PERSONALITY CORRELATES OF COMPLEX INSTRUMENTAL AVOIDANCE LEARNING

by Daniel J. Anderson

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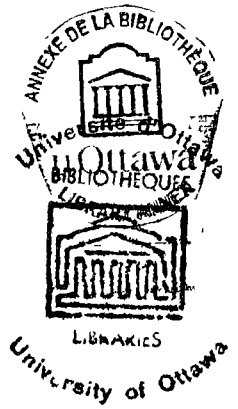

Center City, Minnesota, 1960

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CURRICULUM STUDIORUM

Daniel J. Anderson was born March 30, 1921, in Minneapolis, Minnesota. He received the Bachelor of Arts degree in Psychology from St. Thomas College, St. Paul, Minnesota, in 1950. He received the Master of Arts degree in Clinical Psychology from Loyola University, Chicago, Illinois, in 1957. The title of his thesis was An exploratory Study of Anxiety in Alcoholics.

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INTRODUCTION

Although numerous and extensive publications spanning half a century of research in learning theory may be found in the psychological literature, no generally accepted theory of conditioning and/or learning has emerged. In view of the widespread lack of agreement and even knowledge concerning fundamental relevant variables, parameters and instrumentation this state of affairs is not surprising.

Despite these limitations the exploration of personality constructs in terms of their possible relationship to conditionability proceeds rapidly and numerous reports of research may be found in the experimental literature on personality, learning theory and behavior pathology. Without question, if certain traits of personality were found to have a stable functional relationship to conditioning and learning much light could be thrown on the learned development of both normal and abnormal behavior.

Among those replicated personality constructs investigated, anxiety stands out in the literature as the ubiquitous nuclear theoretical explanatory concept associated with the learning of those conditioned responses usually associated with functional behavior pathology.

One particular aspect of this hypothesized relationship between anxiety and conditioning which has not yet been adequately explored is that relationship which might obtain

between anxiety and instrumental avoidance learning. Since functional behavior pathology can be conceived of on one level of analysis as nothing more than the learned acquisition of instrumental avoidance responses acquired through learning under high levels of internal anxiety accompanied by stressful external precipitating conditions it would seem to be of heuristic value to investigate under experimental conditions certain of the parameters associated with anxiety and avoidance learning.

Briefly stated, the investigation reported here represents an attempt to investigate the functional relationships between one particular category of conditioning, namely, complex instrumental avoidance (stress) learning, and two orthogonal dimensions of personality considered to be alternative anxiety constructs.

In Chapter I literature pertinent to the investigation is presented relative to the reported relationships between anxiety and various forms of conditioning. The differentiation of three types of conditioning is also clarified and a theoretical analysis of alcoholic personality structure in terms of anxiety and instrumental avoidance learning is presented. Conclusions are then drawn applicable to the experimental exploration of certain relationships between anxiety and avoidance learning. The problem to be studied is formally stated in Chapter II in terms of

testable null hypotheses. In Chapter III a detailed presentation is made of the methodology used in the experiment including subjects, tests and apparatus, criterion measures of performance, controls, procedures and statistical design. Results of the experiment are presented in Chapter IV in terms of group performance on control variables and anxiety tests as well as the learning performance differential found between selected groups. The experimental findings are evaluated in terms of obtained results in Chapter V along with a summary and concluding remarks. Fundamental or pivotal research pertinent to the investigation is contained in the annotated bibliography. Appendix 1 offers the reader a detailed account of experimental procedures used in administering the avoidance learning test while Appendix 2 summarizes the numerical data used in the experiment from which the statistical results were derived. Appendix 3 offers the reader a brief abstract of the study.

CHAPTER I

REVIEW OF THE LITERATURE

Numerous attempts have been made in recent years to integrate the study of behavior pathology, personality and learning theory. The basic works of Mowrer,[1] Dollard and Miller,[2] Spence,[3] and Eysenck[4] have been of particular value with respect to this integration. A review of the experimental and clinical literature in any one of these areas readily suggests that anxiety is one of the more fundamental measurable aspects of behavior significant for both research and clinical purposes. This review of the literature will deal with those findings concerning anxiety and conditioned learning pertinent to this particular study. For clarity of analysis this material will be treated in the following sections: 1) Anxiety and Simple Conditioning; 2) Anxiety and Complex Conditioning; 3) Anxiety and Alcoholic

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1 O.H. Mowrer, Learning Theory and Personality Dynamics, New York, Ronald Press, 1950, viii-776 p.

2 J. Dollard and N.E. Miller, Personality and Psychotherapy, New York, McGraw-Hill, 1950, xiii-488 p.

3 Kenneth W. Spence, "Theoretical Interpretations of Learning", in S.S. Stevens, (ed.), Handbook of Experimental Psychology, New York, Wile., 1951, p. 690-729.

4 H.J. Eysenck, "A Dynamic Theory of Anxiety and Hysteria", Journal of Mental Science, Vol. 101, 1955, p. 28-51.

Personality Structure; 4) The Differentiation of Three Forms of Conditioning; 5) Conclusions.

1. Anxiety and Simple Conditioning.

Despite the numerous problems of measurement and replicability found in several recent evaluations of research involving anxiety studies,[5,6,7,8] the fact remains that certain challenging and possibly significant findings seem to be present. A review of the experimental literature on anxiety readily suggests that the majority of investigators have found that anxious subjects tend to be superior to non-anxious subjects in developing simple, classical, conditioned responses when a noxious stimulus is used.[9]

Although there are anxiety measures too numerous to mention without demonstrable behavioral correlates, relative

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5 Donald H. Kausler and E. Phillip Trapp, "Methodological Considerations in the Construct Validation of Drive-Oriented Scales", Psychological Bulletin, Vol. 56, 1959, p. 152-157.

6 Irwin G. Sarason, "Empirical Findings and Theoretical Problems in the Use of Anxiety Scales", Psychological Bulletin, Vol. 57, 1960, p. 403-415.

7 Barclay Martin, "The Assessment of Anxiety by Physiological Behavioral Measures", Psychological Bulletin, Vol. 58, No. 3, 1961, p. 234-255.

8 Ronald S. Wilson, "On Behavior Pathology", Psychological Bulletin, Vol. 60, No. 2, 1963, p. 136-146.

9 H.J. Eysenck, (ed.), Handbook of Abnormal Psychology, New York, Basic Books, 1961, xvi-816 p.

consistency of findings with respect to simple avoidance conditioning is observed to occur when the criterion measure of anxiety has been derived from either drive theory or excitation-inhibition theory, to unrelated (orthogonal) personality questionnaire constructs. With respect to drive theory, Spence, Taylor, and several colleagues,[10,11,12] have presented evidence that, in conditioning a response like eye-blink, a positive relationship obtains between high anxiety and speed of acquisition of the conditioned response. These research findings have been recently reconfirmed by Spence.[13] Most of these conditioning studies used subjects with only very high or very low scores on the Taylor Manifest Anxiety Scale (MAS).[14]

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10 K.W. Spence and J.A. Taylor, "Anxiety and Strength of the UCS as Determiners of the Amount of Eyelid Conditioning", Journal of Experimental Psychology, Vol. 42, 1951, p. 183-188.

11 ————, "The Relation of Conditioned Response Strength to Anxiety in Normal, Neurotic, and Psychotic Subjects", Journal of Experimental Psychology, Vol. 45, 1952, p. 265-272.

12 K.W. Spence and I.E. Farber, "Conditioning and Extinction as a Function of Anxiety", Journal of Experimental Psychology, Vol. 45, 1953, p. 116-119.

13 K.W. Spence, "Anxiety (Drive) Level and Performance in Eyelid Conditioning", Psychological Bulletin, Vol. 61, No. 2, 1964, p. 129-139.

14 Janet A. Taylor, "A Personality Scale of Manifest Anxiety", Journal of Abnormal and Social Psychology, Vol. 48, 1953, p. 285-290.

Hilgard, et al.[15] and Bindra, et al.,[16] using groups randomly selected in terms of MAS scores, however, found only insignificant relationships between anxiety and conditioning speed, when a non-noxious stimulus was used. The evidence suggests that scores on the Taylor Scale are correlated with speed of conditioning the eye-blink response, where a noxious stimulus is used, but is unrelated to simple, positive conditioning.

Other investigators, namely Eysenck[17] and Franks,[18] have suggested that the personality factor of introversion-extraversion is related to conditioning behavior, and that the significant relationship obtained between high MAS scores and conditioning speed may be due to the fact that the MAS is measuring in some, as yet unknown, way measures of both neuroticism, and introversion. There is considerable evidence to support this view. Winne's[19] Neuroticism Scale

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15 E.R. Hilgard, L.V. Jones and S.J. Kaplan, "Conditioned Discrimination as Related to Anxiety", Journal of Experimental Psychology, Vol. 42, 1951, p. 94-99.

16 D. Bindra, A.L. Paterson and J. Strzelecki, "On the Relation Between Anxiety and Conditioning", Canadian Journal of Psychology, Vol. 9, 1955, p. 1-6.

17 Eysenck, "A Dynamic Theory of Anxiety and Hysteria", Op. Cit., p. 28-51.

18 C.M. Franks, "Personality Factors and the Rate of Conditioning", British Journal of Psychology, Vol. 46, 1957, p. 119-126.

19 J.F. Winne, "A Scale of Neuroticism: An Adaption of the M.M.P.I.", Journal of Clinical Psychology, Vol. 7, 1951, p. 117-122.

whose test items were, like Taylor's, selected from the Minnesota Multiphasic Personality Inventory has been found to differentiate normals and neurotics quite reliably. Holtzman, et al.[20] obtained a correlation of .86 between the MAS and the Winne Neuroticism Scale, using 346 students. Deese, et al.[21] obtained a correlation of .81 between Taylor's Anxiety Scale and Winne's Neuroticism Scale. The view that the MAS score is, in part, a measure of neuroticism is also supported by the work of Brackbrill and Little,[22] and Eriksen and Davids[23] who found MAS scores to correlate highly with the MMPI psychasthenia scale. Jensen[24] has also correlated scores of 254 adults on the MAS and the Maudsley Personality Inventory (MPI),[25] which contains both an extraversion-

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20 W.H. Holtzman, A.D. Calvin and H.E. Bitterman, "New Evidence for the Validity of Taylor's Manifest Anxiety Scale", Journal of Abnormal and Social Psychology, Vol. 47, 1952, p. 853-854.

21 J. Deese, R.S. Lazarus and J. Keenan, "Anxiety, Anxiety Reduction and Stress in Learning", Journal of Experimental Psychology, Vol. 46, 1953, p. 55-60.

22 G. Brackbrill and M.P. Little, "M.M.P.I. Correlates of the Taylor Scale of Manifest Anxiety", Journal of Consulting Psychology, Vol. 18, 1954, p. 433-436.

23 C.W. Eriksen and A. Davids, "The Measuring and Clinical Validity of the Taylor Anxiety Scale and the Hysteria Psychasthenia Scales from the M.M.P.I.", Journal of Abnormal and Social Psychology, Vol. 50, 1954, p. 135-137.

24 A.R. Jensen, "The Maudsley Personality Inventory", Acta Psychologica, Vol. 14, 1958, p. 314-325.

25 H.J. Eysenck, The Maudsley Personality Inventory, Educational and Industrial Testing Service, San Diego, 1962, 21 p.

introversion dimension and a neuroticism-normality dimension. Significant correlations of -.35 between MAS and the extraversion scale were obtained and a correlation of .77 between the MAS and the neuroticism scale scores. Such results seem to be in accord with those of Franks', in that MAS scores do contain some measure of both introversion and neuroticism, with the higher anxiety scores being related to both introversion and to neuroticism.

While this anxiety questionnaire controversy appears to be irreconcilable at present it nevertheless is of crucial importance for determining the independent variable in individual difference studies of conditioning. Obviously, the observed correlations between extreme MAS scores and conditioning speed could be due to a relationship between neuroticism and conditioning, introversion and conditioning, or to some inter-action of these two personality factors and conditioning. Franks, employing the personality concepts of Eysenck, has made several experimental attempts to settle this question.[26,27] Results, using both eye-blink and psycho-galvanic skin conductance conditioning, were clearly in favor of a significant relationship between introversion

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26 C.M. Franks, "Effect of Food, Drink, and Tobacco Deprivation on the Conditioning of the Eyeblink Response", Journal of Experimental Psychology, Vol. 53, 1957, p. 117-120.

27 ————, "Personality Factors and the Rate of Conditioning", Op. Cit., p. 119-126.

and conditioning with no significant relationship being found between neuroticism and conditioning.

In view of the above findings, namely, that two orthogonal dimensions of personality are both related to conditionability, the personality dimensions of introversion-extraversion (an excitation-inhibition construct) and neuroticism-stability (a drive theory construct) have been selected by numerous investigators as independent variables in studies of individual differences in conditioning. And despite the fact that these dimensions have been demonstrated to be relatively independent, fundamental factors present in varying degree in all normal and neurotic subjects,[28] research findings in conditioning studies still demonstrate one[29] or the other[30] dimension as being the factor positively related to conditionability.

