

NOTE TO USERS

Page(s) not included in the original manuscript and are unavailable from the author or university. The manuscript was scanned as received.

154

This reproduction is the best copy available.

UMI[®]



Université d'Ottawa • University of Ottawa



Université d'Ottawa - University of Ottawa

FACULTÉ DE ÉTUDES SUPÉRIEURES
ET POSTDOCTORALES

FACULTY OF GRADUATE AND
POSTDOCTORAL STUDIES

Deborah MOORE

AUTEUR DE LA THÈSE - AUTHOR OF THESIS

Ph.D. (Clinical Psychology)

GRADE - DEGREE

School of Psychology

FACULTÉ, ÉCOLE, DÉPARTEMENT - FACULTY, SCHOOL, DEPARTMENT

TITRE DE LA THÈSE - TITLE OF THE THESIS

The Ability of Boys with Attention Deficit Hyperactivity Disorder to Process
Emotional Information of Varying Complexity

C. Whissel

DIRECTEUR DE LA THÈSE - THESIS SUPERVISOR

CO-DIRECTEUR DE LA THÈSE - THESIS CO-SUPERVISOR

EXAMINATEURS DE LA THÈSE - THESIS EXAMINERS

C. Cunningham

P. Firestone

R. Flynn

J. Ledingham

J.-M. De Koninck, Ph.D.

LE DOYEN DE LA FACULTÉ DES ÉTUDES
SUPÉRIEURES ET POSTDOCTORALES

DEAN OF THE FACULTY OF GRADUATE
AND POSTDOCTORAL STUDIES

**The Ability of Boys
with
Attention Deficit Hyperactivity Disorder
to
Process Emotional Information
of
Varying Complexity**

Deborah M. Moore, B.Sc., M.A.

Thesis submitted to the
Faculty of Graduate and Postdoctoral Studies
in partial fulfillment of the requirements for the degree of

**Doctorate in Philosophy
in
Clinical Psychology**

School of Psychology
University of Ottawa

©Deborah M. Moore, Ottawa, Canada, 2004



Library and
Archives Canada

Bibliothèque et
Archives Canada

Published Heritage
Branch

Direction du
Patrimoine de l'édition

395 Wellington Street
Ottawa ON K1A 0N4
Canada

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file *Votre référence*

ISBN: 0-494-01739-2

Our file *Notre référence*

ISBN: 0-494-01739-2

NOTICE:

The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protègent cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.


Canada

In Memoriam

Gerald Miller Moore
May 19, 1927 - March 23, 1994

Frances Mary Moore
December 26, 1937 - March 8, 1998

Acknowledgements

My deepest love and gratitude to my son's, Sterling and Martin, who lived so much of their childhood with mommy away at school, away at work, or just away. Thank you for your unconditional love, patience, and understanding.

Undying love and honour to my parents who left before the completion of this project. While neither had educational opportunities in their lives, they respected my goals and stood behind with encouragement every step of the way.

My sincere gratitude is extended to Dr. Cynthia Whissell, from the Laurentian University faculty, who managed to miraculously leap back into my research following my very lengthy periods of absence. You stuck with me through some very difficult times and for that I am indebted.

To University of Ottawa Professors Dr. Bob Flynn, Dr. Phil Firestone, and Dr. Jane Ledingham, I extend my sincere appreciation for your wisdom and feedback in the preparation and defence of this project.

To McMaster University Professor Dr. Charles Cunningham I extend my gratitude for agreeing to read this project and attending the defence at the University of Ottawa. Chi Meegwetch Dr. Cunningham.

My respect and appreciation goes out to the many ADHD students and their parents who participated in this project and also to those whom I have worked with over the past 16 years.

Finally, my forever and ever love to Colen who put his own goals on the shelf to allow me to follow my dreams. I cherish you.

Table of Contents

List of Tables i-ii

Appendices iii-iv

Introduction 1-2

Emotion 3

 Overview 3-5

 Emotion/Cognition Relationship 5-6

 Emotion/Social Relationship. 6-8

 Emotion Concepts 8-10

 Summary 11-12

Attention Deficit Hyperactivity Disorder 12

 Overview 12-13

 Clinical Criteria. 13-15

 Prevalence 16

 Comorbidity. 16-17

 Aggressive Behaviour 17-18

 Learning Disabilities. 19-20

 Heredity 20-21

 Social Emotional 21-25

 Social Information processing. 25-43

 Summary 43-47

A Problem Defined. 47-52

Hypotheses 52

 Facial Expression Identification 52-53

 Emotion Statement Identification 53-54

 CAST 54-55

Method 55

 Participants 55-60

 Measures 60

 Screening Phase 60

 SNAP 60-61

 PPVT-R 61-63

 Interview Phase 63

 Facial Expression Identification 63-65

 Emotion Statement Identification 65-66

 CAST 66-71

Procedure. 71

 Screening Phase 71-75

 Interview Phase 75-80

Analyses 80-82

Results. . . . .	.83
Primary Statistical Analyses.	83-85
Facial Expression Identification.	85-86
Emotion Statement Identification.	86-88
CAST.	88-89
Positive Affect . . . . .	.89
Negative Affect . . . . .	.90
Verbosity	90-91
Summary . . . . .	.91
Additional Analyses . . . . .	.92
ADHD/ODD Comorbidity.	92-94
Facial Expression Identification.	94-95
Emotion Statement Identification. . . . .	.95
CAST. . . . .	.95-96
Discussion . . . . .	.96
Facial Expression Identification	96-97
Emotion Statement Identification	97-101
CAST . . . . .	.101-103
Application . . . . .	.103-106
Limitations . . . . .	.106-109
Future Directions. . . . .	.110-111
Summary of Conclusions . . . . .	.112-113
References . . . . .	.114-135
Tables	136-153
Appendices	154-195

List of Tables

Table 1	89
Means of Screening Phase Criteria for ADHD and Non-ADHD Participants	
Table 2	90
Means of Interview Phase Criteria for ADHD and Non-ADHD Participants	
Table 3	91
Overall Correlation Coefficients	
Table 4	92
Means for Facial Expression Identification by Group and Grade	
Table 5.....	93
Percentage of ADHD and Non ADHD Participants who Obtained Perfect and Non-Perfect Facial Expression Identification Scores for Grades 4 and 8	
Table 6	94
Means for Emotion Statement Identification by Group and Grade	
Table 7	95
Main Effects and 2-Way Interactions for Emotion Statement Identification by Group and Grade	
Table 8	96
Means for Positive T-Scores by Group and Grade	
Table 9	97
Main Effects and 2-Way Interactions for Positive T-Scores on the CAST by Group and Grade	

Table 10	98
Means for Negative T-Scores by Group and Grade	
Table 11	99
Main Effects and 2-Way Interactions for Negative T-Scores on the CAST by Group and Grade	
Table 12	100
Means for Total Verbosity Score by Group and Grade	
Table 13	101
Main Effects for Total Verbosity T-Score on the CAST by Group and Grade	
Table 14	102
Means of Comorbid ODD in ADHD and non ADHD Participants by Grade	
Table 15	103
Overall Correlation Coefficients for ADHD and ODD	
Table 16	104
Partial Correlations Controlling for ODD	
Table 17	105
Partial Correlations Controlling for ADHD	
Table 18	106
Means for Individual Face Identification by Group and Grade	

List of Appendices

Appendix A	
SNAP Protocol	107-109
Appendix B	
PPVT-R Protocol	110
Appendix C	
Release of Information (PPVT-R)	111
Appendix D	
Consent to Participate Form	112-115
Appendix E	
Child Consent to Participate	116-117
Appendix F	
Educational Management Principles	118-119
Appendix G	
Teacher Instructions to Participants	120
Appendix H	
Participant Information Script	121
Appendix I	
Ekman & Friesen Facial Recognition Task	122-129
and Pictures of Faces	
Appendix J	
Emotion Statement Task	130-131
Appendix K	
CAST Protocol and Picture Cards	132-134
Appendix L	
Emotion Statement Task Instructions	135
Appendix M	
Scoring Form for the Emotion Statement Task	136-137
Appendix N	
Procedure for Handling Peabody Scores Which Fall Below 80	138-139

Appendix O Procedure for Handling SNAP Scores Which are Greater Than 7 Among the Non ADHD Participants	140-141
Appendix P Procedure for Handling SNAP Scores Which are Less Than 8 Among the ADHD Participants	142-143
Appendix Q Recruited Groups	144
Appendix R Screening Phase Inclusion Criteria for ADHD Participants	145
Appendix S Screening Phase Inclusion Criteria for Non ADHD Participants	146
Appendix T ADHD Participants Inclusion Criteria for the Intervention Phase	147
Appendix U Non ADHD Participant Inclusion Criteria for the Intervention Phase	148

Introduction

Since Lois Murphy (1937) reported that young preschool children demonstrate sympathetic responses to peers who are in distress, there has been a continuing investigation of two resulting fundamental questions: Are there stable individual differences in sympathetic responsiveness to another person's emotional state? And, by what mechanism do children come to feel the same emotion as another person or act appropriately in response to someone in distress?

These questions have been approached by a number of contributors from various theoretical positions which this paper will review. Less represented in the growing body of literature regarding emotion is reference to the study of emotions with specific populations. This research examined the ability of boys with Attention Deficit Hyperactivity Disorder to process three types of emotional tasks which vary in terms of their respective degrees of complexity. Those tasks included the following: Facial Expression Identification; Emotion Statement Identification; and the partial administration of the Children's Apperceptive Story Telling test (CAST; Schneider, 1989). Boys with Attention Deficit Hyperactivity Disorder had significantly more difficulty on all three tasks. On the Facial Expression Identification Task, ADHD participants identified significantly

fewer facial expressions than non ADHD participants. Phi Value for Facial Expression Identification was .35. ADHD students were significantly less accurate at Emotion Statement Identification. Moreover, the younger participants, particularly the younger ADHD participants, were significantly less accurate at Facial Expression Identification than their older counterparts. Eta values for group and grade main effects for the Emotion Statement Identification task .32 and .22 respectfully.

The Cast Involved three measures, namely Positive Affect, Negative Affect, and Verbosity. The non ADHD group outperformed the ADHD group on all three measures. Eta values for group main effects for Positive Affect and Negative Affect were .84 and .75 respectively. Eta values for group and grade main effects for Verbosity were .67 and .28 respectively. Grade 8 boys with Attention Deficit Hyperactivity Disorder significantly outperformed their grade 4 counterparts on all three CAST tasks.

EmotionOverview

Much of the earlier research on children's understanding of emotion has been built around the more overt components of emotion such as the behavioural-expressive ones. In the early 1970's, Izard (1971) produced evidence to support the hypothesis that there exists a set of distinct emotional expressions that are universally recognized as conveying particular emotional states. Six basic facial expressions, including happiness, sadness, surprise, disgust, anger and fear, have been identified as expressions of emotion which are universally recognized (Ekman, Friesen & Ellsworth, 1972). Although the availability of a biologically grounded signalling system appeared promising, two fundamental problems existed with this narrow explanation. Firstly, the ability to recognize facial expressions could not guarantee an ability to recognize the emotional state implied (Stein & Trabasso, 1985). And secondly, the explanation of an innate facial recognition capacity failed to distinguish between those emotions which cannot be discriminated solely in terms of facial, postural or vocal cues (e.g. pride and relief) (Harris, Olthof, Meerum, Terwogt & Hardman, 1987).

Also during the 1970's, research pertaining to developmental differences between younger and older children became popular.

Flavell (1971) employed the term 'metamemory' to explain the differences in strategy employed by the younger and older groups in the course of remembering. Metamemory refers to "knowledge about the variables that affect the course of remembering" (p. 475). What seemed evident from this research was that something other than memory, some other cognitive function(s) accounted, at least in part, for the developmental differences observed. In a broader sense, the results suggested that older children would have a deeper and broader knowledge of all sorts of cognitive processes. Hence the term and study of metacognition were born.

As a result, more recent topics of interest within the emotional domain have involved not only children's understanding of emotional processes but also the various cognitive factors associated with emotional experience. With a greater acceptance of introspective techniques as valid measurement techniques, research attention has turned to the more covert cognitive processes as they relate to emotional experience. For instance, researchers interested in emotional development have investigated topics such as children's understanding of the simultaneous experience of multiple emotions and ambivalent feeling states (Donaldson & Westerman, 1986), the type of causal attributions children make for their own and other's emotional states (Strayer, 1986; Thompson, 1987), children's understanding of display rules for emotional expression (Gnepp & Hess, 1986;

Underwood, Coie, & Herbsman, 1992), and the concepts children hold for emotional language (Nicholson, 1996). Hence, the child's understanding of emotion has become an object of study in its own right, rather than an intervening variable that might explain pro or antisocial behaviour in children.

Emotion/Cognition Relationship. Although most researchers generally agree that emotion and cognition interact at some point in the emotion process a number of differing theoretical viewpoints regarding the emotion/ cognition relationship exist. The strongest position taken regards cognition as necessary for the elicitation of some emotions and goes even further to state that certain emotions cannot be experienced without prerequisite cognitive structures in place (Lewis, 1990). Attentional mechanisms, evaluations, perceptual discriminations and retrieval of memories are but a few examples of the differing levels of cognitive involvement sometimes leading to the elicitation of an affective state. In accordance with these assertions, emotions have been classified as simple or complex, depending on the level of cognitive complexity regarded as necessary for the experiencing of different feeling states. For example, lists of basic or simple emotions usually include "happy", "sad", "mad", and "afraid" and require only that the child be able to make the self-other distinction, have self-awareness, and have a concept of person permanence in order to experience them (Lewis &

Rosenblum, 1978; Lewis, 1990). Emotions classified as complex generally include "shame", "guilt", "pride", and "jealousy" and require a knowledge of social standards, a recognition that one plays an active role in the outcome of events sufficient enough to assume responsibility for his/her actions, and realizing when he/she has violated or met a social standard (Lewis & Rosenblum, 1978; Lewis, 1990).

Emotion/Social Relationship. It has been suggested that one's knowledge of emotions is affected by different social agents and that the expression of emotions, sometimes referred to as "display rules", are culturally defined (Saarni, 1987). The socialization of emotions has received considerable attention, especially in terms of the impact others have on the acquisition of emotional knowledge as well as the effects people have on how emotions become experienced and expressed. Viewing emotions as being socialized often carries with it the assumption that emotions and the knowledge of emotions are learned from a number of social agents and this learning is described by Lewis & Saarni (1985) as involving several different processes including direct and indirect influences. This does not mean that children passively absorb all emotional meaning provided by their social environments. What it implies is that regardless of the type of social influences involved, the child will either choose to adopt or reject the information provided by the social agent.

One influential social agent which has been studied extensively is the family. According to Denzin (1984), "socialization of emotions begins within the family and is later influenced by other social interactions" (p.61). Miller & Sperry, (1988) studied how the caregiver effects children's knowledge of anger and aggression and reported that information about emotions may be conveyed via a number of different modes: verbal (descriptive language and key emotion terms) and behavioural (affected by different patterns of reactions to the child's emotional displays).

An investigation by Cassidy, Parke, Butkovsky, & Braungart, (1992) examined patterns of parent and child emotional expressiveness within the family context to determine if there were links between the parent/child patterns of emotional expression and the development of children's social relations with peers. The results indicated that both maternal and paternal expressiveness towards their child, as opposed to the child's expressiveness towards his/her parents, was associated with their child's peer relations.

Children may also learn about emotions indirectly through social learning and imitation (Harris & Saarni, 1989). For example if a child watches his/her mother cry at a funeral parlour, he/she will acquire contextual information about feeling sad. The child

will acquire contextual information about feeling sad. The child will learn that losing a loved one leads to sadness and that it is appropriate behaviour to express one's feelings of sadness in a funeral parlour.

Emotion Concepts. The term concept, as it applies to emotion, refers to the grouping or categorization of emotional experiences. These experiences are stored mentally and called upon when necessary to permit one to recognize not only his or her own emotional states but also the emotional states of others. All aspects of how we approach emotion or affect will be affected by the type of information one has stored conceptually (Russell & Ridgeway, 1982).

In the past two decades, tremendous progress has been made in our understanding of concept acquisition. To summarize that achievement briefly, it now seems clear that in a variety of domains adults form concepts that are organized around a prototype that doesn't necessarily correspond to a specific instance but synthesizes the average or most frequently occurring features of a set of instances (Smith & Medin, 1981). Moreover, the capacity for forming such prototypes appears to be available in early infancy, at least when the infant is presented with a variety of instances of a particular category (Harris, 1983).

sequence for the acquisition of emotional concepts. At first, a child uses words such as sad, mad and so forth to describe current internal states of the self. Next, the child notices the invariant external clues to other people's emotional experiences, including facial and bodily expressive behaviours. Thus the child begins to describe people who look or act in a distressed or angry fashion as sad or mad. Finally instead of categorizing only the overt behaviours that other people express, the child begins to appreciate that other people can feel a given emotion in a variety of circumstances. Thus, even watching an unfamiliar person in a novel situation, the child can figure out whether the person is mad, as opposed to scared or sad.

Moreover, research aimed at broadening the view of the conceptual task involved in expressing and recognizing emotion has focussed on those emotions which can not readily be distinguished in terms of the facial, postural or vocal cues associated with them (i.e. proud, comfortable). Bartolotti, Delia, & Whissell (1993) asked adults and other children to decode the expression of emotion in the stories of children in kindergarten and grade 8. The emotions of happiness and comfort were decoded most accurately. It was also reported that accuracy in decoding emotions increased with the age of the decoder. The implication, particularly with respect to the emotion of comfort, is that the emotional repertoire the child understands goes well beyond those emotions

that are linked to a distinctive facial expression.

Children's emotional concepts were investigated by Nicholson (1996) who asked children in senior kindergarten and grades 4, and 8 to provide a verbal account of what made them feel seven different emotions. The type of emotions children were asked about were selected due to their simplicity (happy, sad, mad, afraid) and their complexity (pride, guilt, comfort) in order to determine whether age related differences would emerge for the type of antecedents as well as the type of people children associated with their emotional experiences. Nicholson's findings suggested that the youngest age group did not have a strong grasp of complex emotions with the exception of the emotion "proud".

Summary. The ability to recognize basic facial expressions of emotion (happiness, sadness, surprise, disgust, anger and fear) is universally present (Izard, 1971), by age 5 (McAlpine, Kendall & Singh, 1992). In addition to recognizing facial expression, Children as young as 5 can provide verbal accounts of what makes them feel happy, sad, mad and afraid (Nicholson, 1996). With respect to those emotions which cannot be discriminated solely in terms of facial or verbal cues (e.g. pride, comfort, and guilt) prerequisite cognitive structures are necessary (Lewis, 1990).

These cognitive structures follow a developmental sequence which begins with focussing on the categorization of overt behaviours that people express, to recognizing that these overt behaviours can be expressed in a variety of circumstances, to correctly identifying expressions of emotion in unfamiliar people in novel situations (Smiley & Huttenlocher, 1989). Most children are able to decode complex emotions by grade 4 (Nicholson, 1996) and this ability increases with age (Bartolotti, Delia & Whissell, 1993).

The ability to recognize facial expression provides a nonverbal means to communicate one's own emotions as well as recognizing the emotions of others. When one considers the number of daily situations encountered, spontaneous or otherwise, in which the ability to decode the emotions of others could determine one's social effectiveness, the immense importance of this ability is revealed. Perhaps more importantly, facial expression, posturing, and verbal cueing from others, allows us to gauge the effects of our own behaviour and adjust it accordingly. Imagine, if possible, not having the ability to utilize the verbal and/or nonverbal cues of others to determine the appropriateness of your own behaviour. The social implications would be immense.

While most individuals are able to decode the facial expressions of emotion elicited by others, in everyday situations, research has shown that individuals in some clinical populations are

consistently less accurate at this task. One example of a clinical population who exhibit a deficit in terms of their ability to recognize facial expression are children with Attention Deficit Hyperactivity Disorder (ADHD) (Singh, Ellis, Winton, Singh, Leung, & Oswald, 1998).

Attention Deficit Hyperactivity Disorder

Overview

Attention Deficit hyperactivity disorder (ADHD) is a persistent problem which usually changes its manifestations from childhood to adulthood. Typically, at least some of the symptoms of ADHD are initially noted in early childhood, before seven years of age, and are exhibited cross-situationally. In younger children, the most prominent features are signs of gross motor overactivity such as excessive running or climbing. In older children and adolescents, the most prominent features may include difficulty paying attention, impulsiveness, disruptiveness, excessive fidgeting and/or restlessness rather than gross motor overactivity (Barkley DuPaul, & McMurray, 1990). Follow-up studies over the past 20 years have done much to dispel the notion that this disorder is outgrown by the adolescent years. Fifty to 80% of children diagnosed with ADHD in childhood continue to display their symptoms to a significant degree in

adolescence and young adulthood (Hinshaw, 1992; Gittelman, Mannuza, Shenker, & Bonagura, 1985; Zametkin, 1993).

Clinical Criteria. Although the cluster of symptoms consisting of excessive motor activity, impulsivity and inattention has been recognised in children since the late 19th century, the diagnostic criteria used to classify this grouping of behaviours have undergone numerous changes. Since 1980, three different editions of the Diagnostic Statistical Manual (DSM) have included three different conceptualizations and diagnostic criteria for ADHD. Of interest to this paper are the two most recent revisions, DSM-III-R (APA, 1987) and DSM-IV (APA, 1994).

In DSM-III-R (APA, 1987), the ADHD syndrome was considered unidimensional although it did include a category called Undifferentiated Attention Deficit Disorder (UADD) which applied to those children exhibiting significant attentional difficulties but not hyperactivity. DSM-III-R (APA, 1987) included 14 ADHD diagnostic criteria, most of which applied to hyperactivity and impulsivity. A score of eight out of 14 was necessary to diagnose ADHD.

In DSM-IV (APA, 1994), three subtypes of ADHD are described. The first, called ADHD Predominantly Inattentive Type, includes those who are not overtly hyperactive but easily distracted and poorly

organized. The second, called ADHD Predominantly Hyperactive-Impulsive Type, involves individuals who display overt signs of hyperactivity such as fidgeting and excessive movement along with impulsive behaviours such as verbal blurting and having difficulty taking turns. The ADHD Combined Type includes individuals who have both inattentive and hyperactive-impulsive behaviours.

In DSM-IV, there are nine symptoms of each dimension (inattention and hyperactive/impulsive). Six or more of the inattentive symptoms and five or fewer of the hyperactive symptoms are required for diagnosis of the predominantly inattentive type. A predominantly hyperactive/impulsive type consists of six or more of the hyperactive/impulsive symptoms and five or less of the inattentive symptoms. The combined type requires the presence of 6/9 of the inattentive symptoms and 6/9 of the hyperactive/impulsive symptoms.

There is a large overlap between the ADHD diagnostic criteria included in DSM-III-R (APA, 1987) and DSM-IV (1994). Eleven of the 14 DSM-III-R (APA, 1987) symptoms are included in the DSM-IV (1994) criteria. All 9 of the hyperactive/impulsive symptoms included in DSM-IV (APA, 1994) can be found in the DSM-III-R (APA, 1987) diagnostic criteria. As such, either of the two most recent versions of the Diagnostic Statistical Manual could

be utilized to diagnose ADHD. Several current studies involving ADHD (e.g. Singh et al., 1998; Firestone, Musten, Pisterman, Mercer, & Bennett, 1988) have utilized DSM-III-R to diagnose the presence of ADHD in their respective studies. One reason for the popularity of DSM-III-R (APA, 1987) in the diagnosis of ADHD, may be the availability of several checklists which include all of the DSM-III-R diagnostic criteria such as the Swanson, Nolan, & Pelham Rating Scale (SNAP, Swanson, Nolan, & Pelham, 1988) and the ADHD Rating Scale (DuPaul, 1991)) which can be completed by parents and teachers.

Prevalence. DSM-IV (APA., 1994) estimates that excessive motor activity, impulsivity, and inattention may occur in as many as 3% of children, while other sources report varying prevalence rates. More specifically, Szatmari, Offord & Boyle (1989) employing Ontario children between the ages of 4-16 years, reported prevalence levels of 9.0% for boys and 3.3% for girls. Wolraich, Hannah, Pinnock, Baumgaertel, & Brown (1996), employing a sample from Tennessee, reported a prevalence range of 3.4 - 4.7 % depending on the specific types of inattentiveness, whereas a similar study carried out in Germany, employing the same subtypes, reported prevalence rates ranging from 3.9 - 9.0 % (Baumgaertel, Wolraich & Dietrich, 1995). ADHD is reportedly more common in males than females in both clinical (9 to 1 respectively) and epidemiological (4 to 1) samples (APA, 1994).

