555 (.41) P=.053	-.4305 (.41) P=.002	-.2419 (.41) P=.564	-.3865 (.41) P=.006	-.5231 (.41) P=.000
WJLB-R PC(1)	-.2158 (.41) P=.088	-.3661 (.41) P=.009	.2313 (.41) P=.073	-.1211 (.41) P=.245	-.0095 (.41) P=.477	-.1547 (.41) P=.167	-.1349 (.41) P=.200	-.1342 (.41) P=.201	-.1430 (.41) P=.186	-.0178 (.41) P=.456	-.4593 (.41) P=.004
WJLB-R BO(1)	-.3551 (.41) P=.054	-.2218 (.41) P=.082	.2826 (.41) P=.037	.0205 (.41) P=.449	-.1089 (.41) P=.249	.4328 (.41) P=.002	-.3010 (.41) P=.028	-.4355 (.41) P=.002	-.3635 (.41) P=.010	.0117 (.41) P=.471	-.5922 (.41) P=.000
WJLB-R PA(1)	-.4327 (.41) P=.002	.3237 (.41) P=.462	.3483 (.41) P=.013	-.1393 (.41) P=.192	-.0546 (.41) P=.367	-.4047 (.41) P=.004	-.2873 (.41) P=.034	-.4413 (.41) P=.002	-.1960 (.41) P=.110	-.0918 (.41) P=.284	-.6945 (.41) P=.000
WJLB-R CA(1)	-.2467 (.41) P=.060	-.2649 (.41) P=.047	.1225 (.41) P=.223	-.0714 (.41) P=.329	-.2478 (.41) P=.059	.2590 (.41) P=.051	-.1727 (.41) P=.140	-.3098 (.41) P=.024	-.2129 (.41) P=.091	.0126 (.41) P=.469	-.4802 (.41) P=.001
WJLB-R DOY(1)	-.3583 (.41) P=.011	-.0956 (.41) P=.216	.3215 (.41) P=.020	-.2185 (.41) P=.085	-.0230 (.41) P=.443	.5116 (.41) P=.000	-.4786 (.41) P=.001	-.5005 (.41) P=.000	-.2628 (.41) P=.048	.0950 (.41) P=.277	-.7463 (.41) P=.000
WJLB-R VTQ(1)	-.2053 (.41) P=.099	-.0109 (.41) P=.473	.6357 (.41) P=.000	-.1675 (.41) P=.148	-.0772 (.41) P=.316	.5181 (.41) P=.000	-.3171 (.41) P=.022	-.4271 (.41) P=.003	-.2619 (.41) P=.049	-.3417 (.41) P=.014	-.6247 (.41) P=.002
WJLB-R PTQ(1)	.0014 (.41) P=.497	-.1106 (.41) P=.246	.4276 (.41) P=.003	-.2308 (.41) P=.073	-.0165 (.41) P=.459	.5043 (.41) P=.000	-.3910 (.41) P=.006	-.5408 (.41) P=.000	-.2169 (.41) P=.087	-.0643 (.41) P=.392	-.5702 (.41) P=.000
WJLB-R IQ(1)	-.1166 (.41) P=.234	-.0886 (.41) P=.291	.5713 (.41) P=.000	-.2122 (.41) P=.091	-.0688 (.41) P=.334	.5521 (.41) P=.000	-.3840 (.41) P=.007	-.5154 (.41) P=.000	-.2794 (.41) P=.038	-.2288 (.41) P=.075	-.6405 (.41) P=.000

Note. (1) = data collected at initial assessment; (P) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	Age	Sex	SES	Recent Events	Psych Rx	Severity	GCS at Admitt.	Hosp. Duration	Imp. Consc.	Hematoma	Skull Fract.	Imp. Index
ANNOX (F)	.0106 (.31) P=.477	.2879 (.31) P=.058	.2376 (.29) P=.099	.0745 (.31) P=.345	-.0374 (.31) P=.431	-.0581 (.31) P=.378	.1619 (.31) P=.192	.0374 (.31) P=.421	-.1183 (.31) P=.263	.0328 (.31) P=.431	.1194 (.31) P=.261	.0498 (.31) P=.395
ANNOX L (F)	.5347 (.29) P=.001	.2147 (.29) P=.132	-.2325 (.29) P=.112	-.2935 (.29) P=.061	-.2447 (.29) P=.100	.3511 (.29) P=.031	-.3247 (.29) P=.043	.3495 (.29) P=.032	.3594 (.29) P=.028	.3447 (.29) P=.034	.1236 (.29) P=.261	.4135 (.29) P=.013
ANNOX L (F)	.2640 (.29) P=.083	-.0571 (.29) P=.384	-.2158 (.29) P=.130	-.0361 (.29) P=.426	.1297 (.29) P=.251	-.1276 (.29) P=.255	.2053 (.29) P=.143	-.2810 (.29) P=.070	-.2608 (.29) P=.086	.0545 (.29) P=.389	.2169 (.29) P=.129	.4232 (.29) P=.011
ANNOX R (F)	.2274 (.29) P=.118	-.0756 (.29) P=.348	.0808 (.29) P=.338	-.2785 (.29) P=.073	-.1682 (.29) P=.192	-.2255 (.29) P=.120	.1356 (.29) P=.242	.1500 (.29) P=.219	-.0480 (.29) P=.402	-.1568 (.29) P=.208	-.1862 (.29) P=.167	-.2915 (.29) P=.063
ANNOX R (F)	.3557 (.29) P=.029	-.1207 (.29) P=.266	-.2270 (.29) P=.118	.1007 (.29) P=.302	.4883 (.29) P=.014	.0268 (.29) P=.445	-.3122 (.29) P=.475	.1885 (.29) P=.164	-.0303 (.29) P=.438	.2530 (.29) P=.093	.1215 (.29) P=.265	.5691 (.29) P=.361
ANNOX D (F)	.1000 (.29) P=.303	.1909 (.29) P=.161	-.1650 (.29) P=.196	.3893 (.29) P=.018	.3950 (.29) P=.017	.0709 (.29) P=.357	.0017 (.29) P=.497	.3247 (.29) P=.043	.0929 (.29) P=.316	.2086 (.29) P=.139	.0628 (.29) P=.373	.0213 (.29) P=.456
ANNOX Dy (F)	.0736 (.29) P=.352	-.0736 (.29) P=.352	-.0272 (.29) P=.444	.1323 (.29) P=.247	.2604 (.29) P=.086	.0472 (.29) P=.404	-.0526 (.29) P=.393	.1561 (.29) P=.209	.0432 (.29) P=.412	.2416 (.29) P=.103	-.0368 (.29) P=.425	-.0469 (.29) P=.405
ANNOX Pd (F)	-.0270 (.29) P=.445	-.2143 (.29) P=.132	.0765 (.29) P=.347	.1656 (.29) P=.203	.0592 (.29) P=.380	-.0287 (.29) P=.441	-.0178 (.29) P=.463	.0166 (.29) P=.466	.0567 (.29) P=.385	-.1905 (.29) P=.161	-.2158 (.29) P=.090	.1306 (.29) P=.250
ANNOX Sd (F)	-.1783 (.29) P=.177	-.9178 (.29) P=.003	.1012 (.29) P=.301	.1252 (.29) P=.259	-.2961 (.29) P=.059	.1329 (.29) P=.246	-.1720 (.29) P=.186	-.0174 (.29) P=.464	.1771 (.29) P=.179	-.2238 (.29) P=.122	.0684 (.29) P=.362	-.0322 (.29) P=.434
ANNOX Pa (F)	.0928 (.29) P=.370	.2154 (.29) P=.131	.0494 (.29) P=.400	.5977 (.29) P=.307	-.2410 (.29) P=.104	-.1422 (.29) P=.231	.1656 (.29) P=.155	.0250 (.29) P=.490	-.0799 (.29) P=.340	-.0568 (.29) P=.486	-.2011 (.29) P=.448	.1933 (.29) P=.157
ANNOX Pz (F)	.0442 (.29) P=.410	.0856 (.29) P=.488	-.1151 (.29) P=.276	.1915 (.29) P=.160	.0660 (.29) P=.367	-.2695 (.29) P=.079	.2381 (.29) P=.110	.0546 (.29) P=.491	-.1770 (.29) P=.179	.0751 (.29) P=.349	-.2126 (.29) P=.128	.0322 (.29) P=.433
ANNOX Sd (F)	.1209 (.29) P=.266	-.0497 (.29) P=.322	-.2200 (.29) P=.126	.2320 (.29) P=.110	.3115 (.29) P=.050	-.1188 (.29) P=.270	.0544 (.29) P=.390	-.0050 (.29) P=.490	-.0329 (.29) P=.433	-.3098 (.29) P=.480	-.1123 (.29) P=.299	.1850 (.29) P=.168
ANNOX Sd (F)	-.2553 (.29) P=.291	-.4718 (.29) P=.005	.0813 (.29) P=.338	.0223 (.29) P=.454	.0411 (.29) P=.416	-.0118 (.29) P=.476	-.0616 (.29) P=.376	-.2456 (.29) P=.100	.0159 (.29) P=.467	-.1180 (.29) P=.271	.1517 (.29) P=.216	-.2913 (.29) P=.319
ANNOX Sd (F)	.2127 (.29) P=.134	.5225 (.29) P=.002	-.2528 (.29) P=.293	.2325 (.29) P=.434	-.1017 (.29) P=.320	-.1373 (.29) P=.424	.0482 (.29) P=.400	.1777 (.29) P=.178	-.1445 (.29) P=.227	.2964 (.29) P=.329	.2884 (.29) P=.324	.2129 (.29) P=.134
ANNOX Sd (F)	.2531 (.29) P=.392	-.0911 (.29) P=.319	-.2201 (.29) P=.149	.4889 (.29) P=.014	.0980 (.29) P=.326	.1150 (.29) P=.276	-.0493 (.29) P=.422	-.2461 (.29) P=.328	.2449 (.29) P=.409	-.0222 (.29) P=.475	.1767 (.29) P=.180	.3242 (.29) P=.138

Note. (1) = data collected at initial assessment. (F) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

Category (F)	Age	Sex	SES	Percent Events	Psych Ha	Severity	SES at Admit	Hosp. Duration	ICU Comp.	Hematoma	Skull Fract.	Imp. Index
	.4213 (.26) P=.016	.2162 (.26) P=.144	-.1888 (.26) P=.178	-.0741 (.26) P=.359	.0204 (.26) P=.461	.0003 (.26) P=.500	.0376 (.26) P=.428	-.1670 (.26) P=.207	-.1141 (.26) P=.249	.0016 (.26) P=.311	.1617 (.26) P=.215	.1608 (.26) P=.001
	.2345 (.30) P=.106	.2703 (.30) P=.074	-.3197 (.30) P=.043	-.1635 (.30) P=.194	.0971 (.30) P=.305	.1634 (.30) P=.001	-.0389 (.30) P=.001	.3283 (.30) P=.038	.0046 (.30) P=.049	.5549 (.30) P=.001	-.1237 (.30) P=.257	.6947 (.30) P=.000
	-.3703 (.30) P=.002	-.2413 (.30) P=.100	.4420 (.30) P=.007	.1072 (.30) P=.286	.0390 (.30) P=.419	-.2585 (.30) P=.084	.2559 (.30) P=.086	-.1170 (.30) P=.235	-.1234 (.30) P=.258	-.2452 (.30) P=.096	.1073 (.30) P=.286	-.2340 (.30) P=.000
	-.3502 (.30) P=.029	-.2371 (.30) P=.104	.2208 (.30) P=.121	-.0216 (.30) P=.455	.1507 (.30) P=.213	-.3918 (.30) P=.016	.3113 (.30) P=.047	-.1943 (.30) P=.152	-.3179 (.30) P=.043	-.2220 (.30) P=.142	.0517 (.30) P=.393	-.1033 (.30) P=.000
	-.2645 (.31) P=.075	-.4032 (.31) P=.012	.3334 (.31) P=.033	.2354 (.31) P=.101	.1013 (.31) P=.294	-.2529 (.31) P=.085	.3724 (.31) P=.020	-.0687 (.31) P=.357	-.2607 (.31) P=.078	.0103 (.31) P=.478	.0282 (.31) P=.440	-.5357 (.31) P=.001
	.3965 (.31) P=.014	-.3106 (.31) P=.044	-.3293 (.31) P=.035	-.1052 (.31) P=.287	.1771 (.31) P=.170	.0016 (.31) P=.497	-.0556 (.31) P=.383	-.0878 (.31) P=.319	-.0604 (.31) P=.373	-.0720 (.31) P=.350	.2782 (.31) P=.065	.4924 (.31) P=.002
	.3642 (.30) P=.022	.0514 (.30) P=.392	-.5533 (.30) P=.001	-.1279 (.30) P=.246	.3368 (.30) P=.032	.2279 (.30) P=.109	-.2134 (.30) P=.124	.1889 (.30) P=.154	.1336 (.30) P=.237	.2654 (.30) P=.075	.0702 (.30) P=.354	.4761 (.30) P=.003
	.2609 (.30) P=.082	-.0440 (.30) P=.409	-.2632 (.30) P=.080	.3154 (.30) P=.045	.1433 (.30) P=.225	.1506 (.30) P=.214	-.1052 (.30) P=.280	-.0033 (.30) P=.493	.0032 (.30) P=.493	.1843 (.30) P=.165	.2448 (.30) P=.096	.3419 (.30) P=.032
	-.0896 (.30) P=.319	-.0053 (.30) P=.489	-.4698 (.30) P=.004	-.0309 (.30) P=.436	-.0083 (.30) P=.483	.2887 (.30) P=.061	-.2606 (.30) P=.082	-.1319 (.30) P=.244	-.0335 (.30) P=.430	.3110 (.30) P=.047	.2735 (.30) P=.072	.3840 (.30) P=.018
	-.4593 (.34) P=.003	-.1659 (.34) P=.174	.4065 (.34) P=.009	.3098 (.34) P=.033	.0399 (.34) P=.411	-.3649 (.34) P=.017	.4477 (.34) P=.004	-.4088 (.34) P=.008	-.4199 (.34) P=.003	-.2227 (.34) P=.103	.0735 (.34) P=.340	-.6811 (.34) P=.000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	TPT Time (s)	TPT Hem (l)	TPT Loc (l)	Finger Tap (l)	Speech Perf (l)	Rhythm (l)	Sens. Deficit (l)	Aph. Spat (l)	Trails (l)
ANCOVA (2)									
	-.0299 (.55) P=.414	-.0692 (.56) P=.306	-.1142 (.56) P=.201	.0075 (.56) P=.478	.0081 (.56) P=.475	.0083 (.60) P=.251	.1224 (.57) P=.182	.0885 (.57) P=.252	-.0494 (.59) P=.354
ANCOVA 2 (2)									
	-.2296 (.55) P=.046	-.3655 (.55) P=.003	-.1329 (.55) P=.167	-.1211 (.55) P=.189	.2291 (.59) P=.040	.0027 (.59) P=.493	.0517 (.56) P=.353	-.0586 (.58) P=.331	-.4234 (.59) P=.000
ANCOVA 3 (2)									
	-.0947 (.55) P=.246	.0073 (.55) P=.263	.0786 (.55) P=.284	.1203 (.55) P=.191	.7847 (.59) P=.014	.0139 (.59) P=.458	-.0345 (.56) P=.400	.2829 (.58) P=.013	.1641 (.59) P=.107
ANCOVA 4 (2)									
	-.1306 (.55) P=.171	-.2017 (.55) P=.070	-.1490 (.55) P=.139	-.1413 (.55) P=.152	-.0634 (.59) P=.317	-.0920 (.59) P=.244	-.0616 (.56) P=.326	-.1979 (.58) P=.068	-.3817 (.58) P=.001
ANCOVA 5a (2)									
	.1263 (.55) P=.179	.0098 (.55) P=.472	-.2334 (.55) P=.043	-.1200 (.55) P=.191	.0344 (.59) P=.398	.0591 (.59) P=.328	.2072 (.56) P=.063	.1510 (.58) P=.129	-.0499 (.58) P=.354
ANCOVA 5b (2)									
	-.2007 (.55) P=.071	.0738 (.55) P=.296	.0411 (.55) P=.383	.0679 (.55) P=.311	.0885 (.59) P=.253	.0433 (.59) P=.370	.0851 (.56) P=.266	.1436 (.58) P=.141	.0619 (.59) P=.321
ANCOVA 5c (2)									
	-.1084 (.55) P=.215	.1542 (.55) P=.130	-.1145 (.55) P=.203	-.2384 (.55) P=.040	-.0654 (.59) P=.311	.0193 (.59) P=.442	.0802 (.56) P=.278	-.0355 (.58) P=.396	-.0289 (.59) P=.434
ANCOVA 5d (2)									
	-.1616 (.55) P=.119	.0155 (.55) P=.455	.0499 (.55) P=.359	-.0555 (.55) P=.484	.1428 (.59) P=.140	.1771 (.59) P=.090	.0920 (.56) P=.250	.0892 (.58) P=.253	.0663 (.58) P=.310
ANCOVA 5E (2)									
	.0098 (.55) P=.472	-.0540 (.55) P=.348	-.0362 (.55) P=.346	-.0084 (.55) P=.476	.0643 (.59) P=.314	-.0635 (.59) P=.316	-.0953 (.56) P=.242	.0214 (.58) P=.437	.0143 (.59) P=.457
ANCOVA 5a (2)									
	-.0275 (.55) P=.421	.0022 (.55) P=.494	-.0946 (.55) P=.235	.0619 (.55) P=.327	.0224 (.59) P=.633	.0590 (.59) P=.359	.1511 (.56) P=.133	.1376 (.58) P=.152	.0322 (.59) P=.405
ANCOVA 5c (2)									
	-.1027 (.55) P=.233	.1086 (.55) P=.215	-.0150 (.55) P=.457	-.0487 (.55) P=.362	.0275 (.59) P=.418	-.0322 (.59) P=.424	-.0463 (.56) P=.367	.2121 (.58) P=.056	.0905 (.59) P=.248
ANCOVA 5d (2)									
	-.0325 (.55) P=.407	.1468 (.55) P=.162	-.0873 (.55) P=.283	-.1344 (.55) P=.264	.0291 (.59) P=.413	-.0284 (.59) P=.415	-.0106 (.56) P=.469	.1676 (.58) P=.104	.1275 (.59) P=.168
ANCOVA 5Ea (2)									
	-.1346 (.55) P=.155	.1096 (.55) P=.213	.1159 (.55) P=.200	.0299 (.55) P=.562	.0536 (.59) P=.343	.0230 (.59) P=.431	.0617 (.56) P=.326	.2086 (.58) P=.058	.2499 (.59) P=.028
ANCOVA 5E (2)									
	-.0325 (.55) P=.407	-.0115 (.55) P=.467	.1351 (.55) P=.221	.0578 (.55) P=.354	.0588 (.59) P=.115	.0103 (.59) P=.445	-.1254 (.56) P=.179	.0623 (.58) P=.324	.0809 (.59) P=.272
ANCOVA 5E (2)									
	-.1881 (.55) P=.005	.2273 (.55) P=.064	.1043 (.55) P=.213	.0446 (.55) P=.269	.1518 (.59) P=.126	.0609 (.59) P=.318	.0355 (.56) P=.342	.2242 (.58) P=.045	.3206 (.59) P=.007