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28 Eysenck, The Maudsley Personality Inventory, Op. Cit., p. 11-13.

29 Muriel D. Vogel, "The Relation of Personality Factors to GSR Conditioning of Alcoholics: An Exploratory Study", Canadian Journal of Psychology, Vol. 14, No. 4, 1960, p. 275-280.

30 Harvey A. Sweetbaum, "Comparison of the Effects of Introversion-Extraversion and Anxiety on Conditioning", Journal of Abnormal and Social Psychology, Vol. 66, No. 3, 1963, p. 249-254.

2. Anxiety and Complex Conditioning.

When one turns to the experimental literature concerned with the relationship between personality, particularly anxiety, and complex conditioning or learning the findings are again found to be somewhat conflicting but still showing a certain consistency. Most of these studies, despite exceptions, tend to show that anxiety as measured by a wide variety of questionnaire scales has a detrimental influence on complex conditioning. Performance tasks usually involve classical experimental designs requiring the subject to make complex discriminations of some kind. Reviews of the experimental literature supporting or confirming the general finding that high anxious subjects condition better in simple classical situations and more poorly in complex situations when compared to low anxious subjects have been made independently by several investigators.[31,32,33]

Recent experimental findings also indicate that anxious subjects tend to show greater detrimental performance effects compared to non-anxious subjects in complex

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31 Percival M. Symonds, "Emotion and Learning", in What Education Has To Learn from Psychology, 3rd Ed., Bureau of Publications, Teachers College Columbia University, (no publication date), p. 61-74.

32 Barclay Martin, "The Assessment of Anxiety by Physiological Behavioral Measures", Psychological Bulletin, Vol. 58, No. 3, 1961, p. 234-255.

33 Sarason, Op. Cit., p. 403-415.

discrimination tasks where motivational threat (failure report, shock threat) is high.[34,35] Most of these experimental designs appear to involve nothing more than complex classical conditioning situations with various kinds of aversive or noxious stimuli added.

Still other studies, however, have shown results contradictory to or inconsistent with the general findings reported above.[36] The plausible reasons for these discrepancies are numerous but primarily include differences in anxiety measures used, correlations versus extreme group comparisons, size of sample, kind and level of complex task, and kind and level of motivational threat used.

3. Anxiety and Alcoholic Personality Structure.

The gathering of data which will contribute to a clearer understanding of the kind of person who becomes addicted to alcohol is of central research interest in the study of alcoholism. Logically it has been thought that if a relatively constant combination of psychological

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34 Ibid., p. 404.

35 I.G. Sarason and E.G. Palola, "The Relationship of Test and General Anxiety, Difficulty of Task, and Experimental Instructions to Performance", Journal of Experimental Psychology, Vol. 59, No. 3, 1960, p. 185-191.

36 Zanwil Sperber, "Test Anxiety and Performance Under Stress", Journal of Consulting Psychology, Vol. 25, No. 3, 1961, p. 226-233.

characteristics were found in persons developing alcoholism, some light as to the etiology of the pathology could be deduced. However, despite the fact that individual research studies have reported psychological characteristics thought to be representative of alcoholics, there is too little agreement among investigators to conclude from their reports that a typical or consistent personality structure is present. As Sutherland, et al.[37] conclude in their critique of thirty-seven reasonably well controlled research studies of personality traits of alcoholics completed up to 1950, no satisfactory evidence has been presented to support a belief that alcoholics compose only one personality type or that they are homogeneous in personality structure. Leonard Syme[38] came to a similar conclusion in 1957 after reviewing the personality studies completed after 1950. Popham and Schmidt,[39] in 1962, after reviewing a decade of research done by the Alcoholism and Drug Addiction Research Foundation of Ontario, came to a similar conclusion.

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37 Edwin H. Sutherland, H.G. Schroeder and C.L. Tordella, "Personality Traits and the Alcoholic. A Critique of Existing Studies", Quarterly Journal of Studies on Alcohol, Vol. 11, 1950, p. 550.

38 Leonard Syme, "Personality Characteristics and the Alcoholic: A Critique of Current Studies", Quarterly Journal of Studies on Alcohol, Vol. 18, 1957, p. 288-302.

39 Robert E. Popham and Wolfgang Schmidt, A Decade of Alcoholism Research, Brookside Monograph No. 3, University of Toronto Press, 1962, p. 16-17.

Although research in the area of alcoholic personality structure has failed to reveal or isolate any common personality variables capable of contributing to a psychological theory of alcoholism, a unifying hypothesis which will explain the phenomenon of addiction within a psychological frame of reference is still being sought. In this search several original investigators, particularly Jellinek[40] and Horton,[41] ventured beyond the monistic personality trait theories of addiction and have formulated certain premises concerning the universal social use of beverage alcohol which appear to be particularly relevant with respect to the development of alcoholism. These basic assumptions may be summarized as follows:

1. Consumption of beverage alcohol is an almost universal phenomenon; with but few exceptions it is ingested in some form by all racial, national and cultural groups.

2. Although numerous reasons are given for this almost universal use, i.e., food, medicine, social purposes, religious use, ceremonial value, etc., the principal physiological effect of alcohol is the alteration of metabolism in

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40 E.M. Jellinek, "The Alcohol Problem: Formulations and Attitudes", Quarterly Journal of Studies on Alcohol, Vol. 11, 1943, p. 453.

41 Donald Horton, "The Functions of Alcohol in Primitive Societies: A Cross-cultural Study", Quarterly Journal of Studies on Alcohol, Vol. 4, 1943, p. 223.

such a manner that a progressive central nervous system depression or cortical anesthesia is created.

3. This anesthetic effect of alcohol on the cerebral cortex, in turn, uniquely alters psychological feeling states, particularly with respect to the reduction or alleviation of feelings of anxiety, frustration and conflict. Thus, in considering its widespread use, the anxiety reducing capacity of alcohol stands out as being unequivocally significant.

The obvious implications which may be drawn from the foregoing premises when considering the alcoholic is that, if the basic function of alcohol in normal social drinking is the reduction of anxiety, then it very likely serves this same function in pathological or excessive drinking. Thus, the exaggerated or persistent use of alcohol may be indicative of a need on the part of the alcoholic to reduce or alleviate comparably exaggerated feelings of anxiety.

Such an anxiety reduction hypothesis, as the above may be called, appears to be of heuristic value in the search for a more comprehensive and meaningful psychological interpretation of excessive or problem drinking. Yet, even though the function of alcohol were to be conceptualized in terms of anxiety reduction a contraindication of this hypothesis and a much greater problem presents itself when one considers the actual drinking behavior of the alcoholic.

How is it possible to state that the alcoholic seeks relief or release from tension or anxiety by ingesting alcohol when the very behavior which is supposed to achieve this end actually becomes so persistent, exaggerated and uncontrolled in practice that it leads to far more pain and conflict than it was intended to relieve? If a physiological dependence upon alcohol could be demonstrated such addictive behavior could be rationally explained. However, such an interpretation is without foundation for, unlike certain other addictions, no evidence for a specific physical dependence upon alcohol has ever been found. As a result of the apparent contradiction between the hypothesized function of alcohol and the actual consequences of alcoholism it would appear at first glance that the anxiety reduction hypothesis may not apply to alcoholics. However, when one turns to a consideration of the role which anxiety plays in conditioned learning the anxiety reducing function of alcohol is not only supported but a psychological explanation of the mechanism of addiction also follows from the conditioning principles which are involved.

Currently, several hypothetical learning formulations have been stated or restated relating the behavior of the alcoholic to a stimulus-response reinforcement theory of

learning.[42,43,44,45] All explicitly hold to an initial reinforcing period based on classical conditioning with instrumental avoidance learning at least being implied. The nuclear hypothesis, of course, is that the alcoholic is in a state of conflict, anxiety or tension and that alcohol alters this state and is consequently rewarding or reinforcing. Little or no research evidence is available, however, to substantiate the basic hypothesis that the problem drinker or alcoholic is, in fact, an anxious person with a low tolerance for stress and conflict although this is a common clinical assumption.[46]

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42 John J. Conger, "Reinforcement Theory and the Dynamics of Alcoholism", Quarterly Journal of Studies on Alcohol, Vol. 17, No. 2, 1956, p. 296-305.

43 Cyril M. Franks, "Alcohol, Alcoholism and Conditioning: A Review of the Literature and Some Theoretical Considerations", Journal of Mental Science, Vol. 104, No. 434, 1958, p. 14-33.

44 ————, "Behavior Therapy, The Principles of Conditioning and the Treatment of the Alcoholic", Quarterly Journal of Studies on Alcohol, Vol. 24, No. 3, 1963, p. 511-529.

45 Elaine Kepner, "Application of Learning Theory to the Etiology and Treatment of Alcoholism", Quarterly Journal of Studies on Alcohol, Vol. 25, No. 2, 1964, p. 279-291.

46 Morris E. Chafetz and Harold Demone, Alcoholism and Society, Oxford University Press, 1962, p. 49-55.

4. The Differentiation of Three Forms of Conditioning.

Unfortunately, the literature on conditioning and learning is confounded with respect to the differentiation between classical and instrumental conditioning and both of these situations and avoidance training. It has been only recently that modest attempts have been made to differentiate these designs. The essence of the problem seems to be that many different techniques for the study of conditioning and learning have and are being used without proper regard for the interrelations and differences between techniques. The comments concerning this problem made by Hebb,[47] Franks,[48] English and English,[49] and Bitterman[50] appear to be the most logically and functionally discriminative.

To this writer's knowledge the most functionally valid analysis and hopefully useful classification of learning designs is that of Bitterman.[51] The transposition of his

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47 D.O. Hebb, "The Distinction Between Classical and Instrumental", Canadian Journal of Psychology, Vol. 1[illegible], No. 3, 1956, p. 165-166.

48 Cyril M. Franks, "Some Fundamental Problems in Conditioning", Acta Psychologica, Vol. 14, No. 3, 1958, p. 223-246.

49 H.B. English and A.C. English, A Comprehensive Dictionary of Psychological and Psychoanalytical Terms, Longmans, Green and Co., New York, 1958, p. 107-108.

50 M.E. Bitterman, "Techniques for the Study of Learning in Animals: Analysis and Classification", Psychological Bulletin, Vol. 59, No. 2, 1962, p. 81-93.

51 Ibid.

classificatory system from animal to human conditioning seems to do no harm because of the generality of the schema. Briefly summarized and paraphrased the system is as follows:

Thorndikian Situations.- Here the investigator measures a change in behavior which springs from a contingency between some defined response and some motivationally significant state of affairs. What is essential only is a contingency of some specified event or circumstance on some measurable bit of behavior. In such situations like the problem box or maze learning the experimenter sets out to change behavior by manipulating its consequences, that is, by arranging a contingency between some motivationally significant state of affairs ('reinforcement') and the behavior in question. Thus, turning to the left in a T maze may be encouraged with food or discouraged with shock. An event that facilitates the occurrence of a response upon which it is contingent is called a <u>reward</u>; an event that has the opposite effect is called a <u>punishment</u>. An aversive stimulus is one whose onset is punishing and in what is called <u>escape training</u> the offset of such a stimulus serves as a reward.

In this classification system two main types of Thorndikian situations may be distinguished. The designation <u>unitary</u> Thorndikian situation (or T-1 situation) is used for any Thorndikian situation in which but a single

course of action is defined and the readiness with which it comes to expression (datum is time) is measured. The designation Thorndikian choice situation (or T-2 situation) is used for any Thorndikian situation in which two or more incompatible courses of action are defined and choice among them is studied (datum is error). Both T-1 and T-2 situations may also be 'chained". A chained T-2 situation would be a maze of many choice-points. Each of these situations, T-1 or T-2, may occur in generalized or discriminative form as well. In a discriminative problem the experimental environment is varied systematically from trial to trial, and with it the consequences of response. The capacity of the organism to discriminate the change is inferred from a corresponding variation in behavior. In a generalized problem there may be some variation in the experimental environment from trial to trial intentional or unintentional, and there may be some variation in the consequences of response, but there is no correlation between the two kinds of change, and hence no objective basis for systematic variation of behavior.

Pavlovian Situations.- Here the investigator measures certain aspects of a situation in which a sequence or conjunction of stimuli whose contiguity is independent of the organism's response is the only essential feature. Such a situation may be defined without reference either to

the occurrence in that situation of any particular kind of behavioral change, or to the functional properties of the stimuli which are paired. While a Thorndikian situation primarily deals with the modification of behavior as a result of its consequences with prediction predicated upon the law of effect, Pavlovian situations are based upon the association of stimuli or stimulus substitution--that is, the acquisition by one stimulus of some of the behavioral properties of a second stimulus as a function of the paring of the two stimuli.