ADHD girls tend to present primarily with problems of inattention and cognition, while ADHD boys are more likely to manifest aggressive/impulsive symptoms (Wolraich et al., 1996).

Therefore, the gender ratio differences observed between clinical and epidemiological samples may be due to the fact that boys are referred more often than girls, as a result of the more overt/aggressive nature of their difficulties.

Comorbidity. Besides their primary problems with inattention, impulsivity, and overactivity, children with ADHD may have a variety of other difficulties. Roughly two thirds of elementary school aged children with ADHD present with at least one other diagnosable psychiatric disorder (Arnold and Jensen, 1995). Children with ADHD have a greater likelihood of having other developmental, behavioural, emotional, and academic difficulties. Not all ADHD children display all of these problems, but many display them to a degree that is greater than expected in normal children (Barkley, 1990). The three most frequently reported areas of difficulty among ADHD children, not defined by the ADHD disorder itself are aggressive behaviour, learning disabilities, and social impairment.

Aggressive Behaviour. Aggression refers to oppositional, defiant, stubborn, explosive, hostile, verbally aggressive, and fighting behaviours. In general, children with ADHD demonstrate

considerably greater levels of aggression than children who have Attention Deficit Disorder but no hyperactivity (ADD) and non ADHD children (Loney, Kramer & Milich, 1981; Loney & Milich, 1982). Barkley, Fischer, Edelbrock & Smallish (1990) reported that upwards of 65% of children with ADHD are likely to develop sufficient levels of oppositional behaviour that qualifies them for a comorbid diagnosis of Oppositional Defiant Disorder (ODD). DSM-III-R (APA, 1987) defines ODD as a pattern of "negativistic, hostile, and defiant behaviour without the more serious violations of the basic rights of others that are seen in Conduct Disorder (CD) (p. 56).

In DSM-III-R (APA, 1987), ODD is diagnosed when 6 out of the 9 diagnostic criteria are met, to a significantly more frequent degree than would be expected in most people of the same mental age. Children with this disorder often argue with, and defy the requests of, adults, even those in positions of authority. ODD children are generally described as having "short fuses" and are often angry and resentful. They seem to go out of their way to annoy others, whom they blame for their problems. They are frequently profane and readily annoyed.

Comorbidity levels in ADHD and ODD are such, that aggression is considered, by some, (e.g. Conners & Wells, 1986) to be a secondary symptom of the disorder. Recently, Paternite, Loney, &

Roberts (1995) investigated boys with ADHD alone, ODD alone, ADHD and ODD and with no ADHD or behaviour disorder to determine if ADHD and ODD could be distinguished in terms of variables relating to problem identification, cognitive/attention functioning, family context, and behaviour symptom differences. While their results provided no evidence for either pure ADHD or pure ODD effects, differences involving the comorbid group (ADHD and ODD) emphasized how misleading diagnosis of either ODD or ADHD can be in isolation from the other.

Learning Disabilities. There have been a number of investigations specifically exploring the relationship between learning disabilities and ADHD. A learning disability is not simply a failure to do one's work in school but is typically defined as a significant discrepancy between one's intellectual ability and one's academic achievement in the areas of reading, writing, and/or arithmetic. The prevalence rates of comorbid learning disabilities reported among ADHD children vary greatly, ranging from 10 - 92%. One explanation for the variance, is that the field of learning disabilities has undergone significant change within the past 20 years, particularly with reference to the use of discrepancy formulae to define learning disabilities. As such the prevalence rates of comorbid learning disability among ADHD children may vary depending on how the term "significant discrepancy" is defined. Moreover, investigations

have reported differences between ADHD and ADD children in terms of incidences of learning disabilities. ADD children demonstrate a higher occurrence of learning disabilities (Edelbrock, Costello & Kessler, 1984). Earlier reported prevalence rates based upon a unidimensional definition of ADHD may not be reflective of the expected differences between ADD and ADHD children from a multidimensional perspective.

Barkley, Fischer, Edelbrock & Smallish (1990) employed a "combined formula" to define learning disability which consisted of a score below the 7th percentile on an achievement test and a significant discrepancy between IQ and achievement on that test. By using this conservative approach, Barkley et al. (1990) reported that between 19 and 26 % of ADHD children have at least one type of learning disability, either in math, reading, or spelling. A similar investigation by Semrud-Clikeman, Biederman, Sprich-Buckminster, Lehman, Faraone & Norman (1992) attempted to more accurately determine the incidence of learning disability among ADHD children by utilizing more stringent methods of definition of learning disability and ADHD. The results of their investigation revealed incidence levels of 23% among ADHD children compared to a level of 2% among normal children. These incidence levels were compared to those resulting from the use of more liberal definitions which were 38% and 8% for ADHD and normal children respectively.

Hereditiy. Clear evidence that ADHD may be inherited comes from studies that directly evaluate all members of an immediate family for ADHD. Biederman, Faraone, Keenan, Knee, & Tsuang (1990) conducted an investigation which evaluated 457 first-degree relatives of 75 children with ADHD and compared these results with those of the family members of 26 control children and 26 children with a variety of psychiatric disorders, not including ADHD. They found that 25% of the first-degree relatives of the ADHD children also had ADHD, whereas only 5% of relatives of the control and psychiatric populations had ADHD. These findings suggest that if a child has ADHD, there is a 500% increase in the chance of a diagnosis for other members of that family. Twin studies have also added information to the issue of heridity. Research findings converge to suggest that, with identical twins, if one twin has symptoms of ADHD, the risk that the other will have the disorder ranges from 73% and 76% in boys and girls respectively (Gjone, Stevenson, & Sundet, 1996) to 79% in a combined sample of boys and girls (Gillis, Gilger, Pennington, & DeFries, 1992). For fraternal twins, the figure was only 32% (Gillis et al., 1992), but this figure is still 6 or more times greater than that seen among unrelated children, where the prevalence of ADHD is at least 3% (DSM-IV, APA, 1994).

Social/Emotional. Most experts would agree that positive relationships with peers in the childhood years provide a

critical buffer against stress as well as psychological and psychiatric problems (Morrison, 1980). Barkley (1995) suggests that 50 to 60% of ADHD children experience some form of social rejection which is reportedly stable over time. Approximately 45% of children who experience peer rejection remain rejected one year later and as many as 30% continue to be rejected four years later (Barkley, 1985). During the early elementary years, peer rejection is often associated with oppositional behaviours such as disruptive classroom behaviour, physical and verbal aggression, arguing, noisy obnoxious behaviour and initiating interactions in a disruptive manner. Barkley et al. (1990) reported upwards of 65% of ADHD children develop oppositional behaviour and from this, 40 to 60% go on to develop a more serious pattern of covert antisocial acts (e.g., theft, breaking and entering, truancy, and running away from home) referred to as Conduct Disorder. Vitelli (1996) reported that childhood conduct problems are a significant predictor of subsequent substance abuse, antisocial personality disorder, and incarceration. Given the accepted link between peer rejection and poor long-term outcome in individuals with ADHD, a variety of programs geared towards improving peer relations in ADHD children have been developed. While such programs appear to be helpful in training environments, the common criticism is that the skills taught do not generalize to outside environments.

Social rejection may lead to another type of condition described by Cantwell (1996) as "lack of social savoir-faire" (pg. 981) which is a very common problem experienced by most individuals with ADHD. A surprising number of researchers have referred to this problem as being a significant one for ADHD children and adults (Greene, Biederman, Faraone, Ouellette, Penn, & Griffin, 1996; Arnold & Jensen, 1995; Cantwell, 1996; Cunningham, Siegel & Offord, 1991; and Gadow, Nolan, Sverd, Sprafkin, & Paolicelli, 1990). Nigg, Hinshaw, Carte, & Treuting (1998) noted that ADHD children display a wide range of social problems and are more negative, disruptive, and noncompliant than normal children. Children with this diagnosis display a lack of concern for others and are deficient in their awareness of the short-term and long-term consequences of their behaviour (Vitelli, 1996).

The inability to self-monitor or the lack of self-awareness in individuals with ADHD may actually produce more negative intra-personal and interpersonal consequences than any other "side effect" associated with ADHD (Wender, 1995). In comparing ADHD adolescents to normal adolescents, Barkley, DuPaul & McMurray, (1991) reported that while significantly more difficulty in social competence, behavioural and emotional adjustment was evidenced by the ADHD population, the ADHD youths actually rated themselves as better adjusted than did their peers or their peers.

Breen and Barkley (1984) found that children with ADHD have significantly elevated scores on the Personality Inventory for Children (PIC) scales of general social adjustment, delinquency, social skills, and emotional lability. Grenell, Glass, & Katz (1987) found that hyperactive children had deficits in social knowledge and in the performance of socially skilled behaviour. Cunningham & Siegel (1987) demonstrated that ADHD children tend to interact with peers in a manner that is more controlling, less academically productive, less cooperative, and less likely to respect situational rules.

This lack of "social savoir faire" may refer to a variety of behaviours directly related to the core features of ADHD (e.g., blurting out answers to questions, interrupting or intruding on the conversations of others, failing to notice or attend to social cues, and handling frustration in an impulsive, aggressive manner), or to other social problems (e.g., failing to understand the impact of one's behaviour on others, misinterpreting social information, possessing a limited repertoire of social responses, difficulty monitoring and reacting to the ongoing stream of one's social interactions) which lead to difficulties in interpersonal relationships.

Recently, Greene et al. (1996) developed a mechanism, referred to as the "Reynolds Formula", for identifying social disability in

children with ADHD. The approach utilized three stages consisting of a psychiatric interview, screening using the 14 item criteria from DSM-III-R (APA, 1987), and parental completion of the Schedule for Affective Disorders and Schizophrenia for School Aged Children-Epidemiologic Version (Orvaschel & Puig-Antich, 1987). The investigation revealed that 22% of ADHD children, compared to 0% of the normal subjects, qualified as socially disabled via their approach. Moreover, the authors concluded that socially impaired children with ADHD had profound deficits in ratings of interpersonal and social functioning and 75% of this population carried one or more comorbid diagnoses (usually major depression or and/or conduct disorder). By contrast, only 10% of ADHD children who carried no comorbid diagnosis, were identified as socially disabled. These findings suggest that comorbidity within ADHD confers a greater risk for social disability than ADHD alone.

Social Information Processing. The causal pathways associating social disability, ADHD, and psychiatric comorbidity are unclear. In fact, the question has been raised as to whether dysfunctional social interactions are related to a skill deficit as opposed to a performance deficit (Weiss, 1991). In other words, are the dysfunctional social interactions observed in many ADHD children related to an inability to accurately perceive social cues or an inability to respond appropriately?

Investigations have examined the ability of children with ADHD to process social information in facial expressions, verbal information, and thematic evaluation. Singh et al., (1998) presented pictures of the basic facial expressions (fear, anger, sadness, disgust, happiness, and surprise) to male and female children, identified with ADHD, ranging in age from 5 to 13. The children were also presented short stories which described an event that was said to have produced one of the six basic emotions. The children were asked to indicate which facial expression matched the emotion inferred from the short story. Singh et al. (1998) reported the percentage of correct identifications for the different emotions were, in descending order, as follows: happiness (93.5%), sadness (86%), disgust (76%), surprise (65.5), anger (64.5%) and fear (61%) (p. 134). The largest error (26%) was observed in terms of the expression fear being mistaken for surprise. Surprise being mistaken for fear was the second most common error (22.5%). Anger mistaken for disgust was the third most common error (21.5%) followed by disgust mistaken for anger which was the fourth most common error (10%). The two most frequently identified facial expressions in the Singh et al. (1998) investigation, happiness (94%) and sadness (86%), match the two most frequently recognised facial expressions, (100% and 88% respectively) in investigations utilizing non ADHD children (McAlpine et al., 1992). In comparing their results to investigations of emotion processing

in normal children, Singh et al. (1998) concluded that ADHD children have significant deficits in their ability to accurately recognize facial expressions of emotion.

An investigation by Walker & Leister (1994) compared adolescents with internalizing disorders, externalizing disorders and non internalizing or externalizing problems (controls) in terms of their ability to correctly identify facial expressions. The results indicated that the two disordered groups were equally and significantly poor, compared to normal controls, at recognizing expressions of anger, surprise, fear, and happiness. Those with externalizing disorders were more accurate than those with internalizing disorders in the identifications of sadness and disgust. In discussing their results, Walker and Leister (1994) hypothesized that repeated exposure of adolescents with externalizing disorders to disapproval from their peers, teachers and parents may have contributed to the greater familiarity with sadness and disgust (p. 272). Support for this hypothesis is provided by McAlpine et al. (1992) who reported, in their study of the abilities of mentally retarded children and adults to recognize facial expression, that living in a community versus the more restricted environment of an institution provided a significant advantage in the individual's ability to recognize emotions, regardless of their level of mental retardation.

The repeated exposure argument may also be reinforced by the powerful influence of parents and peers in the socialization of emotion (Harris & Saarni, 1989). Given the high degree of heritability (.55 - .92) of ADHD (Cantwell, 1996), at least one parent of an ADHD child may also have some degree of ADHD thus lacking in their own understanding of emotion. The ability of that parent to model appropriate emotional responses may be handicapped. Moreover, given that ADHD children are judged by their peer group in terms of emotional behaviour, it is likely that ADHD children are relegated to interacting with only those children who will tolerate their less than ideal behaviour. In such conditions, ADHD children may develop an understanding of emotional concepts and behaviour primarily from persons who are at least as socially/emotionally at risk as they themselves are, if not more so.

Recently, researchers theorizing on behaviour inhibition in individuals with ADHD have developed theories of neuropsychological functions. Some of the evidence for such models is based on findings of comparable difficulties in individuals with prefrontal and frontal lobe injuries. At least 22 studies have compared ADD and ADHD children to normal children using frontal lobe measures (see Barkley, Grodzinsky, & DuPaul, 1992 for a review). The results of several of these studies seem to converge in suggesting that ADHD children have deficits on

some neurological tests of various frontal lobe functions, particularly response inhibition, relative to normal children (Barkley, Grodzinsky, & DuPaul, 1992, p. 174).

Barkley (1997) has proposed a conceptual model that links behavioural inhibition with the performance of four executive functions, namely, working memory, self regulation of affect, internal speech, and reconstitution. Each executive function is thought to represent a semi-independent neuropsychological system that falls along a continuum of normal functioning and interacts with the other executive functions in producing self-regulation. The model predicts that ADHD should be associated with secondary impairments in these four executive functions and the motor control they afford. The model proposes that the four executive functions depend on behavioural inhibition in order to influence the motor system and effect goal-directed behaviour. The executive functions are believed to originate within the brain's motor system (prefrontal and frontal cortex: see Barkley, 1997 for a thorough neuropsychological review).

In the first executive function, working memory, Barkley (1997) purports that one's goals and intentions to act are retained. From these, action plans can be formulated and anticipatory behaviours initiated. More simply put, this form of memory refers to remembering 'so as to do' (Barkley, 1997, pg. 70).

Barkley (1997) puts forth the notion that poor behavioural inhibition in children with ADHD would likely impact memory in that they would be more influenced by context and less controlled by internally represented information that some-age peers without ADHD. Moreover, ADHD children would be more influenced by immediate events and their consequences than distant events and less likely to exercise hindsight in formulating future behaviour plans. ADHD children would also be less proficient at anticipating or preparing behavioural responses and would be more likely to initiate behavioural responses based upon the present with little consideration of past or future behaviours or consequences. Barkley's (1997) neuropsychological model further suggests that ADHD children with poor behavioural inhibition would be less likely to exhibit control of behaviour by time and more deficient in terms of organizing their behaviour relative to time. Similarly, they would be less effective in if-then situations because they cannot bridge such delays utilizing internally represented information, and would likely experience greater difficulty with greater delays in time that separate events, responses, and their consequences.

In the second executive function, self-regulation of affect/motivation/arousal, Barkley's (1997) neuropsychological model makes the following predictions in children with ADHD. Based upon the core feature of ADHD, behavioural inhibition,

children with the disorder are expected to show immediate and greater emotional reaction to situations or events which are emotionally charged. Secondly, due to difficulties in the executive memory functions, they are less likely to be able to anticipate emotional reactions to future emotionally charged events. Thirdly, again likely due to difficulties in the executive memory function (hindsight and foresight), ADHD children are much less likely to consider the impact of their own emotions or others. Fourthly, ADHD children are expected to have less capacity to induce and/or regulate states of emotion, drive/motivation, and/or arousal, particularly the further away in time the behavioural goal is. Finally, the degree the persistence of effort displayed in ADHD children is likely dependent on external sources affecting drive, motivation and arousal that are within the immediate context.

Poor behaviour inhibition in ADHD children contributes to less mature self directed speech. Immature internalized speech is believed to be associated with an increased difficulty in complying with rules, sticking to the task-at-hand, and making moral decisions around behaviour (Barkley, 1997). As such, ADHD children are expected to demonstrate significantly greater variability responding to timed tasks or those requiring continuous performance. ADHD children would be expected to perform better under conditions of immediate, versus delayed,

reinforcement. Moreover, ADHD children would likely have greater task performance difficulty if delays increased in duration. ADHD children are also much more likely to have difficulty transferring initially learned rules to new learning tasks even though they may have initially benefited from the use of a particular rule. This would imply a problem with the manner in which rules are extracted and deployed by children with ADHD in governing their own behaviour (Barkley, 1997).

The link between internalized speech and moral reasoning is less clear. Barkley's (1997) model purports that internalized speech, likely in concert with retrospective and prospective functions of working memory, contributes to moral reasoning. The model is based primarily on the fact that delays in moral development have been found to be significantly predictive of disruptive and aggressive classroom behaviour, diminished social competencies, and consequently diminished social status (Barkley, 1997, pg. 82).

The fourth and final of Barkley's (1997) executive functions is the process of reconstitution. Reconstitution refers to the verbal and non-verbal aspects of behaviour which permit efficient communication of information (behaviour analysis and synthesis). Verbal behaviour may refer to oral or written fluency, whereas non-verbal may refer to problem-solving requiring complex and

novel motor sequences. Both of these areas have been found to be impaired in individuals with pre-frontal lobe damage (Fuster, 1989). Barkley (1997) proposes that ADHD children should manifest greater difficulties with tasks, settings and interpersonal interactions in which reconstitution is essential. Therefore, ADHD children are likely to perform more poorly on tests of simple verbal fluency, particularly younger ADHD children. Likewise, complex language fluency and the organization of language are also areas which are expected to be problematic for ADHD children. For example, Barkley (1997) reports that children with ADHD, compared to those without ADHD, produce less speech in response to confrontational questioning and are less capable to communicating task-essential information to peers in cooperative tasks. Moreover, ADHD children also produce less information and less organized information in their story narratives.

With respect to developmental differences which might be expected within a neuropsychological framework, Barkley's (1997) model views each executive function as a semi-independent neuropsychological system. Evidence from additional theorists could suggest that each function probably emerges at separate times rather than all executive functions emerging simultaneously (Bronowski, 1997). In their review article of 22 frontal lobe investigations with ADHD children, Barkley, Grodzinsky & DuPaul

(1992) report that in several of these investigations, employing ADHD participants within a 12-20 age range (e.g. Fischer, Barkley, Edelbrock & Smallish, 1990), fewer or no significant differences were revealed between ADHD and non ADHD children on specific prefrontal tasks. Whereas similar frontal lobe tasks employing younger ADHD and non ADHD children (5-12 years old) revealed significantly greater difficulty for the ADHD children (e.g. Matson & Fischer, 1991). This suggests that age of ADHD children may be an important variable in determining frontal lobe functioning. Moreover, research with non ADHD children has found significant increases in frontal lobe function, such as sensitivity to feedback, problem solving, concept formation, and impulse control, between groups of children aged 7-8 and 9-12 (Levin, Culhane, Hartmann, Evankovich, Mattson, Harward, Ringholz, Ewing-Cobbs, & Fletcher, 1991). Similarly, frontal lobe differences were also reported in terms of the use of memory strategies, planning time, problem solving and hypothesis seeking between groups of children aged 9-12 and 13-15 (Levin et al., 1991). Moreover, Welsh, Pennington, & Grossier (1991) reported that more complex search behaviour and hypothesis testing matured by age 10, whereas verbal fluency, motor sequencing and complex planning abilities had not reached adult level performances by age 12.

In summary, behaviour inhibition and the four executive functions

of Barkley's (1997) model contribute to organized patterns of motor control, fluency, and syntax. However, uninhibited behaviour contributes to secondary impairments in the four executive functions and the motor control they afford. Consequently, ADHD children are expected to fare more poorly than non ADHD children on pre-frontal or frontal tasks. More specifically, ADHD children are likely to have significant difficulty, inhibiting task-irrelevant responses, carrying out goal-directed responses, and carrying out novel and or complex motor sequences, with goal-directed persistence. Moreover, ADHD children are more likely to have difficulty getting back on task following disruption, controlling their behaviour by internally represented information, communicating task essential information, interpreting interpersonal interactions, and producing as much information in story narratives as non ADHD children. Moreover, given the developmental differences reported in non ADHD children with respect to pre-frontal and frontal tasks, younger ADHD children would be expected to fare more poorly than older ADHD children and non ADHD children on pre-frontal and frontal tasks (Barkley, Grodzinsky, & DuPaul, 1992).

Other theorists have developed similar neuropsychological theories based upon evidence for right hemispheric control of emotional processing. Several studies have provided evidence that the cerebral hemispheres are differentiated with respect to

the processing of emotion laden information. Voeller (1986) described 15 children, all with Attention Deficit Disorder and neuropsychological profiles consistent with right-hemisphere damage or dysfunction. The children ranged in age from 5 to 13 and were presented with tasks associated with left and right neurological functioning. The children were generally found to perform better on left-hemisphere tasks (e.g. better verbal than visuospatial abilities, and higher reading and spelling than arithmetic achievement test scores) than right-hemisphere tasks. Right-hemisphere tasks included three components of emotional expression, namely, prosody, facial expression and gesturing. Voeller (1986) concluded that right-hemisphere dysfunction has a profound impact upon a child's capacity to develop the ability to behave in affectively appropriate fashion and to perceive the emotion states of other human beings (pg. 1008).

Becker, Doane, and Wexler (1993) reported that the left hemisphere, primarily the frontal region, is activated after exposure to stimuli with a positive emotional valence and that it has a specialized role in processing such information. They further suggest that the frontal region of the right hemisphere plays a similar role in the processing of information with a negative emotional valence. The right hemisphere is purported to play a role in the initial analysis of the emotional content of stimuli.

Shapiro, Hughes, August, & Bloomquist (1993) have examined the social difficulties of ADHD children by proposing a model of social behaviour. Contrary to the executive or frontal dysfunction model, Shapiro et al. (1993) approached their investigation with an alternative hypothesis consisting of a posterior-right-hemisphere model to explain the emotional processing deficits exhibited by ADHD children. Their theory was based largely on the similarities between the social skill deficits evidenced by ADHD children and a syndrome of nonverbal learning disability (NLD). Shapiro et al. (1993) hypothesized that if emotional processing was found to be impaired in children with ADHD, a right-hemisphere model of attention deployment could be supported, particularly if such deficits occurred more frequently in the subgroup of children with ADHD who also had characteristics associated with NLD.

The 16 subtest instrument was designed to explore the neuropsychology of emotional perception and to measure sensitivity to emotional stimuli at the different stages of the proposed model. What follows is a brief outline of the proposed model including the neural pathways believed by Shapiro et al. (1993) to be involved in the performance of those stages, and a brief description of the specific tasks or subtests which correspond to the various model stages.

The first step of the Shapiro et al. (1993) model is the processing of social stimuli by the perceptual systems. The inability to process social information at this level may be attributed to visual or auditory perception deficits. An example of the type of task which was presented on the Minnesota Tests of Affective Processing (MNTAP; Shapiro et al., 1993) to measure this ability included the inverted face subtest. This task consisted of presenting subjects with sequentially presented pairs of photographs showing upside-down faces and simply asking them if the faces were the same or different.

The second step of the model involves the application of meaning to the social stimuli (eg. facial expression, gestures or prosodic tone) which is presumably a right hemisphere function. Failure at this level would be manifested as socially inappropriate or immature behaviour, interpersonal insensitivity, naivete, or inappropriate hostility. An example of the type of task which was included on the MNTAP (Shapiro et al., 1993) to measure this ability involves subjects judging the prosodic quality of speech samples (prosody/content preference; e.g. point to the cartoon face that matches the emotion implied in a specific speech sample).