Note. (D) = data collected at initial assessment; (F) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	727 Time (s)	727 Mean (s)	727 Log (s)	Finger Tap (s)	Speech Perc (s)	Rhythm (s)	Seas. Deficit (s)	Apch. Spac (s)	Trail (s)
Age									
	.4013 (.55) P=.001	-.4416 (.56) P=.000	-.2671 (.56) P=.023	-.1946 (.56) P=.075	.3022 (.60) P=.009	.2425 (.60) P=.031	.2675 (.57) P=.022	-.5435 (.59) P=.372	-.3594 (.60) P=.002
Sex									
	.1758 (.55) P=.102	-.1385 (.56) P=.154	-.1164 (.56) P=.196	-.2698 (.56) P=.022	-.1779 (.60) P=.087	.0643 (.60) P=.314	.0451 (.57) P=.375	-.1551 (.59) P=.120	-.2205 (.60) P=.045
SES									
	-.1067 (.55) P=.219	.1341 (.56) P=.162	.0336 (.56) P=.403	.0042 (.56) P=.488	-.2337 (.60) P=.036	-.3757 (.60) P=.002	-.2568 (.57) P=.027	-.4137 (.59) P=.001	.1824 (.60) P=.082
Recent Events									
	-.0046 (.55) P=.487	.0993 (.56) P=.233	.0209 (.56) P=.439	.0176 (.56) P=.449	.0179 (.60) P=.446	-.0497 (.60) P=.353	.1073 (.57) P=.213	-.0014 (.59) P=.496	.0297 (.60) P=.411
Psych. Ex									
	-.0608 (.55) P=.309	.0914 (.56) P=.231	.1335 (.56) P=.163	.2404 (.56) P=.037	.2436 (.60) P=.371	-.0239 (.60) P=.428	.0811 (.57) P=.274	.0131 (.59) P=.461	.1909 (.60) P=.072
Severity									
	.4397 (.55) P=.000	-.4064 (.56) P=.001	-.4698 (.56) P=.000	-.2169 (.56) P=.054	.3692 (.60) P=.002	.3178 (.60) P=.007	.1603 (.57) P=.117	.4632 (.59) P=.000	-.5529 (.60) P=.000
SES at Admit.									
	-.4737 (.55) P=.000	.4631 (.56) P=.000	.4904 (.56) P=.000	.3006 (.56) P=.012	-.3083 (.60) P=.008	-.3501 (.60) P=.003	-.2348 (.57) P=.039	-.4584 (.59) P=.000	.5874 (.60) P=.000
Resp. Duration									
	.3456 (.55) P=.005	-.3593 (.56) P=.003	-.3009 (.56) P=.012	-.1810 (.56) P=.091	.0800 (.60) P=.272	.1603 (.60) P=.111	.2085 (.57) P=.060	.1541 (.59) P=.122	-.4442 (.60) P=.000
Imp. Control.									
	.4367 (.55) P=.000	-.4048 (.56) P=.001	-.4387 (.56) P=.000	-.2504 (.56) P=.031	.2083 (.60) P=.055	.2760 (.60) P=.016	.0999 (.57) P=.230	.3107 (.59) P=.008	-.5249 (.60) P=.000
Maintain									
	.2282 (.55) P=.047	-.3098 (.56) P=.010	-.2026 (.56) P=.067	-.0192 (.56) P=.444	.1747 (.60) P=.091	.2540 (.60) P=.025	.1142 (.57) P=.199	.1730 (.59) P=.095	-.2593 (.60) P=.023
Small Fract.									
	-.0852 (.55) P=.268	.1162 (.56) P=.197	-.1048 (.56) P=.221	-.1463 (.56) P=.141	.2321 (.60) P=.037	.0668 (.60) P=.306	-.1864 (.57) P=.082	.3457 (.59) P=.004	-.0425 (.60) P=.374
Imp. Index									
	.6272 (.55) P=.000	-.7421 (.56) P=.000	-.7057 (.56) P=.000	-.2523 (.56) P=.030	.6476 (.60) P=.000	.6001 (.60) P=.000	.4946 (.57) P=.000	.5458 (.59) P=.000	-.6492 (.60) P=.000

Note. (1) = 24% collected at initial assessment; (F) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

	TPT Time (I)	TPT Mean (I)	TPT Loc (I)	Finger Tap (I)	Speech Perc (I)	Rhythm (I)	Sent. Deficit (I)	Aph. Spat (I)	Trails (I)
TPT Time (I)	1.0000 (.55) P=.000	-.5704 (.55) P=.000	-.5778 (.55) P=.000	-.2764 (.55) P=.022	.2185 (.55) P=.055	.5186 (.55) P=.000	.2983 (.55) P=.013	.2210 (.54) P=.054	-.5264 (.55) P=.000
TPT Mean (I)	-.5704 (.55) P=.000	1.0000 (.56) P=.000	.6680 (.56) P=.000	.1219 (.55) P=.188	-.4934 (.56) P=.000	-.4053 (.56) P=.001	-.3824 (.56) P=.002	-.3486 (.55) P=.005	.6711 (.51) P=.000
TPT Loc (I)	-.5778 (.55) P=.000	.6680 (.55) P=.000	1.0000 (.56) P=.000	.3500 (.55) P=.004	-.3463 (.56) P=.004	-.3799 (.56) P=.002	-.1748 (.56) P=.059	-.4226 (.55) P=.001	.5218 (.56) P=.000
Finger Tap (I)	-.2764 (.54) P=.022	.1219 (.55) P=.188	.3580 (.55) P=.004	1.0000 (.56) P=.000	-.1738 (.56) P=.100	-.2207 (.56) P=.051	.0503 (.56) P=.356	-.1549 (.55) P=.129	.3747 (.56) P=.002
Speech Perc (I)	.2185 (.55) P=.055	-.4934 (.56) P=.000	-.3463 (.56) P=.004	-.1738 (.56) P=.100	1.0000 (.60) P=.000	.3712 (.60) P=.002	.2223 (.57) P=.048	.3256 (.59) P=.006	-.4190 (.60) P=.000
Rhythm (I)	.5186 (.55) P=.000	-.4053 (.56) P=.001	-.3799 (.56) P=.002	-.2207 (.56) P=.051	.3712 (.60) P=.002	1.0000 (.60) P=.000	.5025 (.57) P=.000	.2816 (.59) P=.015	-.3566 (.60) P=.003
Sent. Deficit (I)	.2983 (.55) P=.013	-.3824 (.56) P=.002	-.1748 (.56) P=.059	.0503 (.56) P=.356	.2223 (.57) P=.048	.3256 (.59) P=.006	1.0000 (.57) P=.000	.1466 (.56) P=.141	-.4330 (.57) P=.000
Aph. Spat (I)	.2210 (.54) P=.054	-.3486 (.55) P=.005	-.4226 (.55) P=.001	-.1549 (.55) P=.129	.3712 (.60) P=.002	.3256 (.59) P=.006	1.0000 (.57) P=.000	.1466 (.56) P=.141	-.4330 (.57) P=.000
Trails Making (I)	-.5264 (.55) P=.000	.6711 (.51) P=.000	.5218 (.56) P=.000	.3747 (.56) P=.002	-.4190 (.60) P=.000	-.3566 (.60) P=.003	-.4330 (.57) P=.000	-.3406 (.59) P=.004	1.0000 (.60) P=.000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix R continued

	TP1 Time(I)	TP1 Mes(I)	TP1 Loc(I)	Finger Tap(I)	Speech Per(I)	Rhythm(I)	Sens. Def(I)	Appl. Spec(I)	Tralla(I)
WAB-R I(I)	-.2355 (.36) P=.003	.4346 (.37) P=.002	-.2694 (.37) P=.053	.2043 (.37) P=.544	-.5497 (.41) P=.000	-.4635 (.41) P=.001	-.4353 (.38) P=.001	-.4986 (.40) P=.001	-.5968 (.41) P=.000
WAB-R C(I)	-.0287 (.36) P=.436	.4894 (.37) P=.002	.1912 (.37) P=.128	.1163 (.37) P=.247	-.4928 (.41) P=.001	-.2557 (.41) P=.053	-.2739 (.38) P=.048	-.5168 (.40) P=.000	-.2918 (.41) P=.032
WAB-R A(I)	-.3220 (.36) P=.028	.3992 (.37) P=.007	.2099 (.37) P=.106	.1628 (.37) P=.168	-.2683 (.41) P=.045	-.3982 (.41) P=.005	-.2920 (.38) P=.038	-.2540 (.40) P=.057	-.4526 (.41) P=.001
WAB-R B(I)	-.1329 (.36) P=.220	.5677 (.37) P=.000	.1184 (.37) P=.243	-.0437 (.37) P=.399	-.5536 (.41) P=.000	-.2600 (.41) P=.050	-.3369 (.38) P=.019	-.4766 (.40) P=.001	-.4742 (.41) P=.001
WAB-R D(I)	-.5976 (.36) P=.000	.2475 (.37) P=.070	.2763 (.37) P=.049	.2171 (.37) P=.098	-.2783 (.41) P=.039	-.4546 (.41) P=.001	-.3765 (.38) P=.010	-.2671 (.40) P=.048	-.5793 (.41) P=.000
WAB-R V(I)	-.0336 (.36) P=.423	.2839 (.37) P=.044	.1793 (.37) P=.144	.1738 (.37) P=.152	-.5561 (.41) P=.000	-.3783 (.41) P=.007	-.3507 (.38) P=.015	-.5388 (.40) P=.000	-.4439 (.41) P=.002
WAB-R F(I)	-.3994 (.36) P=.008	.4015 (.37) P=.007	.2124 (.37) P=.103	.2119 (.37) P=.104	-.2721 (.41) P=.043	-.2786 (.41) P=.038	-.3040 (.38) P=.032	-.2336 (.40) P=.073	-.4953 (.41) P=.000
WAB-R M(I)	-.5264 (.36) P=.000	.6030 (.37) P=.000	.2981 (.37) P=.037	.0138 (.37) P=.468	-.3669 (.41) P=.009	-.4289 (.41) P=.003	-.5044 (.38) P=.001	-.3768 (.40) P=.008	-.6302 (.41) P=.000
WAB-R P(I)	-.4334 (.36) P=.004	.5693 (.37) P=.000	.3721 (.37) P=.012	.2067 (.37) P=.110	-.5338 (.41) P=.000	-.4902 (.41) P=.001	-.6318 (.38) P=.002	-.3672 (.40) P=.010	-.5862 (.41) P=.000
WAB-R O(I)	-.4737 (.36) P=.002	.4007 (.37) P=.007	.3263 (.37) P=.024	.0867 (.37) P=.305	-.3394 (.41) P=.015	-.1864 (.41) P=.122	-.2568 (.38) P=.060	-.2849 (.40) P=.037	-.5256 (.41) P=.000
WAB-R D(I)	-.5671 (.36) P=.000	.6606 (.37) P=.000	.4594 (.37) P=.002	.2044 (.37) P=.044	-.3946 (.41) P=.005	-.4324 (.41) P=.002	-.4816 (.38) P=.001	-.4739 (.40) P=.001	-.7456 (.41) P=.000
WAB-R V(I)	-.3383 (.36) P=.022	.5145 (.37) P=.001	.2785 (.37) P=.047	.1908 (.37) P=.129	-.5424 (.41) P=.000	-.4170 (.41) P=.003	-.4519 (.38) P=.001	-.5781 (.40) P=.000	-.6514 (.41) P=.000
WAB-R P(I)	-.5065 (.36) P=.001	.4810 (.37) P=.001	.2487 (.37) P=.069	.1044 (.37) P=.269	-.4181 (.41) P=.003	-.3719 (.41) P=.008	-.5025 (.38) P=.701	-.4508 (.40) P=.002	-.6665 (.41) P=.000
WAB-R I(I)	-.4547 (.36) P=.003	.5367 (.37) P=.000	.2745 (.37) P=.050	.1401 (.37) P=.204	-.4571 (.41) P=.000	-.4252 (.41) P=.003	-.5273 (.38) P=.000	-.5497 (.40) P=.000	-.7091 (.41) P=.000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix R continued