In both Thorndikian and Pavlovian situations behavior is at first altered by the introduction of some motivationally significant stimulus such as food or shock (reinforcement) but as the experiment proceeds certain fundamental differences between the two designs emerge. In a Pavlovian experiment, reinforcement is scheduled without regard to response; the experimenter does not set out to shape behavior in some predetermined fashion, but only to study the way in which the functional properties of one stimulus are altered by virtue of its contiguity with another. The introduction of substitute stimuli is not contingent upon the organism's behavior. Thus Pavlovian reinforcements cannot be treated as rewards or punishments in any meaningful manner, nor can reward and punishment be distinguished in a Pavlovian experiment.

In a Thorndikian situation, on the other hand, the choice of the behavior which is to serve as the index of learning is independent of the choice of reinforcement; any of a variety of responses which the organism may make can be encouraged (shaped) with positive or negative reinforcement. However, in a Pavlovian experiment, the choice of reinforcement restricts the choice of a behavioral indicator. That is, even though the conditioned and unconditioned responses are not always identical, the experimenter must be guided in his measurement of learning by the functional properties of the reinforcing stimulus.

Pavlovian situations, like Thorndikian situations, may be conceived of as unitary or choice situations or as generalized or discriminative situations by the analogue breaks down with further analysis because Pavlovian situations require discrete trials. Nor does the notion of chaining have any application to Pavlovian situations.

Avoidance situations.- If an avoidance situation is defined as one in which the organism learns to make a response that prevents the onset of an aversive stimulus it cannot be classified as either Thorndikian or Pavlovian in design. This difficulty occurs because both designs are closely intertwined in avoidance learning. Initially, in avoidance training, a neutral stimulus is paired with an aversive stimulus, thereby acquiring certain arousing

properties (Pavlovian). But the pairing of stimuli is not for long entirely independent of the organism's behavior if the subject learns to make the response that prevents the occurrence of the aversive stimulus (Thorndikian). As the experiment proceeds the aversive stimulus is only reintroduced if the organism fails to make the conditioned response. This contingency of reinforcement on response, of course, is not displayed on the very first trial as it may be in pure Thorndikian situations, but emerges, if learning is taking place, out of an initial Pavlovian procedure. Because of this confounding of contingencies avoidance training seems to require a design classification of its own. Like Thorndikian situations, however, avoidance designs may be categorized as unitary or choice, generalized or discriminative, discrete and continuous, and they may also be chained. The design of any avoidance situation would require only that a sequence of stimuli is scheduled with the occurrence of the second contingent upon the failure of the organism to make some specified response to the first.

b. Conclusions.

A review of the experimental and clinical literature relative to personality and learning theory readily suggests that anxiety is one of the more fundamental nuclear explanatory concepts for the development of behavior pathology.

Unfortunately, the measurement of anxiety on either a questionnaire or behavioral level is complex and contradictory and several recent evaluations of research have noted the unreplicability and inconsistencies of many of the findings in this field.

Although complicated by numerous problems of measurement one relatively consistent finding with respect to anxiety has been its apparently functional relationship to conditionability. In general, but with certain exceptions, the literature indicates the following behavioral relationships which may be viewed as loose empirical generalizations derived from group data:

1. Two relatively independent dimensions of personality considered to be alternative anxiety constructs derived from drive theory (neuroticism) and excitation-inhibition theory (extraversion) have both been found in replicated studies to be related to conditionability.

2. Despite generalized statements in the literature that anxious subjects tend to condition more readily than non-anxious subjects, it has been noted by several investigators that high and low anxious subjects cannot be differentiated when the conditioning experiment is conducted using simple, positive conditioning stimuli.

3. High anxious subjects in comparison to low anxious subjects do condition more readily, however, in

simple classical conditioning situations where noxious stimuli are used.

4. High anxious subjects in comparison to low anxious subjects show detrimental performance when more complex learning or conditioning tasks are used.

5. Performance detriment in high anxious subjects may be increased by adding aversive threat to a complex discrimination task.

6. Differentiation of performance between high and low anxious subjects if a function of at least three variables: (a) anxiety, (b) motivational stress, and (c) task factors.

7. The failure of most researchers to clearly differentiate Pavlovian, Thorndikian and Avoidance conditioning situations may contribute to the inconsistent findings reported in the literature.

Taking into consideration the various functional relationships which a variety of questionnaire anxiety states may play in different kinds and levels of conditioning and learning it would appear that much research remains to be done before stable functional relationships can be established. One obvious need is to maximize the difference in performance between high and low anxious subjects by whatever means possible. Another need is to clearly differentiate the type of conditioning being used from other

conditioning models. Still another need is to explore more fully the specific intertwining of factors which are involved in superior versus inferior performance in both high and low anxious subjects. And, finally, such findings need to be related to relatively stable and enduring aspects of personality. It is to explore the interrelationships of certain of these factors that this study was directed.

CHAPTER II

STATEMENT OF THE PROBLEM

From the foregoing review of the major findings in the literature concerning personality and conditioning a theoretical rationale may be formulated for maximizing and more clearly differentiating the performance differential between high and low anxious subjects, and perhaps even point up certain differences in conditioning between normal and alcoholic subjects. Since anxious subjects do not appear to differ from non-anxious subjects in tasks requiring the development of simple positive classical conditioned responses, it may very well be, as some experimenters have pointed out, that simple classical positive conditioning is not affected by anxiety because fear or defensiveness is not a variable in such experiments.[1,2] On the other hand, since studies which demonstrate that anxiety improves learning performance have involved simple classical conditioning experiments with aversive stimuli, it may be that fear of aversive stimuli manifested as a simple defensive

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1 E.R. Hilgard, L.V. Jones and S.J. Kaplan, "Conditioned Discrimination as Related to Anxiety", Journal of Experimental Psychology, Vol. 42, 1951, p. 94-99.

2 D. Bindra, A.L. Paterson and J. Strzelecki, "On the Relation Between Anxiety and Conditioning", Canadian Journal of Psychology, Vol. 9, 1955, p. 1-6.

or avoidance response like eye-blink is the major performance variable in such experiments. The superior performance of anxious subjects in such experiments may result, then, primarily from the dynamogenic or excitatory potential which anxiety brings to a situation involving defensive or avoidance learning. It may also be that simple, apparently classical, avoidance situations actually include, in fact, elements of instrumental avoidance training in addition to the classical aspects of the learning situation. Even in complex classical discrimination situations, where high anxious subjects show detrimental performance in comparison to low anxious subjects, it may be that, insofar as the design does not call for an avoidance response, high anxious subjects may not respond efficiently because of the absence of a straightforward noxious stimuli to be avoided. In fact it may well be that high anxious subjects tend to make avoidance or defensive responses against noxious stimuli more readily than low anxious subjects regardless of the design of the situation if an appropriate opportunity is presented high anxious subjects to actually develop a clearly instrumental avoidance response.

One way of exploring this problem more fully would be to compare the performance differential between low and high anxious subjects on a straightforward avoidance learning task. Such a situation could include stress factors

presumably detrimental to high anxious subjects to determine whether or not such factors would affect high anxious subjects in an avoidance situation. At the same time the experiment could include through appropriate instrumentation an alternative opportunity for the high anxious subject to selectively attend to an incidental pain-avoidance aspect of the total situation.

Although the literature on the role of personality, particularly anxiety, in learning and conditioning is extensive little research has been done with respect to the function of personality in instrumental avoidance learning. By definition an avoidance learning situation is one in which the subject learns to make a response that prevents the onset of an aversive stimulus.[3] In order to make the avoidance response the subject must have some prior conditioning in order to use the neutral stimulus as a discriminative stimulus. On this level, conditioning is by associative pairing regardless of the level of complexity and may be defined as Pavlovian (classical) conditioning. However, following the identification of the discriminative stimuli the subject learns to make the response that leads to the non-occurrence of the noxious stimuli. On this level,

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3 Gregory A. Kimble, Hilgard and Marquis' Conditioning and Learning (Revised), New York, Appleton-Century-Crofts, 1961, p. 68-69.

conditioning is Thorndikian (instrumental) since reinforcement is contingent upon the subject's response. As long as the subject makes the correct response the reinforcement of the aversive stimulus does not occur. In this way the subject's behavior is modified (shaped) as a function of its consequences.

Since avoidance training cannot be classified unequivocally as Pavlovian or Thorndikian because of the equivocation of reinforcement contingencies it has been suggested that avoidance training be categorized as a separate type of conditioning.[4]

On empirical as well as theoretical grounds it is quite possible that personality factors in the conditioning situation described above would tend to be quite different from that found in other studies relating personality factors to conditioning and learning. This in part could be the result of the unique aspect of avoidance learning situations in that they incorporate both classical as well as instrumental features of conditioning both simultaneously and/or successively.

The immediate purpose of this study then was to investigate the functional relationships, if any, between a particular category of conditioning, namely, complex

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4 M.E. Bitterman, "Techniques for the Study of Learning in Animals: Analysis and Classification", Psychological Bulletin, Vol. 59, No. 2, 1962, p. 81-93.

instrumental avoidance stress learning, and two orthogonal dimensions of personality considered to be alternative anxiety constructs derived from drive theory (neuroticism) and excitation-inhibition theory (extraversion).

Actually only one study has been reported in the literature which is comparable to the present study.[5] It too represents an attempt to investigate the relationship between the same anxiety constructs used in the present design and instrumental avoidance learning. However, the avoidance behavior measured in this study, finger withdrawal from strong electric shock, involves a simple rather than a complex task. Further, this design does not incorporate a feature considered to be essential by definition to an instrumental avoidance situation, namely, the opportunity for the subject to actively learn to make the response which leads to the non-occurrence of the noxious stimulus. Incidently, the results of this study showed no difference in performance between anxious and non-anxious subjects on either the neuroticism or the extraversion dimension.

The problem which presents itself may be stated as follows: Can the theoretical postulates and empireal findings underlying the relationship between anxiety and

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5 P.O. Davidson, R.W. Payne, and R.B. Sloane, "Introversion, Neuroticism and Conditioning", Journal of Abnormal and Social Psychology, Vol. 65, No. 2, 1964, p. 136-143.

various forms of conditioning and learning in human subjects be extended to apply to complex instrumental avoidance learning? And, if certain relationships are found, which of two major alternative theoretical anxiety constructs, drive theory or excitation-inhibition theory, will best account for any functional relationships observed?

Further, no distinction has yet been made between differences in avoidance learning performance as a function of personality when such differences are related to the response competition between the incidental pain avoidance response (latent task) aspects of performance and the appropriate response (manifest task) aspects of performance. For example, it may be that highly anxious subjects tend to show performance detriment on appropriate task elements because motivation is focused primarily on the defensive or avoidance aspects of the task, while low anxious subjects may show somewhat reversed motivation and comparatively altered performance behavior.

The immediate purpose of this experiment, then, was to determine both the manifest and latent task performance differential between high and low anxious subjects in a complex instrumental avoidance learning situation.

A second purpose of this experiment relates to the clinical hypothesis that alcoholics have a heightened responsiveness to threat or a lower tolerance for stress or

conflict situations than normals. In short, that they are highly anxious individuals who use alcohol, at least initially, as an instrumental anxiety reducing technique. It has never been experimentally determined, however, whether alcoholics do actually differ from normals in terms of experimental performance under stress. Further, if alcoholics do differ from normals in terms of performance under stress, is the difference related to or a function of personality? Thus, a second purpose of this experiment was to determine the manifest and latent task performance differential between alcoholics and normals, and high and low anxious subjects both alcoholic and normal, in a complex instrumental avoidance learning situation.

Formally stated null hypotheses to be tested include the following:

1. When anxiety is defined in terms of either drive theory or excitation-inhibition theory, highly anxious subjects, both alcoholic and normal, will not show significantly greater detrimental performance effects than low anxious subjects on the manifest aspects of an instrumental avoidance learning task.

2. When anxiety is defined in terms of either drive theory or excitation-inhibition theory, highly anxious subjects, both alcoholic and normal, will not show significantly lesser detrimental performance effects than low anxious

subjects on the latent aspects of a complex instrumental avoidance learning task.

3. No significant difference in performance on either the manifest or the latent task will be found when a group of normal subjects is compared to a group of alcoholic subjects matched for sex, age, education and intelligence.

4. Factors of age, education and intelligence will not be found to be significantly related to either the manifest or the latent task aspects of performance.

CHAPTER III

METHOD

In keeping with the hypotheses to be tested the research design called for the evluation of two groups, namely, a normal group and an alcoholic group. The evaluation itself called for the measurement of each subject in each group in terms of his relative position on two dimensions of questionnaire personality structure and in terms of his performance on a complex instrumental avoidance learning task. The manner in which this was done and the rationale for the procedure will be treated systematically in this chapter in the following sections: 1) Subjects; 2) Questionnaire Anxiety Tests; 3) Avoidance Learning Apparatus; 4) Criterion measures of Questionnaire Anxiety and Avoidance Learning; 5) Controls; 6) Procedure; 7) Statistical Analysis.