The third level of the proposed model involves the selection of an appropriate behavioural response which is considered a

frontal/right hemisphere function. Failure at this level would be manifested as situation-inappropriate behaviour or a limited range of response behaviour. An example of the type of task would include the matching of behaviour templates to situation templates (ie. given a friendly greeting, how should one reply?), (Shapiro et al., 1993).

The fourth level involves performance which is purported to be a frontal area function. At this level the response behaviour decided on must be understood and correctly performed. Competence in terms of verbal and non-verbal communication is necessary. Thus, failure at this level would involve a reduced amount of, a limited range of, or poor performance of, expressive behaviour. To measure this ability Shapiro et al. (1993) asked subjects to listen to a short speech sample with emotional intonation and neutral content. Eight seconds later, via computer image, a photograph is presented of an emotional face from the set published by Ekman & Friesen (1978). Subjects were instructed to determine whether the prosody of the sentence matches the facial expression of the photograph. The MNTAP (Shapiro et al., 1993) was administered entirely via computer images and sounds and subjects responded in an entirely non-verbal manner to all items. As such verbal communication competence was not measured on this instrument.

The final stage of the proposed model (Shapiro et al., 1993) involves feedback evaluation and behavioural regulation purported to be a frontal function. At this level the evaluation of the behaviour chosen and its effectiveness occurs (eg. "did I pick the right behaviour?"). This stage requires the ability to utilize feedback from other persons and at least some capacity for accurate self-observation. The MNTAP (Shapiro et al., 1993) did not provide a measure for determining this ability.

The results of the Shapiro et al. (1993) investigation revealed that ADHD subjects had significantly more difficulty than controls on two specific tasks, prosody/content congruence and cross modal matching. Both of these tasks require subjects to listen to a sentence, analyse its prosody, and determine whether it matches the content of the sentence (prosody/content congruence) or a facial expression (cross-modal matching).

Moreover, both of these tasks are characterized by demands on auditory processing and working memory capability. The finding that ADHD subjects were significantly poorer at these tasks is not surprising given that many investigators (e.g. Douglas and Benezra, 1990) have reported that ADHD boys are clearly impaired in terms of recall and recognition on paired associate learning tasks judged to be on the higher end of the effortful-purposeful dimension due to the necessity to deploy more deliberate and

demanding memory strategies to complete such tasks.

Although insignificant, additional findings suggested that younger ADHD children experienced more difficulty than all other participants in terms of accurately decoding facial affective stimuli. Moderate difficulty was reported among the younger grouping in terms of facial recognition. The investigation concluded that the social impairment observed in children with ADHD is not principally due to deficits in the processing of emotional cues but may be due to an inability to apply emotional information, particularly in new situations requiring cross-modal application.

The use of thematic apperception techniques are common in clinical settings to evaluate the emotional states of children. Constantino, Colon-Malgady, Malgady, & Perez, (1991) employed a structured thematic apperception technique (the Tell-Me-A-Story Test) (Themas; Constantino, Malgady, & Rogler, 1988) to measure attention to pictorial stimuli depicting characters, events, settings and covert psychological conflicts in ADHD children. Three groups of ADHD children were employed, one comprised of Caucasian American children, and two groups of children from African-American and Hispanic backgrounds. The participants ranged in age from 7 to 15. Ethnicity effects were reported for both the Hispanic and African-American groups who were more

likely than their non ADHD counterparts to omit details about the characters, events, and settings. Caucasian ADHD children were more likely to omit the characters, settings, and conflicts, but not events. Aside from ethnicity issues, there was a greater tendency of ADHD children to omit stimulus details. Moreover, the ADHD participants were three times more likely to forget the four basic questions they were told to consider in describing the picture cards, thus requiring prompting. The significant differences reported between the Caucasian ADHD and non ADHD groups were considered to be a function of an inability to process the complexity of the stimuli and to remember instructions to comply with four basic commands.

Summary of ADHD/Emotion Literature. ADHD children are more negative, disruptive and noncompliant (Nigg, Hinshaw, Carte, & Treuting, 1998), are poorer at monitoring their own behaviour and that of others (Barkley et al., 1991), have greater difficulty with social skills (Breen & Barkley, 1984), have generally poor social knowledge (Grennell et al., 1987), and are more controlling and are less likely to respect situational rules (Cunningham & Siegel, 1987).

Social ineptness among ADHD children is not only widely prevalent, but may actually produce more negative intrapersonal and interpersonal consequences than any other comorbid condition

of ADHD (Wender, 1995). Twenty-two percent of ADHD children are "socially disabled" (Greene et al., 1996). Three quarters of socially impaired ADHD children carry one or more comorbid psychiatric diagnoses, whereas only 10% of ADHD children who are not socially impaired carry a comorbid diagnosis (Greene et al., 1996). Therefore, comorbidity with ADHD confers a much greater risk for developing social disabilities.

Social ineptness may refer to behaviours directly related to the core features of ADHD or other behaviours such as misinterpreting social information. In view of the fundamental role of social relationships in children's lives, an understanding of the ability of ADHD children to process social/emotional information is necessary though not well represented in terms of available literature. What literature is available, is relatively new and reveals a series of not yet widely understood, and somewhat opposing findings, based upon different theories of ADHD (e.g. frontal/prefrontal cortex vs. right hemisphere), regarding the ability of ADHD children to process emotional information.

More specifically, Shapiro et al. (1993), using a right-hemisphere model of social information processing, reported that the inability of ADHD children to match the prosody and content of a sentence and the prosody in a sentence with the appropriate facial expression is likely a function of the cognitive and

memory demands of the tasks. Likewise, Constantino et al. (1991) hypothesized that the cognitive and memory demands of the TEMAS test (Constantino et al., 1988) may have accounted for the significant difficulties noted between ADHD and non ADHD children. Shapiro et al. (1993), in determining their model for social information processing, reported nonsignificant overall differences between ADHD and non ADHD children in terms of decoding facial expressions, although they did report that younger ADHD children presented with modest difficulty on this task. Conversely, Singh et al. (1998), employing a similar task which involved listening to short stories and selecting facial expressions that would match the emotional states implied in the stories, reported significant facial decoding difficulties for ADHD children.

Discrepant findings in the current literature regarding emotion processing in children with ADHD may be related to a variety of factors. Those factors may include investigations with different goals, investigations based upon different neuropsychological theories, and/or methodological differences with regard to the aspect of emotion being measured. For example, in both Shapiro et al. (1993) and Singh et al. (1998) participants were not merely required to identify facial expression, but rather, they were required to match the emotion implied in statements to facial expressions. In Shapiro et al. (1993) children were asked

to match emotion statements, with spoken emotional intonation but neutral content, to faces of four different types of expressions. Children in Singh et al. (1998) were asked to match statements which included the word for the corresponding target emotion or some derivative of it, to 24 Ekman & Friesen (1978) face photographs representing six emotions. The different cognitive demands imposed by listening to a statement with intonation but otherwise neutral and asked to pair the statement with a facial expression (Shapiro et al., 1993), and, being provided with the actual name of the target emotion in a statement and asked to pair the statement with the appropriate facial expression (Singh et al., 1998), may provide one explanation for the discrepant finding with regard to the available facial identification literature.

The field of facial expression has long established the universality of facial recognition (Ekman & Friesen, 1978; Boucher & Carlson, 1980; Ducci, Arcuri, Georgis, & Sineshaw, 1982) and normal children in all parts of the world can name expressions of happiness, sadness, anger, fear, surprise, and disgust in their own language (Ekman, 1994). What is lacking in facial identification literature are investigations involving clinical populations (e.g. ADHD), which eliminate the possibly confounding process of matching verbal statements with facial identification as a means of determining the ability to identify

facial expression. A less confounding methodology, and one which has been used with normal populations worldwide, would be to simply ask children from clinical populations to identify the emotion expressed in photographs.

What seems painfully obvious, from the ADHD literature regarding emotional information processing is the need to establish non-confounding baselines for ADHD children on tasks of emotion. If identification of facial expression is the task of emotion being investigated, then that task should not be confounded by the inclusion of a second emotion variable (e.g. matching faces with verbal emotion statements). The task of identifying facial expression and identifying emotion statements require separate investigations to avoid artifactually producing results which seem to indicate differences between two groups (e.g. ADHD and normal children). Otherwise, the results may actually be a function of the nature of the task(s) being measured as opposed to reflecting genuine differences between two groups.

A Problem Defined

The ability of children to understand concepts of emotion is largely related to developmental and cognitive factors. Research over the past two decades has provided insight in terms of the relationship between children's understanding of emotional

concepts and developmental. Researchers in the emotion realm have indicated developmental differences in terms of the ability of normal children to interpret and process various aspects of social behaviour (Nannis & Cowan, 1987; Lewis & Rosenblum, 1978; Flavell, 1971). Results would appear to converge to suggest a positive relationship between age and the ability to understand concepts of emotion. Children as young as five years of age can decode simple emotions (happiness, sadness, anger, fear, surprise, disgust) and at least one complex emotion (pride). Most older children can decode complex emotions (comfort, guilt) by grade 4 (Nicholson, 1996).

Literature involving the ability of ADHD children to recognize facial affect and sentence prosody, and to attend to the characters, events, settings and covert psychological conflicts depicted in picture cards have been reviewed. Most of the previous investigations regarding the ability of ADHD children to identify facial expressions, have utilized a matching task methodology (e.g. looking at pictures of faces and listening to emotion statements and matching valences). One shortcoming with this methodology is that previous investigators (e.g. Singh et al., 1998; Shapiro et al., 1993) may have possibly confounded the task of identifying facial expression by including a secondary task involving the matching of the facial expressions to emotion statements. In the present investigation, the emotion tasks

employed, namely, Facial Expression Identification, Emotion Statement Identification, and the CAST (Schneider, 1989) have been separated from each other, and administered as three distinct tasks, in order to avoid confounding.

A second shortcoming of previous investigations, has been a lack of regard for possible gender issues. A search of the literature reveals scarce attention to this area. In the studies available, there is little agreement with regard to the role of gender in ADHD. Brown & Sexson (1989) reported that in a clinically referred sample of ADHD children, girls were more socially withdrawn, and had more internalizing symptoms than boys. Other studies based on school-identified hyperactive children have reported that hyperactive girls are rated as having fewer behavioural and conduct problems than hyperactive boys (deHaas, 1986). Barkley (1990) reported that in general ADHD girls have fewer conduct problems than boys, but otherwise appear little different from males in terms of their patterns of ADHD symptoms on objective tests. Given the earlier mentioned comorbidity of behaviour problems and social disability in ADHD children, it makes sense that if ADHD girls are not as likely to exhibit conduct or behavioural problems as are ADHD boys, they would likely exhibit less social disability. If this were the case, one might expect female ADHD children to perform better than male ADHD children on measures of social ability based upon gender

explanations alone. Given that females may perform better than males on tasks involving social interactions (deHaas, 1986), and the greater incidence of boys versus girls with ADHD, the present investigation utilized male ADHD children only.

In previous investigations (e.g. Singh et al., 1998; Shapiro et al., 1993) no attempt was made to remove ADHD participants with comorbid learning problems or less than average aptitude from the sample populations. Given that both investigations involved active listening to verbal instructions and verbal stories, it is possible that performance deficits among ADHD participants may have been confounded by the presence of learning problems and/or low verbal aptitude. In the present investigation, participants were excluded if they were previously diagnosed with a learning disability or if they failed to attain an average range score on a verbal aptitude measure, namely the Peabody Picture Vocabulary Test - Revised (PPVT-R; Dunn & Dunn, 1981).

The absence of any reference to the use of medication by the ADHD participants in previous investigations, is of serious concern. Particularly so given the number of studies within the literature which have examined the short-term effects of medication treatment of ADHD. The literature converges to indicate that the rates of under controlled aversive behaviours are dramatically reduced, while the ability to attend to task is drastically increased, when medication is present (for a literature review

see Spencer, Biederman, Wilens, Harding, O'Donnell, & Griffen, 1996). It only makes sense that if some of the ADHD participants, in the previously reported investigations, were indeed utilizing medication during their participation, their performance may have exceeded that of their non-medicated counterparts. Given that improved behaviour and attention to task can be directly ascribed to the use of medication treatment in ADHD children (see Spencer et al., 1996 for a thorough review), all ADHD children in the present study had their medication withdrawn during their active participation in the investigation.

One final criticism of previous investigations has been the inability to integrate issues of task complexity and age/grade levels in the processing of emotional information by ADHD children. To move towards developing a better understanding of the ability of ADHD children to process emotional information of varying complexity, three areas of interest were pursued with children at different developmental levels in the present study. The first area, Facial Expression Identification, was considered the simplest because there was no requirement to listen to and retain verbal information. Children at different development levels were merely required to examine photos and identify facial expressions. The second area, Emotion Statement Identification, was considered a slightly more difficult task because it involved

active listening and retention of information as well as searching one's personal repertoire of information as well as searching one's personal repertoire of emotional responses in order to correctly identify emotion statements. The final task, the CAST (Schneider, 1989), was considered the most difficult because it involved looking at pictures of complex human interactions, involving two or more people, and identifying as many emotions as possible per picture card. This task would tap one's ability to attend closely to the stimuli at hand and to correctly interpret all aspects of the emotional interactions.

Hypotheses

Facial Expression Identification. Given the findings of Singh et al. (1998) who concluded that ADHD children have significant difficulty in their ability to accurately recognize facial expression, and the findings of Walker & Leister (1994) who reported that children with internalizing and externalizing disorders were equally and significantly poor, compared to normal controls, at recognizing facial expression, ADHD subjects, in the present investigation were expected to identify significantly fewer facial expressions than the non-ADHD subjects.

Shapiro et al. (1993) reported that younger ADHD children experienced more difficulty, than all other participants, in

accurately decoding facial affective stimuli. Therefore, younger ADHD students, in the presented investigation, were expected to identify fewer facial expressions than older ADHD students and all non ADHD students.

Emotion Statement Identification. Unlike the facial recognition task, the processing of the emotion statements was hypothesized to require close attention to ensure that the statements were heard, the active use of short term memory to retain the statements, and more advanced cognitive skills. Douglas and Benzra (1990) reported that ADHD children have significantly greater difficulty with verbal memory. Likewise Shapiro et al. (1993) reported significant differences between ADHD subjects and normal controls on tasks requiring complex auditory processing and extensive use of working memory. Given that the emotion statement task is judged to be on the higher end of the effortful scale compared to merely looking at pictures of faces, ADHD boys were expected to be significantly impaired, relative to the non ADHD boys, at identifying emotion statements.

Nicholson (1996) concluded that most children can decode simple and complex emotions by grade 4. Bartolotti, Delia & Whissell (1993) reported that the ability to decode complex emotion increases with age. Shapiro et al (1993) concluded that younger ADHD children evidenced significantly more difficulty on the

simpler task of decoding facial expression. Therefore, it would stand to reason that younger ADHD participants would experience significantly more difficulty on this task than all other participants. A Grade main effect, a Group main effect, and a significant interaction were predicted with younger ADHD participants experiencing significantly more difficulty than their older counterparts and all of the non ADHD participants at identifying emotion statements.

Children's Apperceptive Story Telling Test (CAST; Schneider, 1989). Due to the high attentional and cognitive demands and the need for an understanding of appropriate social behaviour on thematic or apperceptive tasks, this particular aspect of this investigation was expected to be the most challenging for all ADHD participants. Constantino et al. (1991) reported that while ADHD children could readily identify the events observed on thematic picture cards, they were significantly impaired in their ability to identify stimulus details. As such, all ADHD participants, regardless of grade, were expected to produce significantly fewer accurate positive affect statements and significantly fewer Negative Affect statements than the non ADHD participants. Moreover, ADHD participants were expected to produce significantly fewer overall emotion statements (Verbosity) to describe the human interactions than the non ADHD participants. The main prediction for this variable was a group

main effect for the number of emotion statements produced (Verbosity) and the number of Positive Affect and Negative Affect statements produced. No Grade main effect was expected because of the use of the T scores in scoring the CAST.

Given the developmental differences noted in children's ability to process emotional information (Shapiro et al., 1993; Singh et al., 1998; Nicholson, 1996; and Bartolotti, Delis & Whissell, 1993) a grade main effect was expected for both groups, with the younger participants experiencing more difficulty than their older counterparts.

Method

Participants

Participants consisted of children in grades 4 (age 8 or 9) and 8 (age 13 or 14) who were attending English schools in the Near North Board of Education in Ontario.

Participants were recruited by sending an Information/Consent to Participate Form (Appendix D) to 1730 parents of grade 4 and grade 8 male students attending English speaking schools in the Near North Board of Education catchment area. Forms were sent to the parents of all grade 4 and 8 males in English speaking schools, including those attending specialized programs (e.g.

Section 19) in order to ensure a more representative community sample of boys with and without ADHD.

The Information/Consent to Participate Form (Appendix D) explained that boys identified with ADHD and those without ADHD would be required for the investigation. Those parents consenting to their sons' participation were asked to indicate the following: Whether their son had previously been identified with, or suspected of having, ADHD; If their son had previously been identified with ADHD, who identified the disorder and when; Whether their son took medication to control symptoms of ADHD; If their son took medication, to name the medication and dosage; and, Whether they would agree to withhold medication during the administration of the emotion tasks (Interview Phase). Parents of ADHD children agreed to withdraw any medication prescribed to their children to control symptoms of ADHD for 24 hours prior to, and during, their participation in the Interview Phase of the nt study.

In addition to questions pertaining to the previous identification of ADHD, parents were also asked to indicate, on the Information/Consent to Participate Form, whether their child had previously been identified, by an Identification, Placement, Review, Committee (IPRC), with a learning disability. Students with previously identified language-based learning disabilities

or special needs were not utilized in the present investigation.

No attempt was made to further rule out the presence of learning disabilities in participants, other than relying on parental report, due to the fact that the North Shore Board of Education enforces an early screening/identification program. It was presumed that learning disabled participants would have been identified by grade 4 if indeed a disability had been present.

In addition to parental consent, students were required to consent to their participation in the present investigation (Appendix E).

Following initial contact, 283 parent and corresponding child consent forms were favourably returned (see Appendix Q for a detailed break-down of recruitment returns). One hundred and thirty one of the positive returned forms indicated a previous identification of ADHD by a family physician, pediatrician, psychiatrist, or registered psychologist, no previous identification of learning disabilities, and a willingness to withhold medication during the Interview Phase of the investigation. In this group, 68 forms were for children in grade 4 and 63 were for children in grade 8. The remaining 152 consent forms indicated no suspicion or previous diagnosis of ADHD and no previously identified learning disabilities. From

this group, 90 were in grade 4 and 62 were in grade 8.

A total of 242 students were accepted for participation in the Screening Phase. Of the 242 students accepted for participation, only 129 ADHD students, 68 from grade 4 and 61 from grade 8, and 113 non ADHD students, 60 from grade 4 and 53 from grade 8, participated in the Screening Phase. Appendix R provides details of ADHD participants who either did not complete the Screening Phase or did not meet the Screening Phase inclusion criteria. Appendix S provides details of non ADHD participants who either did not complete the Screening Phase or did not meet the Screening Phase inclusion criteria.

Table 1 presents the Screening Phase inclusion criteria means and standard deviations for 129 ADHD and 113 non ADHD participants in grades 4 and 8.

Insert Table 1 Here

Of the 129 students who participated in the Screening Phase, a total of 100 ADHD students, 50 in grade 4 and 50 in grade 8, and 100 non-ADHD students, 50 in grade 4 and 50 in grade 8, were utilized in the Interview Phase. Appendix T provides details of

ADHD participants who did not complete the Interview Phase while Appendix U provides details of non ADHD participants who did not complete the Interview Phase. Table 2 presents Interview Phase means and standard deviations for 100 ADHD and 100 non ADHD participants in grades 4 and 8.

Insert Table 2 Here

At the Screening Phase and at the Interview Phase no significant difference in PPVT-R scores was found between ADHD and non ADHD participants from grade 8. However, the grade 4 ADHD students in the Screening Phase, had significantly lower PPVT-R scores than grade 4 non ADHD students by three-and-a-half points ($T=3.43$, $p<.05$). Likewise, ADHD students in the Interview Phase had significantly lower PPVT-R scores than their non ADHD counterparts by two-and-a-half points ($t=2.42$, $p<.05$). These differences, though significant, were small suggesting that grade 4 ADHD and non ADHD students were not vastly different from each other in terms of verbal intelligence.

Measures

Screening Phase. The Screening Phase measures employed in the

present investigation, along with the inclusion criteria for those measures, are as follows:

1. Swanson, Nolan and Pelham Rating Scale (SNAP). The Swanson, Nolan and Pelham Checklist (SNAP; Swanson, Nolan & Pelham, 1988; Appendix A), is a 23-item rating scale which provides information on ADHD core behaviours based on DSM-III-R (Barkley, 1990; Pelham & Bender, 1982) criteria. The scale employs teachers as the primary raters (Johnson et al., 1985). Teachers select a level of 'not at all', 'just a little', 'pretty much', or 'very much' in rating student behaviour on the snap. Fourteen of the 23 items on the SNAP were derived directly from DSM-III-R (APA, 1987) ADHD diagnostic criteria and included the following: A2, A3, B1, B2, B3, B4, C2, C6, D3, E1, E2, E3, E4, and E5. Test-retest reliability on the SNAP (using teachers) has been reported at .69, .78, .92 and .66 for the Inattention, Hyperactivity, Impulsivity, and Peer Problem factors respectively. Each scale has an internal consistency of .90. The SNAP (Swanson, Nolan, & Pelham, 1988) was administered to all participants to confirm the presence of ADHD in the previously diagnosed ADHD participants and to screen for greater than average levels of attentional difficulty among the non ADHD participants. Criteria for inclusion for the ADHD participants was of score of 'pretty much' on 8 or greater of those 14 SNAP items from the DSM-III-R. Criteria for inclusion for the non

ADHD participants was a score of 'pretty much' on less than 8 of the 14 SNAP items from DSM-III-R. In the Interview Phase (Table 2) there were strong significant SNAP differences between ADHD and non ADHD groups in both grades. For grade 4, the difference in SNAP means was 8.8 units ($t=40$, $p<.0001$), while for grade 8, the difference was 7.7 units ($t=38.5$, $p<.0001$).

2. Peabody Picture Vocabulary Test (PPVT-R). The PPVT-R (Dunn & Dunn, 1981) is primarily a test of receptive vocabulary. It features two forms, L and M, and normative scoring data are provided for ages two to 40. The PPVT-R reports a standard score mean of 100 and standard deviation of 15. Scores are generally reported in terms of standard score equivalent, percentile rank, stanine or range.

Another function of the instrument is to provide a quick estimate of one major aspect of verbal ability in English-speaking individuals. In this sense it may be viewed as a scholastic aptitude test. It is not, however, a comprehensive test of general intelligence. Rather, it measures only one facet of general intelligence, that being vocabulary (Dunn & Dunn, 1981, pg.20). While not considered a primary measure of intelligence, a great deal of information has been accumulated comparing the PPVT-R scores with those on individual intelligence tests. The original Peabody Picture Vocabulary Test has been compared to

both the second and third editions of the Stanford-Binet Intelligence Test (Terman & Merrill, 1937) and the Wechsler Intelligence Scale for Children (WISC; Wechsler, 1974), on numerous occasions. The PPVT-R Manual (Dunn & Dunn, 1981, p. 62) reports a median correlation of .62 between the PPVT-R and the Stanford-Binet and a median correlation of .66 with the Verbal Scale of the WISC. Because the Stanford-Binet and WISC have served for so long as the standard intelligence measures, and given the moderate validity coefficients for the PPVT-R versus intelligence test scores, the PPVT-R is considered an appropriate screening measure of scholastic aptitude (Dunn & Dunn, 1981, p. 65).

Reported test-retest coefficients for the PPVT-R range from .52 to .90 and norms for both age groups are available.

Criteria for inclusion for all participants was an average verbal aptitude as indicated by a score equal to or greater than 80 on the PPVT-R (Appendix B). Previously administered test results were acceptable if available and accessed via a release of information form (Appendix C).

Interview Phase. The Interview Phase involved the administration of the three emotion tasks, namely, Facial Expression Identification, Emotion Statement Identification, and the CAST

(Schneider, 1989).