	TPT Time (1)	TPT Mem (1)	TPT Loc (1)	Finger Tap (1)	Speech Perc (1)	Rhythm (1)	Sens. Defic (1)	Aph. Spat (1)	Trall (1)
ANAPH 1 (F)	.0501 (.29) P=.398	.0236 (.29) P=.452	-.1405 (.29) P=.234	.2475 (.29) P=.098	-.2187 (.31) P=.119	.1493 (.31) P=.211	.2553 (.30) P=.087	.1998 (.31) P=.141	.1293 (.31) P=.244
ANAPH 2 (F)	.5070 (.27) P=.003	-.4640 (.27) P=.007	-.1270 (.27) P=.264	-.3251 (.29) P=.049	.4718 (.29) P=.005	.3195 (.29) P=.046	.0461 (.28) P=.408	-.0561 (.29) P=.386	-.5899 (.29) P=.000
ANAPH 3 (F)	-.1356 (.27) P=.250	-.0649 (.27) P=.374	.0572 (.27) P=.388	-.1112 (.29) P=.290	.4654 (.29) P=.005	.4857 (.29) P=.004	.1021 (.28) P=.303	.3026 (.29) P=.055	-.0040 (.29) P=.492
ANAPH 4 (F)	-.1309 (.27) P=.258	-.0284 (.27) P=.444	.1332 (.27) P=.254	-.1692 (.27) P=.199	-.1561 (.29) P=.209	-.1846 (.29) P=.169	-.0614 (.28) P=.378	-.5472 (.29) P=.001	-.1109 (.29) P=.269
ANAPH 5 (F)	-.0418 (.27) P=.418	-.0456 (.27) P=.411	.0202 (.27) P=.460	-.0344 (.27) P=.432	.0021 (.29) P=.696	.3573 (.29) P=.029	.2693 (.28) P=.083	-.1943 (.29) P=.156	.0114 (.29) P=.477
ANAPH 6 (F)	-.1056 (.27) P=.300	.0394 (.27) P=.423	-.0394 (.27) P=.423	.1555 (.27) P=.219	-.1286 (.29) P=.253	.2493 (.29) P=.096	.1358 (.28) P=.245	-.0508 (.29) P=.397	.1599 (.29) P=.204
ANAPH 7 (F)	-.1025 (.27) P=.305	.1335 (.27) P=.253	.0350 (.27) P=.431	-.0401 (.27) P=.421	-.2726 (.29) P=.076	.2171 (.29) P=.129	.1707 (.28) P=.193	-.3068 (.29) P=.053	-.0816 (.29) P=.337
ANAPH 8 (F)	-.1007 (.27) P=.309	.1947 (.27) P=.165	.2021 (.27) P=.156	-.0587 (.27) P=.386	-.0370 (.29) P=.424	.2095 (.29) P=.138	.1235 (.28) P=.266	-.0435 (.29) P=.411	.0911 (.29) P=.319
ANAPH 9 (F)	-.1632 (.27) P=.208	.2023 (.27) P=.156	.2092 (.27) P=.148	-.0186 (.27) P=.463	.0665 (.29) P=.366	-.2248 (.29) P=.121	-.4500 (.28) P=.008	.1984 (.29) P=.151	.2042 (.29) P=.144
ANAPH 10 (F)	-.0369 (.27) P=.427	.0631 (.27) P=.377	.2384 (.27) P=.116	.0223 (.27) P=.456	.0955 (.29) P=.311	.3138 (.29) P=.049	.1652 (.28) P=.200	.0295 (.29) P=.440	.0184 (.29) P=.462
ANAPH 11 (F)	-.2019 (.27) P=.156	.1539 (.27) P=.222	.1992 (.27) P=.160	.0233 (.27) P=.454	-.0237 (.29) P=.451	.1561 (.29) P=.259	.0357 (.28) P=.428	.0320 (.29) P=.435	.1715 (.29) P=.187
ANAPH 12 (F)	-.2156 (.27) P=.140	-.0215 (.27) P=.458	.0924 (.27) P=.323	-.0356 (.27) P=.489	.1589 (.29) P=.205	.3481 (.29) P=.032	.1440 (.28) P=.232	.0614 (.29) P=.376	.0873 (.29) P=.326
ANAPH 13 (F)	-.1341 (.27) P=.252	.1545 (.27) P=.221	.2829 (.27) P=.076	.1858 (.27) P=.177	.0993 (.29) P=.304	-.0020 (.29) P=.486	-.1682 (.28) P=.196	.2469 (.29) P=.098	.2753 (.29) P=.074
ANAPH 14 (F)	.1486 (.27) P=.252	-.3524 (.27) P=.063	-.2798 (.27) P=.079	.0670 (.27) P=.370	.1529 (.29) P=.217	.1227 (.29) P=.263	.2511 (.28) P=.599	.2875 (.29) P=.565	-.1566 (.29) P=.209
ANAPH 15 (F)	-.0066 (.27) P=.487	.0400 (.27) P=.421	.0426 (.27) P=.417	.0339 (.27) P=.179	.2629 (.29) P=.086	.2527 (.29) P=.095	.1957 (.28) P=.159	.4749 (.29) P=.025	.5323 (.29) P=.434

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix R continued

Category (F)	TFT Time (F)	TFT Mem (F)	TFT Loc (F)	Finger Tap (F)	Speech Perf (F)	Rhythm (F)	Sema. Deficit (F)	Apth. Spat (F)	Trails (F)
	-.2615 (.26) P=.098	-.2775 (.26) P=.085	-.1147 (.26) P=.288	-.1390 (.26) P=.254	.4291 (.26) P=.014	-.5320 (.26) P=.003	.2668 (.26) P=.094	.2188 (.26) P=.141	-.4120 (.26) P=.018
TFT Time (F)	-.6966 (.28) P=.000	-.7712 (.28) P=.000	-.5843 (.28) P=.001	-.3999 (.28) P=.054	.4993 (.28) P=.002	.4498 (.30) P=.006	.4171 (.29) P=.012	.2908 (.30) P=.059	-.6163 (.30) P=.000
TFT Mem (F)	-.4269 (.28) P=.012	.7242 (.28) P=.000	.4618 (.28) P=.009	.2265 (.28) P=.123	-.5414 (.28) P=.001	-.5128 (.30) P=.002	-.4810 (.29) P=.004	-.4595 (.30) P=.005	.5326 (.30) P=.001
TFT Loc (F)	-.3901 (.28) P=.020	.5372 (.28) P=.002	.5096 (.28) P=.003	.3104 (.28) P=.054	-.3504 (.30) P=.029	-.4780 (.30) P=.004	-.3740 (.29) P=.023	-.3470 (.30) P=.030	.4908 (.30) P=.003
Finger Tap (F)	-.4977 (.29) P=.003	.5228 (.29) P=.002	.3297 (.29) P=.040	.4920 (.29) P=.003	-.4761 (.31) P=.003	-.4078 (.31) P=.011	-.2651 (.30) P=.078	-.2031 (.31) P=.137	.6304 (.31) P=.000
Speech Perf (F)	.1972 (.29) P=.153	-.4588 (.29) P=.006	-.2837 (.29) P=.068	-.0507 (.29) P=.397	.9109 (.31) P=.000	.3483 (.31) P=.027	.1854 (.30) P=.163	.3479 (.31) P=.028	-.2589 (.31) P=.080
Rhythm (F)	.2340 (.29) P=.092	-.3337 (.29) P=.038	-.0175 (.29) P=.464	-.0975 (.29) P=.307	.4969 (.31) P=.002	.6164 (.31) P=.000	.3538 (.30) P=.028	.2543 (.31) P=.084	-.2370 (.31) P=.100
Sema. Deficit (F)	-.0379 (.28) P=.424	-.1627 (.28) P=.204	.1154 (.28) P=.279	-.0481 (.28) P=.404	.5491 (.30) P=.001	.2265 (.31) P=.114	.3311 (.29) P=.040	.1214 (.30) P=.261	-.3759 (.30) P=.020
Apth. Spat (F)	-.0908 (.28) P=.323	-.0668 (.28) P=.368	-.1341 (.28) P=.248	-.1398 (.28) P=.239	.3138 (.28) P=.046	.2416 (.30) P=.099	.0932 (.29) P=.315	.8862 (.30) P=.000	-.0805 (.30) P=.336
Trails Making (F)	-.6628 (.32) P=.000	.7309 (.32) P=.000	.5238 (.32) P=.001	.1407 (.32) P=.221	-.4634 (.32) P=.003	-.5097 (.33) P=.001	-.4543 (.33) P=.004	-.3825 (.34) P=.013	.8083 (.34) P=.000

Note. (F) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix R continued

	WAIS-R I (1)	WAIS-R CII (1)	WAIS-R A (1)	WAIS-R S (1)	WAIS-R DS (1)	WAIS-R V (1)	WAIS-R PC (1)	WAIS-R BD (1)	WAIS-R PA (1)	WAIS-R CA (1)	WAIS-R DSY (1)	WAIS-R VIQ (1)	WAIS-R PIQ (1)	WAIS-R IQ (1)
ANALOG (1)	-.0084 (.41) P=.479	-.1030 (.41) P=.261	-.2024 (.41) P=.102	-.3036 (.40) P=.027	-.2201 (.41) P=.083	-.0521 (.40) P=.373	-.1707 (.41) P=.143	-.2090 (.40) P=.095	-.1940 (.41) P=.112	-.1061 (.40) P=.255	-.3458 (.40) P=.013	-.1335 (.41) P=.203	-.1934 (.41) P=.113	-.1767 (.41) P=.135
ANALOG L (1)	-.3783 (.40) P=.008	-.1525 (.40) P=.174	-.2868 (.40) P=.036	-.2792 (.40) P=.041	-.1449 (.40) P=.186	-.2908 (.40) P=.034	-.1911 (.40) P=.119	-.1808 (.40) P=.132	-.2857 (.40) P=.037	-.2785 (.40) P=.041	-.0598 (.40) P=.357	-.3110 (.40) P=.025	-.1608 (.40) P=.161	-.2630 (.40) P=.051
ANALOG R (1)	-.1617 (.40) P=.159	-.2756 (.40) P=.043	-.0700 (.40) P=.334	-.2414 (.40) P=.067	.0067 (.40) P=.484	-.3601 (.40) P=.011	.0861 (.40) P=.299	-.0688 (.40) P=.337	-.1616 (.40) P=.160	-.1319 (.40) P=.209	-.0825 (.40) P=.306	-.2453 (.40) P=.064	-.1844 (.40) P=.127	-.2157 (.40) P=.091
ANALOG S (1)	.0709 (.40) P=.314	.2788 (.40) P=.041	.1163 (.40) P=.237	.2147 (.40) P=.092	.0996 (.40) P=.270	.1968 (.40) P=.112	.0793 (.40) P=.313	.0872 (.40) P=.296	.2451 (.40) P=.064	.1499 (.40) P=.178	.1217 (.40) P=.227	.2078 (.40) P=.099	.0510 (.40) P=.377	.1310 (.40) P=.210
ANALOG Sd (1)	-.1826 (.40) P=.130	-.2203 (.40) P=.086	-.0284 (.40) P=.431	-.0333 (.40) P=.419	-.1181 (.40) P=.234	-.2258 (.40) P=.081	.0931 (.40) P=.284	-.0156 (.40) P=.462	-.0878 (.40) P=.295	-.1376 (.40) P=.198	-.0831 (.40) P=.305	-.1886 (.40) P=.122	-.0669 (.40) P=.341	-.1518 (.40) P=.175
ANALOG D (1)	-.0169 (.40) P=.459	-.2767 (.40) P=.042	.0567 (.40) P=.364	-.1230 (.40) P=.225	.1583 (.40) P=.165	-.1746 (.40) P=.141	.2242 (.40) P=.092	-.0483 (.40) P=.384	-.0492 (.40) P=.381	-.1970 (.40) P=.112	-.0270 (.40) P=.434	-.0539 (.40) P=.371	.0294 (.40) P=.429	-.0043 (.40) P=.489
ANALOG Rg (1)	-.0770 (.40) P=.318	-.0634 (.40) P=.349	.1210 (.40) P=.228	.0921 (.40) P=.286	.0165 (.40) P=.460	-.1714 (.40) P=.145	.2488 (.40) P=.061	.0987 (.40) P=.272	.1172 (.40) P=.236	.0449 (.40) P=.392	.0515 (.40) P=.376	.0334 (.40) P=.419	.0940 (.40) P=.282	.0369 (.40) P=.364
ANALOG Pd (1)	.0760 (.40) P=.321	-.1392 (.40) P=.196	.0261 (.40) P=.437	-.1713 (.40) P=.145	.1941 (.40) P=.115	-.1733 (.40) P=.142	.1304 (.40) P=.211	.0030 (.40) P=.493	-.1686 (.40) P=.149	-.0161 (.40) P=.461	-.1203 (.40) P=.230	.0295 (.40) P=.428	-.0320 (.40) P=.422	-.0223 (.40) P=.446
ANALOG Mf (1)	-.1121 (.40) P=.246	-.1393 (.40) P=.197	-.0526 (.40) P=.374	-.1428 (.40) P=.190	.0026 (.40) P=.494	-.2112 (.40) P=.095	.0342 (.40) P=.417	-.1633 (.40) P=.157	-.2188 (.40) P=.087	-.2796 (.40) P=.040	-.1569 (.40) P=.167	-.1621 (.40) P=.159	-.2264 (.40) P=.080	-.1876 (.40) P=.123
ANALOG Pa (1)	.0106 (.40) P=.474	-.1271 (.40) P=.217	-.0430 (.40) P=.396	-.0973 (.40) P=.275	.0612 (.40) P=.354	-.1796 (.40) P=.134	.0486 (.40) P=.383	-.1302 (.40) P=.212	-.0741 (.40) P=.325	-.2713 (.40) P=.045	-.0580 (.40) P=.361	-.0899 (.40) P=.291	-.1565 (.40) P=.167	-.1145 (.40) P=.241
ANALOG Pt (1)	-.1111 (.40) P=.248	-.2811 (.40) P=.039	.0319 (.40) P=.422	-.1024 (.40) P=.265	.1697 (.40) P=.148	-.2544 (.40) P=.057	.0186 (.40) P=.455	-.1661 (.40) P=.253	-.0304 (.40) P=.426	-.3475 (.40) P=.014	-.0571 (.40) P=.363	-.0712 (.40) P=.331	-.1524 (.40) P=.174	-.1013 (.40) P=.267
ANALOG Bo (1)	-.0768 (.40) P=.319	-.1326 (.40) P=.207	.0055 (.40) P=.487	.0285 (.40) P=.431	.0766 (.40) P=.319	-.2712 (.40) P=.045	.2330 (.40) P=.074	-.0556 (.40) P=.486	.0143 (.40) P=.465	-.1630 (.40) P=.157	-.0140 (.40) P=.466	-.0817 (.40) P=.308	-.0560 (.40) P=.366	-.0506 (.40) P=.335
ANALOG Ma (1)	-.1381 (.40) P=.198	-.2418 (.40) P=.066	-.1783 (.40) P=.135	-.1719 (.40) P=.144	-.0164 (.40) P=.460	-.1778 (.40) P=.136	.0284 (.40) P=.480	-.0983 (.40) P=.273	-.1413 (.40) P=.192	-.0164 (.40) P=.460	-.1223 (.40) P=.226	-.1928 (.40) P=.119	-.2150 (.40) P=.091	-.2185 (.40) P=.088
ANALOG al (1)	-.0254 (.40) P=.438	-.2770 (.40) P=.042	-.0736 (.40) P=.326	-.2656 (.40) P=.249	-.0420 (.40) P=.453	-.0431 (.40) P=.396	-.1175 (.40) P=.235	-.1205 (.40) P=.269	-.1384 (.40) P=.211	-.2887 (.40) P=.035	.0132 (.40) P=.468	-.1160 (.40) P=.238	-.2454 (.40) P=.391	-.2748 (.40) P=.323
ANALOG PPS (1)	-.2047 (.40) P=.103	-.3587 (.40) P=.012	-.0984 (.40) P=.273	-.2472 (.40) P=.262	.0248 (.40) P=.464	-.3994 (.40) P=.025	.3366 (.40) P=.411	-.0272 (.40) P=.434	-.2678 (.40) P=.047	-.1169 (.40) P=.236	-.1246 (.40) P=.222	-.2768 (.40) P=.042	-.2454 (.40) P=.161	-.2186 (.40) P=.288