1. Subjects.

Alcoholic Group.- The subjects in this group consisted of fifty abstinent volunteer male problem drinkers drawn from the membership of several alcoholic sub-cultures of two large metropolitan and suburban areas. Evidence of alcoholism was determined by current membership in Alcoholics Anonymous or previous or current treatment for problem drinking. Excluded from the study were those alcoholics who

were found to be physically handicapped, on mood-altering medication of any kind, and those who were functionally illiterate.

Normal Group.- The subjects in this group consisted of fifty volunteer males who were drawn from the same approximate geographic area as the alcoholic group. These subjects were also group matched for age, education and intelligence with the alcoholic group. While there is little evidence in the literature that these four parameters of sex, age, education and intelligence do significantly affect conditioning experiments in any way, they were controlled, nevertheless, as a precautionary measure.

2. Questionnaire Anxiety Tests.

It was crucial for the test of the hypothesis that avoidance learning was functionally related to either the neuroticism or the extraversion dimension of personality that several reasonably reliable and valid estimates of each of these so-called anxiety variables be obtained. The final decision to use the neuroticism and the extraversion scales of the Maudsley Personality Inventory (MPI),[1] the N, the Psychasthenia (Pt) and Social Introversion (SI) scales

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1 H.J. Eysenck, The Maudsley Personality Inventory, Educational and Industrial Testing Service, San Diego, 1962, 21 p.

of the Minnesota Multiphasic Personality Inventory (MMPI)[2] as well as the Taylor Manifest Anxiety Scale (MAS)[3] was based upon the fact that replicated factor analyses by independent investigators repeatedly have shown that these scales have high factor loadings on either the neuroticism or the extraversion dimension. This is illustrated in the factor analytic studies of Kassebaum, et al.,[4] Franks, et al.,[5] and Eysenck[6] as well as other factor analyses and correlational studies.

3. Avoidance Learning Apparatus.

Perhaps the single most important measure used in this experiment was the apparatus described below and designated as an instrumental avoidance learning test. Designed by Lykken, the apparatus was originally used by

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2 S.R. Hathaway and J.C. McKinley, Minnesota Multiphasic Personality Inventory, (Revised), New York, Psychological Corp., 1951, p. 31.

3 Janet A. Taylor, "A Personality Scale of Manifest Anxiety", Journal of Abnormal and Social Psychology, Vol. 48, 1953, p. 285-290.

4 G.G. Kassebaum, A.S. Couch, and P.E. Slater, "The Factorial Dimensions of the MMPI", Journal of Consulting Psychology, Vol. 23, No. 3, 1959, p. 226-236.

5 C.M. Franks, M.I. Jouleff, and A.E. Maxwell, "A Factorial Study of Certain Scales from the MMPI and the STDCR", Acta Psychologica, Vol. 17, 1960, p. 407-416.

6 H.J. Eysenck, (ed.), Handbook of Abnormal Psychology, New York, Basic Books, 1961, p. 21.

him as a measure of reactivity to shock by various diagnostic groups.[7] The apparatus used here was modeled after Lykken's and is contained in a metal box 15 x 10 x 10 inches square. Internally it is made up of a power transformer, a power supply tube, a time delay relay, two stepping switches, relays, condensers, terminal strips, resistors, and two error counters. Externally the front panel of the apparatus shows a horizontal row of four toggle switches with a red shock light on the left side of the panel and a green advance light on the right side of the panel. On the center panel directly above the middle toggle switches is located an error counter easily visible to the subject. A receptable for the shocking electrode is located on the bottom of the left side of the front panel. A shock error counter is also located on the back of the apparatus and is not visible to the subject. At the time of testing the shock electrode was attached to the first and third fingers of the subject's non-dominant hand. Shocks were administered instrumentally and instantaneously at a consistent level of 240 volts, a level found in a pilot study to be tolerated by most male subjects.

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7 D.T. Lykken, "A Study of Anxiety in the Sociopathic Personality", Journal of Abnormal and Social Psychology, Vol. 55, 1957, p. 6-10.

The actual manifest task which the subject performed consisted of learning by trial and error which one of the four toggle switches would light a green advance light. The three other switches, when pressed, registered errors on the error counter. Once the advance switch is located the switch location is automatically changed and the subject proceeds to find the next advance toggle switch location, etc., until he has completed one trial involving the location of twenty different and randomly located advance switches. The subject then repeats these trials for a maximum of thirty trials, always seeking to get a perfect score; that is, avoiding all error switches per trial and depressing only the advance switches. Meanwhile the subject's total errors cumulate on the visible error counter.

In the course of attempting to accomplish the manifest task the subject was also exposed to response competition in the form of receiving a shock when certain randomly distributed shocking error switches were depressed. Thus, at any given time or choice point a subject could attend selectively to the fact that one switch was a non-error advance switch and the other three were error switches, or he could focus on the fact that at any given time one of the three error switches produced shock. Shock errors were also recorded cumulatively on the error counter not visible to the subject.

Considering the rationale of the avoidance learning procedure and apparatus described above it may be pointed out that, by definition, the avoidance of all errors was the fundamental manifest task goal. The specific avoidance of shock errors, the latent task goal. It should be noted, however, that the subject was instructed to achieve only the manifest task. The task was designed in the manner indicated above in order to maximize those factors presumably detrimental to high anxious subjects, namely, 1) task complexity, 2) response competition, 3) noxious stimuli, and 4) failure report. Latent task behavior was also designed for analysis because of the possibility that high anxious subjects might perform inefficiently on the manifest task precisely because attention was selectively focused on the avoidance of shock rather than the avoidance of error. In terms of Bitterman's[6] notation for a straightforward avoidance learning design the overall task may be described as a chained avoidance learning situation (A) in which the choice point responses are made and measured in terms of error reduction (A-2) and in which the experimental environment is varied to demand discriminative behavior (d) over discrete ($_d$) trials. The complete notation would be designated as a chained A_d-2d design.

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6 M.E. Bitterman, "Techniques for the Study of Learning in Animals: Analysis and Classification", Psychological Bulletin, Vol. 59, No. 2, 1962, p. 81-93.

On a more molecular level this basic avoidance design may be viewed as one in which any and every specific toggle switch is initially a neutral stimulus. Following an unspecified period of Pavlovian conditioning any specified switch takes on the characteristics of either an aversive stimulus (shock error or error) or a response which terminates an aversive stimulus (green advance light, no errors, no shock). As the subject gradually learns to make the specific response which terminates the aversive stimulus his experimental behavior takes on elements of Thorndikian conditioning. The aversive stimulus is only reinstated when the subject does not make the response which terminates the aversive stimulus.

4. Criterion Measures.

Although the subject is told to go as fast as he can on the avoidance learning test time is not a criterion variable. The actual variables which were used as performance criteria were:

1. The total errors recorded cumulatively on the error counter observable to the subject acquired over each trial.

2. The total shock errors recorded cumulatively on the shock error counter not observable to the subject acquired over each trial.

3. The total errors recorded cumulatively on the error counter observable to the subject acquired over thirty (or less) trials.

4. The total shock errors recorded cumulatively on the error counter not observable to the subject acquired over thirty (or less) trials.

5. The percentage of shock errors (shock errors divided by total errors) per trial and per thirty criterion (or less) trials.

It should be observable from the above that the criteria of performance was the actual trial by trial and total trial behavior of the subject as this is related to the task of avoiding both shock and non-shock errors. The manifest task of making only green light advance switch selections is the actual avoidance response, the response that prevents the onset of an aversive stimulus. The extent to which the subject makes this avoidance response is what is measured negatively in terms of error reports.

On the other hand, the criteria of performance with respect to the latent task of avoiding shock errors is represented by the extent to which a subject succeeds in avoiding shock errors as compared by ratio to non-shock errors. The response competition between the manifest task (avoid errors) and the latent task (avoid shock) was thus measured in this manner.

Criterion measures on the questionnaire personality tests, actually independent variables in this design, consisted of the actual raw scores on both the neuroticism and extraversion scales of the MPI, the raw scores on the k scale, the Pt scale and the Si scale of the MMPI, and the raw score on the MAS. It perhaps should be noted that the extraversion scale of the MPI and the k scale of the MMPI involve reversed scoring. That is, high anxiety on the MPI is associated with low extraversion scores while high anxiety on the MMPI, k scale is associated with low k scores. The k correction usually applied to MMPI T scores was not applied to any of the MMPI scales used because of the risk of confounding the raw data with the questionable suppressor variable.

5. Controls.

As was mentioned previously, there is little evidence in the literature to suggest that conditionability is significantly related to age, education, intelligence or sex. However, since this research involved a more complex level of learning than simple conditioning the above parameters were controlled by: 1) using only males, 2) matching the normal and alcoholic groups for age, education and intelligence, and 3) correlating all avoidance learning performance criteria with age, education and intelligence. Age was measured in terms of age last birthday. Education was measured in terms

of last formal school grade completed. Intelligence was measured directly with the Shipley-Hartford Retreat Scale[9] and converted to an estimated Wechsler Adult Intelligence Scale equivalent score standardized on a Minnesota hospital population.[10,11] In order to avoid experimenter bias[12,13] a naive assistant gave all tests and associated preliminary instructions.

6. Procedure.

All subjects were first given the MPI, the MAS, the MMPI booklet form and a vital statistics questionnaire for completion. Then each subject was individually scheduled for supervised testing with the Shipley Scale and the avoidance

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9 W.C. Shipley, Shipley-Hartford Retreat Scale: Manual of Directions and Scoring Key, Hartford, Conn., Hartford Retreat, 1940, 4 p.

10 S.K. Zines and Helen Simmons, "The Shipley-Hartford Scale and the Loppelt Short Form as Estimators of WAIS IQ in a State Hospital Population", Journal of Clinical Psychology, Vol. 15, 1959, p. 452-453.

11 A.N. Wiens and J.H. Banaka, "Estimating WAIS IQ from Shipley-Hartford Scores: A Cross-Validation", Journal of Clinical Psychology, Vol. 16, No. 4, 1964, p. 452.

12 Robert Rosenthal, "Experimenter Outcome-Orientation and the Results of the Psychological Experiment", Psychological Bulletin, Vol. 61, No. 6, p. 405-412.

13 R.L. Kanz, D.J. Delprato, D.R. Mattee, C.E. Persons, and R.H. Schappe, "The Experimenter Effect", Psychological Bulletin, Vol. 63, No. 4, 1965, p. 223-232.

learning apparatus by a naive assistant. Instructions to the assistant and the subject were in written form and were systematically followed throughout the testing with the learning apparatus. Instructional details are contained in Appendix 1. The total testing and scoring time for each subject took about two and one half hours.

7. Statistical Analysis.

It was originally intended that the data involving the relationships between personality constructs as measured by the six anxiety variables and the avoidance learning performance as measured by manifest and latent task scores would be analyzed by means of a 2 x 2 x 6 analysis of variance design. However, it was soon learned that significant differences between cell sizes developed precluding the use of analysis of variance. Further, the elimination of cases to produce equal cell sizes would have resulted in such a reduction in N's that the loss of data was considered to be excessive. Consequently it was decided to analyze all comparative data in terms of Fisher's t tests.

CHAPTER IV

RESULTS

Pertinent findings and comparative results found in this study will be reported in this chapter under the following section headings: 1) Matching for Age, Education and Intelligence; 2) Relationship of Matching to Performance Variables; 3) Group Performance on Criterion Anxiety Variables; 4) Learning Performance Differential Between Selected Groups.

1. Matching for Age, Education and Intelligence.

The attempt to match the normal group with the alcoholic group for age, education and intelligence was successful as indicated in Table 1, page 44. No significant differences between groups on any of these variables were obtained. However, all three variables are somewhat above the expected mean for a random sample of the general population. This occurs primarily because no attempt was made to obtain a random sample of subjects. Rather, volunteer alcoholic subjects were first obtained and then normals were selected for group matching with that primary group.

Table 1.-

Means, SDs, and Significance of Difference Between Normals and Alcoholics on Matching Variables.

Variable	Normals(N=50) Mean	SD	Alcoholics(N=50) Mean	SD	t
Age	38.36	7.07	39.12	6.14	.49
Education	13.98	2.83	13.04	2.35	1.79
I.Q.[a]	114.80	6.21	113.64	8.20	.82

a Converted data.

2. Relationship of Matching to Performance Variables.

The relationship of age, education and intelligence designated as control variables to performance is shown in Table II, page 46, as Pearson r's. Correlations are shown between the control variables and each of the major task factors, namely, total errors and shock errors, for both normals and alcoholics. Certain consistent and statistically significant relationships are indicated. For example, as age increases total errors and shock errors tend to increase for both groups. As education decreases errors tend to increase for both groups, especially alcoholics. As intelligence decreases errors also tend to increase for both groups. While none of the correlations are high enough to appreciably or meaningfully account for observed performance differences, they all appear, nevertheless, to be uniformly associated with optimum cortical functioning. Considering the complex nature of the performance task such relationships are probably to be expected.