1. Facial Expression Identification. Ekman & Friesen (1978) developed a series of facial affect photographs to determine what emotions could be judged from viewing a face. They employed a total of 98 photographs of facial expressions, which consisted of 14 posers for six emotions reflecting sadness, anger, disgust, fear, surprise, and happiness. They also included one photograph of each poser in a neutral expression. Ekman & Friesen (1978) concluded that all of the photographs were judged to show the intended emotion by 70 percent of the observers. Not including the neutral photographs, all but 11 of the photographs were correctly judged by 90 percent of the raters. Mean correct judgement percentages per emotion were as follows: Happiness (99.8), Sadness (90.83), Fear (88.36), Anger (88), disgust (92.5), Surprise (92.5).

Ekman & Friesen's (1978) face cards were developed to demonstrate that facial expression is a basic and innate ability regardless of the cultural context of the social interaction (Boucher & Carlson, 1980; Ducci, Arcuri, Georgis, & Sineshaw, 1982). They have been employed in investigations throughout the world, therefore, cross cultural validity has been established (Izard, 1979; Ekman, 1994). Moreover, the Ekman & Friesen (1978) faces have been employed in most investigations involving emotional

processing in ADHD Children (e.g. Singh et al, 1998; McAlpine, 1992; Walker & Leister, 1994; Shapiro et al., 1993). This fact establishes the construct validity of this instrument as a measure of facial expression knowledge, especially with regard to ADHD children.

Reliability data which examined the overall agreement across all coders when scoring was compared to experts is .82. Intercoder reliability is .76 (Ekman & Friesen, 1978).

In the present investigation, 36 of Ekman & Friesen's (1976) pictures were professionally transferred from slide format to 4 ½ X 6 inch mounted photographs.

An internal consistency coefficient (Cronbach's alpha) was calculated for the Facial Expression Identification task in the current sample. An alpha coefficient of .82 indicated good internal consistency in the task.

The dependent measure derived from this task was accurate Facial Expression Identification in 36 photographs.

2. Emotion Statement Identification. Nicholson (1996) derived in excess of 2000 emotion statements by simply asking

children in kindergarten, grade 4 and grade 8 to tell 'what makes you feel _____?' (Happy, sad, angry, afraid, proud, guilty and comfortable). The procedure used to collect this data was to repeat the question for each emotion until the child's repertoire of responses had been exhausted. Thirty five statements, five per each emotion of happiness, sadness, fear, anger, pride, guilt and comfort, produced by children in grades 4 and 8 in Nicholson (1996) were randomly selected from Nicholson's (1996) list. The exact statements were used to develop 35 closure type sentences in which participants would be required to fill-in the appropriate emotion in the present investigation. For example, in Nicholson (1996) children reported 'when I do something I know I'm not supposed to, I feel guilty'. In the present investigation, one item representing the emotion guilt read, 'When I do something I'm not supposed to, I feel _____.' Participants were expected to fill in the appropriate emotion. The same process, employing the exact statements produced in Nicholson (1996), was followed to develop all 35 closure statements (see appendix J).

No reliability or validity data are available for the statements which were produced by children in the Nicholson (1996) study. However, they are considered to have face validity in that they were produced by normal children, of nearly identical age to participants in the present investigation, to reflect various

emotions. Moreover, the same statements were employed by Bartolotti, Delia, and Whissell (1993) who reported the following recognition results: anger (.35), guilt (.38), sadness (.45), pride (.46), fear (.49), comfort (.55) and happiness (.64), which were significantly higher than chance (.14).

An internal consistency coefficient (Cronbach's alpha) was calculated for facial expression in the current sample. An alpha coefficient of .87 indicated good internal consistency.

The dependent variable was accurate Emotion Statement Identification in 35 emotion statements.

3. Children's Apperceptive Story Telling Test (CAST). The CAST (Schneider, 1989) was designed to assess social, emotional, and behavioural adjustment issues evidenced by children and early adolescents. This instrument reports normative data for well-adjusted children and behaviour disordered children. The set of 17 picture cards consists of 3 cards (numbered 2, 4, and 15) that are administered to both boys and girls and 14 pairs of cards (numbered 1,3,5, 6,7,8,9,10,11,12,13,14,16, and 17) that have been designed with separate male and female versions and are to be administered to the appropriate sex. The picture cards are coloured. Participants are generally asked the five following

questions for each picture presented: 1) What is happening in this picture? 2) How are they feeling?/How is s/he feeling? 3) What happened before this? 4) What are they saying?/What is s/he saying? and 5) How will the story end? What will happen at the end? The participant's responses to these questions contain words, phrases, and sentences that reflect particular significant themes. Given that the present investigation was not concerned with all of the thematic themes measured by the CAST, not all of the questions were asked.

The CAST, in the present study, was used to identify one's ability to label positive emotions (Positive Affect), negative emotions (Negative Affect) and to measure the number of emotion statements produced (Verbosity) from examining 17 picture cards depicting human interaction. Therefore, only question 2, 'How are they feeling?/How is s/he feeling?' was asked. Moreover, restricting the number of questions reduced the amount of time each student was withdrawn from valuable classroom learning time.

The apperceptive stories are scored story by story, for four Adaptive Thematic Scales (Instrumentality, Interpersonal Cooperation, Affiliation, and Positive Affect), and five Nonadaptive Thematic Scales (Inadequacy, Alienation, Interpersonal Conflict, Limits and Negative Affect). Six additional scales, which had no bearing on the present

investigation may also be reported. The administration of individual scales is acceptable and normative data (t-scores) are available for each of the thematic scales.

In this investigation, only the Positive Affect and Negative Affect thematic scales of the CAST were administered. A third dependent variable, Verbosity, is not a CAST scale, but the CAST presented an excellent means by which to collect information regarding differences in the number of emotion statements produced by ADHD and non ADHD children. Barkley's (1997) neuropsychological model, particularly in the fourth executive function, reconstitution, purports that ADHD children have significantly more difficulty with respect to the verbal aspects of their behaviour. Given Barkley's predictions and the fact that the CAST essentially involves the production of story narratives regarding interpersonal interactions, ADHD children were expected to produce fewer narrative details, particularly with respect to emotions. For this reason a third measure was included for the CAST which examined Verbosity. Verbosity was measured based upon the number of emotion statements made per picture card. Each statement produced was manually recorded and later totalled for scoring purposes.

For the t distribution, in the CAST, the mean is set at 50 and the standard deviation at 10. The manual provided guidelines for

the use of a shortened version of the CAST for the purpose of exploring specific themes.

Construct validity was established by three different approaches: factor analysis for the scales; intercorrelations between the scales and the factors; and t-tests demonstrating differences between known groups on the scales and factors. Concurrent validity was established by comparing the CAST to the Roberts Apperception Test for Children (RATC; McArthur & Roberts, 1982). Those CAST scales which were hypothesized to correlate either positively or negatively with the RATC did so moderately providing evidence for concurrent validity. The adaptive scales and the corresponding median total-card correlations are reported as follows: Instrumentality (.46); Interpersonal Cooperation (.47); Affiliation (.39); Positive Affect (.45); and Positive Operational (.59). The nonadaptive scales and their median total-card correlations are reported as follows: Inadequacy (.46); Alienation(.37); Interpersonal Conflict (.34); Limits (.47); Negative Affect (.40); and Negative Operational (.43).

Four types of reliability are reported for the CAST: Interrater; test-retest; split half; coefficient alpha. Interrater reliability is available for each scale of the CAST, adjusted by age. With the exception of five scales, which are not being employed in the present investigation, reliability coefficients

were in the .90 range. The median reliability coefficients for all 15 scales are in the .90 range. Test-retest reliabilities for the 15 scales ranged from .39 - .98 for the well adjusted population and with a median reliability of .72, and from .24 - .99 for the behaviour disordered subjects with a median of .76. When individual scale scores were examined, reliability ranged from .49 - .98 for the well adjusted group and from .71 - .94 for the behaviour disordered sample. Combined samples ranged from .77 - .96. Test-retest reliability for Positive Affect is .66 for the well-adjusted, and .93 for the behaviour-disordered. Negative Affect test-retest reliability is .61 for the well-adjusted and .93 for the behaviour-disordered. Split half reliability for the standardized sample for all scales is reported as .72 and for the behaviour disordered sample, .70. Coefficient *alpha* was calculated for the standardized sample only and reliabilities are reported to range from .90 - .93.

An internal consistency coefficient was not applicable to this measure.

The three dependent measures for the CAST were the accuracy of Positive Affect identified, the accuracy of Negative Affect identified, and Verbosity for statements per the 17 interaction cards.

Procedure

Screening Phase

A letter was sent to all physicians, pediatricians, and psychiatrists serving the Near North catchment informing them of the present investigation and that parents would be contacting them to request their permission to withhold medication for 24 hours prior to the administration of the Interviews (Appendix V).

In compliance with the rules and restrictions outlined in the Freedom of Information Act, the Consent to Participate Forms (Appendix D and E), and the Release of Information Form (Appendix C) which permits the release of previous PPVT-R Scores if available, were addressed and mailed by the respective school principals to the parents of all grade 4 and grade 8 male students. Sufficient pre-stamped envelopes for the mailing and return of the forms were provided to each school.

As forms were returned, they were grouped by parent responses on the Information/Consent Forms. A positive return for ADHD students consisted of a previous diagnosis of ADHD, no previously identified learning disabilities, and a willingness on the part of the participants parents to withhold medication during the Interview Phase. A positive return for non ADHD participants

consisted of no previous diagnosis, or suspicion of, ADHD, and no previously identified learning disabilities.

Within two days of receiving returned positive consent forms, the SNAP profiles (Appendix A) were delivered to the respective classroom teachers for completion. Teachers were instructed to base their behavioural ratings on direct observations versus hearsay. Moreover, for ADHD participants, teachers were asked to complete the SNAP based upon any earlier opportunity they may have had to observe students while they were not taking medication.

The parents of children who returned positive consent forms were telephoned directly within one week of receiving their returned forms to ensure that they fully understood the procedure, to answer any questions about the study, and to inform them of their child's PPVT-R date. Every attempt was made to select a date and time which interfered least with the children's academic schedules for administering the PPVT-R.

For those students who were previously administered the PPVT-R, the scores were requested. Those students whose previous scores fell below a standard score of 80 were excused and a letter of explanation was sent home (Appendix N).

The PPVT-R was administered to all students who had not previously been assessed. In the present investigation, the PPVT-R was utilized as a basic screening instrument to ensure that all participants were functioning at least within an average aptitude range. A standard score of 80 was employed as an inclusion criterion. While a standard score of 80 falls slightly below the average range (Dunn & Dunn, 1981, p. 21), a standard score error of measurement of 5, was recommended for both the 9-10 and 13-13 age groups (Dunn & Dunn, 1981, p.23). Standard instructions for the PPVT-R were read to each participant. The PPVT-R was scored as per manual instructions.

SNAP tests were scored. The entire SNAP was completed for each student although teacher ratings on the 14 DSM-III-R (APA, 1987) items were the primary interest of the present investigation. ADHD participants required a rating level of 'very much' on eight, or greater, out of the 14 ADHD items, in order to participate in the Interview Phase. Non ADHD participants required a rating of 'very much' on less than eight, out of 14, in order to participate in the Interview Phase. A rating of 'very much' constituted a positive score due to an increased prevalence of ADHD reported when SNAP levels of 'pretty much' and 'very much', versus only levels of 'very much', constituted a positive score (Pelham, Evans, Gnagy, & Greenslade, 1992). Non ADHD students who obtained teacher completed SNAP scores which

were greater than 7 out of 14, utilizing only items endorsed with ratings of 'very much', were excused and a letter of explanation was sent home (Appendix O). ADHD students who obtained scores of less than 8 out of 14, utilizing only items endorsed with ratings of 'very much' were excused and a letter of explanation was sent home (Appendix P).

Once the SNAP and PPVT-R profiles were scored, student names were replaced by student identification numbers so that the examiner could later administer the Interview Phase blindly. A final list, consisting of student identification numbers only, of those ADHD and non ADHD grade 4 and 8 boys who met all of the inclusion criteria, was assembled.

The lists were presented to the respective school principals, who, by cross referencing the master name list, informed teachers of the dates for administration of the Interview Phase.

The parents of all students who participated in the Screening Phase were contacted by the school principals to inform them of their child's participation status. Those parents with students meeting all of the Screening Phase inclusion criteria were given the date upon which the Interview Phase would be administered. This step was completed no later than 30 days following the home mailing of the consent and information forms.

Interview Phase

Parents were telephoned the day prior to the interviews, by the school principal, to remind them to withhold medication during the Interview Phase. They were also informed that medication might be resumed at any time following the interview.

Principals provided teachers with a list of educational management principles (Appendix F) to facilitate the classroom management of unmedicated ADHD participants.

On interview day, teachers were asked to read a brief set of instructions (see Appendix G), 30 minutes prior to the interview, to prepare students for the transition.

Students were escorted to a pre-determined environment by the school principal who confirmed the student identification number, and introduced students, to the examiner, by first name only.

The examiner read a brief participant information script to each student (Appendix H) prior to administering the Interview Phase.

The administration of the three tasks comprising the Interview Phase were randomized in order to avoid confounding which may have occurred as a result of the ADHD children losing interest by

the time the final task was administered. All tasks were administered in one sitting for each participant. The order of administration of the tasks was recorded for each student.

The three tasks comprising the Interview Phase were administered.

On the Facial Expression Identification task, 36 photographs, from the Ekman & Friesen set (1979), were randomly presented to each participant. Each participant viewed six photographs per each of six emotions (happiness, sadness, anger, surprise, fear, and disgust) and was asked to identify the emotion in each photograph. Each of the six emotion photographs featured 3 female and 3 male actors. On the alternate side of each photograph was a photograph code which identified each actor by emotion. The photograph codes and corresponding participant responses were recorded on the Facial Expression Identification recording sheets (Appendix I). All of the Facial Expression Identification tasks were scored at one time, following the administration of the Interview Phase for all participants. Group affiliation was not known to the examiner at the time of administering the Facial Expression Identification task nor during the scoring. All Facial Expression Identification recording sheets were scored by the same examiner who administered the task. Student identification numbers only appeared on the recording sheets.

On the Emotion Statement Identification task, 35 statements from Nicholson's (1996) findings were utilized. Participants were read five randomly selected incomplete statements per 7 emotions (happiness, sadness, anger, fear, pride, guilt and comfort) and asked to complete the statements by indicating the correct emotion implied (Appendix J). The emotion statements were printed on white 4 X 5 inch cards and shuffled for each participant to ensure random presentation. The alternate side of the statement cards were numbered for later scoring. Instructions for the Emotion Statement Identification task are listed in Appendix L. The 35 statements were read by the examiner to participants exactly as recorder in order to standardize the procedure. The cards were also shown to each participant for re-reading. Scoring of the Emotion Statement Identification task was completed following the administration of the Interview Phase for all participants. The Emotion Statement Identification recording sheets (Appendix M) contained student identification numbers versus student names. Group affiliation was not known to the examiner at the time of administration or during the scoring. All emotion Statement Identification recording sheets were scored by the same examiner who administered the task.

On the CAST (Schneider, 1989; Appendix K) standard instructions

were read to each participant as they appeared in the test manuals. The Positive and Negative Affect scales, in which participants were asked to label how the individual(s) depicted on the 17 picture cards might be feeling, were administered. Scoring of the CAST was completed following the administration of all student interviews. The CAST protocols were numbered for later identification. Group assignment was not known to the examiner during the administration, nor during the scoring, of the cast.

The Interview Phase was administered in one sitting which took no longer than 40 minutes to administer. All of the Screening Phase and Interview Phase materials were uniformly administered under uniform conditions. All participants on medication to control symptoms of ADHD took their final dose 24 hrs prior to the beginning of the school day in which the administration of the emotion tasks took place. Presumably, medication was resumed according to the usual schedule following the Interview Phase.

Once all of the participants had been administered the three tasks comprising the Interview Phase, the tasks were scored. The Facial Expression Identification and Emotion Statement Identification tasks were straightforward because the responses were either correct or incorrect according to an objective standard. In scoring the CAST, participant responses required

coding as either positive or negative in order to determine a score. The manual provided instruction regarding the coding and scoring of responses for each interaction card. A second examiner was employed to score 10 randomly selected ADHD participant CAST protocols and 10 non ADHD CAST protocols, to ensure interrater reliability. Utilizing the manual procedures for coding and scoring responses, scores from the second examiner were exactly the same as the original examiner on all 20 of the profiles selected.

Analyses

Three 2 (groups) X 2 (grade levels) univariate analyses of variance (ANOVAS) were planned on the results of the Facial Expression Identification, Emotional Statement Identification and CAST tasks for the ADHD and non ADHD groups at grade 4 and grade 8. However, only two ANOVAS were performed. The third planned ANOVA, relating to Facial Expression Identification, was replaced with a chi square analysis because of a ceiling effect and skewed data. A .05 level of significance was used throughout. Because this was a 2X2 design, the only post tests required were for significant interactions, in which case t-tests of A at level B were employed.

Given that the present research sought to examine how two groups

of differing grade levels would differ from each other with respect to three individual outcome variables, the use of univariate analyses of variance (ANOVAS) was considered the most appropriate analysis strategy. Moreover, Huberty and Morris (1989) describe several situations in which multiple univariate ANOVAS could be conducted without the necessity of the usually administered preliminary multivariate analysis of variance (MANOVA). They refer specifically to the use of multiple univariate ANOVAS in situations when the outcome variables are "conceptually independent" (p. 303) which was considered to be the case in the present study. However, some measures in the present study (see Table 3) did prove to be intercorrelated (.31-.82), therefore, a MANOVA was employed.

Previous to testing, a power analysis was conducted for a univariate design. The power analysis indicates a conservative estimate of the number of subjects which will be required. Employing known differences between children in grades 2 & 5 in terms of their ability to assign the correct emotion to emotionally laden statements taken from the Bartolotti, Delia & Whissell (1993), an effect size was predicted. More specifically, data from Bartolotti, Delia & Whissell (1993) were assigned to an effect size formula (in Lipsey, 1990 p. 78) to produce an expected effect size of .50. The effect size information was used with Cohen's (1988) recommended power value

of .80 and assigned to Cohen's Power Tables (in Lipsey, 1990 p. 92) in order to determine the sample size necessary for each of the groups. The necessary sample size was 50 children in the ADHD group and 50 in the non-ADHD group based upon the Cohen Power Charts with an alpha value of .05 (1 tailed). A checklist for screening data, as outlined in Tabachnick & Fidell (1989) was followed prior to analyses.

No developmental data of the kind that allow an estimate of power was available for the Facial Expression Identification task. The power estimate was based on the Emotion Statement Identification task for which developmental data were available. The Facial Expression Identification task was presumed to be easier and the responses were less variable. Therefore, it was presumed that if a sample size of 50 was required for the more difficult task of Emotion Statement Identification, a sample size of 50 would be adequate for the easier task. As such, the final sample size satisfied the power requirements. The ADHD group was made up of 50 participants in grade 4 and 50 in grade 8. Likewise, the non-ADHD group was made up of 50 participants in grade 4 and 50 in grade 8. In the single MANOVA performed, multivariate power was high for all variables except Positive Affect for the grade effect.

Results

Primary Statistical Analyses

Strict assumptions of homogeneity of variance were contravened for all dependent variables ($p < .05$). For the Facial Expression Identification task, the ratio of highest to lowest variance was 4.7/0, while for the Emotion Statement Identification task, it was 15.7/.07. For the CAST, smaller differences were observed (Positive Affect=44.6/10.4, Negative Affect=35.2/16.9, Verbosity=333.1/108.6). Given the large sample size ($N=200$), and Winer's (1962) assertion that 'moderate departures from [homogeneity] do not, however, seriously effect the sampling distribution' (pg. 205) and 'F tests are robust with respect to departures from homogeneity of variance' (pg. 206), it was decided to use ANOVAS for the CAST variables and to back up the ANOVA for the Emotion Statement Identification task with non-parametric tests. Non-parametric techniques were employed for the Facial Expression Identification task.

The data were processed using the SSPSX(1988) statistical program. A total of 199 cases were processed by Statistical Analysis. Correlation coefficients for the overall sample are reported in Table 3.

Insert Table 3 Here

The overall correlation coefficients reveal mainly moderate to strong correlations among the various measures. The highest correlation was observed for the Facial Expression Identification and Emotion Statement Identification tasks. There were also high correlations among the CAST measures of .74 or higher. All measures were intercorrelated at a medium-weak level and higher. Multivariate analysis of variance (MANOVA) was used to analyse the three normally distributed CAST measures (Positive Affect, Negative Affect, and Verbosity) simultaneously. The remaining measures (Facial Expression Identification and Emotion Statement Identification) were treated separately.

The multivariate analyses of variance (MANOVA), which was carried out on the three CAST variables (Positive Affect, Negative Affect, and Verbosity) revealed a significant multivariate grade effect, ($F=13.88$ (3, 194) $p<.001$). Participants in grade 8, regardless of group, performed significantly better than the grade 4 participants on all three CAST tasks. A significant multivariate group effect ($F=155.48$ (3, 194) $p<.001$) was also revealed. ADHD participants performed significantly poorer than non ADHD participants on all three CAST tasks. Lastly, a

multivariate interaction effect between Grade and ADHD ($F=3.38$ (3, 194) $p<.001$) was revealed. This finding suggests that group and grade combined are also useful in determining how well children will perform on the CAST. Significant differences were noted between younger and older participants in both groups on all tasks.

A power analysis indicated that power for the multivariate Grade by ADHD interaction was high (.98). Power for the multivariate Group main effect was also high (1). Lastly, power for the multivariate Grade main effect, overall power was high (1).

Facial Expression Identification. The Facial Expression Identification means and standard deviations for group and grade are presented in Table 4.

Insert Table 4 Here

Because of ceiling effects and unequal variances, scores for this variable were categorized as either perfect or not perfect. Chi square analysis was performed within grade relating group category to type of response (perfect/ non-perfect). Table 5 shows the relationship between facial ID and group.

Insert Table 5 Here

At the level of grade 4, 6% of non ADHD and 32% of ADHD participants had less than perfect Facial Expression Identification scores. At grade 8, 0% of the non ADHD and 22% of the ADHD participants had less than perfect Facial Expression Identification. This categorical variable was significantly related to the ADHD category for both grades ($\phi = .33, .35, p < .05$). ADHD students had significantly fewer perfect scores at both grade levels, though the difference in percentage of perfect scores between groups remained relatively constant (grade 4=26%, grade 8=22%). As predicted, the ADHD grade 4 participants had the lowest proportion of perfect scores (68%), significantly lower than scores for the grade 8 ADHD participants and both the grade 4 and 8 non ADHD participants (z tests for proportions, $z > 7, p < .01$).

Emotion Statement Identification. The means and standard deviations for Emotion Statement Identification are presented in Table 6.

Insert Table 6 Here

Group and grade main effects were significant for the emotion statement identification task. The group by grade interaction was also significant (see Table 7).

Insert Table 7 Here

The grade main effect showed that students from grade 8 had significantly more correct Emotion Statement Identification answers than those participants from grade 4. Non ADHD participants had significantly higher Emotion Statement Identification scores than did ADHD participants. Two t-tests employed to investigate the significant interaction showed that non ADHD participants did not significantly improve from grade 4 (34.53) to grade 8 (34.92) while ADHD participants' scores increased significantly between grade 4 (32.22) and grade 8 (34.02). The difference between the younger ADHD group (32.22) and the younger non ADHD group (34.92) was significant. The difference between ADHD and non ADHD participants in Emotion Statement Identification was not significant at the grade 8 level. All significant differences were again small - or the order of 1-2 statements and effect sizes were moderate (Table 8).

Although this data was not as skewed as the Facial Expression

Identification data, it was decided to confirm the findings with a non-parametric analysis similar to that employed with faces. Because of lesser ceiling effects and somewhat unequal variances, scores for this variable were categorized as either perfect or not perfect. This categorical variable was significantly related to ADHD category for both grades ($\phi = .48, .26, p < .05$). Significantly fewer ADHD participants obtained perfect scores, particularly the younger ADHD participants.

Children's Apperceptive Story Telling Test (CAST). Cell means and standard deviations for Positive Affect, Negative Affect, and Verbosity by group and grade are presented in Tables 8, 10, and 12 respectively.