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Appendix R continued

	MAIS-R I(1)	MAIS-R C(1)	MAIS-R A(1)	MAIS-R S(1)	MAIS-R DS(1)	MAIS-R V(1)	MAIS-R FC(1)	MAIS-R BS(1)	MAIS-R PA(1)	MAIS-R CA(1)	MAIS-R DSY(1)	MAIS-R V(1)	MAIS-R PID(1)	MAIS-R EQ(1)
Age	-.1014 (.41) P=.264	-.1521 (.41) P=.171	-.2926 (.41) P=.032	-.4054 (.41) P=.004	-.1930 (.41) P=.113	.0095 (.41) P=.289	-.2158 (.41) P=.088	-.2351 (.41) P=.054	-.4327 (.41) P=.002	-.2467 (.41) P=.060	-.3583 (.41) P=.011	-.2053 (.41) P=.099	-.0014 (.41) P=.497	-.1166 (.41) P=.234
Sex	-.0428 (.41) P=.348	-.2804 (.41) P=.038	-.2490 (.41) P=.058	-.0614 (.41) P=.351	-.2168 (.41) P=.087	.2377 (.41) P=.067	-.3661 (.41) P=.059	-.2218 (.41) P=.082	.0237 (.41) P=.442	-.2649 (.41) P=.047	-.0956 (.41) P=.276	-.0109 (.41) P=.473	-.1106 (.41) P=.246	-.0886 (.41) P=.291
SES	.6100 (.41) P=.000	.5179 (.41) P=.000	.2204 (.41) P=.083	.2637 (.41) P=.048	.2792 (.41) P=.039	.7025 (.41) P=.000	.2313 (.41) P=.073	.2826 (.41) P=.037	.3403 (.41) P=.013	.1225 (.41) P=.223	.3215 (.41) P=.020	.6357 (.41) P=.000	.4276 (.41) P=.003	.5713 (.41) P=.000
Recent Events	-.2708 (.41) P=.043	-.0657 (.41) P=.342	.0189 (.41) P=.453	-.0478 (.41) P=.383	.0097 (.41) P=.476	-.2225 (.41) P=.081	-.1111 (.41) P=.245	.0205 (.41) P=.449	-.1393 (.41) P=.192	-.0714 (.41) P=.329	-.2185 (.41) P=.085	-.1675 (.41) P=.148	-.2308 (.41) P=.073	-.2122 (.41) P=.091
Psych. Ex	-.1005 (.41) P=.266	-.1136 (.41) P=.240	.0473 (.41) P=.384	.0430 (.41) P=.395	-.0332 (.41) P=.413	-.1079 (.41) P=.251	-.0095 (.41) P=.477	.1089 (.41) P=.249	-.0546 (.41) P=.367	.2478 (.41) P=.059	-.0230 (.41) P=.443	-.0772 (.41) P=.316	-.0165 (.41) P=.459	-.0688 (.41) P=.334
Severity	-.5053 (.41) P=.000	-.2630 (.41) P=.048	-.2927 (.41) P=.032	-.3654 (.41) P=.009	-.3756 (.41) P=.008	-.5510 (.41) P=.000	-.1547 (.41) P=.167	-.4489 (.41) P=.002	-.4776 (.41) P=.001	-.3411 (.41) P=.015	-.5158 (.41) P=.000	-.5671 (.41) P=.000	-.5341 (.41) P=.000	-.6038 (.41) P=.000
OCI at Admit.	.5054 (.41) P=.000	.2719 (.41) P=.043	.2677 (.41) P=.045	.2828 (.41) P=.037	.3820 (.41) P=.007	.4805 (.41) P=.001	.1556 (.41) P=.166	.4328 (.41) P=.002	.4047 (.41) P=.004	.2590 (.41) P=.051	.5116 (.41) P=.000	.5181 (.41) P=.000	.5043 (.41) P=.000	.5521 (.41) P=.000
Sleep. Duration	-.3232 (.41) P=.020	-.0432 (.41) P=.394	-.1647 (.41) P=.152	-.1475 (.41) P=.179	-.2121 (.41) P=.092	-.2555 (.41) P=.053	-.1349 (.41) P=.200	-.3010 (.41) P=.028	-.2873 (.41) P=.034	-.1727 (.41) P=.140	-.4786 (.41) P=.001	-.3171 (.41) P=.022	-.3910 (.41) P=.006	-.3840 (.41) P=.007
Imp. Outcome	-.4377 (.41) P=.002	-.1248 (.41) P=.218	-.2163 (.41) P=.087	-.1935 (.41) P=.113	-.3445 (.41) P=.014	-.4305 (.41) P=.002	-.1342 (.41) P=.201	-.4355 (.41) P=.002	-.4813 (.41) P=.002	-.3098 (.41) P=.024	-.5005 (.41) P=.000	-.4271 (.41) P=.003	-.5408 (.41) P=.000	-.5154 (.41) P=.000
Maintenance	-.3622 (.41) P=.010	-.1497 (.41) P=.175	-.1621 (.41) P=.156	-.4003 (.41) P=.005	-.0420 (.41) P=.397	-.2419 (.41) P=.064	-.1430 (.41) P=.186	-.3635 (.41) P=.010	-.1960 (.41) P=.110	-.2129 (.41) P=.091	-.2628 (.41) P=.048	-.2619 (.41) P=.049	-.2169 (.41) P=.087	-.2794 (.41) P=.038
Small Pract.	-.3055 (.41) P=.026	-.1370 (.41) P=.196	-.2147 (.41) P=.089	-.1777 (.41) P=.133	-.3088 (.41) P=.025	-.3865 (.41) P=.006	-.0178 (.41) P=.456	.0117 (.41) P=.471	-.0918 (.41) P=.284	.0126 (.41) P=.469	.0950 (.41) P=.277	-.3417 (.41) P=.014	-.0443 (.41) P=.392	-.2248 (.41) P=.075
Imp. Dates	-.6194 (.41) P=.000	-.4649 (.41) P=.001	-.4506 (.41) P=.002	-.6249 (.41) P=.000	-.4569 (.41) P=.001	-.5231 (.41) P=.000	-.4093 (.41) P=.004	-.5922 (.41) P=.000	-.6945 (.41) P=.000	-.4802 (.41) P=.001	-.7463 (.41) P=.000	-.6247 (.41) P=.000	-.5702 (.41) P=.000	-.6405 (.41) P=.000

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix R continued

	MAIS-R IQ(1)	MAIS-R C(1)	MAIS-R A(1)	MAIS-RS S(1)	MAIS-R DS(1)	MAIS-R V(1)	MAIS-R PC(1)	MAIS-R ED(1)	MAIS-R PA(1)	MAIS-R CA(1)	MAIS-R DSY(1)	MAIS-R VIO(1)	MAIS-R PIO(1)	MAIS-R IQ(1)
WPE Time(1)	-.2355 (.36) P=.083	-.0287 (.36) P=.434	-.3220 (.36) P=.028	-.1329 (.36) P=.220	-.5976 (.36) P=.000	-.0336 (.36) P=.423	-.3994 (.36) P=.008	-.5264 (.36) P=.000	-.4334 (.36) P=.004	-.4737 (.36) P=.002	-.5671 (.36) P=.000	-.3383 (.36) P=.022	-.5065 (.36) P=.001	-.4547 (.36) P=.003
WPE Mem(1)	.4346 (.37) P=.002	.4694 (.37) P=.002	.3992 (.37) P=.007	.5677 (.37) P=.000	.2475 (.37) P=.070	.2839 (.37) P=.044	.4015 (.37) P=.007	.6030 (.37) P=.000	.5693 (.37) P=.000	.4007 (.37) P=.007	.6606 (.37) P=.000	.5145 (.37) P=.001	.4810 (.37) P=.001	.5367 (.37) P=.000
WPE Leo(1)	.2694 (.37) P=.053	.1912 (.37) P=.128	.2099 (.37) P=.106	.3184 (.37) P=.243	.2763 (.37) P=.049	.1793 (.37) P=.144	.2124 (.37) P=.103	.2981 (.37) P=.037	.3721 (.37) P=.012	.3263 (.37) P=.024	.4594 (.37) P=.002	.2795 (.37) P=.047	.2487 (.37) P=.069	.2745 (.37) P=.050
Finger Tap(1)	.2843 (.37) P=.044	.1163 (.37) P=.247	.1628 (.37) P=.168	-.0437 (.37) P=.399	.2171 (.37) P=.098	.1738 (.37) P=.152	.2119 (.37) P=.104	.0138 (.37) P=.468	.2067 (.37) P=.110	.0867 (.37) P=.305	.2844 (.37) P=.044	.1908 (.37) P=.129	.1044 (.37) P=.269	.1401 (.37) P=.204
Speech Poro(1)	-.5497 (.41) P=.000	-.4928 (.41) P=.001	-.2683 (.41) P=.045	-.5536 (.41) P=.000	-.2783 (.41) P=.039	-.5561 (.41) P=.000	-.2721 (.41) P=.043	-.3669 (.41) P=.059	-.5338 (.41) P=.000	-.3394 (.41) P=.015	-.3946 (.41) P=.005	-.5424 (.41) P=.000	-.4181 (.41) P=.003	-.5071 (.41) P=.000
Rhythm(1)	-.4655 (.41) P=.001	-.2537 (.41) P=.053	-.3982 (.41) P=.005	-.2600 (.41) P=.050	-.4544 (.41) P=.001	-.3783 (.41) P=.007	-.2796 (.41) P=.038	-.4289 (.41) P=.003	-.4902 (.41) P=.001	-.1864 (.41) P=.122	-.4324 (.41) P=.002	-.4170 (.41) P=.003	-.3719 (.41) P=.008	-.4252 (.41) P=.003
Reas. DefClo(1)	-.4153 (.40) P=.005	-.2739 (.40) P=.048	-.2920 (.40) P=.038	-.3369 (.40) P=.019	-.3765 (.40) P=.010	-.3567 (.40) P=.015	-.3040 (.40) P=.032	-.5044 (.40) P=.001	-.4618 (.40) P=.002	-.2568 (.40) P=.060	-.4816 (.40) P=.001	-.4819 (.40) P=.001	-.5025 (.40) P=.001	-.5273 (.40) P=.000
Appl. Spat(1)	-.4986 (.40) P=.001	-.5168 (.40) P=.000	-.2540 (.40) P=.057	-.4766 (.40) P=.001	-.2671 (.40) P=.048	-.5388 (.40) P=.000	-.2336 (.40) P=.073	-.3768 (.40) P=.058	-.3672 (.40) P=.010	-.2849 (.40) P=.037	-.4739 (.40) P=.001	-.5781 (.40) P=.000	-.4508 (.40) P=.002	-.5497 (.40) P=.000
Trail Making(1)	.5968 (.41) P=.000	.2918 (.41) P=.032	.4526 (.41) P=.001	.4742 (.41) P=.001	.5793 (.41) P=.050	.4439 (.41) P=.002	.4953 (.41) P=.000	.6302 (.41) P=.000	.5862 (.41) P=.000	.5236 (.41) P=.000	.7456 (.41) P=.000	.6514 (.41) P=.000	.6665 (.41) P=.000	.7091 (.41) P=.000

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up;
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Appendix R continued

	MAIS-R I(I)	MAIS-R C(I)	MAIS-R A(I)	MAIS-RS S(I)	MAIS-R DS(I)	MAIS-R V(I)	MAIS-R PC(I)	MAIS-R BD(I)	MAIS-R PA(I)	MAIS-R CA(I)	MAIS-R DSV(I)	MAIS-R VQ(I)	MAIS-R PQ(I)	MAIS-R IQ(I)
MAIS-R I(I)	1.0000 (.41) P=.000	.6746 (.41) P=.000	-.4957 (.41) P=.000	-.6220 (.41) P=.000	-.3765 (.41) P=.000	.8330 (.41) P=.000	.5111 (.41) P=.000	.6366 (.41) P=.000	.6492 (.41) P=.000	.4475 (.41) P=.002	.5155 (.41) P=.000	.8555 (.41) P=.000	.6912 (.41) P=.000	.8423 (.41) P=.000
MAIS-R C(I)	.6746 (.41) P=.000	1.0000 (.41) P=.000	.2180 (.41) P=.000	.6268 (.41) P=.000	.0527 (.41) P=.000	.7017 (.41) P=.000	.3377 (.41) P=.000	.4633 (.41) P=.000	.5361 (.41) P=.000	.3397 (.41) P=.000	.3872 (.41) P=.000	.6639 (.41) P=.000	.4654 (.41) P=.000	.5921 (.41) P=.000
MAIS-R A(I)	-.4957 (.41) P=.000	.2180 (.41) P=.000	1.0000 (.41) P=.000	-.5168 (.41) P=.000	-.6943 (.41) P=.000	.3794 (.41) P=.000	.2235 (.41) P=.000	.5052 (.41) P=.000	.4644 (.41) P=.000	.2420 (.41) P=.000	.4949 (.41) P=.000	.6925 (.41) P=.000	.4265 (.41) P=.000	.6250 (.41) P=.000
MAIS-R S(I)	-.6220 (.41) P=.000	.6268 (.41) P=.000	-.5168 (.41) P=.000	1.0000 (.41) P=.000	-.2966 (.41) P=.000	.5494 (.41) P=.000	.4125 (.41) P=.000	.5917 (.41) P=.000	.6368 (.41) P=.000	.4589 (.41) P=.000	.6023 (.41) P=.000	.7014 (.41) P=.000	.5165 (.41) P=.000	.6695 (.41) P=.000
MAIS-R DS(I)	-.3765 (.41) P=.000	.0527 (.41) P=.000	-.6943 (.41) P=.000	-.2966 (.41) P=.000	1.0000 (.41) P=.000	.2706 (.41) P=.000	.2358 (.41) P=.000	.4377 (.41) P=.000	.4022 (.41) P=.000	.2614 (.41) P=.000	.4951 (.41) P=.000	.6040 (.41) P=.000	.4601 (.41) P=.000	.5827 (.41) P=.000
MAIS-R V(I)	.8330 (.41) P=.000	.7017 (.41) P=.000	.3794 (.41) P=.000	.5494 (.41) P=.000	-.2736 (.41) P=.000	1.0000 (.41) P=.000	.1852 (.41) P=.000	.3995 (.41) P=.000	.5147 (.41) P=.000	.2812 (.41) P=.000	.4036 (.41) P=.000	.8109 (.41) P=.000	.5166 (.41) P=.000	.7171 (.41) P=.000
MAIS-R PC(I)	.5111 (.41) P=.000	.3377 (.41) P=.000	-.4957 (.41) P=.000	-.4125 (.41) P=.000	-.2358 (.41) P=.000	.1852 (.41) P=.000	1.0000 (.41) P=.000	.6502 (.41) P=.000	.5282 (.41) P=.000	.5335 (.41) P=.000	.4277 (.41) P=.000	.6045 (.41) P=.000	.6888 (.41) P=.000	.5791 (.41) P=.000
MAIS-R BD(I)	.6366 (.41) P=.000	.4633 (.41) P=.000	.5052 (.41) P=.000	.5917 (.41) P=.000	.4377 (.41) P=.000	.3995 (.41) P=.000	.6502 (.41) P=.000	1.0000 (.41) P=.000	.7108 (.41) P=.000	.7651 (.41) P=.000	.6050 (.41) P=.000	.6831 (.41) P=.000	.8875 (.41) P=.000	.8395 (.41) P=.000
MAIS-R PA(I)	.6492 (.41) P=.000	.5361 (.41) P=.000	.4644 (.41) P=.000	.4589 (.41) P=.000	.4022 (.41) P=.000	.2614 (.41) P=.000	.2358 (.41) P=.000	.4377 (.41) P=.000	.4022 (.41) P=.000	.2614 (.41) P=.000	.4951 (.41) P=.000	.6040 (.41) P=.000	.4601 (.41) P=.000	.5827 (.41) P=.000
MAIS-R CA(I)	.4475 (.41) P=.002	.3397 (.41) P=.000	.2420 (.41) P=.000	.4949 (.41) P=.000	.6023 (.41) P=.000	.7014 (.41) P=.000	.5165 (.41) P=.000	.6695 (.41) P=.000	.5827 (.41) P=.000	.5335 (.41) P=.000	.4277 (.41) P=.000	.6045 (.41) P=.000	.6888 (.41) P=.000	.5791 (.41) P=.000
MAIS-R DSV(I)	.5155 (.41) P=.000	.3872 (.41) P=.000	.4949 (.41) P=.000	.6023 (.41) P=.000	.7014 (.41) P=.000	.5165 (.41) P=.000	.6695 (.41) P=.000	.5827 (.41) P=.000	.5335 (.41) P=.000	.4277 (.41) P=.000	.6045 (.41) P=.000	.6831 (.41) P=.000	.8875 (.41) P=.000	.8395 (.41) P=.000
MAIS-R VQ(I)	.8555 (.41) P=.000	.6639 (.41) P=.000	.6925 (.41) P=.000	.7014 (.41) P=.000	.6040 (.41) P=.000	.8109 (.41) P=.000	.4045 (.41) P=.000	.6831 (.41) P=.000	.5562 (.41) P=.000	.4774 (.41) P=.000	.6134 (.41) P=.000	1.0000 (.41) P=.000	.7190 (.41) P=.000	.9336 (.41) P=.000
MAIS-R PQ(I)	.6912 (.41) P=.000	.4654 (.41) P=.000	.4065 (.41) P=.000	.5165 (.41) P=.000	.4601 (.41) P=.000	.5146 (.41) P=.000	.6888 (.41) P=.000	.8875 (.41) P=.000	.7050 (.41) P=.000	.7415 (.41) P=.000	.6627 (.41) P=.000	.7190 (.41) P=.000	1.0000 (.41) P=.000	.9145 (.41) P=.000
MAIS-R IQ(I)	.8423 (.41) P=.000	.5921 (.41) P=.000	.6050 (.41) P=.000	.6695 (.41) P=.000	.5827 (.41) P=.000	.7171 (.41) P=.000	.5791 (.41) P=.000	.8395 (.41) P=.000	.7231 (.41) P=.000	.6374 (.41) P=.000	.6861 (.41) P=.000	.9336 (.41) P=.000	.9145 (.41) P=.000	1.0000 (.41) P=.000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.
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Appendix R continued