3. Performance on Criterion Anxiety Variables.

The comparison of the performance of both normals and alcoholics on each of the six anxiety questionnaire tests is shown in Table III, page 47, in terms of group means, standard deviations and significance of difference. As indicated, significant differences between group means were

Table II.-

Correlation of Matching Variables with Total Errors and Shock Errors for Normals and Alcoholics.

	Normals (N=50)		Alcoholics (N=50)	
Variable	Total Errors	Shock Errors	Total Errors	Shock Errors
Age	.243	.297[b]	.330[b]	.309[b]
Education	-.294[b]	-.233	-.4[illegible][c]	-.5[illegible]3[c]
I.Q.[a]	-.367[c]	-.347[c]	-.378[c]	-.333[b]

a Converted data.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

Table III.-

Means, SDs, and Significance of Difference Between Means of Normals and Alcoholics on Criterion Anxiety Variables.

Criterion[a]	Normals (N=50) Mean	SD	Alcoholics (N=50) Mean	SD	t[b]
1. MPI-N	17.16	9.93	27.62	11.70	4.91[c]
2. MAS	10.10	6.06	21.94	10.50	6.76[c]
3. MMPI-Pt	9.16	5.60	17.64	9.21	5.14[c]
4. MPI-S	26.52	10.96	24.06	10.44	1.16
5. MMPI-K	16.46	3.58	12.94	4.30	4.40[c]
6. MMPI-Si	24.90	10.23	28.82	10.92	.73

a Criteria 1, 2, 3, and 5 represent neuroticism dimension; criteria 4 and 6 the introversion-extraversion dimension.

b All t values are based on raw scores.

c Significant beyond the .01 level of confidence.

obtained on all of the neuroticism dimension criteria, with the alcoholic group obtaining the higher anxiety score in every case. A comparison of the standard deviations of the two groups on the neuroticism dimension variables also shows greater dispersion of the alcoholics about their means indicating a relatively broad individual difference continuum. A comparison of scores on the two variables designated as introversion-extraversion dimension criteria, on the other hand, shows no significant mean differences and little or no difference in dispersion about the mean between groups.

4. Learning Performance Differential Between Selected Groups.[1]

In comparing the performance differential between selected groups as a function of the several anxiety criteria it should perhaps first be pointed out that comparative differences were studied by dichotomizing the total sample of subjects (N = 100) into four elementary groups. The first dichotomy was between normals and alcoholics; the second between low and high anxious subjects using the mean for all subjects as the cutting point. This 2 x 2 classification then produced six primary sub-divisions each of which were systematically compared in terms of 1) low to high anxious normals; 2) low to high anxious alcoholics; 3) low anxious

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1 See Appendix 2 for summary data sheets.

normals to low anxious alcoholics; 4) high anxious normals to high anxious alcoholics; 5) all low anxious subjects to all high anxious subjects; and, 6) all normals to all alcoholics. Six paired group comparisons were thus made for each of the major learning performance criteria. Total cumulative errors (manifest task), total cumulative shock errors (latent task) and ratio of total cumulative shock errors to total cumulative errors (shock ratio) were designated as learning performance criteria. In addition, massed trial learning curve comparisons were also made for both normals and alcoholics and low and high anxious subjects in terms of total error and shock error performance.

Criterion 1: Maudsley Personality Inventory-Neuroticism.- The results of the analysis of means, standard deviations and significance of difference between means for the six comparisons noted above in terms of performance differences on cumulative total errors (manifest task) is shown in Table IV, page 50. As will be observed, when anxiety is defined in terms of the neuroticism dimension as measured by criterion 1, all high anxious subjects, both normals and alcoholics, show significantly greater detrimental performance effects than low anxious subjects (t is 2.37, P is beyond the .02 level) on the manifest task aspects of performance. When normals are compared to alcoholics on the manifest task the difference is even greater with the

Table IV.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Total Errors, Anxiety Being Measured by Criterion 1, Maudsley Personality Inventory-Neuroticism.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	37	229.51	132.59	1.76
High Anxious	13	326.3[illegible]	174.3[illegible]	
Alcoholics	50			
Low Anxious	15	359.20	254.27	.09
High Anxious	35	366.40	186.01	
Low Anxious	52			
Normals	37	229.51	132.59	1.81
Alcoholics	15	359.20	254.27	
High Anxious	48			
Normals	13	326.3[illegible]	174.3[illegible]	.67
Alcoholics	35	366.40	186.01	
All Subjects	100			
Low Anxious	52	266.92	190.65	2.37[b]
High Anxious	48	355.54	183.77	
All Subjects	100			
Normals	50	294.68	159.65	2.98[c]
Alcoholics	50	364.24	203.87	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

alcoholic group obtaining far more total errors than the normal group (t is 2.98, P is beyond the .01 level). When other sub-groups are compared on manifest task performance, however, no significant differences are observed although all mean differences are in the expected direction. That is, performance deficit in the form of higher total errors is greater in all comparisons for the group with the higher anxiety level. As will be observed dispersion about the mean is considerable for all sub-groups with alcoholics showing the highest standard deviations. It should also be observed that in terms of performance efficiency low anxious normals with a mean total error score of 229.51 represent the most efficient learners while high anxious alcoholics with a mean total error score of 366.40, the most inefficient.

The results of the analysis of means, standard deviations and significance of difference between means for cumulative shock errors (latent task) again using criterion 1 are shown in Table V, page 52. Mean differences for various groups found here are similar to those found for total errors except that the present differences are not as great. The only statistically significant difference occurs between normals and alcoholics (t is 2.52, P is beyond the .02 level). All differences, however, with the exception of that between low and high anxious alcoholics, are in the direction expected if it is assumed that subjects with higher anxiety

Table V.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Shock Errors, Anxiety Being Measured by Criterion 1, Maudsley Personality Inventory-Neuroticism.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	37	80.57	50.78	1.43
High Anxious	13	106.15	54.45	
Alcoholics	50			
Low Anxious	15	130.33	92.17	.56
High Anxious	35	115.29	63.25	
Low Anxious	52			
Normals	37	80.57	50.78	1.91
Alcoholics	15	130.33	92.17	
High Anxious	48			
Normals	13	106.15	54.45	.48
Alcoholics	35	115.29	63.25	
All Subjects	100			
Low Anxious	52	94.92	40.57	1.57
High Anxious	48	112.81	61.12	
All Subjects	100			
Normals	50	87.22	52.96	2.52[b]
Alcoholics	50	119.30	73.46	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

will show concomitant performance detriment. Further, since shock errors are expected to occur randomly 33.33 per cent of the time they may be expected to vary quite closely with any given group's total error performance. It should be observed, however, that even though a significant difference was noted between all low and all high anxious subjects on total errors a comparison of the same groups on shock errors produced no significant difference.

A somewhat different kind of performance comparison is shown in Table VI, page 54. Here various groups are compared for means, standard deviations and significance of difference between means in terms of ratio of shock errors to total errors. It should be pointed out that this type of comparison is independent of the number of total or shock errors received by each group or between groups. By way of example, it is known that all high anxious subjects obtain significantly higher total error scores and also higher, but not significantly higher, shock error scores than low anxious subjects. But when the two groups are compared in terms of ratio or percentage of shock errors to total errors high anxious subjects obtain a significantly lower shock error ratio (t is 2.35, P is between the .05 and .01 levels of confidence) than low anxious subjects. High anxious alcoholics are also found to obtain a significantly lower ratio of shock errors than low anxious alcoholics (t is 2.37, P is

Table VI.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Shock Error Ratio, Anxiety Being Measured by Criterion 1, Maudsley Personality Inventory- Neuroticism.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	37	.3487	.078	.34
High Anxious	13	.3387	.091	
Alcoholics	50			
Low Anxious	15	.3587	.068	2.37[b]
High Anxious	35	.3125	.043	
Low Anxious	52			
Normals	37	.3487	.078	.45
Alcoholics	15	.3567	.068	
High Anxious	48			
Normals	13	.3387	.091	.97
Alcoholics	35	.3125	.043	
All Subjects	100			
Low Anxious	52	.3516	.075	2.35[b]
High Anxious	48	.3197	.061	
All Subjects	100			
Normals	50	.3461	.083	1.34
Alcoholics	50	.3264	.060	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

between the .05 and .01 levels of confidence). Other comparisons in this table, although none are significant, show a consistent trend for high anxious subjects to obtain lower ratios of shock errors than low anxious subjects. Expressed another way, Table VI suggests that even though high anxious subjects consistently obtain higher total errors and shock errors than low anxious subjects, their relative percentage of shock errors is lower than that of low anxious subjects.

The ratio of shock errors to total errors may also be analyzed in terms of differences between obtained group shock error ratios and the expected ratio based on random expectancy which is .333. No significant differences were found, however, between the obtained ratios shown in Table VI and the expected ratio. Such findings indicate that even if differences between group means are found and trends indicated, none of the group means treated individually differ significantly from random expectancy.

Further evidence of differences in performance between normals and alcoholics on both total errors and shock errors is presented in Tables VII and VIII, pages 56 and 57. Here mean error reduction learning scores over thirty trials, tabulated in terms of six blocks of massed trials, show clearly the significant performance differential between normals and alcoholics on both the manifest and the latent task. As will be observed both groups tend to reduce their

Table VII.-

Means, SDs, and Significance of Difference Between Means of Normal and Alcoholic S's on Error Reduction Learning Curves for Total Errors.

Passed Trials	Normals(N=50) Mean	SD	Alcoholics(N=50) Mean	SD	t[a]
1-5	87.10	25.26	106.46	30.63	3.41[c]
6-10	58.06	31.24	72.64	39.95	2.05[b]
11-15	42.56	32.36	58.44	30.79	2.14[b]
16-20	29.20	29.51	50.88	30.27	3.04[c]
21-25	22.60	20.43	43.58	36.94	3.02[c]
26-30	14.96	21.70	32.24	35.72	2.85[c]

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

Table VIII.-

Means, SDs, and Significance of Difference Between Means of Normal and Alcoholic S's on Error Reduction Learning Curves for Shock Errors

Massed Trials	Normals(N=50) Mean	SD	Alcoholics(N=50) Mean	SD	t[a]
1-5	31.26	9.43	37.80	11.53	3.07[c]
6-10	19.96	12.65	24.50	14.35	1.69
11-15	14.82	12.29	18.70	15.00	1.40
16-20	9.56	10.15	15.36	13.75	2.30[b]
21-25	7.06	8.83	13.16	13.3.	2.67[c]
26-30	4.56	6.06	10.20	11.56	2.86[c]

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

error scores over the thirty trials but at all tabulated points on the curves the alcoholic group shows detrimental performance in comparison to the normal group. Keeping in mind the response competition involved because of the shock-error switches the pattern of significant differences between the two groups on total errors indicates that the alcoholic group is at first seriously detrimentally affected by the intermittent shocks as shown in the first five trials. Then a qualified recovery is made between trials eleven and fifteen, but performance is again detrimentally affected throughout the remainder of the trials. Although the alcoholic group is similarly detrimentally affected on their shock error trial by trial performance it should be noticed that significant differences between their scores and those of the normal group are fewer.

Similar differences are found when all low anxious subjects are compared to all high anxious subjects over massed trials. Tables IX and X, pages 59 and 60, show a pattern of mean differences on both total errors and shock errors similar to that found for normals and alcoholics. However, not as great a difference between the two anxiety groups on manifest task performance is found over each of the massed trials, and most important, significant differences on the latent task between low and high anxious subjects are absent with the exception of the one found on the first

Table IX.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Total Errors, Anxiety Being Measured by Criterion 1, Maudsley Personality Inventory-Neuroticism.

Passed Trials	Low Anxious(N=52) Mean	SD	High Anxious(N=48) Mean	SD	t[a]
1-5	88.56	26.03	105.69	26.02	2.98[c]
6-10	58.69	33.05	72.56	36.66	1.94
11-15	43.65	30.74	57.92	34.61	1.92
16-20	31.96	35.06	46.79	36.07	2.31[b]
21-25	26.77	35.40	40.15	34.55	1.89
26-30	17.29	29.65	30.44	30.63	2.15[b]

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

Table X.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Shock Errors, Anxiety Being Measured by Criterion 1, Maudsley Personality Inventory-Neuroticism.

Massed Trials	Low Anxious(N=52) Mean	SD	High Anxious(N=46) Mean	SD	t^a
1-5	32.11	11.04	37.15	10.44	2.32[b]
6-10	21.02	14.35	23.62	12.55	[illegible]
11-15	15.85	14.00	17.75	12.65	.70
16-20	10.95	12.53	14.21	12.60	1.35
21-25	8.60	12.12	11.46	11.05	1.11
26-30	6.23	10.34	8.62	9.50	1.10

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

massed trial. Thus, despite their comparative detrimental performance on the manifest task, high anxious subjects do nearly as well as low anxious subjects on the latent task.