A significant group main effect for Positive Affect as well as a significant Positive Affect group by grade interaction are reported in Table 9. Group and grade main effects for Negative Affect as well as the interaction for group by grade are reported in Table 11. Main effects for Verbosity for group and grade are reported in Table 13.

Positive Affect. On Positive Affect, the ADHD groups (37.73) fell significantly below the non ADHD groups (51.36). The eta value was .82 indicating a very powerful effect. The t-tests used to tease apart the significant interaction effect indicated no

significant differences between non ADHD participants in grade 4 (51.67) and grade 8 (51.06). However, the scores for ADHD participants rose significantly from 36.67 to 38.76 from grade 4 to 8 respectively. As standardized scores were used, there were no significant differences between grades.

Insert Table 8 Here

Insert Table 9 Here

Negative Affect. There was a significant difference between ADHD and non ADHD participants with respect to Negative Affect. The ADHD groups (40.14) identified significantly less Negative Affect than the non ADHD groups (50.55). As with Positive Affect, the eta value was .74 which indicates a strong effect of Group (ADHD/non ADHD) on Negative Affect. The t-tests used to tease apart the significant interaction showed no significant differences between non ADHD participants in grade 4 (50.59) and Grade 8 (50.51). However, scores for the ADHD groups rose significantly by a little over 4 points from grade 4 (37.98) to grade 8 (42.26). In this case standardized scores indicated a

significant difference between grades 4 (44.29) and 8 (46.43), though this was a weak difference ($\eta = .14$)

Insert Table 10 Here

Insert Table 11 Here

Verbosity. The two main effects associated with Verbosity scores (which were not standardized) show that verbosity increased with grade from 63.53 in grade 4 to 75.04 in grade 8. Moreover, verbosity was greater for non ADHD students (82.93) than it was for ADHD students (55.68).

Insert Table 12 Here

Insert Table 13 Here

Distributions for the three CAST measures were close to normal with few outliers, and, within group variances were similar.

In summary, there were significant differences between ADHD and non ADHD participants in terms of Positive Affect ($\eta^2=.84$), Negative Affect (.75) and Verbosity (.67). In addition there were interaction effects. On all three of the CAST measures, a significant improvement was noted between the grade 4 and grade 8 performances of ADHD students while non ADHD participants differed significantly between grades 4 and 8 on one dimension only, Verbosity.

Additional Analyses

ADHD/ODD Comorbidity. Comorbidity of ODD is estimated to occur in upwards of 65% of ADHD children (Barkley, DuPaul & McMurray, 1990). Social disability is evident in 22% of ADHD children and this number increases with the presence of comorbid behavioural problems. Therefore, individuals with comorbid ODD were thought to be more likely to have greater difficulty with processing of emotional information than are children with ADHD but no comorbid ODD. For this reason, analyses to determine the effects of ODD in the present investigation were undertaken. The SNAP includes all nine of the ODD diagnostic criteria included in DSM-III-R which enabled the identification of ODD in ADHD participants in

the present investigation. DSM-111-R requires 6 out of 9 symptoms to diagnose ODD, and, as with the 14 ADHD items, only items endorsed as 'very much' constituted a positive score. The SNAP items which represent ODD criteria are the following: D7, F1, F2, F3, F4, F5, F6, F7, and F8. The number, means, and standard deviations of ADHD and non ADHD participants in grades 4 and 8 who obtained ODD scores of greater than 6 out of 9 are presented in Table 14. Table 15 presents the means and standard deviations for the entire SNAP score (23 items).

Insert Table 14 Here

Insert Table 15 Here

A strong correlation was found between ADHD and ODD (Pearson $r = .77$, $P = .01$). Both ADHD and ODD were found to be related to all the dependent variables at medium to high strength. Table 16 includes the overall correlation coefficients for ADHD and ODD with the dependent variables.

Insert Table 16 Here

When the ODD score was partialled out of the relationship between ADHD and the dependent variables, the ADHD scores still showed significant correlations for facial identification and emotional statements though the partial correlations were weak. For the CAST variables, the negative correlation remained relatively high. Table 17 includes the partial correlations when ODD is partialled out.

Insert Table 17 Here

The converse is not true. Two relationships between ODD and the dependent variables are no longer significant when ADHD is removed and one is significant but reduced in size (see Table 18 for partial correlations when ADHD is partialled out). This leads to the conclusion that ADHD and ODD alone each contribute to the prediction of the dependent variables and that ADHD alone is the better predictor of CAST performance.

Insert Table 18 Here

Summary of Findings Relevant to Hypotheses

Facial Expression Identification. As predicted, ADHD participants identified significantly fewer facial expressions than non ADHD participants. Group main effects were predicted and found for Facial Expression Identification at both grade levels, though they were rather weak. As predicted, grade 4 ADHD participants had lower accuracy scores than all remaining groups.

Emotion Statement Identification. As predicted, group and grade main effects were found for Emotion Statement Identification. A group by grade interaction was also predicted and found. While non-ADHD participants did not significantly improve from grade 4 to grade 8, the ADHD participants improved by almost two correct statements between grade 4 and grade 8. Overall, the ADHD participants identified significantly fewer emotional statements than non ADHD participants. Significant differences were expected but not found between ADHD and non ADHD participants in terms of identifying simple versus complex emotions, likely because overall identification rates were so high. As predicted, grade 4 ADHD students had lower accuracy scores than all

remaining groups.

Children's Apperceptive Story Telling Test (CAST). Group main effects for Verbosity, Positive Affect, and Negative Affect, were predicted and found. ADHD participants were less verbose, and identified fewer positive and negative emotions than non ADHD participants. A grade main effect was found for Verbosity, the only non-standardized score. Younger ADHD and non ADHD participants were significantly less verbose than their older counterparts.

ADHD participants experienced greater levels of difficulty as the emotional information they were asked to process became increasingly complex.

Discussion

Although there were differences between the ADHD and non ADHD participants on all of the dependent measures, not all differences were of equal strength. Effect size for Facial Expression Identification was represented by a weak phi value (.35). A moderate effect size was produced by Emotion Statement Identification (.32). Eta values for individual emotions on Emotion Statement Identification task ranged from .23 - .32. The strongest effects were produced by the three CAST measures. Eta

values were .84 (Positive Affect), .75 (Negative Affect), and .67 (Verbosity). Differences between ADHD and non ADHD children on the most difficult emotion task, the CAST, were the strongest.

Facial Expression Identification. The results of the present study show differences between ADHD and non ADHD children in Facial Expression Identification. ADHD children are less likely than non ADHD children to perfectly identify facial expressions.

These results are consistent with the findings of Singh et al. (1998) who reported significant differences between ADHD and non ADHD children in terms of identifying facial expression. Singh et al. (1998) read short stories depicting one of the basic emotions (happiness, sadness, anger, fear, surprise and disgust) and asked ADHD children to indicate the corresponding emotion employing Ekman and Friesen's (1978) normed photographs. ADHD children had significant difficulty on all of the basic emotions compared to non ADHD participants.

The results of the present investigation are not entirely consistent with the earlier findings of Shapiro et al. (1993) who, with the exception of modest difficulties reported for the youngest ADHD participants (ages 6-8), reported no significant differences between ADHD and non ADHD children on a facial recognition task. The role of medication was not clarified in

Shapiro's study.

Emotion Statement Identification. Results of the present study show that ADHD children have more difficulty with Emotion Statement Identification than non ADHD children. Moreover, the present findings show that younger (grade 4) ADHD children have significantly more difficulty on this task, relative to controls, than their older (grade 8) counterparts.

Both in the present study and in Shapiro et al's (1993) there was agreement that ADHD children perform significantly worse than non ADHD children on tasks requiring enhanced memory and cognitive skills. More specifically, In Shapiro et al. (1993) participants were asked to match the emotion implied in simple emotion statements to the appropriate facial expressions. In the present investigation, ADHD participants were presented both simple and complex incomplete emotion sentences and asked to complete the sentence with the appropriate emotion. No clear distinction was delineated between the simple versus complex emotions in the present investigation. In other words it was not the inclusion of complex emotions that produced the differences observed between the ADHD and non ADHD participants on the Emotion Statement Identification task in the present investigation. ADHD children in Shapiro et al. (1993) seemed to have difficulty listening to emotion statements and then matching that

information with pictures of emotional expressions (Shapiro et al., 1993). In the present investigation, participants had difficulty listening to incomplete emotion statements and completing each statement with emotion information from their own personal repertoires of emotion knowledge. The present results support the findings of Shapiro et al. (1993) that ADHD children experience significantly greater difficulty on emotion tasks which involve active listening and matching.

Unlike Shapiro et al. (1993) who did not find performance differences between the younger and older ADHD children in terms of prosody/content, the present investigation did reveal a significant grade effect for the ADHD participants on Emotion Statement Identification. One possible explanation for this difference is that the methods employed in the present study, for this particular task, may have been slightly more difficult for the younger ADHD participants, than the methods employed by Shapiro et al. (1993). More specifically, in Shapiro et al. (1993) a computer was used to present the digitally recorded speech samples. The participants were required to select, from four computer presented cartoon faces, which face matched which statement. In the present investigation, participants were read and were shown randomly selected incomplete emotion statements which they were required to complete. Seven emotions, ranging from simple to complex, were presented five times each for a

total of 35 statements. Participants in the present investigation were not provided with faces, as with Shapiro et al. (1993), for matching purposes. Perhaps the matching of emotional valence is a simpler task than listening to neutrally read statements about emotion and completing the statements by providing the correct emotion. In the present investigation, participants had to search their own emotion repertoires to determine what response best suited them. No choices were provided to narrow down the field of response possibilities as in Shapiro et al. (1993), perhaps rendering the present task more difficult than that employed in Shapiro et al. (1993).

Another possible explanation for some of the differences in findings between Shapiro et al. (1993) and the present investigation, at least with respect to differences between ADHD and non ADHD participants, has to do with the use of medication among the ADHD participants. Shapiro et al. (1993) did not monitor ADHD participants to determine how many may have been utilizing medication to control symptoms of the disorder. Therefore, it is reasonable to expect that at least some of the Shapiro et al. participants were using medication during their participation in the investigation. Given the significantly positive impact of medication among individuals with ADHD, across a variety of dimensions (e.g. behaviour, attending, etc.; see Spencer et al., 1996 for a thorough review), it is possible that

some of the medicated ADHD participants in Shapiro et al. (1993) may actually have performed better than the non medicated participants. Developmental differences should not have been impacted by the use of medication, therefore differences between the younger and older ADHD participants would likely have had nothing to do with medication, but more likely related to the methodological differences previously noted. The present investigation attempted to eliminate the confounding effect of medication by ensuring that none of the ADHD participants took medication during their participation. Shapiro et al. (1993) mention that a comparison of children with and without medication would be informative in understanding emotional cue processing in ADHD (pg. 222).

Additional methodological differences between the present study and that of Shapiro et al. (1993) may have contributed to the different findings. For example, Shapiro et al. (1993) employed both males and females in their investigation while males only were included in the present study. ADHD girls have fewer comorbid behaviour and social problems than ADHD boys (deHaas, 1986) and as such are likely to have less difficulty with aspects of social behaviour (e.g. facial recognition, etc..). The male to female ratio among ADHD participants in Shapiro et al. (1993) was reportedly 3:1 and no gender comparison was undertaken. Therefore, it is possible that one third of Shapiro et al.'s ADHD

population might actually have performed better on all of the emotion tasks, than the remaining 2/3, possibly causing a favourable confounding of the findings.

Children's Apperceptive Story Telling Test (CAST). ADHD participants performed at a significantly lower level than non ADHD participants on all three dimensions of the CAST. The effect sizes on all three tasks were larger than those for Facial Expression Identification and Emotion Statement Identification suggesting that this task was more difficult for ADHD participants, regardless of age. ADHD participants identified less Positive Affect, less Negative Affect, and had lower Verbosity scores, than non ADHD participants. These results, in part, support the findings of Constantino et al. (1991) who employed a thematic apperception technique to determine the utility of projective measures in diagnosing ADHD. Their study examined the abilities of seven-to-15-year-old children, some of whom were suspected of having ADHD, to pay attention to, and report verbally on, what they believed was happening on a number of pictorial stimuli depicting characters, events, settings, and covert psychological conflicts. As with the present study, Constantino et al. (1991) found that those children who met the DSM-III-R criteria for having ADHD were significantly more likely than non ADHD children to omit information when reporting on the stimuli.

An additional point of interest with the Constantino et al. (1991) study is that of the five categories measured, which included whether children reported on the main character, secondary character, event, setting, and conflict, the only category that the ADHD and non ADHD groups did not significantly differ upon was the event category. While this was not an area of focus in the present study, an informal examination of the statements made by both groups in the present study revealed that the event taking place in the CAST picture cards was usually the first item mentioned by participants from both groups and at both grade levels. This suggests that male children, ADHD or non ADHD, may be more inclined to talk about general events or happenings than they are to talk about their feelings, unless prompted.

Application. The results of the present study may have useful application in highlighting the need for specific training for ADHD children in the processing of emotional information. As with social skill training programs, which have been developed in the past 20 years in an attempt to improve social behaviour in children who are socially rejected or isolated from their peer groups, programs geared towards teaching ADHD children how to monitor aspects of emotional behaviour (e.g. facial expressions, voice intonation, emotion statement valence, and so forth) may be necessary to ADHD children.

Recently, training programs have targeted specific groups with known social deficits, such as ADHD (e.g. Social Skill Training for Attention Deficit Children; Goldstein & Pollock, 1988). Some of these programs teach social skills by using role play in which small groups of socially disabled children are asked to act out different behaviour scenarios (e.g. Adolescent Curriculum for Communication and Effective Social Skills (ACCESS), Walker, Todis, Holmes, & Horton, 1988; Getting Along With Others, Jackson & Monroe, 1983; Skill Streaming the Adolescent (Goldstein, Sprafkin, Gershaw, & Klein, 1980) and others are taught in the classroom environment using verbally mediated activities (e.g. Think Aloud, Bash & Camp, 1985; A Social Skills Program for Adolescents, Hazel Bragg Shumaker, Sherman, & Sheldon Wildgen, 1981; etc..).

Unfortunately, most of these programs include very little, if any, direct instruction on the recognition of facial expressions, the identification of emotion statements, or the identification of affect in human interaction. It would seem that students requiring social skill training are assumed to already have these skills within their personal repertoires. This may account for at least one of the reasons why so many ADHD children are unsuccessful in terms of generalizing skills learned in social skill training programs. Perhaps basic skills such as the ability to delineate one's emotional state from their facial

expression, or with the valence of their statements, or from how they interact with others, are actually pre-cursors to developing additional social skills. Therefore, either social skill training programs need to include specific instruction on identifying facial expression, identifying emotion statements, and identifying emotion in interactions or new programs need to be developed which focus on teaching these basic skills.

Moreover, given that ADHD participants in the present investigation evidenced significant difficulty on all of these tasks when they were presented in isolation, it is reasonable to expect that ADHD children would likely be significantly impaired in situations where they were required to process one or more of these tasks simultaneously. The degree to which ADHD children can simultaneously monitor various aspects of emotional behaviour is questionable. Needless to say, it would seem that training programs need to be developed which teach ADHD children to monitor all aspects of emotional and social behaviour.

Therefore, training programs probably need to focus on teaching the various aspects of social behaviour (e.g. faces, language, interactions, etc.) in isolation of each other, at least initially. Once these skills are mastered, ADHD children could be provided with a cognitive-behavioural strategy, such as completing a mental checklist, to ensure that all aspects of social-emotional behaviour are being considered prior to gauging

the behaviour or actions of others.

Another application of the present investigation relates to the question of who should receive training in emotion processing. It is not uncommon to find that the students referred to current training programs (e.g. social skill training) usually have the most severe behaviour. In the present investigation, when ODD was partialled out, ADHD participants still had significantly greater difficulty than non ADHD participants on all three tasks. Because of this, it would make sense that all ADHD children receive training in emotion processing.

Limitations of The Present Study

The present results included only male participants, therefore the findings cannot be generalized to all ADHD children.

Findings of the present investigation are limited to ADHD and non ADHD males.

A post hoc investigation was undertaken, utilizing the DSM-III-R (APA, 1987) ODD items from the SNAP (Swanson et al., 1988), to determine the confounding effect of ODD in the present investigation. However, one cannot assume, based upon the ODD items on the SNAP (Swanson et al., 1988) alone, that all of the children thought to have ODD in the post hoc investigation were

indeed ODD. A diagnosis of ODD should be based on the completion of a variety of checklists, which examine disturbances in behaviour over an extended period of time (at least six months). Therefore, an additional limitation of this study is that the ODD results may not be specific to ODD.

ADHD is no longer viewed as a unidimensional construct. DSM-IV (APA, 1994) includes diagnostic criteria for ADHD and ADD-H. The present investigation relied on the ADHD diagnostic criteria from DSM-III-R (APA, 1987) primarily because a normed checklist, based on DSM-IV, which included both ADHD and ADD diagnostic criteria, was unavailable. Therefore, the results of this investigation are limited to ADHD children only and cannot be concluded for ADD-H children.

The Emotion Statement Identification task utilized statements produced by Nicholson (1996) which were used in a investigation by Bartolotti, Delia, & Whissel (1993). While Bartolotti, Delia & Whissel reported an overall mean recognition level of .49, which was significantly higher than chance (.14), the lack of additional validity and reliability data impacts the ability to make inferences regarding the data obtained on this measure.

The findings of the present investigation are also limited in that a contrast group, consisting of children with problems but

not ADHD problems was not included in the present investigation. Had such a group been employed, it might have been possible to determine whether the differences observed were specific only to ADHD children or true of children with various problems.

The issue of task difficulty in the demonstration of deficits, particularly among the ADHD participants in the present investigation, requires further investigation. Miller, Chapman, Chapman & Collins (1995) reported examples of investigations in which increasingly difficult tasks were employed to compare the performance of normal and schizophrenic individuals. They found that both normal and schizophrenic individuals became less accurate as tasks became more difficult, but schizophrenic performance differed from normal performance more on the harder tasks than on the easier ones. Miller et al. (1995) refer to a greater schizophrenic-normal difference on one task than on another as a differential performance deficit. Furthermore, they suggest that investigators who find such differential performance deficits, may inaccurately interpret the findings as supporting the hypothesis of a differential deficit of ability specific to a particular population (e.g. schizophrenics). The problem with this interpretation is that the tasks, which are manipulated to differ in levels of difficulty, may themselves artifactually produce differential deficits by their characteristics (e.g. difficulty level; Miller, Chapman, Chapman & Collins, 1995, pg.

251). In other words, the validity of inferences drawn from differences between groups (e.g. ADHD and normal) may indeed have more to do with the difficulty level of the tasks than with a genuine difference in ability between groups.

Miller et al. (1995) are primarily concerned with the interpretation of differences between the difficulty level of tasks. While Miller et al. (1995) raise a very important psychometric issue, this research was specifically designed to study the relationship of complexity to group differences. To that end, three tasks which were known to vary in terms of complexity (e.g., increasing cognitive demands) were selected for use. The degree to which the three tasks satisfied that end is best addressed by summarizing the differences observed between groups (ADHD and non ADHD), and grades (4 and 8), and groups and grades combined. A difference is a difference, regardless of whether the tasks employed were actually an equal distance from each other in terms of difficulty level as suggested by Miller et al (1995).

Future Directions

One interesting area, worthy of future consideration, has to do with the influence of medication on the ability to identify emotional information. Previous studies (i.e. Shapiro et al.,

1993 & Constantino et al., 1991) did not indicate whether medication was withheld during the administration of the emotion tasks. It stands to reason, given the many reported improvements in ADHD children who take medication to control the symptoms of this disorder, that differences between medicated ADHD and non-medicated ADHD participants and also between ADHD and non ADHD participants might be realized. Future investigations might include a comparison of ADHD participants who take medication treatment and those who do not, to determine what influence, if any, the ability to process emotional information is compromised.

An additional area of interest for future study is the comparison of gender differences in processing emotional information. The present results cannot be concluded for female participants. ADHD females present with fewer comorbid behaviour problems than boys (Brown et al., 1989). Twenty two percent of ADHD children are socially disabled and this number increases with comorbid behaviour problems (Greene et al., 1996). If females have fewer comorbid behaviour problems it is reasonable to expect that they may also have better developed social skills. As such, they may have less difficulty identifying facial expressions, emotion statements, and interpreting thematic measures.

A number of differences between ADHD and ADD children have been concluded. More specifically, behavioural comparisons have shown

that children with ADHD exhibit more conduct disorder problems than ADD children (Barkley et al., 1990; Cantwell & Baker, 1992), are more impulsive (Cantwell & Baker, 1992), are less anxious (Lahey et al., 1987), receive higher Child Behaviour Checklist (CBCL) (Achenbach & Edelbrock, 1983) externalizing scores, and generally demonstrate poorer long-term prognosis (Hechtman, Weiss, Perlman, & Amsel, 1984). In terms of social differences, ADHD children are more unpopular with their peers (Edelbrock et al., 1984) and are less socially competent (Cantwell & Baker, 1992). Given these differences it is reasonable to expect that ADD children might actually have had less difficulty than ADHD children on the emotion tasks assigned in the present investigation. Future investigations involving the processing of emotion should examine this ability among both ADHD and ADD children.

Summary of Conclusions

The ability of ADHD boys to process emotional information of varying complexity is significantly poorer than it is for non ADHD boys. Unmedicated ADHD boys in grades 4 and 8 are significantly less accurate than non ADHD boys in grades 4 and 8 on Facial Expression Identification, Emotion Statement Identification, and identifying Positive and Negative Affect. Moreover, unmedicated ADHD boys in grades 4 and 8 are also

significantly less verbose than non ADHD boys in grades 4 and 8 in terms of developing story narratives for emotionally laden picture cards depicting human interactions.

The present results also suggest that younger ADHD boys have significantly greater difficulty, than same age non ADHD boys and older ADHD and non ADHD boys, in terms of processing emotional information of varying complexity. Unmedicated grade 4 ADHD boys experience significantly more difficulty than grade 4 and 8 non ADHD boys and grade 8 unmedicated ADHD boys in terms of Facial Expression Identification, Emotion Statement Identification, and identifying Positive and Negative Affect. Moreover, unmedicated ADHD boys in grade 4 are also significantly less verbose than non ADHD children in grades 4 and 8 and grade 8 unmedicated boys in terms of developing story narratives for emotionally laden picture cards depicting human interactions.

REFERENCES

Achenbach, T. M. & Edelbrock, C. (1983). *Manual for the child behavior checklist and revised behavior profile*. Burlington: University of Vermont, Department of Psychiatry.

American Psychiatric Association (1994). *Diagnostic and statistical manual of mental disorders* (3rd ed. rev.). Washington, DC: American Psychiatric Association.

American Psychiatric Association (1987). *Diagnostic and statistical manual of mental disorders* (3rd ed. rev.). Washington, DC: American Psychiatric Association.

American Psychiatric Association (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington, DC: American Psychiatric Association.

Arnold, L.E., & Jensen, P.S. (1995). Attention deficit disorders. In *Comprehensive Textbook of Psychiatry*, 6th ed., Kaplan, H. & Sadock, B., eds. Baltimore: Williams and Wilkins, pp. 2295 - 2310.

Barkley, R. A. (1997). Behavioral Inhibition, sustained attention, and executive functions: Constructing a unifying theory of ADHD. *Psychological Bulletin*, 121, 65-94.

Barkley, R.A. (1995). *Taking Charge of ADHD: The complete authoritative guide for parents*. New York: Guilford.

Barkley, R. A. (1985). The social interactions of hyperactive children: Developmental changes, drug effects, and situational variables. In R. McMahon & R. Peters (Eds.), *Childhood Disorders: Behavioural Developmental approaches*. New York: Brunner/Mazel (pp. 218-243).

Barkley, R.A., DuPaul, G.J., & McMurray, M.B. (1990). A comprehensive evaluation of attention deficit disorder with and without hyperactivity as defined by research criteria. *Journal of Consulting and Clinical Psychology*, 58, 775-789.

Barkley, R.A., Fischer, M., Edelbrock, C.S., & Smallish, L (1990). The adolescent outcome of hyperactive children diagnosed by research criteria: An 8-year follow-up study. *Journal of American Academy of Child and Adolescent Psychiatry*, 29, 546-557.

Barkley, R.A., Grodzinsky, G., & DuPaul, G. (1992). Frontal lobe functions in attention deficit disorder with and without hyperactivity: A review and research report. *Journal of Abnormal Child Psychology*, 20, 163-188.