	WAIS-R I (1)	WAIS-R C (2)	WAIS-R A (3)	WAIS-R S (4)	WAIS-R DS (5)	WAIS-R V (6)	WAIS-R PC (7)	WAIS-R BD (8)	WAIS-R PA (9)	WAIS-R CA (10)	WAIS-R DS (11)	WAIS-R V (12)	WAIS-R PIQ (13)	WAIS-R IQ (14)
ANALYSIS 1 (F)	.2683 (.23) P=.108	.2512 (.23) P=.124	-.2344 (.23) P=.141	-.0912 (.23) P=.339	-.1635 (.23) P=.228	-.2464 (.23) P=.129	.2035 (.23) P=.324	.1006 (.23) P=.324	.1403 (.23) P=.262	-.0157 (.23) P=.472	-.1764 (.23) P=.210	.1265 (.23) P=.283	.1135 (.23) P=.303	.1006 (.23) P=.324
ANALYSIS 2 (F)	-.5520 (.21) P=.005	-.2108 (.21) P=.179	-.2024 (.21) P=.189	-.3777 (.21) P=.046	-.3416 (.21) P=.065	-.3195 (.21) P=.079	-.3235 (.21) P=.076	-.4365 (.21) P=.024	-.4341 (.21) P=.025	-.3935 (.21) P=.039	-.3444 (.21) P=.063	-.3299 (.21) P=.072	-.3014 (.21) P=.092	-.3567 (.21) P=.056
ANALYSIS 3 (F)	-.4042 (.21) P=.035	-.4986 (.21) P=.011	-.2571 (.21) P=.130	-.4913 (.21) P=.012	-.0459 (.21) P=.422	-.3757 (.21) P=.047	-.4153 (.21) P=.031	-.2914 (.21) P=.100	-.5494 (.21) P=.005	-.3210 (.21) P=.078	-.2216 (.21) P=.167	-.3444 (.21) P=.063	-.3459 (.21) P=.062	-.3373 (.21) P=.067
ANALYSIS 4 (F)	-.0129 (.21) P=.478	-.0209 (.21) P=.464	-.0841 (.21) P=.359	.2878 (.21) P=.103	.1509 (.21) P=.257	-.0480 (.21) P=.418	.2980 (.21) P=.095	.1943 (.21) P=.199	.0764 (.21) P=.371	.2817 (.21) P=.108	.2346 (.21) P=.153	.0827 (.21) P=.361	.3886 (.21) P=.041	.2494 (.21) P=.138
ANALYSIS 5 (F)	-.2182 (.21) P=.171	-.3529 (.21) P=.058	.0732 (.21) P=.376	-.0116 (.21) P=.480	.1476 (.21) P=.262	-.2436 (.21) P=.144	.2189 (.21) P=.170	.0509 (.21) P=.413	-.1462 (.21) P=.264	-.0394 (.21) P=.433	-.0563 (.21) P=.404	-.0687 (.21) P=.384	.2233 (.21) P=.165	.0658 (.21) P=.388
ANALYSIS 6 (F)	-.1639 (.21) P=.239	-.1790 (.21) P=.219	.0324 (.21) P=.445	-.0455 (.21) P=.422	-.0271 (.21) P=.454	-.0354 (.21) P=.439	.0098 (.21) P=.483	.0057 (.21) P=.490	-.1593 (.21) P=.245	-.1741 (.21) P=.477	-.0608 (.21) P=.397	-.0050 (.21) P=.491	.0491 (.21) P=.416	.0198 (.21) P=.466
ANALYSIS 7 (F)	-.0978 (.21) P=.337	-.1781 (.21) P=.220	.2029 (.21) P=.189	.1243 (.21) P=.296	.1594 (.21) P=.245	-.1271 (.21) P=.292	.2675 (.21) P=.121	.1078 (.21) P=.321	-.0744 (.21) P=.374	-.0131 (.21) P=.478	.1280 (.21) P=.290	.1118 (.21) P=.315	.2636 (.21) P=.124	.2007 (.21) P=.192
ANALYSIS 8 (F)	.0933 (.21) P=.344	.0046 (.21) P=.492	.1827 (.21) P=.214	.0541 (.21) P=.408	.1922 (.21) P=.252	-.1411 (.21) P=.271	.0855 (.21) P=.356	.0374 (.21) P=.436	-.3552 (.21) P=.057	.0133 (.21) P=.477	-.0617 (.21) P=.395	.2227 (.21) P=.166	-.0296 (.21) P=.449	.1419 (.21) P=.270
ANALYSIS 9 (F)	.1324 (.21) P=.284	-.0732 (.21) P=.376	.1977 (.21) P=.195	-.0756 (.21) P=.372	.1987 (.21) P=.194	-.2033 (.21) P=.188	.2615 (.21) P=.126	.1272 (.21) P=.291	-.1007 (.21) P=.332	-.1649 (.21) P=.237	.1350 (.21) P=.280	.0008 (.21) P=.499	-.0178 (.21) P=.469	.0104 (.21) P=.482
ANALYSIS 10 (F)	-.0918 (.21) P=.346	.0263 (.21) P=.455	-.1876 (.21) P=.208	-.2807 (.21) P=.109	-.1205 (.21) P=.301	-.0914 (.21) P=.347	-.1795 (.21) P=.218	-.2852 (.21) P=.105	-.2380 (.21) P=.149	-.4283 (.21) P=.026	-.2144 (.21) P=.175	-.0423 (.21) P=.428	-.2179 (.21) P=.171	-.1223 (.21) P=.330
ANALYSIS 11 (F)	-.0593 (.21) P=.399	-.1905 (.21) P=.204	.0781 (.21) P=.368	-.0530 (.21) P=.493	.2183 (.21) P=.171	.0155 (.21) P=.473	-.2056 (.21) P=.186	-.0388 (.21) P=.434	-.0189 (.21) P=.468	-.3577 (.21) P=.056	.1049 (.21) P=.325	.1006 (.21) P=.332	-.0568 (.21) P=.488	.1094 (.21) P=.318
ANALYSIS 12 (F)	-.2123 (.21) P=.178	-.3755 (.21) P=.047	-.1053 (.21) P=.325	-.3284 (.21) P=.160	.2010 (.21) P=.191	-.2405 (.21) P=.159	-.1146 (.21) P=.310	-.0921 (.21) P=.349	-.3134 (.21) P=.083	-.1615 (.21) P=.242	-.0834 (.21) P=.360	-.0569 (.21) P=.403	-.0385 (.21) P=.451	-.0264 (.21) P=.455
ANALYSIS 13 (F)	.0367 (.21) P=.437	-.0783 (.21) P=.368	-.3800 (.21) P=.045	-.1349 (.21) P=.280	-.0391 (.21) P=.433	-.0450 (.21) P=.423	.0021 (.21) P=.496	-.1133 (.21) P=.312	.0636 (.21) P=.392	.0018 (.21) P=.497	.0951 (.21) P=.361	-.1635 (.21) P=.239	-.1544 (.21) P=.252	-.1634 (.21) P=.240
ANALYSIS 14 (F)	-.0415 (.21) P=.429	-.0388 (.21) P=.434	-.2014 (.21) P=.191	-.2322 (.21) P=.156	-.1988 (.21) P=.193	.1564 (.21) P=.323	-.1834 (.21) P=.213	.1657 (.21) P=.236	-.0025 (.21) P=.496	-.3596 (.21) P=.055	-.2393 (.21) P=.348	-.1583 (.21) P=.247	-.0864 (.21) P=.355	-.1218 (.21) P=.299
ANALYSIS 15 (F)	-.1946 (.21) P=.199	-.3391 (.21) P=.066	-.1384 (.21) P=.275	-.5286 (.21) P=.027	-.1625 (.21) P=.244	-.3168 (.21) P=.081	-.1977 (.21) P=.195	-.2816 (.21) P=.158	-.3122 (.21) P=.060	-.5310 (.21) P=.027	-.3467 (.21) P=.062	-.2407 (.21) P=.165	-.4434 (.21) P=.222	-.3966 (.21) P=.238

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Appendix R continued

	MAIS-R I(1)	MAIS-R C(1)	MAIS-R A(1)	MAIS-RS S(1)	MAIS-R DS(1)	MAIS-R VIC(1)	MAIS-R PC(1)	MAIS-R BS(1)	MAIS-R PA(1)	MAIS-R CA(1)	MAIS-R DSY(1)	MAIS-R VIC(1)	MAIS-R PC(1)	MAIS-R DSY(1)
Category (F)	-.4956 (.18) P=.018	-.4392 (.18) P=.028	-.4422 (.18) P=.034	-.6890 (.18) P=.001	-.4856 (.18) P=.021	-.3194 (.18) P=.098	-.6295 (.18) P=.004	-.5865 (.18) P=.005	-.5546 (.18) P=.009	-.5813 (.18) P=.005	-.5384 (.18) P=.011	-.6501 (.18) P=.002	-.6223 (.18) P=.003	-.6572 (.18) P=.002
SPR Time (F)	-.3909 (.22) P=.036	-.1646 (.22) P=.232	-.1103 (.22) P=.313	-.3476 (.22) P=.056	-.2533 (.22) P=.128	-.2508 (.22) P=.130	-.3856 (.22) P=.038	-.5541 (.22) P=.004	-.3665 (.22) P=.083	-.4723 (.22) P=.013	-.5890 (.22) P=.003	-.2510 (.22) P=.130	-.4629 (.22) P=.015	-.3911 (.22) P=.036
SPR Man (F)	.4405 (.22) P=.020	.5091 (.22) P=.008	.0650 (.22) P=.387	.5551 (.22) P=.004	-.0127 (.22) P=.478	.4260 (.22) P=.074	.4164 (.22) P=.027	.5623 (.22) P=.003	.4786 (.22) P=.012	.5646 (.22) P=.003	.4853 (.22) P=.010	.3143 (.22) P=.077	.4342 (.22) P=.022	.3892 (.22) P=.037
SPR Laid (F)	.3149 (.22) P=.077	.1998 (.22) P=.186	-.1305 (.22) P=.281	.4480 (.22) P=.018	-.1161 (.22) P=.303	.2850 (.22) P=.099	.2898 (.22) P=.095	.4699 (.22) P=.014	.4673 (.22) P=.014	.6122 (.22) P=.001	.4821 (.22) P=.012	.1225 (.22) P=.286	.4740 (.22) P=.013	.3224 (.22) P=.072
Player Tag (F)	.4907 (.23) P=.009	.0351 (.23) P=.637	.3371 (.23) P=.058	.2119 (.23) P=.166	.4492 (.23) P=.016	.2373 (.23) P=.138	.4119 (.23) P=.025	.3893 (.23) P=.033	.2612 (.23) P=.114	.4322 (.23) P=.020	.3867 (.23) P=.034	.2848 (.23) P=.094	.3803 (.23) P=.037	.3581 (.23) P=.047
Speech Pace (F)	.3062 (.23) P=.074	-.5879 (.23) P=.002	-.3138 (.23) P=.072	-.5547 (.23) P=.003	-.2551 (.23) P=.120	-.6083 (.23) P=.001	-.2060 (.23) P=.173	-.2659 (.23) P=.106	-.4292 (.23) P=.020	-.1069 (.23) P=.314	-.4296 (.23) P=.020	-.5429 (.23) P=.004	-.3601 (.23) P=.046	-.4709 (.23) P=.012
 rhythm (F)	.6775 (.23) P=.000	-.5774 (.23) P=.002	-.3625 (.23) P=.045	-.5407 (.23) P=.004	-.3920 (.23) P=.030	-.6239 (.23) P=.001	-.3408 (.23) P=.056	-.5286 (.23) P=.005	-.5686 (.23) P=.002	-.2203 (.23) P=.156	-.5052 (.23) P=.007	-.6395 (.23) P=.001	-.4162 (.23) P=.024	-.5886 (.23) P=.002
Game Deficit (F)	-.6111 (.22) P=.001	-.4940 (.22) P=.010	-.4031 (.22) P=.031	-.7041 (.22) P=.000	-.3156 (.22) P=.076	-.5824 (.22) P=.002	-.5780 (.22) P=.002	-.5514 (.22) P=.004	-.6302 (.22) P=.001	-.4997 (.22) P=.009	-.5436 (.22) P=.004	-.6898 (.22) P=.000	-.6597 (.22) P=.000	-.7026 (.22) P=.000
Appl. Spect (F)	-.4182 (.22) P=.026	-.4609 (.22) P=.015	-.1781 (.22) P=.214	-.5697 (.22) P=.003	-.0679 (.22) P=.382	-.5487 (.22) P=.004	-.1731 (.22) P=.221	-.3170 (.22) P=.075	-.2304 (.22) P=.151	-.3773 (.22) P=.042	-.1148 (.22) P=.306	-.5062 (.22) P=.008	-.3241 (.22) P=.071	-.4356 (.22) P=.021
Trail Making (F)	.4412 (.26) P=.012	.2517 (.26) P=.107	.2861 (.26) P=.078	.4465 (.26) P=.011	.4244 (.26) P=.015	.3398 (.26) P=.045	.3920 (.26) P=.024	.6921 (.26) P=.000	.6131 (.26) P=.000	.4133 (.26) P=.018	.6856 (.26) P=.000	.5298 (.26) P=.003	.6643 (.26) P=.000	.6461 (.26) P=.000

Note. (F) = data collected at initial assessment; (F) = data collected at follow-up;
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

ANAGER (F)	MOPI L (F)	MOPI F (F)	MOPI K (F)	MOPI Ha (F)	MOPI D (F)	MOPI Hy (F)	MOPI Pd (F)	MOPI Hc (F)	MOPI Pa (F)	MOPI Pt (F)	MOPI Sc (F)	MOPI Ma (F)	MOPI St (F)	MOPI PIS (F)
ANAGER (I)	.6269 (.31) P=.000	-.4586 (.29) P=.006	-.1352 (.29) P=.242	-.4032 (.29) P=.015	-.0126 (.29) P=.474	-.1386 (.29) P=.206	-.2475 (.29) P=.098	-.3281 (.29) P=.041	-.3127 (.29) P=.049	-.1137 (.29) P=.279	-.0221 (.29) P=.455	-.2490 (.29) P=.096	-.2679 (.29) P=.080	-.1526 (.29) P=.215
ANAGER L (I)	-.3030 (.31) P=.049	.7319 (.29) P=.000	.0026 (.29) P=.495	.4388 (.29) P=.009	.1067 (.29) P=.291	.0835 (.29) P=.333	.0426 (.29) P=.413	.0637 (.29) P=.368	.1675 (.29) P=.193	.0580 (.29) P=.382	.1284 (.29) P=.253	-.2538 (.29) P=.092	-.0644 (.29) P=.370	-.1263 (.29) P=.237
ANAGER M (I)	-.2399 (.31) P=.097	-.2584 (.29) P=.088	.3577 (.29) P=.028	-.2132 (.29) P=.133	-.1149 (.29) P=.243	.0128 (.29) P=.474	.4939 (.29) P=.003	.6888 (.29) P=.000	.2000 (.29) P=.149	.2988 (.29) P=.058	.1394 (.29) P=.235	.2730 (.29) P=.076	-.1871 (.29) P=.166	.3017 (.29) P=.056
ANAGER N (I)	-.2346 (.31) P=.102	.4549 (.29) P=.007	-.4038 (.29) P=.015	.5684 (.29) P=.001	.2242 (.29) P=.121	.2951 (.29) P=.060	-.0920 (.29) P=.318	-.0543 (.29) P=.390	-.1211 (.29) P=.266	-.1503 (.29) P=.218	-.1522 (.29) P=.215	-.2855 (.29) P=.067	-.1735 (.29) P=.184	-.5726 (.29) P=.001
ANAGER Ha (I)	-.0643 (.31) P=.365	-.0011 (.29) P=.498	.0025 (.29) P=.495	.1201 (.29) P=.267	.5558 (.29) P=.001	.6331 (.29) P=.000	.1739 (.29) P=.184	.1289 (.29) P=.253	-.1266 (.29) P=.256	-.0634 (.29) P=.372	-.0326 (.29) P=.433	-.0159 (.29) P=.467	-.2819 (.29) P=.069	-.0870 (.29) P=.327
ANAGER D (I)	.0371 (.31) P=.422	-.2412 (.29) P=.104	.3208 (.29) P=.045	.1022 (.29) P=.299	.3334 (.29) P=.039	.4072 (.29) P=.014	.4240 (.29) P=.011	.3789 (.29) P=.021	.4256 (.29) P=.011	.4534 (.29) P=.007	.3922 (.29) P=.018	.1248 (.29) P=.260	-.0627 (.29) P=.373	.3219 (.29) P=.044
ANAGER Hy (I)	-.1029 (.31) P=.291	-.0132 (.29) P=.473	-.1559 (.29) P=.210	.1962 (.29) P=.154	.3198 (.29) P=.045	.5582 (.29) P=.001	.2256 (.29) P=.120	.0129 (.29) P=.473	.0145 (.29) P=.470	-.1149 (.29) P=.276	-.0168 (.29) P=.466	-.0275 (.29) P=.444	-.4441 (.29) P=.008	-.2721 (.29) P=.147
ANAGER Pa (I)	-.0761 (.31) P=.342	-.3383 (.29) P=.016	.3696 (.29) P=.024	-.0519 (.29) P=.395	.1124 (.29) P=.281	.2697 (.29) P=.079	.6186 (.29) P=.000	.4976 (.29) P=.003	.7869 (.29) P=.059	.3576 (.29) P=.028	.4205 (.29) P=.012	.3286 (.29) P=.041	-.2802 (.29) P=.070	.2423 (.29) P=.103
ANAGER Ma (I)	-.2988 (.31) P=.051	.0368 (.29) P=.425	.2566 (.29) P=.090	.0337 (.29) P=.431	-.2333 (.29) P=.112	.0760 (.29) P=.447	.4948 (.29) P=.003	.7563 (.29) P=.000	.4631 (.29) P=.006	.2322 (.29) P=.113	.1760 (.29) P=.181	.2748 (.29) P=.075	-.2458 (.29) P=.099	.2677 (.29) P=.080
ANAGER St (I)	-.0279 (.31) P=.441	-.3522 (.29) P=.030	.2402 (.29) P=.105	-.1506 (.29) P=.302	-.1260 (.29) P=.257	.1070 (.29) P=.290	.4585 (.29) P=.006	.4699 (.29) P=.005	.3707 (.29) P=.024	.2417 (.29) P=.103	.2254 (.29) P=.120	.2596 (.29) P=.379	-.1123 (.29) P=.247	.4284 (.29) P=.014
ANAGER Pt (I)	.0238 (.31) P=.450	-.2895 (.29) P=.064	.1420 (.29) P=.231	-.1383 (.29) P=.237	-.0408 (.29) P=.417	.1767 (.29) P=.180	.3046 (.29) P=.054	.4500 (.29) P=.007	.2784 (.29) P=.072	.3861 (.29) P=.019	.1725 (.29) P=.185	.1073 (.29) P=.290	-.0267 (.29) P=.465	.2651 (.29) P=.082
ANAGER Sc (I)	-.1855 (.31) P=.159	-.2886 (.29) P=.064	-.0610 (.29) P=.375	.1083 (.29) P=.288	.0424 (.29) P=.414	.3130 (.29) P=.049	.3968 (.29) P=.017	.5297 (.29) P=.002	.1224 (.29) P=.263	.1823 (.29) P=.172	.0165 (.29) P=.466	.1037 (.29) P=.296	-.2829 (.29) P=.068	.0034 (.29) P=.493
ANAGER Ma (I)	.0418 (.31) P=.412	-.4361 (.29) P=.069	.1246 (.29) P=.263	-.4308 (.29) P=.010	-.1506 (.29) P=.218	-.1099 (.29) P=.285	.1240 (.29) P=.261	.3416 (.29) P=.035	-.1795 (.29) P=.176	-.0151 (.29) P=.469	.2541 (.29) P=.392	.7180 (.29) P=.000	-.2810 (.29) P=.572	.2931 (.29) P=.561
ANAGER St (I)	.3153 (.31) P=.288	-.0196 (.29) P=.460	.4527 (.29) P=.037	-.2641 (.29) P=.283	-.1222 (.29) P=.264	-.2445 (.29) P=.101	-.0186 (.29) P=.462	.5664 (.29) P=.291	.2600 (.29) P=.287	.3719 (.29) P=.223	.1375 (.29) P=.239	-.1245 (.29) P=.417	.5860 (.29) P=.053	.3596 (.29) P=.528
ANAGER PIS (I)	.0355 (.31) P=.425	-.5199 (.29) P=.022	.3869 (.29) P=.019	-.4242 (.29) P=.015	-.2928 (.29) P=.320	-.0158 (.29) P=.468	.3416 (.29) P=.035	.4338 (.29) P=.027	.1683 (.29) P=.191	.2722 (.29) P=.078	.2113 (.29) P=.136	.3758 (.29) P=.024	-.2634 (.29) P=.372	.3279 (.29) P=.522