Figure 1, page 62, offers a graphic representation of the massed trial performance noted above for normals and alcoholics and for low and high anxious subjects. As will be observed, all curves show various degrees of rather steep negative acceleration. Thus, learning is rapid at first but then the rate of improvement gradually, if imperceptibly, decreases. Similar curves are commonly observed in the acquisition of complex skills.

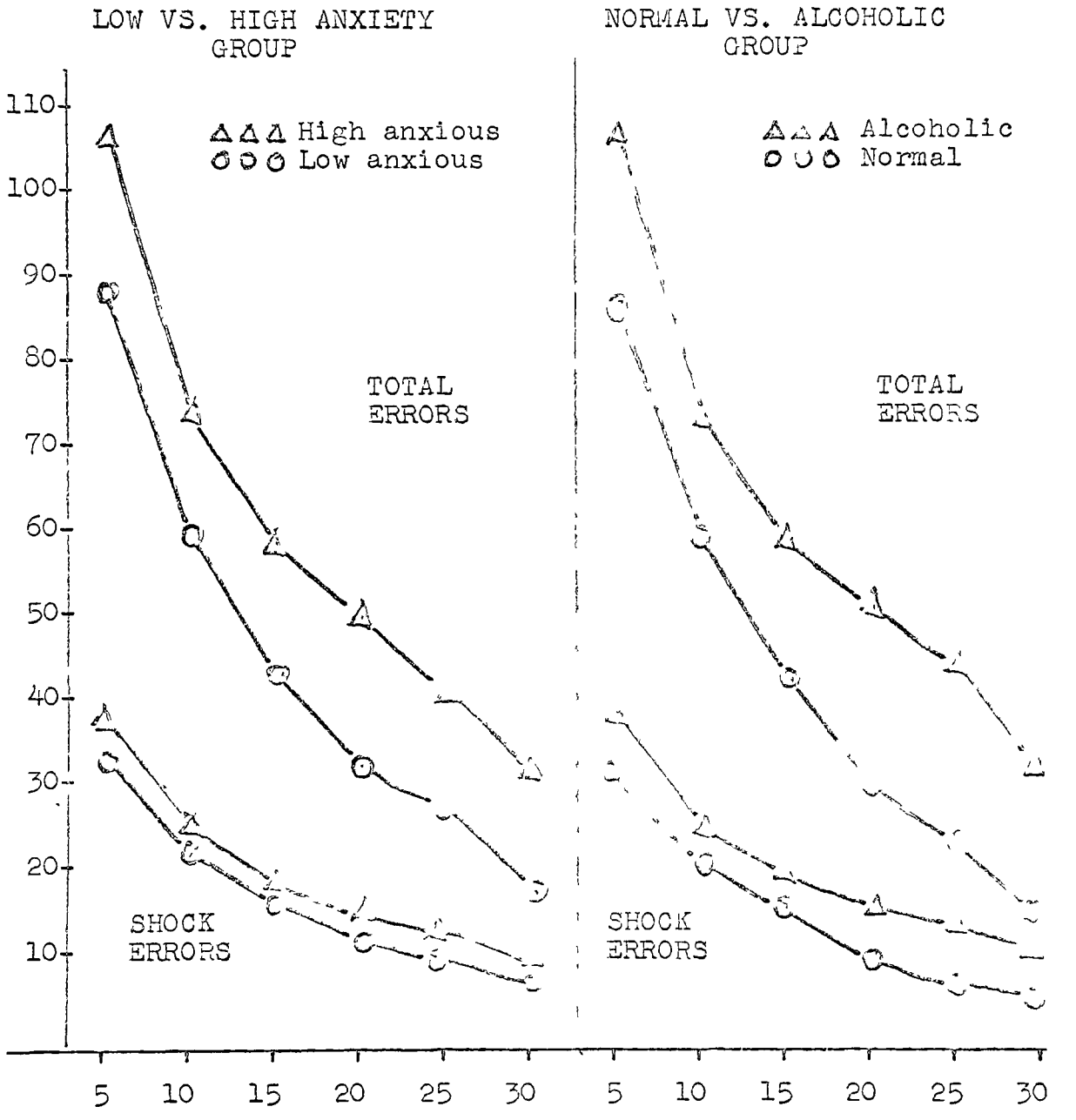

Figure 1.- Mean total error and shock error avoidance learning curves for low anxious vs. high anxious S's (left) and normals vs. alcoholics (right). Anxiety was measured by Criterion 1 (Maudsley Personality Inventory-Neuroticism).

Criterion 2: Taylor Manifest Anxiety Scale.- The results of the analysis of means, standard deviations and significance of difference between means for various sub-groups in terms of performance differences on cumulative total errors (manifest task) is presented in Table XI, page 64. Here it may be observed that when anxiety is defined in terms of the neuroticism dimension as measured by criterion 2, high anxious subjects, both normals and alcoholics, show significantly greater detrimental performance effects than low anxious subjects (t is 2.52, P is beyond the .02 level) on the manifest task aspects of performance. The comparison of mean score differences between all normals and all alcoholics is included here for purposes of comparison. And, again, this comparison of difference produces the highest level of significance. When other sub-groups are compared on manifest task performance no significant differences are observed. All mean differences are in the expected direction, however, if one assumes that the group with the highest anxiety level will also show the highest level of detrimental performance. Once again low anxious normals with a mean total error score of 245.30 represent the most efficient learners while all high anxious subjects with a mean total error score of 368.05 represent those showing the greatest detrimental performance.

Table 21.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Total Errors, Anxiety Being Measured by Criterion 2, Taylor Manifest Anxiety Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	43	245.30	151.60	1.15
High Anxious	7	312.29	129.50	
Alcoholics	50			
Low Anxious	17	333.88	216.31	.71
High Anxious	33	379.08	203.19	
Low Anxious	60			
Normals	43	245.30	151.60	1.50
Alcoholics	17	333.88	216.31	
High Anxious	40			
Normals	7	312.29	129.50	1.05
Alcoholics	33	379.08	203.19	
All Subjects	100			
Low Anxious	60	270.43	177.10	2.52[b]
High Anxious	40	368.05	194.03	
All Subjects	100			
Normals	50	294.60	150.69	2.96[c]
Alcoholics	50	364.24	203.87	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

The results of the analysis of means, standard deviations and significance of difference between means for cumulative shock errors (latent task) as measured by criterion 2 is shown in Table XII, page 66. Mean differences for various sub-groups found here are similar in direction to those found for total errors, except that differences are not as great. Here two statistically significant differences occur; that between normals and alcoholics, already reported, and that between all low to all high anxious subjects (t is 2.28, P is beyond the .02 level). As in previous comparisons, all additional differences are in the expected direction.

A comparison of means, standard deviations and significance of difference between means in terms of ratio of shock errors to total errors is presented in Table XIII, page 67. No significant statistical differences are found between sub-groups in terms of this analysis indicating that any group classified in terms of criterion 2 obtained shock errors in the same relative ratio to total errors as any other group. As would be expected from an analysis of the various shock error ratios shown in this table no significant differences were found between the obtained ratio and that which would be anticipated on the basis of random expectancy.

Since error reduction learning curve scores for normals and alcoholics have already been presented only the results of differences in trial by trial performance for all

Table XII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Shock Errors, Anxiety Being Measured by Criterion 2, Taylor Manifest Anxiety Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	43	83.68	41.53	.97
High Anxious	7	107.71	56.89	
Alcoholics	50			
Low Anxious	17	109.06	74.53	.72
High Anxious	33	125.33	72.28	
Low Anxious	60			
Normals	43	83.68	41.53	1.24
Alcoholics	17	109.06	74.53	
High Anxious	40			
Normals	7	107.71	56.89	.66
Alcoholics	33	125.33	72.28	
All Subjects	100			
Low Anxious	60	91.02	59.97	2.20[b]
High Anxious	40	122.25	70.16	
All Subjects	100			
Normals	50	97.22	52.06	2.52[b]
Alcoholics	50	119.60	73.46	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

Table XIII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Shock Error Ratio, Anxiety Being Measured by Criterion 2, Taylor Manifest Anxiety Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	43	.3479	.077	.29
High Anxious	7	.3348	.108	
Alcoholics	50			
Low Anxious	17	.3219	.062	.37
High Anxious	33	.3286	.053	
Low Anxious	60			
Normals	43	.3479	.077	1.32
Alcoholics	17	.3219	.062	
High Anxious	40			
Normals	7	.3446	.108	.44
Alcoholics	33	.3286	.053	
All Subjects	100			
Low Anxious	60	.3406	.073	.76
High Anxious	40	.3297	.067	
All Subjects	100			
Normals	50	.3461	.083	1.34
Alcoholics	50	.3264	.080	

a All t values are based on raw scores.

low to all high anxious subjects will be discussed here. As shown in Tables XIV and XV, pages 69 and 70, significant differences are obtained throughout most of the massed trials when low and high anxious subjects are compared on both manifest and latent task performance. The pattern appears again to be one in which high anxious subjects show initial performance detriment with a tendency to recover between trials six to fifteen but then comparative detrimental performance is resumed throughout the remaining trials.

Figure 2, page 71, shows massed trial learning performance over thirty trials for low and high anxious subjects and, for comparison purposes, normals and alcoholics, on both the manifest and the latent task. All curve characteristics are similar in most respects to those found for criterion 1.

Table XIV.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Total Errors, Anxiety Being Measured by Criterion 2, Taylor Manifest Anxiety Scale.

Passed Trials	Low Anxious(N=60) Mean	SD	High Anxious(N=40) Mean	SD	t[a]
1-5	89.20	20.46	108.15	27.76	3.27[c]
6-10	59.42	34.97	74.25	37.41	2.04[b]
11-15	44.48	36.39	59.52	37.39	1.97
16-20	32.72	32.66	51.02	25.32	3.11[c]
21-25	26.47	33.01	43.27	37.03	2.29[b]
26-30	18.12	26.63	31.82	34.30	2.10[b]

a All t values are based on raw scores.

b Significant between the .05 and the .01 levels of confidence.

c Significant beyond the .01 level of confidence.

Table XV.-

Means, SDs, and Significance of Difference between Means of Low and High Anxious S's on Error Reduction Learning Curves for Block Errors, Anxiety Being Measured by Criterion 2, Taylor Manifest Anxiety Scale.

Massed Trials	Low Anxious (N=60) Mean	SD	High Anxious (N=40) Mean	SD	t[a]
1-5	31.80	10.37	38.62	10.72	3.12[c]
6-10	20.52	13.23	24.90	14.04	1.55
11-15	15.10	13.30	19.12	14.32	1.36
16-20	10.00	10.95	16.15	13.53	2.37[b]
21-25	8.10	10.25	13.12	13.04	2.03[b]
26-30	5.42	8.43	10.32	11.71	2.23[b]

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of Confidence.

c Significant beyond the .01 level of confidence.