Bartolotti, S., Delia, P., & Whissell, C. (1993). When children talk about the causes of their emotions, how well do adults and other children understand which emotion they are talking about? *Perceptual and Motor Skills*, 77, 67-78.

Bash, M.S., & Camp, B. (1985). *Think aloud: Increasing social and cognitive skills - A problem solving program for children*. Champaign, Ill.: Research Press.

Baumgaertel, A., Wolraich, M.L., Dietrich, M. (1995). Comparison of diagnostic criteria for attention deficit disorders in a German elementary school sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 34, 629-638.

Becker, D.F., Doane, J.A., & Wexler, B.E. (1993). Effects of emotion on perceptual asymmetry in adolescent inpatients with attention-deficit hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 32, 318-323.

Biederman, J., Faraone, S.V., Keenan, K., Knee, D., & Tsuang, M.T. (1990). Family-genetic and psychosocial risk factors in DSM-III attention deficit disorder. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 526-533.

Boucher, J.D., & Carlson, G.E. (1980). Recognition of facial expression in three cultures. *Journal of Cross-Cultural Psychology, 11*, 263-280.

Breen, M.J. & Barkley, R.A. (1984). Psychological adjustment in learning disabled children as measured by the Personality Inventory for Children. *Journal of Clinical Child Psychology, 13*, 232-236.

Bronowski, J. (1977). Human and animal languages. In J. Bronowski (Ed.), *A sense of the future* (pp131). Cambridge, MA: MIT Press.

Brown, R.T., & Sexson, S.B. (1989). Effects of methylphenidate on cardiovascular responses in attention deficit hyperactivity disordered adolescents. *Journal of Adolescent Health Care, 10*, 179-183.

Cantwell, D.P. (1996). Attention deficit disorder: A review of the past 10 years. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 978-987.

Cantwell, D.P. & Baker, L. (1992). Attention deficit disorder with and without hyperactivity: A review and comparison of matched groups. *Journal of the American Academy of Child and Adolescent Psychiatry*, 31, 432-438.

Cassidy, J., Parke, R.D., Butkovsky, L., & Braungart, J.M. (1992). Family-peer connections: The roles of emotional expressiveness within the family and children's understanding of emotions. *Child Development*, 63, 603-618.

Cohen, J. (1988). *Statistical power analysis for the behavioural sciences* (2nd ed,). Hillsdale, NJ: Lawrence Erlbaum.

Conners, C.K., & Wells, K.C. (1986). *Hyperkinetic children: A neuropsychological approach*. Beverly Hills, CA: Sage.

Constantino, G., Colon-Malgady, G., Malgady, R.G., & Perez, A. (1991). Assessment of attention deficit disorder using a thematic apperception technique. *Journal of Personality*.

Assessment, 57(1), 87-95.

Constantino, G., Malgady, R., & Rogler, L.H. (1988). *Tell-Me-A-Story TEMAS Manual*. Los Angeles: Western Psychological Services.

Cunningham, C.E., Siegel, L.S., & Offord, D.R. (1991). A dose-response analysis of the effects of methylphenidate on the peer interactions and simulated classroom performance of ADD children with and without conduct problems. *Journal of Child Psychology and Psychiatry*, 32, 439-452.

Cunningham, C.E. & Siegel, L.S. (1987). Peer interactions of normal and attention deficit disordered boys during free-play, cooperative tasks, and simulated classroom situations. *Journal of Abnormal Child Psychology*, 15, 247-258.

DeHaas, P.A. (1986). Attention styles and peer relationships of hyperactive and normal boys and girls. *Journal of Abnormal Child Psychology*, 14, 457-467.

Denzin, N.K. (1984). *On understanding emotion*. San Francisco: Jossey-Bass Inc.

Donaldson, S.K. & Westerman, M.A. (1986). Development of children's understanding of ambivalence and causal theories of emotion. *Developmental Psychology*, 23, 114-123.

Douglas, V.I., & Benezra, E. (1990). Supraspan verbal memory in attention deficit hyperactivity disorder with hyperactivity normal and reading disabled boys. *Journal of Abnormal Child Psychology*, 18, 617-638.

Ducci, L., Arcuri, L., Georgis, T.W., & Sineshaw, T. (1982). Emotion recognition in Ethiopia: The effects of familiarity with Western culture on accuracy of recognition. *Journal of Cross-Cultural Psychology*, 13, 340-351.

Dunn, L.M. & Dunn, L.M. (1981). *The Peabody Picture Vocabulary Test - Revised*. Circle Pines, MN: American Guidance Service.

DuPaul, G.J. (1991). Parent and teacher ratings of ADHD symptoms: Psychometric properties in a community-based sample. *Journal of Clinical Child Psychology*, 20, 245-253.

Edelbrock, C. S., Costello, A., & Kessler, M.D. (1984).

Empirical corroboration of attention deficit disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 23, 285-290.

Ekman, P. (1994). Strong evidence for universals in facial expressions: A reply to Russell's mistaken critique. *Psychological Bulletin*, 115, 268-287.

Ekman, P. & Friesen, W.V. (1978). *Facial action coding system*. Palo Alto, CA: Consulting Psychologists Press.

Ekman, P., Friesen, W.V., & Ellsworth, P. (1972). *Emotion in the human face: Guidelines for research and an integration of findings*. New York: Pergamon.

Firestone, P., Musten, L.M., Pisterman, S., Mercer, J, & Bennet, S. (1998). Short-term side effects of stimulant medication are increased in preschool children with attention-deficit/hyperactivity disorder: A double-blind placebo-controlled study. *Journal of Child and Adolescent Psychopharmacology*, 8, 13-25.

Fischer, M., Barkley, R.A., Edelbrock, C.S. & Smallish, L.

(1990). The adolescent outcome of hyperactive children diagnosed by research criteria. Academic, attentional, and neuropsychological status. *Journal of Consulting and Clinical Psychology, 58*, 580-588.

Flavell, J. (1971). First discussant's comments: What is memory development the development of? *Human Development, 14*, 272-278.

Fuster, J.M. (1989). *The prefrontal cortex*. New York: Raven Press.

Gadow, K.D., Nolan, E.E., Sverd, J., Sprafkin, J., & Paolicelli, L. (1990). Methylphenidate in aggressive-hyperactive boys: effects on peer aggression in public school settings. *Journal of the American Academy of Child and Adolescent Psychiatry, 29*, 710-718.

Gillis, J.J., Gilger, J.W., Pennington, B.F. & Defries, J.C. (1992). Attention deficit disorder in reading disabled twins. Evidence for a genetic etiology. *Journal of Abnormal Child Psychology, 20*, 303-315.

Gittelman, R., Mannuza, S., Shenker, R., & Bonagura, N. (1985). Hyperactive boys almost grown up. *Archives of General Psychiatry*, 42, 937-947.

Gjone, H., Stevenson, J., & Sundet, J.M. (1996). Genetic influence on parent-reported attention-related problems in a Norwegian general population twin sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 588-598.

Gnepp, J. & Hess, D.L. (1986). Children's understanding of verbal and facial display rules, *Developmental Psychology*, 22, 103-108.

Goldstein, A.P., Sprafkin, R.P., Gershaw, N.J., & Klein, P. (1980). *Skill streaming the adolescent: A structured learning approach to teaching social skills*. Champaign, Ill: Research Press.

Goldstein, S., & Pollock, E. (1988). *Social skills training for attention deficit children*. Salt Lake City, UT: Neurology, Learning and Behavior Center.

Greene, R.W., Biederman, J., Faraone, S.V., Ouellette, C.A.,

Penn, C., Griffin, S.M. (1996). Toward a psychometric definition of social disability in children with attention deficit hyperactivity disorder. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 571-578.

Grenell, M.M., Glass, C.R. & Katz, K.S. (1987). Hyperactive children and peer interaction: Knowledge and performance of social skills. *Journal of Abnormal Child Psychology*, 15, 1-13.

Harris, P.L. (1983). Children's understanding of the link between situation and emotion. *Journal of Experimental Child Psychology*, 36, 490-509.

Harris, P.L. & Saarni, C. (1989). Children's understanding of emotion: an introduction. In P.L. Harris and C. Saarni (Eds.), *Children's understanding of emotion*, pp. 3-24, New York: Cambridge University Press.

Harris, P.L., Olthof, T., Meerum, Terwogt, M., & Hardman, C.E. (1987). Children's knowledge of the situations that provoke emotion. *International Journal of Behavioural Development*, 10, 319-344.

Hazel, J.S., Bragg Shumaker, J., Sherman, J.A., & Sheldon-Wildgen, J. (1981). *Asset: A social skill training program for adolescents*. Champaign, Ill.: Research Press.

Hechtman, L., Weiss, G., Perlman, R. & Amsel, R (1984). Hyperactives as young adults: initial predictors of adult outcome. *Journal of the American Academy of Child Psychiatry*, 23, 250-260.

Hinshaw, S.P. (1992). Academic underachievement, attention deficits, and aggression: Comorbidity and implications for intervention. *Journal of Consulting and Clinical Psychology*, 60, 893-903.

Huberty, C. J. & Morris, J.D. (1989). Multivariate analysis versus multiple univariate analyses. *Psychological Bulletin*, 105, 302 -308.

Izard, C.E. (1971). *The face of emotion*. New York: Appleton-Century-Crofts.

Jackson, D.A., & Monroe, C. (1983). *Getting along with others: Teaching social effectiveness to children*. Champaign,

Ill: Research Press.

Johnson, C., Pelham, W.E. & Murphy, H. (1985). Peer relationships in ADDH and normal children: a developmental analysis of peer and teacher ratings. *Journal of Abnormal Child Psychology*, 13, 89-100.

Lahey, B.B., Schaughency, E., Hynd, G., Carlson, C. & Nieves, N. (1987). Attention deficit disorder with and without hyperactivity: comparison of behavioural characteristics of clinic-referred children. *Journal of the American Academy of Child Psychiatry*, 26, 718-723.

Levin, H.S., Culhane, K.A., Hartmann, J., Evankovich, K., Mattson, A.J., Harward, H., Ringholz, G., Ewing-Cobbs, L., & Fletcher, J.M. (1991). Developmental changes in performance on tests of purported frontal lobe functions. *Developmental Neuropsychology*, 7, 377-396.

Lewis, M. (1990). Thinking and feeling - the elephant's tail. In M. Schwebel, A. Maher & W.S. Fagley (Eds.) *Promoting cognitive growth over the lifespan*, 89-110. New Jersey: Lawrence Erlbaum Associates Inc.

Lewis, M. & Rosenblum, C. (1978). Introduction: Issues in affect development. In M. Lewis & L.A. Rosenblum (Eds.), *The development of affect*, pp. 1-10, New York: Plenum Press.

Lewis, M. & Saarni, C. (1985). Culture and emotions. In M. Lewis and C. Saarni (Eds.), *The socialization of emotions*, pp. 1-17. New York: Plenum Press.

Lipsey, M. W. (1990). *Design sensitivity*. Sage Publications, Newbury Park: California.

Loney, J., Kramer, J., & Milich, R.S. (1981). The hyperkinetic child grows up: Predictors of symptoms, delinquency and achievement at follow-up. In K.D. Gadow & J. Loney (Eds.), *Psychosocial aspects of drug treatment for hyperactivity*. Boulder, CO: Western Press.

Loney, J., & Milich, R.S. (1982). Hyperactivity, inattention, and aggression in clinical practice. In M. Wolraich & D.K. Routh (Eds.), *Advances in behavioural pediatrics (Vol. 2)*. Greenwich, CT: JAI Press.

Matson, D.E., & Fischer, M. (1991). A comparison of

internalizing, externalizing, and normal children using the WISC-R and Wisconsin Card Sort Test. *Journal of Psychoeducational Assessment*, 101, 78-87.

McAlpine, C., Kendall, K.A., & Singh, N.N. (1992). Recognition of facial expression by persons with mental retardation. *American Journal of Mental Retardation*, 96, 29-36.

McArthur, D.S. & Roberts, G.E. (1982). *Roberts Apperception Test for Children*. Los Angeles: Western Psychological Services.

Miller, M.B., Chapman, J.P., Chapman, L.J. & Collins, J. (1995). Task difficulty and cognitive deficits in schizophrenia. *Journal of Abnormal Psychology*, 104, 251-258.

Miller, P.J. & Sperry, L.L. (1988). The socialization and acquisition of emotional meanings, with special reference to language: a reply to Saarni. *Merrill-Palmer Quarterly*, 14, 217-222.

Morrison, J.R. (1980). Childhood hyperactivity in an adult psychiatric population: Social factors. *Journal of Clinical*

Psychiatry, 41, 40-43.

Murphy, L. B. (1937). *Social behavior and child personality*. New York: Columbia University Press.

Nannis, E.D. and Cowan, P.A. (1987). Emotional understanding: a matter of age, dimension, and point of view. *Journal of Applied Developmental Psychology*, 8, 289-304.

Nicholson, S. H. (1996). Concepts for emotional language. Unpublished Master of Arts Thesis. Laurentian University: Sudbury, Ontario.

Nigg, J.T., Carte, E.T., Hinshaw, S.P., & Treuting, J.J. (1998). Neuropsychological correlates of childhood attention-deficit/hyperactivity disorder: Explainable by comorbid disruptive behaviour or reading problems? *Journal of Abnormal Psychology*, 107, 468-480.

Orvaschel, H. & Puig-Antich, J. (1987). *Schedule for Affective Disorders and Schizophrenia for School Aged Children - Epidemiologic 4th Version*. Ft. Lauderdale, FL: Nova University, Centre for Psychological Study.

Paternite, C.E., Loney, J., & Roberts, M.A. (1995). External validation of oppositional disorder and attention deficit disorder with hyperactivity. *Journal of Abnormal Child Psychology*, 23, 453-471.

Pelham, W.E. & Bender, M.E. (1982). Peer relationships in hyperactive children: Description and treatment. In K.D. Gadow & I. Bailer (Eds.), *Advances in learning and behavioural difficulties*. Greenwich, CT: JAI press.

Pelham, W.E., Evans, S.W., Gnagy, E.M., & Greenslade, K.E. (1992). Teacher ratings of DSM-III-R symptoms for the disruptive behaviour disorders: Prevalence, factor analyses, and conditional probabilities in a special education sample. *School Psychology Review*, 21, 285-298.

Russell, J.A. & Ridgeway, D. (1982). Dimensions underlying children's emotion concepts. *Developmental Psychology*, 19, 795-804.

Saarni, C. (1987). Cultural rules of emotional experience: A commentary on Miller and Sperry's study. *Merrill-Palmer Quarterly*, 33, 535-540.

Schneider, M.F. (1989). *Children's Apperceptive Story Telling Test*. Austin Texas: Pro-Ed.

Semrud-Clikeman, M., Biederman, J., Sprich-Buckminster, S., Lehman, B., Faraone, S., & Norman, D. (1992). Comorbidity between ADHD and learning disability: A review and report in a clinically referred sample. *Journal of the American Academy of Child and Adolescent Psychiatry, 31*, 439-448.

Shapiro, E.G., Hughes, S.J., August, G.J. & Bloomquist, M.L. (1993). Processing of emotional information in children with attention deficit hyperactivity disorder. *Developmental Neuropsychology, 9*, 207-224.

Singh, S.D., Ellis, C. R., Winton, A.S., Singh, N.N., Leung, J.P., & Oswald, D.P. (1998). Recognition of facial expressions of emotion by children with attention-deficit hyperactivity disorder. *Behavior Modification, 22*, 128-142.

Smiley, P. & Huttenlocher (1989). Young children's acquisition of emotion concepts. In C. Saarni and P. Harris (Eds.), *Children's understanding of emotion*, pp. 27 - 49, New York: Cambridge University Press.

Smith, E.E. & Medin, D.L. (1981). *Categories and Concepts*. Cambridge, MA: Harvard University Press.

Spencer, T., Biederman, J., Wilens, T., Harding, M., O'Donnell, D., & Griffin, S. (1996). Pharmacotherapy of attention deficit hyperactivity disorder across the life cycle. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 409-432.

SPSSX (1988). *SPSSX Users Guide 3rd Edition*. Chicago, Illinois: SPSS Inc.

Stein, N.L. & Trabasso, T. (1985). The search after meaning: Comprehension and comprehension monitoring. In F.J. Morrison, C. Lord, & D. Keating (Eds.), *Applied development psychology*, Vol. 2. New York: Academic Press.

Strayer, J. (1986). Children's attributions regarding the situational determinants of emotion in self and others. *Developmental Psychology*, 22, 649-654.

Swanson, J., Nolan, R., & Pelham, W. (1988). *Swanson, Nolan & Pelham Rating Scale (SNAP)*. Pittsburg, PA: Western

Psychiatric Institute.

Szatmari, P., Offord, D.R., & Boyle M. H. (1989).
Ontario child health study: prevalence of attention deficit
disorder with hyperactivity. *Journal of Child Psychology &
Psychiatry*, 30, 219-230.

Tabachnick, B.G. & Fidell, L.S. (1989). *Using multivariate
statistics-second edition*. New York, N.Y.: Harper Collins
Publishers.

Terman, L.M., & Merrill, M.A. (1960). *Stanford-Binet
Intelligence Scale: Form L=M* (3rd ed.). Boston: Houghton
Mifflin.

Thompson, R.A. (1987). Development of children's
inferences of the emotions of others. *Developmental
Psychology*, 23, 124-131.

Underwood, M.K., Coie, J.D. & Herbsman, C.R. (1992).
Display rules for anger and aggression in school-age children.
Child Development, 63, 366-380.

Vitelli, R. (1996). Prevalence of childhood conduct and attention deficit hyperactivity disorders in adult maximum-security inmates. *International Journal of Offender Therapy and Comparative Criminology*, 40, 263-271.

Voeller, K.K.S. (1986). Right hemisphere deficit syndrome in children. *American Journal of Psychiatry*, 143, 1004-1009.

Walker, H.M., Todis, B., Holmes, D., & Horton, G. (1988). *The Walker social skills curriculum: The Access program*. Austin, Texas: Pro-Ed.

Walker, D.W. & Leister, C. (1994). Recognition of facial affect cues by adolescents with emotional and behavioural disorders. *Behavior Disorders*, 19, 269-276.

Wechsler, D. *Wechsler Intelligence Scale for Children-Revised*. New York: The Psychological Corporation.

Weiss, G. (1991). Attention Deficit Hyperactivity Disorder. In M. Lewis (Ed.), *Child and adolescent psychiatry: A comprehensive textbook*. Baltimore, MD: Williams & Wilkins.

Welsh, M.C., Pennington, B.F., & Grossier, D.B. (1991). A normative-developmental study of executive function: A window on prefrontal functions in children. *Developmental Neuropsychology*, 7, 131-149.

Wender, P.H. (1995). *Attention Deficit Hyperactivity Disorder in Adults*. New York: Oxford.

Wolraich, M.L., Hannah, J.N., Pinnock, T.Y., Baumgaertel, A. & Brown, J. (1996). Comparison of diagnostic criteria for attention deficit hyperactivity disorder in a country-wide sample. *Journal of the American Academy of Child and Adolescent Psychiatry*, 35, 319-324.

Zametkin, A.J. (1993). Brain metabolism in teenagers with attention deficit hyperactivity disorder. *Archives of General Psychiatry*, 50, 333-340.

Table 1

Screening Phase Inclusion Criteria Means and Standard Deviations for Grade 4 and 8 ADHD and non-ADHD Participants

Inclusion Criteria	ADHD		Non-ADHD	
	Grade 4 n=68	Grade 8 n=61	Grade 4 n=60	Grade 8 n=53
PPVT-R Standard Score				
<u>M</u>	88.2	91.9	91.8	91.5
<u>SD</u>	6.4	5.3	5.5	6.1
SNAP Score out of 14				
<u>M</u>	10.3	9.7	2.8	3.0
<u>SD</u>	2.2	1.6	1.9	1.4
Participant Age				
<u>M</u>	9.4	13.8	9.3	13.5
<u>SD</u>	.3	.4	.4	.3

Table 2

Interview Phase Inclusion Criteria Means and Standard Deviations for Grade 4 and 8 ADHD and Non ADHD Participants

Inclusion Criteria	ADHD		Non-ADHD	
	Grade 4 n=50	Grade 8 n=50	Grade 4 n=50	Grade 8 n=50
PPVT-R Standard Score				
<u>M</u>	90.6	93.0	93.1	92.3
<u>SD</u>	5.7	5.4	4.6	5.6
SNAP Score out of 14				
<u>M</u>	11.4	10.5	2.6	2.8
<u>SD</u>	1.4	.7	.8	1.2

Table 3

Correlation Coefficients for Interview Phase (Emotion Statement Identification (ESI), Facial Expression Identification (FEI), and the CAST Positive Affect (PosA), Negative Affect (NegA) and Verbosity (Verb).

Interview Phase	Interview Phase				
	ESI	FEI	PosA	NegA	Verb
ESI	1.00	.82**	.44**	.40**	.52**
FEI		1.00	.37**	.31**	.39**
PosA			1.00	.79**	.78**
NegA				1.00	.74**
Verb					1.00
<u>M</u>	33.94	35.57	44.61	45.41	69.28
<u>SD</u>	2.52	1.31	8.15	7.00	20.28

**p<.01 (2-tailed)

Table 4

Means and Standard Deviations for Facial
Expression Identification by Group and Grade

<u>Group</u>	<u>Grade</u>		<u>Total Population</u>
	4	8	
Non-ADHD			
<u>M</u>	35.84	36.00	35.95
<u>SD</u>	.68	.0	
ADHD			
<u>M</u>	34.88	35.56	35.22
<u>SD</u>	2.17	1.01	
Total Population			
<u>M</u>	35.36	35.78	

Table 5

Percentage of ADHD and Non ADHD Participants Who Obtained Perfect and Non-Perfect Facial Expression Identification Scores For Grades 4 and 8.