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	ANZSR (F)	MOET L (F)	MOET F (F)	MOET F (F)	MOET Half (F)	MOET D (F)	MOET HY (F)	MOET P (F)	MOET H (F)	MOET P (F)	MOET S (F)	MOET S (F)	MOET Half (F)	MOET S (F)	MOET P (F)
Age	.0126 (31) P=.477	.5347 (29) P=.501	.2274 (29) P=.118	.2274 (29) P=.118	.3557 (29) P=.229	.1022 (29) P=.523	.0736 (29) P=.352	-.5270 (29) P=.445	-.1783 (29) P=.177	.0208 (29) P=.320	.2442 (29) P=.410	.2229 (29) P=.266	-.2553 (29) P=.091	.2127 (29) P=.134	.2521 (29) P=.342
Sex	.2879 (31) P=.058	.2147 (29) P=.132	-.0756 (29) P=.348	-.0756 (29) P=.348	-.1207 (29) P=.266	.1929 (29) P=.551	-.0736 (29) P=.352	-.2143 (29) P=.132	-.4978 (29) P=.100	.2154 (29) P=.131	.0506 (29) P=.488	-.0997 (29) P=.322	-.4718 (29) P=.035	.5225 (29) P=.022	-.2911 (29) P=.319
END	.2376 (31) P=.099	-.2325 (29) P=.112	-.0808 (29) P=.338	-.0808 (29) P=.338	-.2270 (29) P=.118	-.1650 (29) P=.196	-.0272 (29) P=.444	.0765 (29) P=.347	.1022 (29) P=.301	.0494 (29) P=.400	-.1151 (29) P=.276	-.2220 (29) P=.126	-.0813 (29) P=.338	-.2128 (29) P=.093	-.2021 (29) P=.144
Amount Events	.0745 (31) P=.385	-.2935 (29) P=.061	-.2765 (29) P=.073	-.2765 (29) P=.073	.1007 (29) P=.302	.3893 (29) P=.018	.1323 (29) P=.247	.1006 (29) P=.203	.1252 (29) P=.259	-.0977 (29) P=.307	.1915 (29) P=.160	.2320 (29) P=.113	.0223 (29) P=.454	.0325 (29) P=.434	.4889 (29) P=.004
Psych. Ex	-.0324 (31) P=.431	-.2447 (29) P=.100	-.1682 (29) P=.192	-.1682 (29) P=.192	.4083 (29) P=.014	.3953 (29) P=.017	.2604 (29) P=.086	.0582 (29) P=.380	-.2961 (29) P=.059	-.2410 (29) P=.104	.0660 (29) P=.367	.3115 (29) P=.050	.0411 (29) P=.416	-.1017 (29) P=.300	.0980 (29) P=.306
Severity	-.0581 (31) P=.378	-.3511 (29) P=.031	-.2255 (29) P=.120	-.2255 (29) P=.120	.0268 (29) P=.145	.0709 (29) P=.357	.0472 (29) P=.404	-.0287 (29) P=.461	.1329 (29) P=.246	-.1422 (29) P=.231	-.2695 (29) P=.079	-.1188 (29) P=.270	-.0118 (29) P=.476	-.0373 (29) P=.424	.1150 (29) P=.276
OCB at Admit.	.1619 (31) P=.192	-.3247 (29) P=.043	.1356 (29) P=.242	.1356 (29) P=.242	-.0122 (29) P=.475	.0017 (29) P=.497	-.0526 (29) P=.393	.0178 (29) P=.463	-.1720 (29) P=.186	.1656 (29) P=.195	.2351 (29) P=.110	.0344 (29) P=.390	-.0616 (29) P=.376	.0492 (29) P=.400	-.0493 (29) P=.400
Sleep. Duration	.0374 (31) P=.421	.3495 (29) P=.032	.1500 (29) P=.219	.1500 (29) P=.219	.1885 (29) P=.164	.3247 (29) P=.043	.1561 (29) P=.209	.0166 (29) P=.466	-.0174 (29) P=.464	.0050 (29) P=.450	.0046 (29) P=.491	-.0050 (29) P=.490	-.2456 (29) P=.100	.1777 (29) P=.178	-.0861 (29) P=.328
Imp. Comm.	-.1183 (31) P=.263	.3594 (29) P=.028	-.0480 (29) P=.402	-.0480 (29) P=.402	-.0303 (29) P=.438	.0929 (29) P=.316	.0432 (29) P=.412	.0567 (29) P=.385	.1771 (29) P=.179	-.0799 (29) P=.340	-.1770 (29) P=.179	-.0329 (29) P=.433	.0159 (29) P=.467	-.1445 (29) P=.221	.0449 (29) P=.409
Stimulons	.0328 (31) P=.431	.3447 (29) P=.034	-.1568 (29) P=.208	-.1568 (29) P=.208	.2530 (29) P=.093	.2086 (29) P=.139	.2416 (29) P=.103	-.1905 (29) P=.161	-.2238 (29) P=.122	-.0062 (29) P=.486	.0751 (29) P=.349	-.0098 (29) P=.480	-.1180 (29) P=.271	.0964 (29) P=.309	-.0122 (29) P=.475
Stimul Pref.	.1194 (31) P=.261	.1236 (29) P=.261	.2169 (29) P=.167	.2169 (29) P=.167	.1215 (29) P=.265	.0628 (29) P=.373	-.0368 (29) P=.425	-.2558 (29) P=.090	.0684 (29) P=.362	-.2011 (29) P=.148	-.2176 (29) P=.128	-.1023 (29) P=.259	-.1517 (29) P=.216	-.0884 (29) P=.324	.1767 (29) P=.180
Imp. Index	.0498 (31) P=.395	.4135 (29) P=.013	.4232 (29) P=.011	.4232 (29) P=.011	.0691 (29) P=.361	.0213 (29) P=.456	-.0469 (29) P=.405	.1306 (29) P=.250	-.0322 (29) P=.634	.1933 (29) P=.157	.0327 (29) P=.433	.0327 (29) P=.168	-.0913 (29) P=.319	.2129 (29) P=.134	.3342 (29) P=.031

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Appendix R continued

	ANGER (F)	MORI L (F)	MORI F (F)	MORI K (F)	MORI Hs (F)	MORI D (F)	MORI HY (F)	MORI Pd (F)	MORI NI (F)	MORI Pa (F)	MORI PL (F)	MORI Sc (F)	MORI Ma (F)	MORI SI (F)	MORI PTS (F)
TEF Time (I)	(.050) (.29) P=.398	(-.507) (.27) P=.003	(-.135) (.27) P=.250	(-.130) (.27) P=.258	(-.041) (.27) P=.418	(-.105) (.27) P=.300	(-.102) (.27) P=.305	(-.100) (.27) P=.309	(-.163) (.27) P=.208	(-.036) (.27) P=.427	(-.201) (.27) P=.156	(-.215) (.27) P=.140	(-.134) (.27) P=.252	(.148) (.27) P=.230	(-.006) (.27) P=.487
TEF Min (I)	(.023) (.29) P=.452	(-.460) (.27) P=.007	(-.064) (.27) P=.374	(-.084) (.27) P=.444	(-.045) (.27) P=.411	(.039) (.27) P=.423	(.133) (.27) P=.253	(.194) (.27) P=.165	(.023) (.27) P=.156	(.061) (.27) P=.377	(.153) (.27) P=.222	(.021) (.27) P=.458	(.154) (.27) P=.221	(-.302) (.27) P=.063	(.000) (.27) P=.421
TEF Len (I)	(.140) (.29) P=.234	(-.127) (.27) P=.264	(.057) (.27) P=.388	(.132) (.27) P=.254	(.020) (.27) P=.460	(-.039) (.27) P=.423	(.035) (.27) P=.431	(.021) (.27) P=.156	(.022) (.27) P=.148	(.284) (.27) P=.116	(.192) (.27) P=.160	(.092) (.27) P=.323	(.282) (.27) P=.076	(-.279) (.27) P=.079	(.026) (.27) P=.417
Finger Tap (I)	(.247) (.29) P=.038	(-.325) (.27) P=.049	(-.111) (.27) P=.290	(-.162) (.27) P=.199	(-.034) (.27) P=.432	(.155) (.27) P=.219	(-.040) (.27) P=.421	(-.058) (.27) P=.386	(-.018) (.27) P=.463	(.022) (.27) P=.456	(.023) (.27) P=.454	(.005) (.27) P=.489	(.183) (.27) P=.177	(.067) (.27) P=.370	(.039) (.27) P=.179
Speech Pace (I)	(.218) (.31) P=.119	(.471) (.29) P=.005	(.464) (.29) P=.005	(.156) (.29) P=.205	(.001) (.29) P=.696	(-.128) (.29) P=.253	(-.272) (.29) P=.076	(-.037) (.29) P=.424	(.065) (.29) P=.366	(.095) (.29) P=.311	(-.023) (.29) P=.451	(.158) (.29) P=.205	(.099) (.29) P=.361	(.150) (.29) P=.217	(.260) (.29) P=.086
Rhythm (I)	(.149) (.31) P=.211	(.319) (.29) P=.046	(.485) (.29) P=.004	(.184) (.29) P=.169	(.357) (.29) P=.029	(.249) (.29) P=.096	(.217) (.29) P=.129	(.205) (.29) P=.138	(-.224) (.29) P=.121	(.313) (.29) P=.049	(.156) (.29) P=.209	(.140) (.29) P=.032	(.002) (.29) P=.496	(.127) (.29) P=.263	(.250) (.29) P=.095
Sens. Deficit (I)	(.255) (.30) P=.087	(.046) (.28) P=.408	(.102) (.28) P=.303	(.061) (.28) P=.378	(.269) (.28) P=.083	(.138) (.28) P=.245	(.170) (.28) P=.193	(.123) (.28) P=.266	(-.450) (.28) P=.008	(.162) (.28) P=.200	(.037) (.28) P=.428	(.140) (.28) P=.232	(.162) (.28) P=.196	(.251) (.28) P=.099	(.197) (.28) P=.159
Alph. Spet (I)	(.198) (.31) P=.141	(.056) (.29) P=.386	(.302) (.29) P=.055	(.542) (.29) P=.001	(.194) (.29) P=.156	(.050) (.29) P=.397	(.308) (.29) P=.053	(.043) (.29) P=.411	(.198) (.29) P=.151	(.029) (.29) P=.440	(.032) (.29) P=.435	(.061) (.29) P=.376	(.246) (.29) P=.038	(.287) (.29) P=.065	(.474) (.29) P=.005
Trail Making (I)	(.129) (.31) P=.244	(.589) (.29) P=.000	(.004) (.29) P=.492	(.118) (.29) P=.269	(.014) (.29) P=.677	(.159) (.29) P=.254	(.081) (.29) P=.337	(.091) (.29) P=.319	(.242) (.29) P=.144	(.014) (.29) P=.462	(.171) (.29) P=.187	(.087) (.29) P=.326	(.273) (.29) P=.074	(.156) (.29) P=.239	(.023) (.29) P=.434