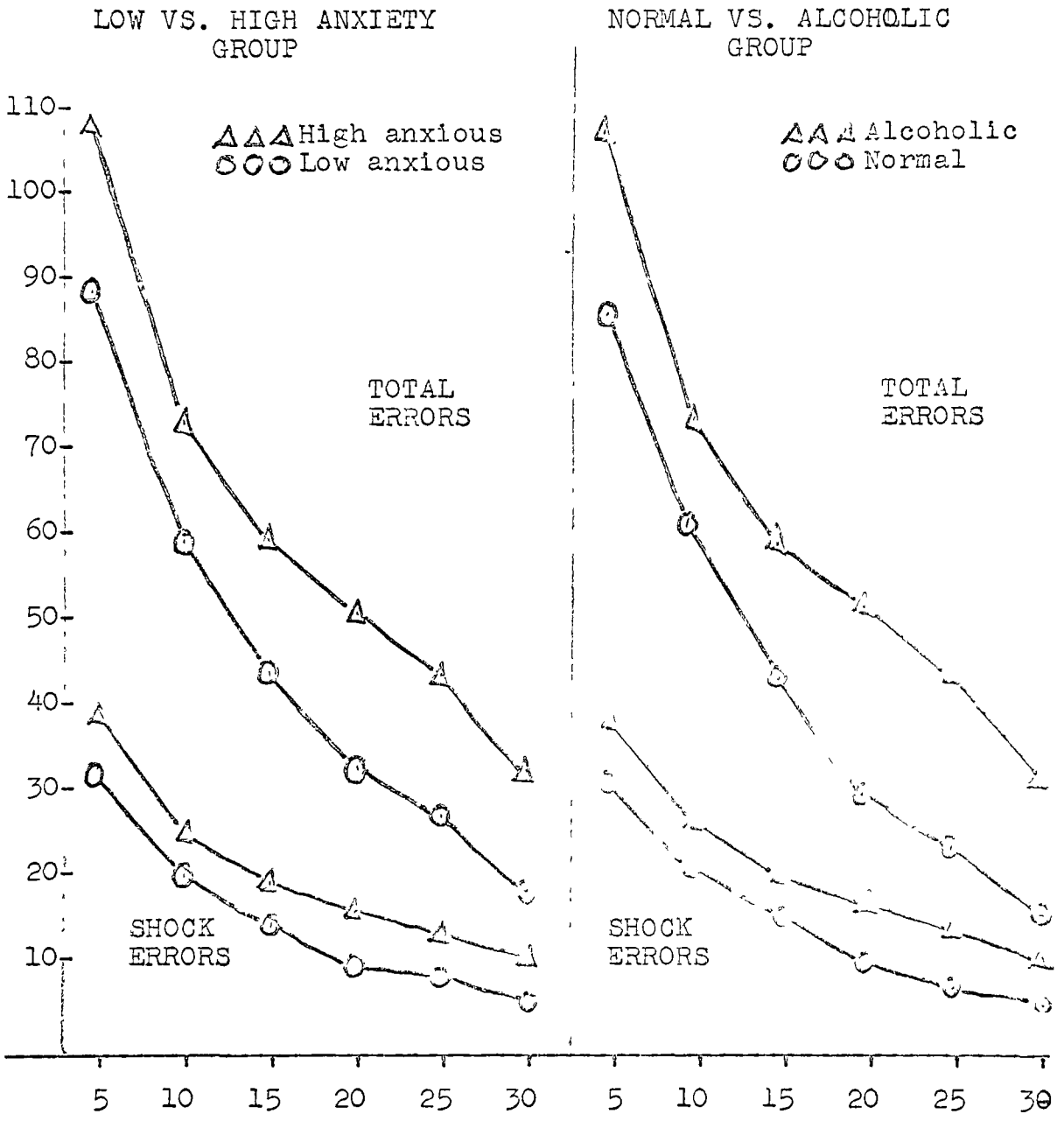

Figure 2.- Mean total error and shock error avoidance learning curves for low anxious vs. high anxious S's (left) and normals vs. alcoholics (right). Anxiety was measured by Criterion 2 (Taylor Manifest Anxiety Scale).

Criterion 3: Minnesota Multiphasic Personality Inventory-Psychasthenia Scale.- The results of the analysis of means, standard deviations and significance of difference between means for various sub-groups presented in terms of performance differences on cumulative total errors (manifest task) is shown in Table XVI, page 73. It may be observed here that when anxiety is defined in terms of the neuroticism dimension as measured by criterion 3 high anxious subjects, both alcoholic and normals, show significantly greater detrimental performance than low anxious subjects on the manifest task aspects of performance (t is 2.52, P is beyond the .02 level). As usual, however, the mean difference between normals and alcoholics is greater. When other sub-groups are compared on manifest task performance, only one comparison shows a significant difference. Here, low anxious normals obtain far more efficient total error learning scores than low anxious alcoholics (t is 2.49, P is beyond the .02 level). Again, all differences between all sub-groups are in the expected direction if a detrimental performance-high anxiety level hypothesis is used. The group with the greatest performance efficiency is low anxious normals with a mean total error score of 231.95. High anxious alcoholics with a score of 360.21 represent the group showing the greatest detrimental performance. This latter score happens to be the highest mean total error score obtained by any group in any

Table XVI.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Total Errors, Anxiety Being Measured by Criterion 3, MMPI-Pt.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	41	231.95	134.09	1.91
High Anxious	9	358.22	176.68	
Alcoholics	50			
Low Anxious	22	343.91	131.97	.62
High Anxious	28	380.21	226.50	
Low Anxious	63			
Normals	41	231.95	134.09	2.49[b]
Alcoholics	22	343.91	131.97	
High Anxious	37			
Normals	9	358.22	176.68	.29
Alcoholics	28	380.21	226.50	
All Subjects	100			
Low Anxious	63	271.05	150.49	2.52[b]
High Anxious	37	374.86	215.65	
All Subjects	100			
Normals	50	254.66	150.69	2.94[c]
Alcoholics	50	364.24	208.87	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

of the anxiety criterion classifications.

The results of the analysis of means, standard deviations and significance of difference between means for cumulative shock errors (latent task) are shown in Table XVII, page 75. Mean differences for various groups found here are similar to those found for total errors except that the present differences are not as great. Outside of the already reported significant difference between normals and alcoholics, the only other significant difference is between low anxious normals and low anxious alcoholics. While all differences are again in the expected direction except for that between low and high anxious alcoholics, it should be noted that the difference between all low to all high anxious subjects does not reach a significant level. Once again the results indicate that even though high anxious subjects show detrimental performance in terms of total errors, they sometimes reduce their latent task errors to the point where significant levels of differences do not occur.

When group comparisons are made in terms of mean differences in ratio of shock errors to total errors as indicated in Table XVIII, page 76, further evidence is found for assuming that shock error performance is a variable closely related to anxiety level. In Table XVIII it may be observed that high anxious alcoholics make significantly fewer shock errors by ratio than low anxious alcoholics

Table XVII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Block Errors, Anxiety Being Measured by Criterion 3, MMPI-Pt.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	41	83.16	50.95	1.61
High Anxious	9	105.56	56.47	
Alcoholics	50			
Low Anxious	22	121.18	67.97	.15
High Anxious	28	117.94	78.65	
Low Anxious	63			
Normals	41	83.16	50.95	2.25[b]
Alcoholics	22	121.18	67.97	
High Anxious	37			
Normals	9	105.56	56.47	.52
Alcoholics	28	117.94	78.65	
All Subjects	100			
Low Anxious	63	96.46	60.17	1.32
High Anxious	37	115.51	73.53	
All Subjects	100			
Normals	50	87.22	52.96	2.52[b]
Alcoholics	50	119.80	73.46	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

Table XVIII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Shock Error Ratio, Anxiety Being Measured by Criterion 3, MAI-Pt.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	41	.3556	.077	1.60
High Anxious	9	.3026	.067	
Alcoholics	50			
Low Anxious	22	.3446	.060	2.01[b]
High Anxious	28	.3120	.041	
Low Anxious	63			
Normals	41	.3556	.077	.62
Alcoholics	22	.3446	.060	
High Anxious	37			
Normals	9	.3026	.067	.2[illegible]
Alcoholics	28	.3120	.041	
All Subjects	100			
Low Anxious	63	.3513	.072	3.06[c]
High Anxious	37	.3096	.061	
All Subjects	100			
Normals	50	.3461	.073	1.34
Alcoholics	50	.3264	.060	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

(t is 2.01, P is at the .05 level). And all high anxious subjects make significantly fewer shock errors by ratio than all low anxious subjects (t is 3.06, P is beyond the .01 level). Although not statistically significant, all other low to high anxious comparisons in the table show the same direction of difference in shock ratio performance. Thus, despite the detrimental performance shown by high anxious subjects on both the manifest and latent tasks in comparison to low anxious subjects, various high anxious groups, nevertheless, manage to keep their shock errors sharply reduced as measured by shock error ratio.

When each of the twelve shock error ratios in Table XVIII are tested for significance of difference from random expectancy no significant differences are found. Such findings indicate that even if differences between selected group means are found to be significant, none of the group means treated as individual variations differ significantly from random expectancy.

Further evidence of differences in performance between low and high anxious subjects as measured by criterion 3 is presented in Tables XIX and XX, pages 78 and 79. Here mean total error and shock error reduction learning scores over thirty trials, and again tabulated in terms of massed trials, show clearly the significant performance differential between these two groups. Once again both groups tend to

Table XIX.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Total Errors, Anxiety Being Measured by Criterion 3, MMPI-Pt.

Based Trials	Low Anxious(N=63) Mean	SD	High Anxious(N=37) Mean	SD	t[a]
1-5	69.24	28.01	1[illegible].62	26.61	3.55[c]
6-10	60.24	32.66	74.05	35.33	1.76
11-15	45.43	34.93	5[illegible].14	40.07	1.71
16-20	33.21	30.85	51.66	43.01	2.26[b]
21-25	25.94	27.98	45.54	43.0[illegible]	2.45[b]
26-30	17.00	23.73	34.84	37.55	2.[illegible]7[b]

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

Table XX.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Shock Errors, Anxiety Being Measured by Criterion 3, MAS-t.

Passed Trials	Low Anxious(N=63) Mean	SD	High Anxious(N=37) Mean	SD	t[a]
1-5	32.75	11.22	37.57	10.00	2.20[b]
6-10	21.54	13.23	23.51	14.42	.67
11-15	16.46	13.45	17.27	14.46	.27
16-20	11.02	11.09	14.92	14.07	1.43
21-25	8.73	9.59	12.46	7.55	2.13[b]
26-30	5.97	8.77	9.70	11.75	1.69

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

reduce their errors over all trials, but at all tabulated points on the curves the high anxious group shows detrimental performance in comparison to the low anxious group. In keeping with previous findings, not as great a difference is found between the two groups on manifest task performance over each of the massed trials as is observed between normals and alcoholics in their trial by trial performance, although the same pattern of detrimental performance and recovery is observed. Also observed is the similar reduction in significant differences between groups on shock error performance. Thus, the observation must again be made that despite their comparative detrimental performance on the manifest task, high anxious subjects do nearly as well as low anxious subjects on the latent task aspects of performance.

Figure 3, page 91, illustrates the massed trial performance referred to above for low and high anxious subjects as measured by criterion 3 and for normals and alcoholics on both the manifest and the latent task. The general attitude of the curves is similar to those reported previously.

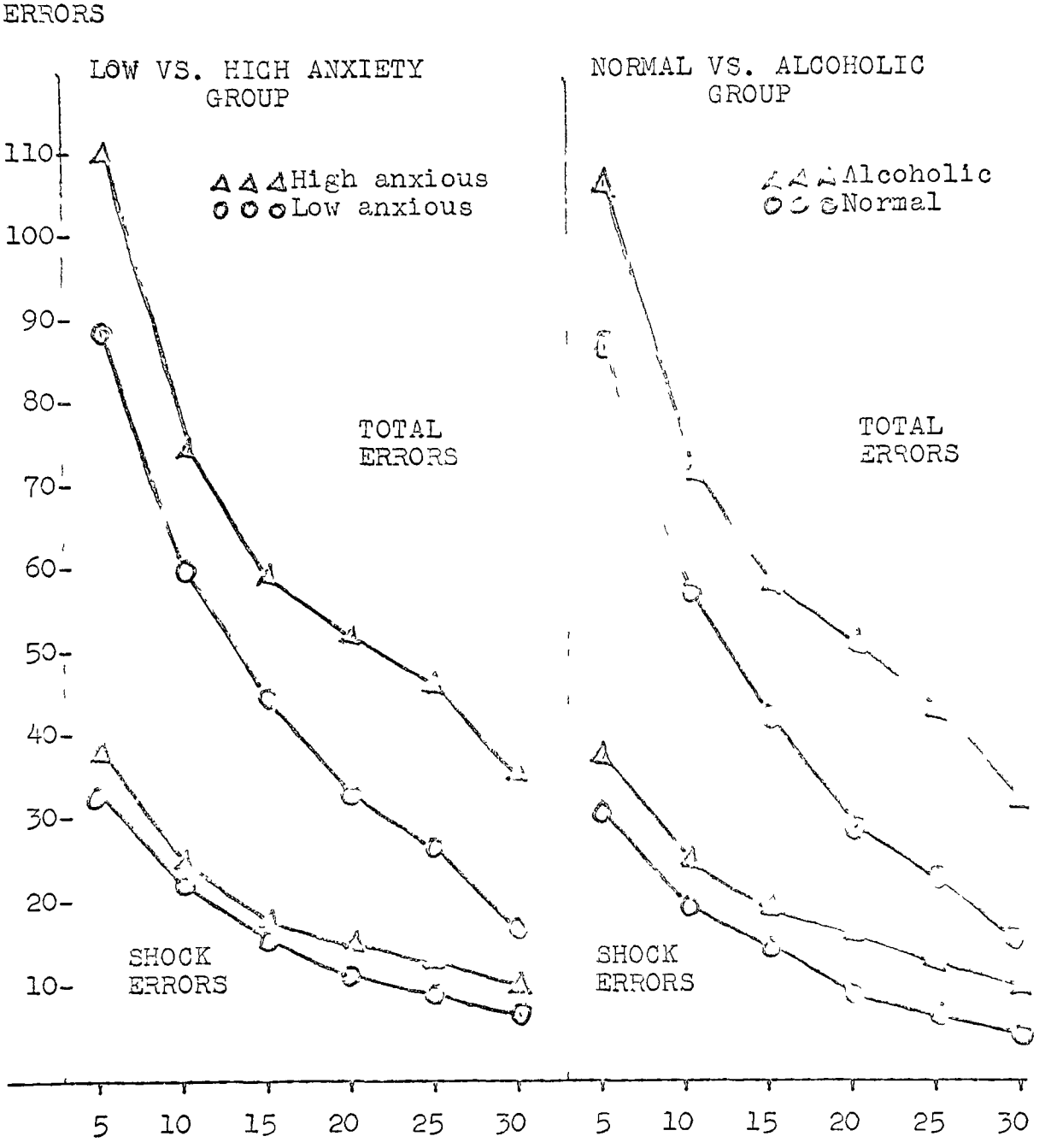

Figure 3.- Mean total error and shock error avoidance learning curves for low anxious vs. high anxious S's (left) and normals vs. alcoholics (right). Anxiety was measured by Criterion 3 (Minnesota Multiphasic Personality Inventory-Psychasthenia Scale).