Grade 4

	Non ADHD	ADHD
Non-Perfect	6%	32%
Perfect	94%	68%
	100%	100%

Chi squared = 10.98, $df = 1$, $p < .0001$

Grade 8

	Non ADHD	ADHD
Non-Perfect	0%	22%
Perfect	100%	78%
	100%	100%

Chi squared = 12.35, $df = 1$, $p = .001$

Table 6

Means and Standard Deviations for Emotion Statement
Identification by Group and Grade

	<u>Grade</u>		<u>Total Population</u>
	4	8	
<u>Group</u>			
Non-ADHD			
<u>M</u>	34.53	34.92	34.73
<u>SD</u>	1.43	.27	
ADHD			
<u>M</u>	32.22	34.02	33.13
<u>SD</u>	3.96	1.95	
Total Population			
<u>M</u>	33.38	34.48	

Table 7

Main Effects and 2-Way Interactions for Emotion Statement
Identification by Group and Grade

Source of Variation	SS	DF	MS	F	Sig.Of F	ETA
Main Effects						
Group	126.288	1	126.288	23.378	.000	.32
Grade	59.072	1	59.072	10.935	.001	.22
2-Way Interactions						
Group	24.530	1	24.530	4.541	.034	.15
Error	1053.401	195	5.042			

Table 8
Means and Standard Deviations for CAST
Positive Affect by Group and Grade

	<u>Grade</u>		<u>Total Population</u>
	4	8	
<hr/>			
Group	<hr/>		
Non-ADHD			
<u>M</u>	51.67	51.06	51.36
<u>SD</u>	6.68	3.97	
ADHD			
<u>M</u>	36.67	38.76	37.73
<u>SD</u>	3.81	3.17	
Total Population			
<u>M</u>	44.17	44.97	

Table 9

Main Effects and 2-Way Interactions for CAST
Positive Affect by Group and Grade

Source of Variation	SS	DF	MS	F	Sig. Of F	ETA
Main Effects						
Group	9240.744	1	9240.744	236.199	.000	.82
Grade	26.458	1	26.458	1.348	.247	.05
2-Way Interactions						
Group Grade	90.723	1	90.723	4.622	.033	.13
Error	3827.5	195	19.63			

Table 10

Means and Standard Deviations for CAST
Negative Affect by Grade and Group

Group	<u>Grade</u>		<u>Total Population</u>
	4	8	
Non-ADHD			
<u>M</u>	50.59	50.51	50.55
<u>SD</u>	5.93	3.75	
ADHD			
<u>M</u>	37.98	42.26	40.14
<u>SD</u>	4.15	4.11	
Total Population			
<u>M</u>	44.29	46.43	

Table 11

Main Effects and 2-Way Interactions for CAST
Negative Affect by Group and Grade

Source of Variation	SS	DF	MS	F	Sig. Of F	ETA
Main Effects						
Group	5378.880	1	5378.880	271.507	.000	.74
Grade	216.957	1	216.957	10.951	.001	.14
2-Way Interactions						
Group Grade	236.631	1	236.631	11.944	.001	.22
Error	3863.18	195	19.81			

Table 12

Means and Standard Deviations for CAST
Verbosity by Group and Grade

Group	<u>Grade</u>		<u>Total Population</u>
	4	8	
Non-ADHD			
<u>M</u>	76.31	89.29	82.93
<u>SD</u>	18.25	12.05	
ADHD			
<u>M</u>	50.76	60.50	55.68
<u>SD</u>	10.42	14.46	
Total Population			
<u>M</u>	65.53	75.04	

Table 13

Main Effects and Interactions for CAST
Verbosity by Group and Grade

Source of Variation	SS	DF	MS	F	Sig. Of F	ETA
Main Effects						
Group	36796.915	1	36796.915	185.590	.000	.67
Grade	6434.831	1	6434.831	32.455	.000	.28
2-Way Interactions						
Group Grade	130.778	1	130.778	.660	.418	.07
Error	38662.56	195	198.27			

Table 14

Numbers, Means and Standard Deviations of
Comorbid ODD (Scores of 6 or greater out of 9)
by Group and Grade

Comorbid ODD	ADHD		Non ADHD	
	Grade 4	Grade 8	Grade 4	Grade 8
	N=50	N=50	N=50	N=50
<u>n</u>	19	25	1	3
<u>M</u>	6.60	6.72	6	6
<u>SD</u>	.73	.79	0	0

Table 15

Numbers, Means and Standard Deviations
for the Total SNAP Score (out of 23)

	ADHD		Non-ADHD	
SNAP	Grade 4	Grade 8	Grade 4	Grade 8
	N=50	N=50	N=50	N=50
<u>M</u>	15.7	15.0	3.4	4.4
<u>SD</u>	3.2	3.2	1.7	2.6

Table 16

Correlation Coefficients of SNAP ODD and ADHD Symptoms
for Interview Phase tasks (Emotion Statement Identification
(ESI), Facial Expression Identification (FEI), and the CAST
Positive Affect (PosA), Negative Affect (NegA), and
Verbosity (Verb) (N=200)

	Interview Phase Tasks				
SNAP Symptoms	<hr/>				
	ESI	FEI	PosA	NegA	Verb
ODD	-.50**	-.49**	-.61**	-.53**	-.45**
ADHD	-.47**	-.44**	-.82**	-.73**	-.70**

**p<.01 (2 tailed)

Table 17

Partial Correlations Controlling for SNAP ODD Symptoms in Interview Phase tasks (Emotion Statement Identification (ESI), Facial Expression Identification (FEI), and the CAST Positive Affect (PosA), Negative Affect (NegA), and Verbosity (Verb)).

	Interview Phase Tasks				
	ESI	FEI	PosA	NegA	Verb
SNAP ADHD Controlling for ODD	-.1496	-.1196	-.6881	-.6078	-.6115
<u>P</u>	.046	.017	.000	.000	.000

Table 18

Partial Correlations Controlling for SNAP ADHD Symptoms in Interview Phase Tasks (Emotion Statement Identification (ESI), Facial Expression Identification (FEI) and the CAST Positive Affect (PosA), Negative Affect (NegA), and Verbosity (Verb)

	Interview Phase Tasks				
	ESI	FEI	PosA	NegA	Verb
SNAP ODD	-.2640	-.2561	.0444	.0846	.1765
Controlling for ADHD					
<u>P</u>	.000	.000	.267	.117	.006

Appendix A

SNAP Protocol

SNAP

NO. SYMPTOMS: _____
COMPOSITE SCORE: _____

B #1 #2 #3

ID NO. : _____

Child's name: _____

Date: _____

Completed by: Mother _____

Father _____

OBSERVATION	Not at all	Just a little	Pretty much	Very much
A.				
1) Excessive running or climbing.	0	1	2	3
2) Difficulty sitting or excessive fidgeting.	0	1	2	3
3) Difficulty staying seated	0	1	2	3
4) Motor restlessness during sleep. (Parents)	0	1	2	3
Motor restlessness. (Teachers)	0	1	2	3
5) Always on the go or acts as if "driven by a motor."	0	1	2	3
B.				
1) Often fails to finish things he or she starts.	0	1	2	3
2) Often doesn't seem to listen.	0	1	2	3
3) Easily distracted.	0	1	2	3
4) Difficulty sticking to a play activity.	0	1	2	3
5) Difficulty concentrating on school work or other tasks requiring sustained attention.	0	1	2	3
C.				
1) Often acts before thinking.	0	1	2	3
2) Excessive shifting from one activity to another.	0	1	2	3
3) Has difficulty organizing work -not due to cognitive impairment	0	1	2	3

Appendix A Cont'd.

OBSERVATION	Not at all	Just a little	Pretty much	Very much
4) Needs a lot of supervision.	0	1	2	3
5) Frequent calling out in class.	0	1	2	3
6) Difficulty waiting for turn in games or group situation.	0	1	2	3
D.				
1) Fights, hits punches, etc.	0	1	2	3
2) Is disliked by other children.	0	1	2	3
3) Frequently interrupts other children's activities.	0	1	2	3
4) Bossy, always telling other children what to do.	0	1	2	3
5) Teases or calls other children names.	0	1	2	3
6) Refuses to participate in group activities.	0	1	2	3
7) Loses temper often and easily.	0	1	2	3
E.				
1) Blurts out answers to questions before they have been completed.	0	1	2	3
2) Has difficulty playing quietly.	0	1	2	3
3) Talks excessively.	0	1	2	3
4) Loses things necessary for tasks or activities at school or at home e.g., toys, pencils, books, assignments.	0	1	2	3
5) Engages in physically dangerous activities without considering possible consequences (not for the purpose of thrill-seeking).	0	1	2	3

Appendix A Cont'd.

OBSERVATION	Not at all	Just a little	Pretty much	Very much
F.				
1) Argues with adults.	0	1	2	3
2) Actively defies or refuses adult requests or rules.	0	1	2	3
3) Deliberately does things that annoy other people.	0	1	2	3
4) Blames others for his or her own mistakes.	0	1	2	3
5) Is often touchy or easily annoyed by others.	0	1	2	3
6) Is angry and resentful.	0	1	2	3
7) Is spiteful or vindictive.	0	1	2	3
8) Swears or uses obscene language.	0	1	2	3

Appendix B

PPVT-R Protocol

Rebody Picture Vocabulary Test - Form 1

FORM L TEST ITEMS AND ABBREVIATED INSTRUCTIONS

Administering the TRAINING ITEMS

For most subjects under age 6: Use Plates A, B, and C. Administer as many training item series as necessary to secure three consecutive correct responses. For most subjects age 6 and over: Use Plates D and E. Administer as many training item series as necessary to secure two consecutive correct responses.

Plate	Item	Response	Item	Response	Item	Response
A	doll (4)	fork (1)	table (2)	car (2)		
B	man (2)	comb (3)	sock (4)	mouth (1)		
C	swinging (3)	drinking (4)	walking (1)	climbing (2)		
D	wheel (4)	clapper (2)	rope (1)	cake (2)		
E	glant (1)	bride (2)	watch (4)	royal (2)		

(Complete directions are given in Part I of the Manual.)

Administering the TEST ITEMS

Scout: Highest 6 consecutive correct responses
 Calling: Lowest 6 consecutive responses containing 6 errors
 Starting Point: For a subject assumed to be of average ability, find the person's age stated in the margin, and begin the test with that item. Otherwise consult Part I of the Manual for further instructions.
 Recording Responses and Errors: Record the subject's response (1, 2, 3, or 4) for each item administered. For each error, draw an oblique line either through the plate number of the item missed, or through the geometric figure, as illustrated below:

22 envelope ... (2) 4 or 32 envelope ... (2) 4

Every eighth figure is identical to help determine the base and ceiling.

NOTE:

Ages in circles refer to the lowest age in a 6- or 12-month interval. For example, item 1 is the starting item for ages 3-6 through 3-5, and item 30 for ages 5-6 through 5-5. Use item 110 for ages 10-6 and over.

page 4

Item	Response	Item	Response	Item	Response	Item	Response
10 lamp	(4) <input type="checkbox"/>	44 dripping	(2) <input type="checkbox"/>	78 spatula	(3) <input type="checkbox"/>	106 carlier	(1) <input type="checkbox"/>
11 drum	(3) <input type="checkbox"/>	45 claw	(4) <input type="checkbox"/>	79 cooperation	(4) <input type="checkbox"/>	107 dissecting	(3) <input type="checkbox"/>
12 knee	(4) <input type="checkbox"/>	46 decorated	(3) <input type="checkbox"/>	80 scalp	(4) <input type="checkbox"/>	108 link	(4) <input type="checkbox"/>
13 helicopter	(2) <input type="checkbox"/>	47 frame	(1) <input type="checkbox"/>	81 twig	(2) <input type="checkbox"/>	109 solemn	(3) <input type="checkbox"/>
14 elbow	(4) <input type="checkbox"/>	48 forest	(3) <input type="checkbox"/>	82 vessel	(2) <input type="checkbox"/>	110 archery	(2) <input type="checkbox"/>
15 bandage	(4) <input type="checkbox"/>	49 faucet	(2) <input type="checkbox"/>	83 demolishing	(4) <input type="checkbox"/>	111 transparent	(3) <input type="checkbox"/>
16 leather	(1) <input type="checkbox"/>	50 group	(3) <input type="checkbox"/>	84 balcony	(1) <input type="checkbox"/>		
17 empty	(3) <input type="checkbox"/>	51 stem	(3) <input type="checkbox"/>	85 lockel	(1) <input type="checkbox"/>		
18 lance	(4) <input type="checkbox"/>	52 vase	(3) <input type="checkbox"/>	86 amazed	(3) <input type="checkbox"/>		
19 accident	(2) <input type="checkbox"/>	53 pedal	(1) <input type="checkbox"/>	87 tubular	(1) <input type="checkbox"/>		
20 net	(2) <input type="checkbox"/>	54 capsule	(2) <input type="checkbox"/>	88 tusk	(1) <input type="checkbox"/>		
21 tearing	(4) <input type="checkbox"/>	55 surprised	(4) <input type="checkbox"/>	89 bolt	(3) <input type="checkbox"/>		
22 seal	(1) <input type="checkbox"/>	56 bolt	(2) <input type="checkbox"/>	90 communication	(4) <input type="checkbox"/>		
23 measuring	(3) <input type="checkbox"/>	57 mechanic	(2) <input type="checkbox"/>	91 carpenter	(2) <input type="checkbox"/>		
24 peeling	(3) <input type="checkbox"/>	58 tambourine	(1) <input type="checkbox"/>	92 isolation	(1) <input type="checkbox"/>		
25 cage	(1) <input type="checkbox"/>	59 disappointment	(4) <input type="checkbox"/>	93 inflated	(3) <input type="checkbox"/>		
26 tool	(4) <input type="checkbox"/>	60 awarding	(3) <input type="checkbox"/>	94 coast	(3) <input type="checkbox"/>		
27 square	(4) <input type="checkbox"/>	61 pitcher	(3) <input type="checkbox"/>	95 adjustable	(2) <input type="checkbox"/>		
28 stretching	(1) <input type="checkbox"/>	62 reel	(1) <input type="checkbox"/>	96 fragile	(3) <input type="checkbox"/>		
29 arrow	(2) <input type="checkbox"/>	63 signal	(1) <input type="checkbox"/>	97 ascending	(1) <input type="checkbox"/>		
30 tying	(2) <input type="checkbox"/>	64 trunk	(2) <input type="checkbox"/>	98 appliance	(1) <input type="checkbox"/>		
31 nest	(1) <input type="checkbox"/>	65 human	(2) <input type="checkbox"/>	99 pyramid	(4) <input type="checkbox"/>		
32 envelope	(2) <input type="checkbox"/>	66 nozzle	(1) <input type="checkbox"/>	100 blazing	(1) <input type="checkbox"/>		
33 hook	(3) <input type="checkbox"/>	67 disagreement	(1) <input type="checkbox"/>	101 hoisting	(1) <input type="checkbox"/>		
34 peeling	(4) <input type="checkbox"/>	68 exhausted	(2) <input type="checkbox"/>	102 arch	(4) <input type="checkbox"/>		
35 patting	(1) <input type="checkbox"/>	69 vine	(4) <input type="checkbox"/>	103 lecturing	(4) <input type="checkbox"/>		
36 penguin	(1) <input type="checkbox"/>	70 ceremony	(4) <input type="checkbox"/>	104 displaced	(4) <input type="checkbox"/>		
37 sewing	(2) <input type="checkbox"/>	71 casserole	(2) <input type="checkbox"/>	105 contemplating	(2) <input type="checkbox"/>		
38 delivering	(1) <input type="checkbox"/>	72 vehicle	(4) <input type="checkbox"/>	106 carlier	(1) <input type="checkbox"/>		
39 diving	(2) <input type="checkbox"/>	73 globe	(3) <input type="checkbox"/>	107 dissecting	(3) <input type="checkbox"/>		
40 parachute	(3) <input type="checkbox"/>	74 ring	(3) <input type="checkbox"/>	108 link	(4) <input type="checkbox"/>		
41 funny	(4) <input type="checkbox"/>	75 clamp	(2) <input type="checkbox"/>	109 solemn	(3) <input type="checkbox"/>		
42 vegetable	(4) <input type="checkbox"/>	76 rapids	(2) <input type="checkbox"/>	110 archery	(2) <input type="checkbox"/>		
43 shoulder	(3) <input type="checkbox"/>	77 island	(1) <input type="checkbox"/>	111 transparent	(3) <input type="checkbox"/>		

Appendix C

Release of Previously Administered PPVT-R Scores

I _____ hereby consent to the release
of Peabody Picture Vocabulary Test (PPVT) or Peabody Picture
Vocabulary Test - Revised (PPVT-R) scores regarding my child
_____ for use in the doctoral thesis study
of Deborah M. Moore.

Parent Signature

Date

Appendix D

Parental Consent to Participate Form Date: _____

Parents:

Over the next several weeks, Mrs. Debbie Moore who is a doctoral student from the University of Ottawa in the Clinical Psychology Program, will be in our school conducting interviews of some students for her doctoral thesis. Your consent to have your son participate in this study is hereby requested. The information collected during the individually conducted interviews will be held in the strictest confidence and used solely for the purpose of Mrs. Moore's doctoral thesis. No individual results will be reported upon in the study, nor will participants be named. Student identification numbers rather than student names will appear on any forms used in this study. To ensure anonymity an envelope which is void of identifying characteristics has been attached for returning this consent form should you consent to your son's participation.

Mrs. Moore's thesis will examine the ability of grade 4 and grade 8 boys with Attention Deficit Hyperactivity Disorder (ADHD) to understand emotional concepts. Your son need not have ADHD in order to participate as the present study will require grade 4 and grade 8 boys who do not have ADHD as a comparison group.

Prior to the interviews all participants will be administered a language assessment called the Peabody Picture Vocabulary Test -Revised to ensure that language difficulties do not interfere with the interview process. It will take no more than 30 minutes to administer this test. If your son has previously taken this test you will be asked to sign a release of information form which permits the results of the test to be released to Mrs. Moore. Also prior to the interviews, your child's classroom teacher will be asked to complete a checklist called the Swanson, Nolan, and Pelham Questionnaire which will rate your child in terms of how well they are able to pay attention within the classroom environment. Participation from your son is not required in this process.

Following the administration of the Peabody Picture Vocabulary Test and the Teacher Questionnaire, some children will proceed to the interview stage. The parents of all students will be informed, by letter, as to whether or not their child will be

Appendix D Cont'd.

asked to participate in the interview stage of the study. If your child is not selected you will receive a letter of explanation.

The interview stage, which shall not exceed 30 minutes involves the following tasks:

- 1) Your son will be asked to identify the emotion being depicted for a series of picture cards showing faces of people with different expressions.
- 2) Your son will be read statements such as 'when I do something wrong I feel _____' and asked to fill in the blank.
- 3) Your son will look at a series of picture cards and be asked to tell how the people in the action pictures might be feeling.

There are no right or wrong answers and students require no preparation.

All children participating in this study will be given the exact same tasks under the exact conditions. Given that not every child with an Attention Deficit Disorder takes medication, we will ask that those children with ADHD who normally take medication not do so on the day of the interview only. If your child has ADHD, it will be necessary to consult your physician and determine any possible behavioural consequences or ill effects that may occur as a result of your child not taking his prescribed medication during this period. If your child has ADHD your physician's approval is very important and must be sought prior to withholding any prescribed medication. A handout of classroom strategies will be made available to all teachers for use during this period in order to address behavioural and attentional difficulties which may result from not taking medication. Medication may be resumed at any time following the interview. You will be reminded by telephone the day prior to the interview not to administer your son's medication on the interview day.

Should you consent to your son's participation, be assured that he may opt to withdraw at any time, refuse to participate, refuse to answer certain questions, he may ask to be returned to

Appendix D Cont'd.

Date: _____

I _____ (parent) hereby consent to my son
_____ participating in the study conducted by
Deborah Moore.

If you consent, please complete the following Questions:

- 1) My son has been identified with ADHD ___yes ___no
- 2) If yes, who identified ADHD and when _____
- 3) My son takes medication for ADHD ___yes ___no
- 4) If yes name medication and dosage _____
- 5) If yes do you agree, with your
physicians approval, to withhold
medication during the interviews ___yes ___no
- 6) I suspect my child may have ADHD ___yes ___no

Appendix E

Child Consent to Participate Form

Date: _____

Hello;

Over the next several weeks Mrs. Moore, who is a student at the University of Ottawa, will be in your school. She is doing a school project which involves looking at how well boys understand information about emotion and feelings. Only boys from grades 4 and 8 will be needed for the project. The purpose of this letter is to explain the project to you and to ask you if you are interested in participating.

The project has two steps. During step 1, your teacher will be asked to fill out a form that tells Mrs. Moore how well you are able to pay attention in class. Also Mrs. Moore will meet with you, show you pictures and ask you questions to measure your vocabulary. During Step 2, which will not happen on the same day as Step 1, you will be asked to leave your classroom for about 30 minutes. While out of your classroom you will be asked by Mrs. Moore to do the following three things:

- 1) Look at pictures of human faces and tell how the person in the picture might be feeling.
- 2) Read sentences such as 'when I do something wrong I feel _____' and asked to fill in the blank.
- 3) Look at a series of picture cards and asked to tell how the people in the action cards might be feeling.

There are no right or wrong answers to these questions so you don't have to do anything to prepare. If you decide to participate in the project you should know that you will be free to change your mind at any time. Also, you don't have to answer any questions that you don't want to, and you can ask to return to your classroom or take a break at any time. You should also know that when the project is completed neither your name or information about how well you answered will be included in the findings in order to protect your privacy.

Appendix E Cont'd.

If you have questions about the study that your parents cannot answer, you can call Mrs. Moore, for no charge, at 1-888-536543946 (Kenjgewin).

Thank you for taking the time to hear about Mrs. Moore's project. If you think you might be interested, you should speak to your parents first to see how they feel before signing this consent form.

School Principal

Deborah Moore

I _____ (child's signature) had read or have had read to me the information regarding Mrs. Moore's project. I understand what is required from me if I choose to participate.

I _____ agree to participate in Mrs. Moore's project.

Appendix F

Educational Management Principles

The following list of Education Management Principles (Phelan, 1995) will be provided to all teachers who have students from their classroom participating in the present study.

- 1) Decrease work load to fit child's attentional capacity
 - smaller quotas for productivity
 - more frequent but shorter work periods
 - lower accuracy quotas
 - eliminate high appeal distracters
- 2) Alter teaching style
 - allow some restlessness
 - allow periodic exercise breaks
 - employ participatory teaching with more child activities
 - stay flexible, be open to unusual ways to teach
 - preferential seating (close to teacher's desk)
- 3) Post rules externally
 - posters with rules for various work periods
 - cards on desks with rules for individual desk work
 - employ a buddy system to reinforce rules as necessary
- 4) Increase frequency of rewards
 - token economies (reward desirable behaviours)
 - have access to rewards several times per day
- 5) Set time limits for work completion
- 6) Use a hierarchy of classroom punishments
 - head down at desk
 - response cost (no token earned)
 - time out in corner
 - time out at school office
 - call parents and request that child be taken home
- 7) Manage your own stress level
 - stay calm even when ADHD child is overly emotional
 - catch the problem and address it at first sign
 - keep your wits about you when reacting to misconduct (don't over-react on impulse; take time to decide on consequence if necessary)

Appendix F Cont'd.

- have a management plan in mind should a classroom assembly or other unstructured event occur
- ask for back up from special education teacher or classroom assistant

Classroom Strategies taken from: Phelan, T.W. (1995). Effective discipline for children 2-12: Teaching your child to do what you want. Child Management Inc: Glen Ellyn, Illinois.

Appendix G

Teacher Instructions to Participants

Please read these directions to students approximately 30 minutes prior to the interview.

Teacher script

In a little while you are going to go to the _____ room to meet Mrs. Moore. You will be helping her with a study that she is undertaking that will be looking at how well children understand emotions. Mrs. Moore will show you pictures and ask you questions. There are no right or wrong answers so there is no need to worry about making a mistake. You will not be gone for long and you may decide to withdraw at any time, refuse to answer any questions, ask to return to the classroom or take a break at any time. O.K. ?

Appendix H

Participant Information Script

Hello _____, my name is Mrs. Moore. Thank you for agreeing to participate in this study which is looking at how well children understand feelings. Before we begin I want to be sure you understand that you are free to change your mind about participating at any time, you may refuse to answer any questions, you may ask to be returned to the classroom at any time, or you may request to take a break at any time and you don't have to worry about getting in trouble. O.K.?

I will be showing you pictures and asking you questions. There are no right or wrong answers so you don't have to worry about making a mistake. You will not be here for a long time.

Appendix I

Ekman & Friesen Facial Recognition Task

Instructions to Participants:

Now I am going to show you some pictures showing faces of people. I would like you to tell me how you think the person in the picture might be feeling.

In order to ensure randomization, the 36 facial expression cards will be individually coded and shuffled prior to each administration.

Student Response and Order of Administration Form

1) _____	16) _____
2) _____	17) _____
3) _____	18) _____
4) _____	19) _____
5) _____	20) _____
6) _____	21) _____
7) _____	22) _____
8) _____	23) _____
9) _____	24) _____
10) _____	25) _____
11) _____	26) _____
12) _____	27) _____
13) _____	28) _____
14) _____	29) _____

Appendix I Cont'd.

- | | |
|-----------|-----------|
| 15) _____ | 30) _____ |
| 31) _____ | 34) _____ |
| 32) _____ | 35) _____ |
| 33) _____ | 36) _____ |

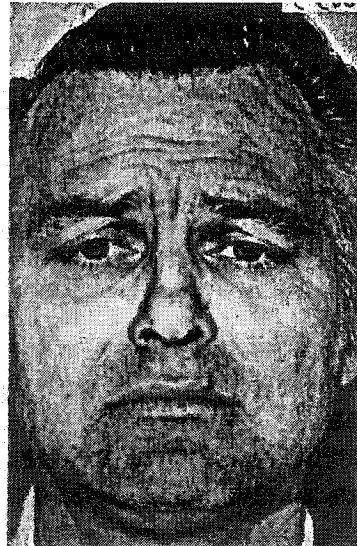
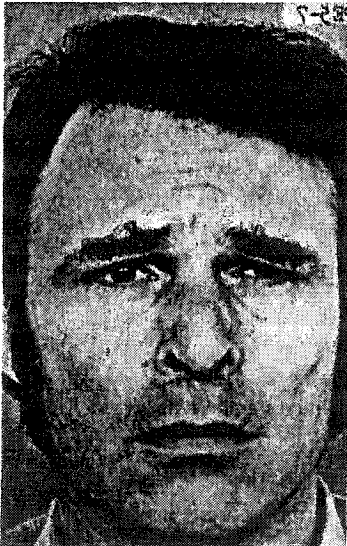
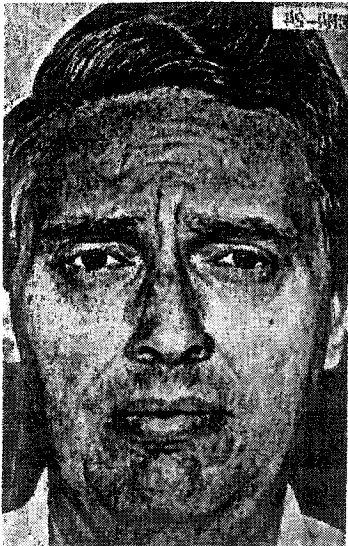
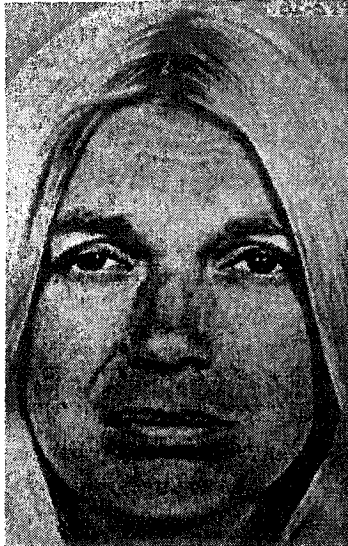
Appendix I Cont'd.