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Appendix R continued

ANALYSIS	MOD1 L (F)	MOD2 F (F)	MOD3 Hs (F)	MOD4 D (F)	MOD5 Hy (F)	MOD6 Pd (F)	MOD7 Wt (F)	MOD8 Pa (F)	MOD9 Pz (F)	MOD10 Sc (F)	MOD11 Ma (F)	MOD12 Sl (F)	MOD13 Pz (F)
WALS-R I (2)	.2683 (.231) P=.055	-.4542 (.211) P=.035	-.2182 (.211) P=.171	-.1639 (.211) P=.239	-.0978 (.211) P=.337	.0933 (.211) P=.344	.1324 (.211) P=.384	-.0918 (.211) P=.346	-.0593 (.211) P=.359	-.2123 (.211) P=.178	-.2367 (.211) P=.437	-.0415 (.211) P=.429	-.1946 (.211) P=.199
WALS-R C (2)	.3512 (.231) P=.124	-.4986 (.211) P=.011	-.3529 (.211) P=.058	-.1792 (.211) P=.219	-.1781 (.211) P=.222	.0046 (.211) P=.492	-.0732 (.211) P=.376	-.0263 (.211) P=.455	-.1925 (.211) P=.234	-.3755 (.211) P=.047	-.0743 (.211) P=.368	-.0388 (.211) P=.434	-.3391 (.211) P=.066
WALS-R A (2)	-.2344 (.231) P=.141	-.2571 (.211) P=.130	.0341 (.211) P=.359	.0324 (.211) P=.445	.2229 (.211) P=.189	.1827 (.211) P=.214	.1977 (.211) P=.195	-.1876 (.211) P=.208	.0781 (.211) P=.368	-.1553 (.211) P=.325	-.3802 (.211) P=.045	-.2214 (.211) P=.151	-.1384 (.211) P=.375
WALS-R B (2)	-.0912 (.231) P=.339	-.4913 (.211) P=.012	-.0116 (.211) P=.480	-.0455 (.211) P=.422	.1243 (.211) P=.296	.0541 (.211) P=.408	-.0756 (.211) P=.372	-.2807 (.211) P=.109	-.0038 (.211) P=.493	-.2284 (.211) P=.160	-.1349 (.211) P=.280	-.2322 (.211) P=.156	-.5286 (.211) P=.007
WALS-R D (2)	-.1635 (.231) P=.228	-.3416 (.211) P=.065	.1509 (.211) P=.257	.0271 (.211) P=.454	.1594 (.211) P=.245	.1922 (.211) P=.202	.1987 (.211) P=.194	-.1205 (.211) P=.301	.2183 (.211) P=.171	-.2010 (.211) P=.191	-.0391 (.211) P=.433	-.1998 (.211) P=.193	-.1625 (.211) P=.244
WALS-R V (2)	.2464 (.231) P=.129	-.3195 (.211) P=.079	-.0480 (.211) P=.418	-.0354 (.211) P=.439	-.1371 (.211) P=.292	-.1411 (.211) P=.271	-.2033 (.211) P=.188	-.0914 (.211) P=.367	.0155 (.211) P=.473	-.2485 (.211) P=.139	-.0450 (.211) P=.423	.1064 (.211) P=.323	-.3168 (.211) P=.081
WALS-R FC (2)	.2035 (.231) P=.176	-.3235 (.211) P=.076	-.2980 (.211) P=.095	.0098 (.211) P=.483	.2875 (.211) P=.121	.0855 (.211) P=.356	.2615 (.211) P=.126	-.1795 (.211) P=.218	-.2056 (.211) P=.186	-.1146 (.211) P=.310	.0021 (.211) P=.496	-.1834 (.211) P=.213	-.1977 (.211) P=.195
WALS-R MD (2)	.1006 (.231) P=.324	-.4765 (.211) P=.024	.1943 (.211) P=.159	.0057 (.211) P=.490	.1078 (.211) P=.321	.0374 (.211) P=.436	.1272 (.211) P=.291	-.2852 (.211) P=.105	-.0388 (.211) P=.434	-.0901 (.211) P=.349	-.1133 (.211) P=.312	-.1657 (.211) P=.236	-.2816 (.211) P=.108
WALS-R PA (2)	.1403 (.231) P=.262	-.4341 (.211) P=.025	.0764 (.211) P=.371	-.1593 (.211) P=.245	-.0744 (.211) P=.374	-.3552 (.211) P=.057	-.1007 (.211) P=.332	-.2380 (.211) P=.149	-.0189 (.211) P=.488	-.3134 (.211) P=.083	-.0636 (.211) P=.392	-.0025 (.211) P=.496	-.3502 (.211) P=.060
WALS-R OA (2)	.0157 (.231) P=.472	-.3210 (.211) P=.078	.2817 (.211) P=.108	-.1741 (.211) P=.225	-.0131 (.211) P=.478	.0133 (.211) P=.477	-.1649 (.211) P=.237	-.4283 (.211) P=.026	-.3577 (.211) P=.056	-.1615 (.211) P=.242	.0018 (.211) P=.497	-.3596 (.211) P=.055	-.5310 (.211) P=.007
WALS-R Day (2)	-.1764 (.231) P=.210	-.3444 (.211) P=.063	.2346 (.211) P=.153	-.0608 (.211) P=.397	.1240 (.211) P=.290	-.0617 (.211) P=.395	.1350 (.211) P=.200	-.2144 (.211) P=.175	.1049 (.211) P=.325	-.0834 (.211) P=.360	.0951 (.211) P=.341	-.2393 (.211) P=.148	-.3467 (.211) P=.062
WALS-R VTO (2)	.1265 (.231) P=.283	-.3299 (.211) P=.072	.0827 (.211) P=.361	-.0050 (.211) P=.491	.1118 (.211) P=.315	.2227 (.211) P=.166	.0008 (.211) P=.499	-.0423 (.211) P=.428	.1006 (.211) P=.332	-.0569 (.211) P=.403	-.1635 (.211) P=.239	-.1583 (.211) P=.247	-.3407 (.211) P=.065
WALS-R FTO (2)	.1135 (.231) P=.303	-.3014 (.211) P=.092	.3086 (.211) P=.041	.0491 (.211) P=.416	.2836 (.211) P=.124	-.0296 (.211) P=.449	-.0178 (.211) P=.469	-.2179 (.211) P=.171	-.0068 (.211) P=.488	-.0585 (.211) P=.401	-.1544 (.211) P=.232	-.0864 (.211) P=.355	-.4434 (.211) P=.022
WALS-R IQ (2)	.1006 (.231) P=.324	-.3567 (.211) P=.067	.2494 (.211) P=.138	.0198 (.211) P=.466	.2807 (.211) P=.192	.1419 (.211) P=.270	.0104 (.211) P=.482	-.1023 (.211) P=.330	.1094 (.211) P=.318	-.0264 (.211) P=.455	-.1634 (.211) P=.240	-.1218 (.211) P=.299	-.3966 (.211) P=.038

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

ANALYSIS	ANALYSIS (F)	MOPI L (F)	MOPI F (F)	MOPI R (F)	MOPI Hs (F)	MOPI D (F)	MOPI Hy (F)	MOPI Pd (F)	MOPI M (F)	MOPI Pa (F)	MOPI Pt (F)	MOPI Sc (F)	MOPI Ma (F)	MOPI SI (F)	MOPII PTS (F)
ANALYSIS	1.0000 (.31) P=.008	-.4449 (.29) P=.008	-.0604 (.29) P=.378	-.5573 (.29) P=.001	-.0951 (.29) P=.312	-.2494 (.29) P=.096	-.1965 (.29) P=.153	-.2148 (.29) P=.132	-.3613 (.29) P=.027	-.0732 (.29) P=.353	-.0596 (.29) P=.379	-.0244 (.29) P=.450	.0096 (.29) P=.480	.4777 (.29) P=.004	.3508 (.29) P=.031
MOPI L	-.4449 (.29) P=.008	1.0000 (.29) P=.008	.0337 (.29) P=.431	.4235 (.29) P=.011	.2507 (.29) P=.095	-.0452 (.29) P=.408	.1653 (.29) P=.196	.1317 (.29) P=.248	.0057 (.29) P=.488	.2084 (.29) P=.139	-.0555 (.29) P=.388	.0297 (.29) P=.439	-.2700 (.29) P=.078	-.0699 (.29) P=.359	-.2344 (.29) P=.092
MOPI F	-.0604 (.29) P=.378	.0337 (.29) P=.431	1.0000 (.29) P=.008	-.1908 (.29) P=.161	.2367 (.29) P=.108	.3661 (.29) P=.025	.1357 (.29) P=.241	.3712 (.29) P=.024	.1790 (.29) P=.176	.4855 (.29) P=.004	.6088 (.29) P=.000	.6620 (.29) P=.000	-.0190 (.29) P=.461	.2711 (.29) P=.077	.5110 (.29) P=.002
MOPI R	-.5573 (.29) P=.001	.4235 (.29) P=.011	-.1908 (.29) P=.161	1.0000 (.29) P=.008	.4055 (.29) P=.015	-.0543 (.29) P=.390	.4867 (.29) P=.004	.2582 (.29) P=.088	.0638 (.29) P=.371	.1236 (.29) P=.261	-.0115 (.29) P=.476	.0084 (.29) P=.483	-.3382 (.29) P=.036	-.3722 (.29) P=.023	-.6430 (.29) P=.000
MOPI Hs	-.0951 (.29) P=.312	.2507 (.29) P=.095	.2367 (.29) P=.108	.4055 (.29) P=.015	1.0000 (.29) P=.000	.5978 (.29) P=.000	.8308 (.29) P=.000	.2159 (.29) P=.130	-.1854 (.29) P=.168	-.0332 (.29) P=.432	.3453 (.29) P=.033	.5216 (.29) P=.002	-.1473 (.29) P=.223	.0049 (.29) P=.490	-.1114 (.29) P=.282
MOPI Hy	-.2148 (.29) P=.132	.1317 (.29) P=.248	.3712 (.29) P=.024	.2582 (.29) P=.088	.0638 (.29) P=.371	.1236 (.29) P=.261	.4867 (.29) P=.004	.2159 (.29) P=.130	-.1854 (.29) P=.168	-.0332 (.29) P=.432	.3453 (.29) P=.033	.5216 (.29) P=.002	-.1473 (.29) P=.223	.0049 (.29) P=.490	-.1114 (.29) P=.282
MOPI M	-.3613 (.29) P=.027	.0057 (.29) P=.488	.2084 (.29) P=.139	.1317 (.29) P=.248	.0638 (.29) P=.371	.1236 (.29) P=.261	.4867 (.29) P=.004	.2159 (.29) P=.130	-.1854 (.29) P=.168	-.0332 (.29) P=.432	.3453 (.29) P=.033	.5216 (.29) P=.002	-.1473 (.29) P=.223	.0049 (.29) P=.490	-.1114 (.29) P=.282
MOPI Pa	-.0732 (.29) P=.353	-.0596 (.29) P=.379	-.0244 (.29) P=.450	.0096 (.29) P=.480	.4777 (.29) P=.004	.3508 (.29) P=.031	.2344 (.29) P=.092	.0699 (.29) P=.359	.2711 (.29) P=.077	.5110 (.29) P=.002	.6430 (.29) P=.000	.6336 (.29) P=.000	-.1761 (.29) P=.180	.3518 (.29) P=.031	.3970 (.29) P=.016
MOPI Pt	-.0596 (.29) P=.379	-.0244 (.29) P=.450	.0096 (.29) P=.480	.4777 (.29) P=.004	.3508 (.29) P=.031	.2344 (.29) P=.092	.0699 (.29) P=.359	.2711 (.29) P=.077	.5110 (.29) P=.002	.6430 (.29) P=.000	.6336 (.29) P=.000	-.1761 (.29) P=.180	.3518 (.29) P=.031	.3970 (.29) P=.016	.3970 (.29) P=.016
MOPI Sc	-.1965 (.29) P=.153	.2507 (.29) P=.095	.2367 (.29) P=.108	.4055 (.29) P=.015	1.0000 (.29) P=.000	.5978 (.29) P=.000	.8308 (.29) P=.000	.2159 (.29) P=.130	-.1854 (.29) P=.168	-.0332 (.29) P=.432	.3453 (.29) P=.033	.5216 (.29) P=.002	-.1473 (.29) P=.223	.0049 (.29) P=.490	-.1114 (.29) P=.282
MOPI Ma	-.3382 (.29) P=.023	.0638 (.29) P=.371	.1236 (.29) P=.261	.4867 (.29) P=.004	.2159 (.29) P=.130	-.1854 (.29) P=.168	-.0332 (.29) P=.432	.3453 (.29) P=.033	.5216 (.29) P=.002	-.1473 (.29) P=.223	.0049 (.29) P=.490	-.1114 (.29) P=.282	.0049 (.29) P=.490	-.1114 (.29) P=.282	.0049 (.29) P=.490
MOPI SI	-.3722 (.29) P=.023	.6430 (.29) P=.000	.6336 (.29) P=.000	-.1761 (.29) P=.180	.3518 (.29) P=.031	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016
MOPII PTS	.3508 (.29) P=.031	.2344 (.29) P=.092	.0699 (.29) P=.359	.2711 (.29) P=.077	.5110 (.29) P=.002	.6430 (.29) P=.000	.6336 (.29) P=.000	-.1761 (.29) P=.180	.3518 (.29) P=.031	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016	.3970 (.29) P=.016

Note. (F) = data collected at initial assessment; (F) = data collected at follow-up.
The number of subjects (n) used in the calculation of a correlation is given in brackets underneath the correlation; below n is the significance level.

Appendix R continued

Category (F)	TPT Time (F)	TPT Mem (F)	TPT Loc (F)	Finger Tap (F)	Speech Perc (F)	Rhythm (F)	Sens. Defic (F)	Aph. Spat (F)	Trail Making (F)
ADHD I (1)	-.1846 (.26) P=.180	-.3194 (.30) P=.043	.2782 (.30) P=.068	-.2541 (.31) P=.084	.2282 (.31) P=.108	-.0932 (.31) P=.309	-.0650 (.30) P=.366	-.1094 (.30) P=.282	-.0247 (.34) P=.445
ADHD I L (1)	.1626 (.26) P=.214	-.4574 (.30) P=.006	-.3223 (.30) P=.041	-.4437 (.31) P=.006	.0855 (.31) P=.324	.2743 (.31) P=.068	.0224 (.30) P=.453	-.0498 (.30) P=.397	-.3255 (.34) P=.030
ADHD I F (1)	.0498 (.26) P=.404	-.0333 (.30) P=.431	-.0287 (.30) P=.440	.1451 (.31) P=.218	.1559 (.31) P=.201	.1143 (.31) P=.270	.2401 (.30) P=.101	.4367 (.30) P=.008	.2395 (.34) P=.086
ADHD I E (1)	-.2208 (.26) P=.139	-.0234 (.30) P=.451	-.1284 (.30) P=.249	-.3606 (.31) P=.023	-.2231 (.31) P=.114	-.2028 (.31) P=.137	-.3177 (.30) P=.044	-.3054 (.30) P=.050	-.2197 (.34) P=.106
ADHD I Ba (1)	-.1773 (.26) P=.153	.1200 (.30) P=.424	-.1357 (.30) P=.237	.0166 (.31) P=.465	-.0987 (.31) P=.299	-.0250 (.31) P=.447	.0060 (.30) P=.487	.0904 (.30) P=.317	.2369 (.34) P=.089
ADHD I D (1)	-.0428 (.26) P=.418	-.1216 (.30) P=.261	.0053 (.30) P=.489	.1403 (.31) P=.226	.0396 (.31) P=.416	.1875 (.31) P=.156	.1314 (.30) P=.244	.2558 (.30) P=.086	.1463 (.34) P=.205
ADHD I Ry (1)	-.2320 (.26) P=.127	.0403 (.30) P=.296	-.0788 (.30) P=.339	-.0264 (.31) P=.444	-.2718 (.31) P=.070	-.0419 (.31) P=.411	-.0453 (.30) P=.406	-.0404 (.30) P=.416	.2242 (.34) P=.101
ADHD I Rd (1)	-.0213 (.26) P=.459	-.0603 (.30) P=.376	-.0777 (.30) P=.342	.2595 (.31) P=.079	.0946 (.31) P=.306	.0448 (.31) P=.405	.0914 (.30) P=.315	.2147 (.30) P=.127	.1572 (.34) P=.187
ADHD I LR (1)	.1213 (.26) P=.278	.1176 (.30) P=.268	.0450 (.30) P=.407	.0675 (.31) P=.359	-.0950 (.31) P=.306	-.0359 (.31) P=.424	.2925 (.30) P=.058	.1244 (.30) P=.256	.1297 (.34) P=.232
ADHD I Pa (1)	.1089 (.26) P=.298	-.1752 (.30) P=.177	-.2217 (.30) P=.120	.2778 (.31) P=.065	.0510 (.31) P=.393	-.1270 (.31) P=.248	.2217 (.30) P=.120	.2342 (.30) P=.106	.2157 (.34) P=.110
ADHD I Pt (1)	-.2332 (.26) P=.126	.1646 (.30) P=.192	-.1351 (.30) P=.434	.1251 (.31) P=.251	.0214 (.31) P=.433	-.0532 (.31) P=.388	.0312 (.30) P=.435	.4197 (.30) P=.010	.2326 (.34) P=.093
ADHD I Sc (1)	-.2855 (.26) P=.079	.0870 (.30) P=.324	.0688 (.30) P=.359	.0996 (.31) P=.297	-.1191 (.31) P=.262	-.0976 (.31) P=.301	.0471 (.30) P=.402	.2464 (.30) P=.095	.3074 (.34) P=.038
ADHD I Mm (1)	-.0332 (.26) P=.436	.0204 (.30) P=.457	.1836 (.30) P=.166	.2123 (.31) P=.126	.1327 (.31) P=.238	-.2302 (.31) P=.436	.2514 (.30) P=.090	.3525 (.30) P=.028	.2922 (.34) P=.047
ADHD I G1 (1)	.2362 (.26) P=.123	.1809 (.30) P=.169	-.3127 (.30) P=.046	-.0432 (.31) P=.459	.3742 (.31) P=.229	.2589 (.31) P=.280	.1737 (.30) P=.179	.4224 (.30) P=.010	-.0174 (.34) P=.461
ADHD I PPS (1)	.0213 (.26) P=.498	.0282 (.30) P=.459	.0594 (.30) P=.480	.3383 (.31) P=.031	.2254 (.31) P=.134	.1733 (.31) P=.176	.3664 (.30) P=.023	.4925 (.30) P=.023	.3320 (.34) P=.028

Note: (1) = data collected at initial assessment. (F) = data collected at follow-up.
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 The reason that no values are given for some of these symptoms is that no individual in that subsample endorsed them.

Appendix R continued

	Category (F)	TPT Time(F)	TPT Mem(F)	TPT Loc(F)	Finger Tap(F)	Speech Perc(F)	Rhythm (F)	Sema. Defic(F)	Aph. Spat(F)	Trail Making(F)
TPT Time(I)	.2615	.6966	-.4269	-.3901	-.4977	.1972	.2540	-.0379	-.0908	-.6628
	(.26)	(.28)	(.28)	(.28)	(.29)	(.29)	(.29)	(.28)	(.28)	(.32)
	P=.098	P=.000	P=.012	P=.020	P=.003	P=.153	P=.092	P=.424	P=.323	P=.000
TPT Mem(I)	-.2775	-.7712	.7242	.5372	.5228	-.4588	-.3337	-.1627	-.0688	.7309
	(.26)	(.28)	(.28)	(.28)	(.29)	(.29)	(.28)	(.28)	(.32)	(.32)
	P=.085	P=.000	P=.000	P=.002	P=.002	P=.006	P=.038	P=.204	P=.368	P=.000
TPT Loc(I)	-.1147	-.5843	.4418	.5095	.3297	-.2837	-.0175	.1154	-.1341	.5238
	(.26)	(.28)	(.28)	(.28)	(.29)	(.29)	(.29)	(.28)	(.32)	(.32)
	P=.288	P=.001	P=.009	P=.003	P=.040	P=.068	P=.464	P=.279	P=.248	P=.001
Finger Tap(I)	-.1390	-.3099	.2265	.3104	.4920	-.0507	-.0975	-.0481	-.1398	.1407
	(.26)	(.28)	(.28)	(.28)	(.29)	(.29)	(.29)	(.28)	(.28)	(.32)
	P=.254	P=.054	P=.123	P=.054	P=.003	P=.397	P=.307	P=.404	P=.239	P=.221
Speech Perc(I)	.4291	.4993	-.5414	-.3504	-.4761	.8109	.4969	.5491	.3138	-.4634
	(.26)	(.30)	(.30)	(.30)	(.31)	(.31)	(.31)	(.30)	(.30)	(.34)
	P=.014	P=.002	P=.001	P=.029	P=.003	P=.000	P=.002	P=.001	P=.046	P=.003
Rhythm(I)	.5320	.4498	-.5128	-.4780	-.4078	.3483	.6164	.2265	.2416	-.5097
	(.26)	(.30)	(.30)	(.30)	(.31)	(.31)	(.31)	(.30)	(.30)	(.34)
	P=.003	P=.006	P=.002	P=.004	P=.011	P=.027	P=.000	P=.114	P=.099	P=.001
Sema. Defic(I)	.2668	.4171	-.4810	-.3740	-.2651	.1854	.3538	.3311	.0932	-.4543
	(.26)	(.29)	(.29)	(.29)	(.30)	(.30)	(.30)	(.29)	(.29)	(.33)
	P=.094	P=.012	P=.094	P=.023	P=.078	P=.163	P=.028	P=.040	P=.315	P=.004
Aph. Spat(I)	.2188	.2908	-.4595	-.3470	-.2031	.3479	.2543	.1214	.8862	-.3825
	(.26)	(.30)	(.30)	(.30)	(.31)	(.31)	(.31)	(.30)	(.30)	(.34)
	P=.141	P=.059	P=.005	P=.030	P=.137	P=.028	P=.084	P=.281	P=.000	P=.013
Trail Making(I)	-.4120	-.6163	.5326	.4908	.6304	-.2509	-.2370	-.3759	-.0805	.8083
	(.26)	(.30)	(.30)	(.30)	(.31)	(.31)	(.31)	(.30)	(.30)	(.34)
	P=.018	P=.000	P=.001	P=.003	P=.000	P=.080	P=.100	P=.020	P=.336	P=.000

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Appendix R continued

	Category (F)	TPT Time(F)	TPT Mem(F)	TPT Loc(F)	Finger Tap(F)	Speech Perc(F)	Physi- me (F)	Sens- Defic(F)	Aph- Spas(F)	Trail Making(F)
WALS-R I (I)	-.4956 (.18) P=.016	-.3909 (.22) P=.036	.4425 (.22) P=.020	.3149 (.23) P=.077	.4927 (.23) P=.059	-.3262 (.23) P=.078	-.4775 (.23) P=.053	-.6121 (.22) P=.001	-.4182 (.22) P=.026	-.4412 (.26) P=.012
WALS-R C (I)	-.4592 (.18) P=.028	-.1646 (.22) P=.232	.5591 (.22) P=.008	.3998 (.23) P=.186	.0351 (.23) P=.437	-.5979 (.23) P=.002	-.5774 (.23) P=.032	-.4940 (.22) P=.010	-.4629 (.22) P=.015	-.2517 (.26) P=.107
WALS-R A (I)	-.4402 (.18) P=.034	-.1103 (.22) P=.313	.0650 (.22) P=.387	-.1305 (.22) P=.281	.3371 (.23) P=.058	-.3138 (.23) P=.072	-.3625 (.23) P=.045	-.4031 (.23) P=.031	-.1781 (.22) P=.214	.2861 (.26) P=.078
WALS-R B (I)	-.6690 (.18) P=.001	-.3476 (.22) P=.056	.5551 (.22) P=.004	.4480 (.22) P=.018	.2119 (.23) P=.166	-.5547 (.23) P=.003	-.5407 (.23) P=.004	-.7041 (.22) P=.000	-.5697 (.22) P=.003	.4485 (.26) P=.011
WALS-R D (I)	-.4856 (.18) P=.021	-.2533 (.22) P=.128	-.0127 (.22) P=.478	-.1161 (.22) P=.303	.4492 (.23) P=.016	-.2551 (.23) P=.120	-.3970 (.23) P=.030	-.3156 (.22) P=.076	-.0679 (.22) P=.382	.4244 (.26) P=.015
WALS-R V (I)	-.3194 (.18) P=.098	-.2508 (.22) P=.130	.4260 (.22) P=.024	.2850 (.22) P=.099	.2373 (.23) P=.138	-.6083 (.23) P=.001	-.6239 (.23) P=.001	-.5824 (.22) P=.002	-.5487 (.22) P=.004	.3398 (.26) P=.045
WALS-R PC (I)	-.6095 (.18) P=.004	-.3856 (.22) P=.038	.4164 (.22) P=.027	.2898 (.22) P=.095	.4119 (.23) P=.025	-.2060 (.23) P=.173	-.3408 (.23) P=.056	-.5780 (.22) P=.002	-.1731 (.22) P=.221	.3920 (.26) P=.024
WALS-R BD (I)	-.5865 (.18) P=.005	-.5541 (.22) P=.004	.5623 (.22) P=.003	.4699 (.22) P=.014	.3893 (.23) P=.033	-.2699 (.23) P=.106	-.5286 (.23) P=.005	-.5514 (.22) P=.004	-.3170 (.22) P=.075	.6921 (.26) P=.000
WALS-R PA (I)	-.5546 (.18) P=.008	-.3065 (.22) P=.083	.4786 (.22) P=.012	.4673 (.22) P=.014	.2612 (.23) P=.114	-.4292 (.23) P=.020	-.5686 (.23) P=.002	-.6302 (.22) P=.001	-.2304 (.22) P=.151	.6131 (.26) P=.000
WALS-R OA (I)	-.5443 (.18) P=.005	-.4723 (.22) P=.013	.5654 (.22) P=.003	.6122 (.22) P=.001	.4322 (.23) P=.020	-.1069 (.23) P=.314	-.2203 (.23) P=.156	-.4997 (.22) P=.009	-.3773 (.22) P=.042	.4133 (.26) P=.018
WALS-R Ddy (I)	-.5384 (.18) P=.011	-.5580 (.22) P=.003	.4953 (.22) P=.010	.4821 (.22) P=.012	.3867 (.23) P=.034	-.4296 (.23) P=.020	-.5052 (.23) P=.007	-.5436 (.22) P=.004	-.1148 (.22) P=.306	.6856 (.26) P=.000
WALS-R VTD (I)	-.6501 (.18) P=.002	-.2510 (.22) P=.130	.3143 (.22) P=.077	.1275 (.22) P=.286	.2848 (.23) P=.094	-.5429 (.23) P=.004	-.6395 (.23) P=.001	-.6898 (.22) P=.000	-.5062 (.22) P=.008	.5298 (.26) P=.003
WALS-R PTD (I)	-.6203 (.18) P=.003	-.4629 (.22) P=.015	.4342 (.22) P=.022	.4740 (.22) P=.013	.3803 (.23) P=.037	-.3601 (.23) P=.046	-.4162 (.23) P=.024	-.6597 (.22) P=.000	-.3241 (.22) P=.071	.6649 (.26) P=.000
WALS-R TD (I)	-.6572 (.18) P=.002	-.3911 (.22) P=.036	.3892 (.22) P=.037	.3224 (.22) P=.072	.3581 (.23) P=.047	-.4709 (.23) P=.012	-.5886 (.23) P=.002	-.7026 (.22) P=.000	-.4356 (.22) P=.021	.6461 (.26) P=.000

Note. (I) = data collected at initial assessment; (F) = data collected at follow-up.
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Appendix R continued

Category (F)	TPT Time (F)	TPT Mem (F)	TPT Loc (F)	Finger Tap (F)	Speech Perc (F)	Rhythm (F)	Sema. Defic (F)	Aph. Spat (F)	Trial Making (F)
ANOS I (F)	-.1724 (.25) P=.205	-.1580 (.30) P=.497	-.0013 (.30) P=.497	-.0380 (.30) P=.421	.1887 (.31) P=.164	-.2008 (.31) P=.139	-.2311 (.30) P=.110	-.1098 (.30) P=.282	.1180 (.31) P=.264
ANOS I L (F)	.2612 (.28) P=.114	-.5307 (.28) P=.006	-.4688 (.28) P=.006	-.3562 (.27) P=.000	-.1536 (.27) P=.213	.5601 (.29) P=.001	.1580 (.28) P=.211	-.0618 (.29) P=.375	-.6187 (.29) P=.000
ANOS I L (F)	.2883 (.28) P=.000	-.0180 (.28) P=.464	-.3320 (.28) P=.082	-.0188 (.27) P=.463	.3436 (.29) P=.034	.3678 (.29) P=.025	.5647 (.28) P=.001	.4467 (.29) P=.008	-.1460 (.29) P=.225
ANOS I R (F)	-.0878 (.28) P=.365	-.0759 (.28) P=.350	.1440 (.28) P=.232	.2050 (.28) P=.148	-.1168 (.27) P=.281	.1943 (.29) P=.156	-.0459 (.28) P=.408	-.4442 (.29) P=.008	-.0433 (.29) P=.412
ANOS I R (F)	.0685 (.28) P=.378	.0131 (.28) P=.474	-.1073 (.28) P=.293	-.1051 (.28) P=.297	-.0588 (.27) P=.385	.4343 (.29) P=.009	-.0074 (.28) P=.485	-.0529 (.29) P=.393	.0287 (.29) P=.441
ANOS I R (F)	.1485 (.23) P=.230	-.1960 (.28) P=.159	-.0642 (.28) P=.373	-.0874 (.28) P=.329	.1255 (.27) P=.266	-.2014 (.29) P=.147	-.0141 (.28) P=.472	-.0128 (.29) P=.474	.2059 (.29) P=.142
ANOS I R (F)	.0310 (.23) P=.444	-.0110 (.28) P=.478	.0380 (.28) P=.424	-.0669 (.28) P=.368	.0010 (.27) P=.498	-.3973 (.29) P=.016	-.0336 (.28) P=.433	-.1181 (.29) P=.271	.2175 (.29) P=.128
ANOS I R (F)	.1056 (.23) P=.316	-.0900 (.28) P=.324	-.1218 (.28) P=.269	-.2124 (.28) P=.139	-.0473 (.27) P=.407	.3212 (.29) P=.045	.0621 (.28) P=.377	-.0428 (.29) P=.413	.1378 (.29) P=.238
ANOS I R (F)	-.0097 (.23) P=.482	-.2156 (.28) P=.135	.0997 (.28) P=.307	-.0465 (.28) P=.407	.1613 (.27) P=.211	.0117 (.29) P=.476	.0776 (.28) P=.347	.1720 (.29) P=.186	.2522 (.29) P=.093
ANOS I R (F)	.4266 (.28) P=.021	.0082 (.28) P=.484	-.2963 (.28) P=.063	-.2656 (.28) P=.086	-.2221 (.27) P=.127	-.0778 (.29) P=.364	.2717 (.28) P=.081	.1254 (.29) P=.259	-.0705 (.29) P=.358
ANOS I R (F)	.3562 (.23) P=.048	-.1612 (.28) P=.206	-.1897 (.28) P=.167	-.0242 (.28) P=.451	.0012 (.27) P=.498	-.0852 (.29) P=.330	.1593 (.28) P=.250	.2719 (.29) P=.077	.1596 (.29) P=.204
ANOS I R (F)	.4398 (.23) P=.018	-.1658 (.28) P=.172	-.2901 (.28) P=.067	-.2415 (.28) P=.108	-.0528 (.27) P=.397	.1572 (.29) P=.258	.7128 (.28) P=.138	.2161 (.29) P=.130	.0081 (.29) P=.683
ANOS I R (F)	-.1887 (.23) P=.221	-.2789 (.28) P=.075	.2447 (.28) P=.185	.2587 (.28) P=.143	.1065 (.27) P=.299	.2118 (.29) P=.155	.5077 (.28) P=.485	.1852 (.29) P=.175	.2776 (.29) P=.072
ANOS I R (F)	.2768 (.23) P=.101	.1769 (.28) P=.184	-.3615 (.28) P=.029	-.1146 (.28) P=.581	-.1126 (.27) P=.288	.2523 (.29) P=.053	.1282 (.28) P=.250	.3482 (.29) P=.032	-.2613 (.29) P=.086
ANOS I R (F)	.4611 (.23) P=.013	-.1748 (.28) P=.187	-.2979 (.28) P=.062	-.3222 (.28) P=.147	.1399 (.27) P=.243	.2728 (.29) P=.078	.3814 (.28) P=.123	.4639 (.29) P=.056	-.0332 (.29) P=.432

Note: (F) = data collected at initial assessment; (F) = data collected at follow-up.
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Appendix R continued

Category (F)	TPT Time(F)	TPT Mem(F)	TPT Loc(F)	Finger Tap(F)	Speech Perc(F)	Rhythm (F)	Sens. Deficit(F)	Apth. Spat(F)	Tactile Making(F)
Category (F)	1.0000 (26) P=. .	-.1531 (24) P=.238	-.4031 (24) P=.525	-.3495 (24) P=.147	-.2523 (24) P=.117	.2729 (25) P=.093	.3881 (25) P=.028	.6701 (25) P=.000	-.5309 (26) P=.003
TPT Time(F)		1.0000 (30) P=. .	-.6841 (30) P=.000	-.5301 (30) P=.001	-.5773 (28) P=.001	.2313 (30) P=.109	.3445 (30) P=.031	.1416 (29) P=.232	-.5995 (30) P=.000
TPT Mem(F)	-.4031 (24) P=.025		1.0000 (30) P=. .	.7715 (30) P=.000	.5538 (28) P=.001	-.4305 (30) P=.009	-.4768 (30) P=.004	-.1812 (29) P=.173	.7019 (30) P=.000
TPT Loc(F)	-.3495 (24) P=.067	-.5301 (30) P=.001		1.0000 (30) P=. .	.5604 (28) P=.001	-.2268 (30) P=.114	-.1765 (30) P=.175	-.0516 (29) P=.392	-.5549 (30) P=.001
Finger Tap(F)	-.2523 (24) P=.117	-.5773 (28) P=.001	-.5604 (28) P=.001		1.0000 (31) P=. .	-.2190 (29) P=.127	-.3699 (29) P=.024	-.0655 (28) P=.370	.6086 (31) P=.000
Speech Perc(F)	.2729 (25) P=.093	.2313 (30) P=.109	-.4305 (30) P=.009	-.2268 (30) P=.114	-.2190 (29) P=.127	1.0000 (31) P=. .	.3144 (31) P=.042	.3087 (30) P=.070	-.5117 (31) P=.002
Rhythm (F)	.3881 (25) P=.028	.3445 (30) P=.031	-.4768 (30) P=.004	-.1765 (30) P=.175	-.3699 (29) P=.024	1.0000 (31) P=. .	.2173 (30) P=.124	-.2841 (30) P=.064	-.4522 (31) P=.005
Sens. Deficit(F)	.6701 (25) P=.000	.1416 (29) P=.232	-.1812 (29) P=.173	-.0516 (29) P=.392	-.0655 (28) P=.370	.3087 (30) P=.070	1.0000 (30) P=. .	.2604 (29) P=.086	-.2613 (30) P=.002
Apth. Spat(F)	-.5309 (26) P=.003	-.5995 (30) P=.000	.7019 (30) P=.000	.5549 (30) P=.001	.6086 (31) P=.000	-.5117 (31) P=.002	-.4522 (30) P=.082	1.0000 (30) P=. .	

Note. (1) = data collected at initial assessment; (F) = data collected at follow-up;
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