Happy Faces



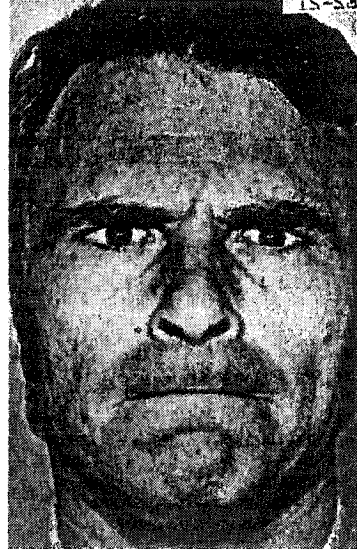
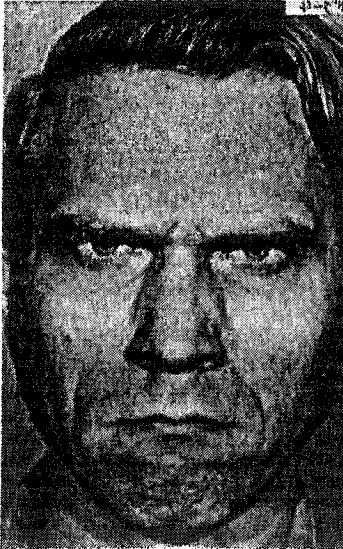
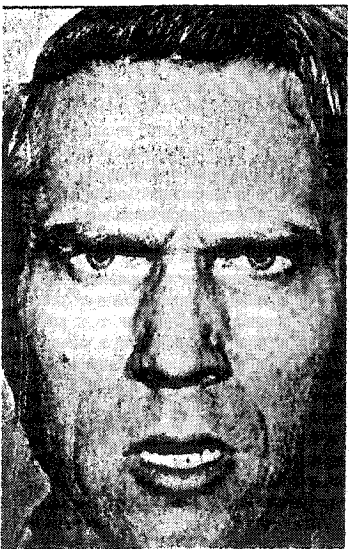
Appendix I Cont'd.

Sad Faces



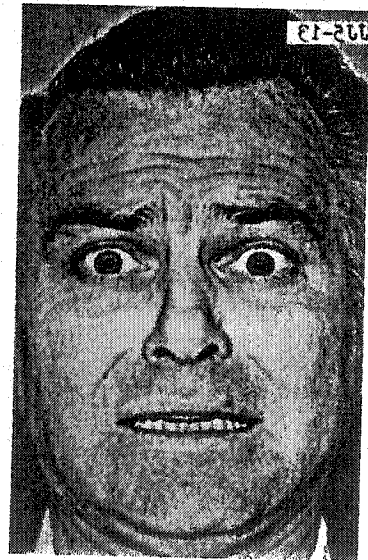
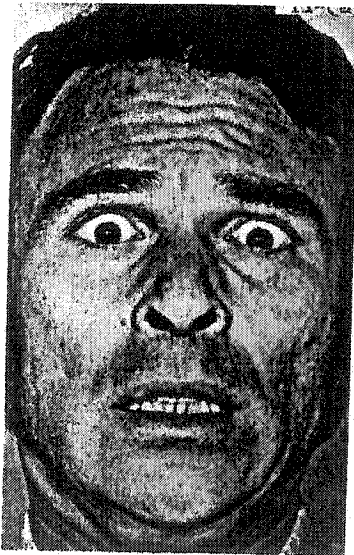
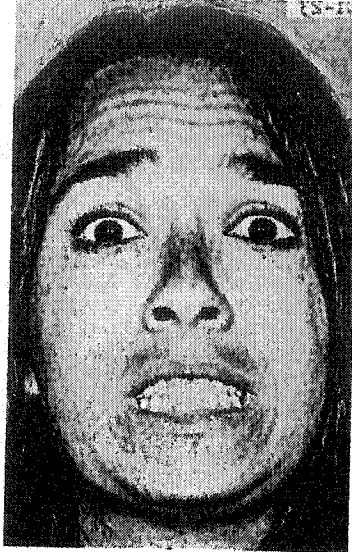
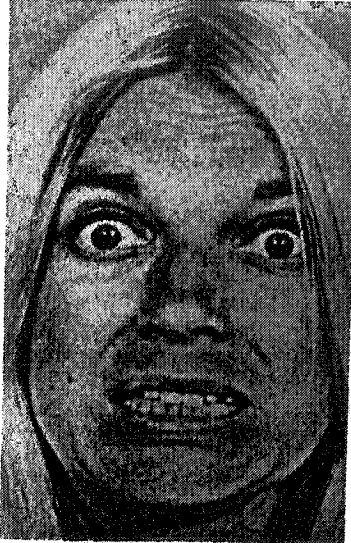
Appendix I Cont'd.

Angry Faces



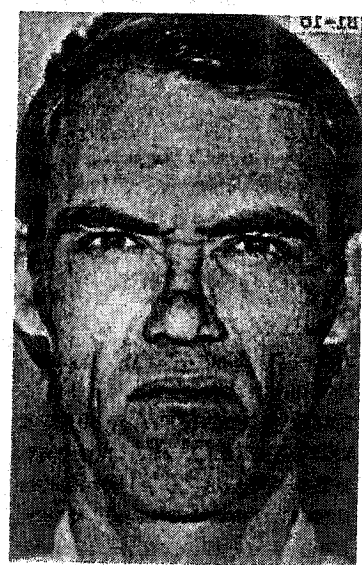
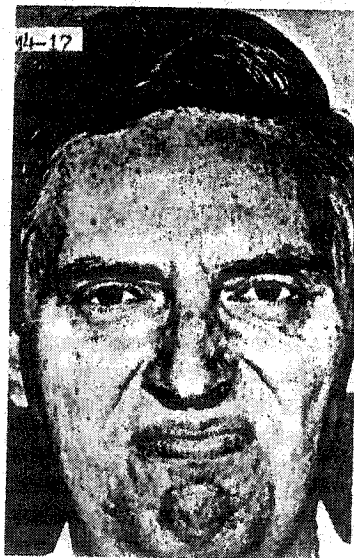
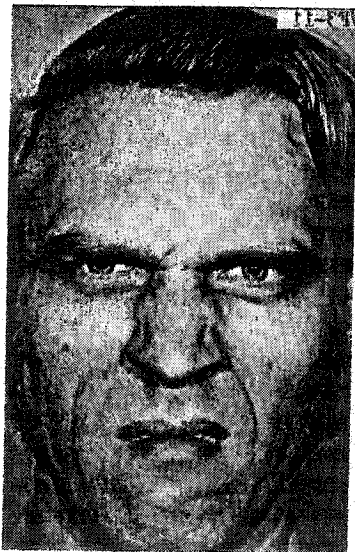
Appendix I Cont'd.

Afraid Faces



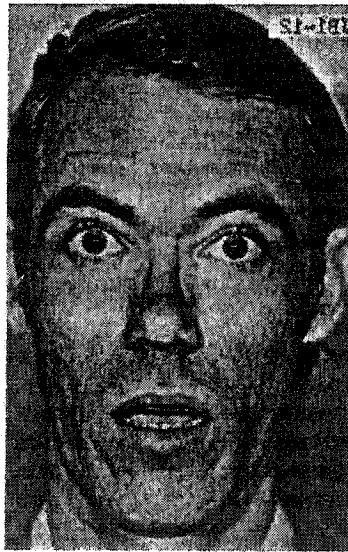
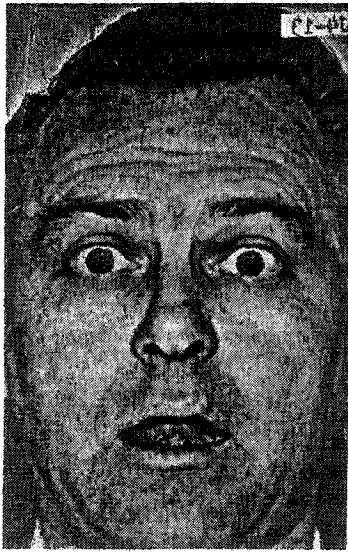
Appendix I Cont'd.

Disgusted Faces



Appendix I Cont'd.

Surprised Faces



Appendix J

Emotion Statement TaskAngry Statements

1. When my mom and dad send me to my room I feel _____.
2. When somebody hits me I feel _____.
3. When my cat scratches me I feel _____.
4. When my parents make unfair rules I feel _____.
5. When I strike out in baseball I feel _____.

Comfortable Statements

1. When I am sitting on the couch drinking hot chocolate on a cold day I feel _____.
2. Soft teddy bears make me feel _____.
3. Sitting on a beach just listening to the waves makes me feel _____.
4. When I am sitting in an easy chair watching TV I feel _____.
5. When there is peace and quiet I feel _____.

Happy Statements

1. Playing with my friends makes me feel _____.
2. When the sun is shining I feel _____.
3. When my mom buys me new shoes I feel _____.
4. When I get invited to a party I feel _____.
5. When I pass at school I feel _____.

Guilty Statements

1. When I cheat in something I feel _____.
2. When I take money from my mom and I forget to tell her I feel _____.
3. When I do something I'm not supposed to do I feel _____.
4. When I tell a lie I feel _____.
5. When something happens that I know I could have prevented I feel _____.

Afraid Statements

1. Going into the bush and getting lost would make me

Appendix J Cont'd.

feel _____.

2. Facing my parents with a bad test makes me feel _____.
3. When someone wants to beat me up I feel _____.
4. When I have to go to the hospital I feel _____.
5. When I'm left alone in the house I feel _____.

Sad Statements

1. When my pet dies I feel _____.
2. When I'm sick I feel _____.
3. When I ask to go somewhere with my dad and he says "no" I feel _____.
4. Seeing commercials for children in third world countries makes me feel _____.
5. When somebody hurts my feelings I feel _____.

Proud Statements

1. Getting all A's on my report card would make me feel _____.
2. When I accomplish something major I feel _____.
3. When I save up my own money to buy things I feel _____.
4. When I achieve what I want to do I feel _____.
5. Being the best at something that no one else can do as well makes me feel _____.

Appendix K

CAST Protocol and Picture Cards

Instructions to Participants:

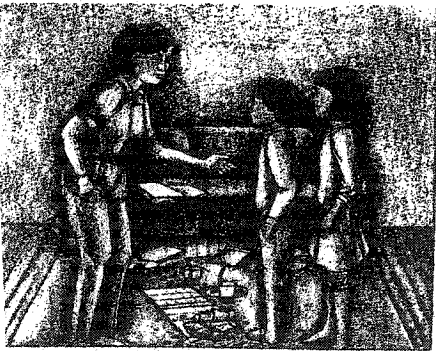
Now I am going to show you some pictures cards. I would like you to look at the cards and tell me how each person shown in the picture card might be feeling.

In order to ensure randomization the picture cards will be shuffled prior to each administration.

Order of administration will be recorded on the test protocol.



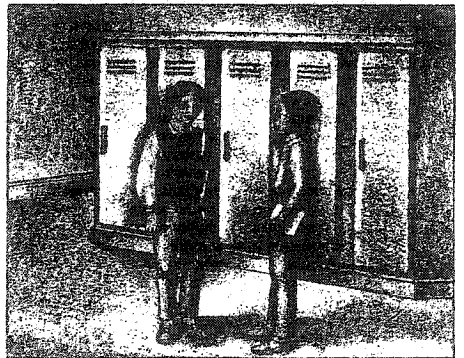
18



48C



58



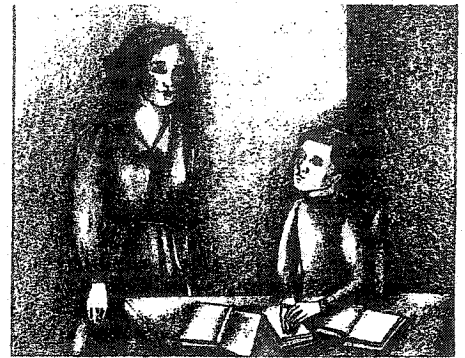
Appendix K Cont'd.



10 B



11 B



12 B

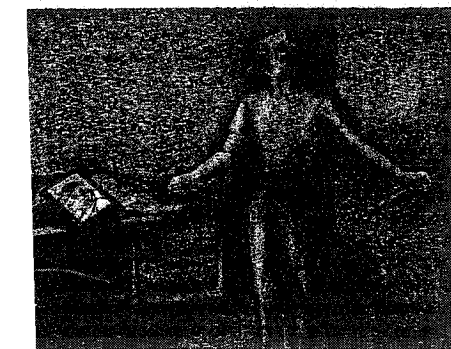
13 B



13 B



15 B



16 B



17 B

Appendix L

Instructions to be read to participants for Emotion Statement Task

Now I am going to read you some sentences that have a word left out on the end. I am going to ask you to listen carefully to the sentence and fill in the blank with a feeling that you think the person who made the statement may have been feeling. Only one feeling word is required so think about the feeling word that fits best with each sentence. O.K.?

Appendix M

Scoring Form for the Emotion Statement Task

In order to randomize order, each of the 35 emotion statements will be placed on individually coded cards which will be shuffled prior to being presented to each participant.

Statement Code: Angry(AN); Comfortable (C); Happy (H);
Guilty (G); Afraid (AF); Sad (s); Proud (P)

Order of Statement Administration	Participant Response
-----------------------------------	----------------------

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____
- 7) _____
- 8) _____
- 9) _____
- 10) _____
- 11) _____
- 12) _____
- 13) _____
- 14) _____
- 15) _____

Appendix M Cont'd.

16)

17)

18)

19)

20)

21)

22)

23)

24)

25)

30)

31)

32)

33)

34)

35)

Appendix N

Procedure for Handling Peabody Scores Which Fall Below 80

The following letter will be sent to parents of children with Peabody scores which fall below 80.

Dear _____;

Thank you for consenting to your child's participation in my thesis study. At this point your son has participated in the pre-interview phase of the study which involves the administration of the Peabody Picture Vocabulary Test - Revised. This test is administered to ensure that all verbal instructions which are given during the interview phase are clearly understood by all children participating. Your son did have some difficulty, of an undetermined nature, on this vocabulary test.

Children who exhibit difficulty on the Peabody Vocabulary Test, may do so for a variety of reasons. For example, they may find the test boring, they may be having an 'off' day, they may be nervous or anxious about how well they perform, they may be distracted or preoccupied, it may be that English is a second language for some children and they have not yet mastered an English vocabulary commensurate with their age level, and in some cases the vocabulary may be weak due to language or general learning difficulties. In other words, difficulty on the Peabody Language Test is not necessarily indicative of a specific problem, but rather could be ascribed to any one or more of a number of possible explanations.

I knew in advance that some of the children who chose to participate in the study may not perform well on this measure, for a variety of reasons or explanations. Although the ability to communicate freely, without inhibition or other interferences is critical in this study, it is certainly a skill which some children find quite difficult. For this reason a decision was made between myself and my research committee to only include children who obtained a specific score or higher on the Peabody Vocabulary Test would participate in the second phase of the study. This decision was made in order to ensure the best possible results in the present study, and also to ensure that children who are less comfortable with verbal communication, for any reason, would not be made to feel uncomfortable in the interview environment. For this reason I will not ask _____

Appendix N Cont'd.

to continue on to the next level. Please contact me directly should you have questions regarding this letter (1-888-KENJGEWIN). Once again, thank you for supporting my research.

Deborah M. Moore

Appendix O

Procedure For Handling SNAP Scores Which Are Greater Than 7
Among The Non ADHD Participants

The following letter will be sent to the parents of non ADHD participants with SNAP scores of greater than 7.

Dear _____;

Thank you for consenting to your child's participation in my thesis study. At this point your son has participated in the pre-interview phase of the study which involves the completion of the SNAP Rating Scale. This screening measure was completed by your son's classroom teacher who rated him in terms of how well he seems to be able to pay attention and concentrate. The completion of this screening measure was necessary to ensure that his performance during the interview phase would not be affected by any difficulty he may have paying attention or concentrating.

Children who do not have difficulty paying attention or concentrating usually receive teacher rating scores which are below 8 on the SNAP measure. However, it is important to note that some children, who do not have attention or concentration problems, may, for various reasons, obtain teacher rating scores of 8 or higher. Ratings could be influenced by many factors including the tolerance level of his classroom teacher, the amount of structure within the classroom during the period in which the SNAP rating was based, a change in structure or routine in your child's home schedule, difficulty listening or attending to auditory information due to weak listening skills, peer pressure, etc... . It is important to note that a rating of 8 or higher on the SNAP measure should never, in isolation, be interpreted as meaning a child has attention or concentration problems.

I knew in advance that some children, who do not have ADHD, might, for various reasons, obtain scores of 8 or higher on the SNAP measure. In consultation with my research advisors it was decided that in order to receive the best possible results in this study, those children who obtained scores of 8 or greater on the SNAP would not be asked to participate in the interview phase. For this reason I am writing to inform you that your son has obtained a SNAP screening score of 8 or greater and will not

Appendix O Cont'd.

be required to participate in the interview phase of the study. As noted earlier, a score of greater than 8 does not necessarily indicate the presence of ADHD. However, if your child has also had a history of attention or concentration problems you may wish to consult your physician for further assessment. Should you have questions about this decision please contact myself at 1-888-kenjgewin or my research advisor Dr. Cynthia Whissell at (705) 675-1151 ext. 4251.

Once again thank you for supporting my research.

Deborah M. Moore

Appendix P

Procedure for Handling SNAP Scores Which are Less than 8
Among the ADHD Participants

The following letter will be sent to the parents of ADHD participants with SNAP scores of less than 8.

Dear _____;

Thank you for consenting to your child's participation in my thesis study. At this point your son has participated in the pre-interview phase of the study which involves the completion of the SNAP Rating Scale. Even though your son has already been identified as having ADHD we asked his classroom teacher to rate him in terms of how much difficulty he seems to have paying attention and concentrating. The completion of this screening measure was necessary to ensure that all of the ADHD children participating in this study were experiencing clinically similar levels of attention and concentration problems.

Children who have ADHD usually receive teacher rating scores which are 8 or greater on the SNAP measure. However, it is important to note that some ADHD children, may, for various reasons, obtain teacher rating scores of less than 8 on this measure. The diagnosis of ADHD is not made based upon one measure and is usually comprised of a combination of several checklists, observations, interviews, and perhaps a psychometric evaluation. It is not uncommon for ADHD children to obtain lower scores than expected on any aspect of the ADHD diagnostic evaluation. Ratings could be influenced by many factors including the tolerance level of his classroom teacher, the amount of structure within the classroom during the period in which the SNAP rating was based, a change in structure or routine in your child's home schedule, etc. . . . It is important to note that a rating of less than 8 on the SNAP measure should never, in isolation, be interpreted as meaning a child does not have attention or concentration problems.

I knew in advance that some ADHD children, might, for various reasons, obtain scores of less than 8 on the SNAP measure. In consultation with my research advisors it was decided that in order to receive the best possible results in this study, those ADHD children who obtained scores of less than 8 on the SNAP would not be asked to participate in the interview phase. For

Appendix P Cont'd.

this reason I am writing to inform you that your son has obtained a SNAP screening score of less than 8 and will not be required to participate in the interview phase of the study. Should you have any questions about this decision please contact myself at 1-888-kenjgewin or my research advisor Dr. Cynthia Whissell at (705)-675-1151 ext. 4251.

Once again thank you for supporting my research.

Deborah M. Moore

Appendix Q

Recruited Groups

A total of 1130 Parental Consent to Participate Forms (Appendix D) were issued to the parents of male students attending grades 4 and 8 in schools within the Near North Board of Education. Of the 1130 forms issued, 342 were returned to the respective schools. Of the 342 returned forms, 137 were from parents of ADHD children while 205 were from the parents of non ADHD children. Of the 137 forms returned by the parents of ADHD children, 131 parents and their ADHD children positively consented to participate. Of the 205 forms returned by the parents of non-ADHD children, 152 parents and their non ADHD children consented to participate.

Appendix R

Screening Phase Inclusion Criteria for ADHD Participants

Of the 131 ADHD children who consented to participate, 68 were in grade 4 while 63 were in grade 8. The screening process involved the administration of the PPVT-R and the SNAP Rating Scale. Two students from the grade 8 group refused to participate in the administration of the PPVT, and were subsequently excused from the screening process and from further participation in the study.

Of the 129 ADHD children who were screened, six children from grade 4 did not meet the PPVT cut-off criterion score of 80 and were subsequently thanked and excused from further participation in the study.

An additional 22 ADHD children, 12 from grade 4 and 10 from grade 8, were excused from further participation because their teacher completed SNAP Rating Scale scores fell below the cut-off criterion of ten. The teacher completed SNAP Rating Scale proved to be quite a serious problem in terms of the screening process for the ADHD children. More specifically, because it was necessary to carry out the screenings earlier in the school year than anticipated due to the threat of teacher work-to-rule, many teachers reported that they simply did not know the ADHD participants well enough to complete the SNAP Rating Scale. Several teachers also reported that they had not yet observed their medicated ADHD students in situations without medication. As such, their SNAP ratings failed to reach clinical significance and it was necessary to drop 22 otherwise consenting ADHD children from further participation in the study.

In total, 129 ADHD students were screened (see Table 1 for inclusion criteria means). One hundred and one ADHD students, 50 from grade 4 and 51 from grade 8, successfully completed the screening phase of the study.

Appendix S

Screening Phase Inclusion Criteria for Non-ADHD Participants

Of the 152 non-ADHD children who consented to participate, 90 were from grade 4 while 64 were from grade 8. Nine of the grade 8 boys subsequently changed their minds hence they were excused from both the screening process and the interview phase. Time constraints did not allow the screening of all 90 grade 4 students. From the 90 consenting children, 60 were accepted for screening. Of the 116 non-ADHD children who participated in the screening phase, 2 from grade 8 and 6 from grade 4 were excused due to their PPVT scores falling below the cut-off criterion score of 80. Moreover, three grade 8 students and four grade 4 students obtained SNAP Rating Scale scores of greater than 8 and were subsequently excused from further participation.

In total, 116 non-ADHD participants were screened (See Table 2 for non-ADHD inclusion criteria means). One hundred and one non-ADHD students, 50 from grade 4 and 51 from grade 8, successfully completed the screening phase of the study.

Appendix T

ADHD Participants Inclusion Criteria for the Interview Phase

The interview phase of the study involved the administration of the facial expression cards, the emotion statements, and the CAST picture cards. All three tasks were administered in one sitting. Of the 101 ADHD children selected to participate in the interview phase of the study, one grade 4 child was unable to sit still long enough to administer even one of the three interview phase tasks and was subsequently excused from further participation. Moreover, one grade 8 child was absent from school, without explanation, on both occasions when his pre-scheduled interview was supposed to take place. He was subsequently excused from further participation.

In total, 99 ADHD children, 49 from grade 4 and 50 from grade 8 successfully completed the interview phase of the study. Table 2 represents the means of the inclusion criteria for the interview phase of the study.

Appendix U

Non ADHD Participant Inclusion Criteria for the Interview Phase

Of the 101 non-ADHD students selected to participate in the interview phase of the study, one grade 4 non-ADHD child refused to participate in the administration of the CAST picture card task and were subsequently dismissed.

In total 49 non-ADHD children from grade 4 and 51 non-ADHD children from grade 8 successfully completed the interview phase of the study. Table 2 represents the means of inclusion criteria for the interview phase.