Criterion 4: Maudsley Personality Inventory-Extraversion.- The results of the analysis of means, standard deviations and significance of difference between means for various sub-groups in terms of performance on cumulative total errors (manifest task) is presented in Table XXI, page 83. Here it may be observed that when anxiety is defined in terms of the excitation-inhibition dimension as measured by criterion 4, no significant differences are found except for those occurring as a result of the normal versus alcoholic dichotomy. Thus, low anxious normals and alcoholics, high anxious normals and alcoholics and all subjects dichotomized as normal versus alcoholic show significant mean differences in the expected direction. But all mean differentiations based upon a low versus high anxiety classification produce no significant mean differences. In fact, there is an insignificant tendency for high anxious subjects, introverts according to this criterion, to have lower scores than low anxious subjects; that is, extraverts. Thus, high anxious normals with a total error mean score of 240.36 represent the most efficient learners while, as might be expected, all alcoholics with a mean score of 364.24 represent those showing the greatest detrimental performance.

The results of the analysis of means, standard deviations and significance of difference between mean for cumulative shock errors (latent task) as measured by criterion 4

Table XXI.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Total Errors, Anxiety Being Measured by Criterion 4, Maudsley Personality Inventory-Extraversion.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	28	265.93	150.99	.59
High Anxious	22	240.36	149.09	
Alcoholics	50			
Low Anxious	26	365.58	199.40	.03
High Anxious	24	362.79	218.65	
Low Anxious	54			
Normals	28	265.93	150.99	2.42[b]
Alcoholics	26	365.58	199.40	
High Anxious	46			
Normals	22	240.36	149.09	2.19[b]
Alcoholics	24	362.79	218.65	
All Subjects	100			
Low Anxious	54	313.91	182.86	.25
High Anxious	46	304.24	198.28	
All Subjects	100			
Normals	50	254.68	150.69	2.98[c]
Alcoholics	50	364.24	206.07	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

is shown in Table XXII, page 85. Mean differences between various sub-groups found here are negligible, it may be noted, except for the already reported significant difference between all normals and all alcoholics. Once again the low versus high anxious dichotomy as determined by this criterion produces no differences in performance. The notable non-significant differences that do occur are again the result of the differentiation of normals and alcoholics and not the result of an anxiety dichotomization.

A comparison of total errors to shock errors in terms of shock error ratio per group also produces no significant nor noticeable differences between sub-groups. As will be observed in Table XXIII, page 86, most shock ratios come very close to the 33.33 per cent expectancy level, thus no significant individual group differences from random expectancy are observed either.

Trial by trial error reduction learning curves expressed in terms of massed trials for low versus high anxious subjects on both total errors and shock errors is presented in Tables XXIV and XXV, pages 87 and 88. Again no significant differences between low and high anxiety groups are found on either performance variable.

This same massed trial learning performance over thirty trials is shown again in Figure 4, page 89, where it is compared to that achieved by normals versus alcoholics.

Table XXII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Shock Errors, Anxiety Being Measured by Criterion 4, Maudsley Personality Inventory-Extraversion.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	28	90.46	55.14	.49
High Anxious	22	83.09	49.74	
Alcoholics	50			
Low Anxious	26	123.58	71.87	.37
High Anxious	24	115.71	74.93	
Low Anxious	54			
Normals	28	90.46	55.14	1.53
Alcoholics	26	123.58	71.87	
High Anxious	46			
Normals	22	83.09	49.74	1.71
Alcoholics	24	115.71	74.93	
All Subjects	100			
Low Anxious	54	106.41	65.86	.47
High Anxious	46	100.11	66.17	
All Subjects	100			
Normals	50	87.22	52.96	2.52[b]
Alcoholics	50	119.30	73.46	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

Table XXIII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Shock Error Ratio, Anxiety Being Measured by Criterion 4, Maudsley Personality Inventory-Extraversion.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	22	.3521	.060	.44
High Anxious	28	.3414	.066	
Alcoholics	50			
Low Anxious	24	.3189	.054	.66
High Anxious	26	.3333	.061	
Low Anxious	46			
Normals	22	.3521	.060	1.17
Alcoholics	24	.3189	.054	
High Anxious	54			
Normals	28	.3414	.066	.29
Alcoholics	26	.3333	.061	
All Subjects	100			
Low Anxious	46	.3340	.066	.12
High Anxious	54	.3375	.076	
All subjects	100			
Normals	50	.3461	.063	1.34
Alcoholics	50	.3264	.060	

a All t values are based on raw scores.

Table XXIV.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Total Errors, Anxiety Being Measured by Criterion 4, Maudsley Personality Inventory-Extraversion.

Passed Trials	Low Anxious(N=54) Mean	SD	High Anxious(N=46) Mean	SD	t[a]
1-5	97.09	30.40	96.41	28.74	.11
6-10	64.93	34.37	65.85	37.63	.12
11-15	51.93	30.34	48.83	36.44	.41
16-20	40.44	34.66	39.57	39.42	.12
21-25	33.91	31.04	32.35	34.55	.21
26-30	25.61	29.05	21.24	32.62	.69

a All t values are based on raw scores.

Table XXV.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Shock Errors, Anxiety Being Measured by Criterion 4, Maudsley Personality Inventory-Extraversion.

Passed Trials	Low Anxious(N=54) Mean	SD	High Anxious(N=46) Mean	SD	t*
1-5	34.35	11.75	34.74	10.10	.17
6-10	22.15	13.60	22.41	13.89	.09
11-15	18.26	14.39	15.00	12.96	1.18
16-20	13.20	12.21	11.59	12.65	.64
21-25	10.24	10.44	9.96	13.04	.12
26-30	6.20	10.10	6.41	10.15	.07

* All t values are based on raw scores.

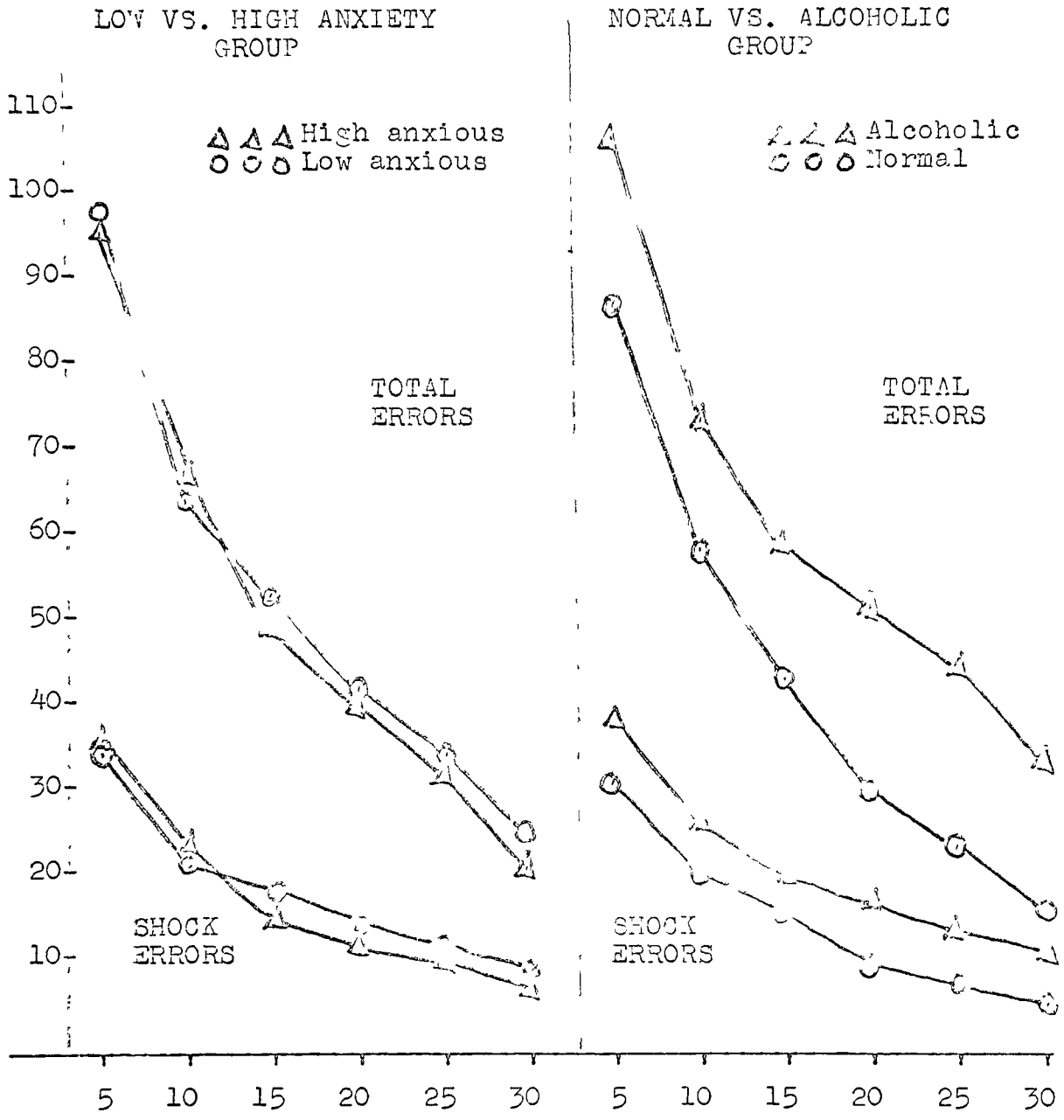

Figure 4.- Mean total error and shock error avoidance learning curves for low anxious vs. high anxious S's (left) and normals vs. alcoholics (right). Anxiety was measured by Criterion 4 (Maudsley Personality Inventory-Extraversion).

General curve characteristics are similar to those previously reported.

Criterion 5: Minnesota Multiphasic Personality Inventory-k Scale.- Results of the analysis of means, standard deviations and significance of difference between means for various sub-groups in terms of performance differences on cumulative total errors (manifest task) is presented in Table XXVI, page 91. When anxiety is defined in terms of the neuroticism dimension as measured by criterion 5, no significant differences are observed that can be related directly to the low versus high anxiety dichotomy. The significant differences that do occur, between the low anxious normals versus low anxious alcoholics and all normals versus all alcoholics, appear to take place primarily because of the more detrimental performance of alcoholics in general rather than to any really significant differences caused by overall anxiety level. However, with the exception of the slight reversal in direction between means of low versus high anxious alcoholics, all other mean relationships are in keeping with the high anxiety-detrimental performance hypothesis. It perhaps should be pointed out, also, that the low anxious normal group in criterion 5 has the lowest mean total error score of any group in the whole study. As indicated in Table XXVI it is 226.65. It should also be pointed out that reversed scoring has been applied to this anxiety variable;

Table XXVI.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Total Errors, Anxiety Being Measured by Criterion S, MMPI-K Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	34	226.65	136.19	1.10
High Anxious	16	314.25	293.69	
Alcoholics	50			
Low Anxious	20	369.20	206.52	.13
High Anxious	30	360.93	210.35	
Low Anxious	54			
Normals	34	226.65	136.19	2.69[b]
Alcoholics	20	369.20	206.52	
High Anxious	46			
Normals	16	314.25	293.69	.55
Alcoholics	30	360.93	210.35	
All Subjects	100			
Low Anxious	54	279.44	179.49	1.71
High Anxious	46	344.70	196.24	
All Subjects	100			
Normals	50	254.68	196.69	2.96[b]
Alcoholics	50	364.24	208.37	

a All t values are based on raw scores.

b Significant beyond the .01 level of confidence.

that is, high anxiety is associated with low MPI-k scale scores, low anxiety with high k scores.

The results of the analysis of means, standard deviations and significance of difference between means for various groups in terms of performance differences on cumulative shock errors (latent task) is presented in Table XXVII, page 93. Here it may be observed that mean differences for subgroups are similar in direction to those found for total errors. The significant mean differences between low anxious normals versus low anxious alcoholics, and all normals versus all alcoholics is again associated with detrimental alcoholic performance rather than overall anxiety level.

Despite the absence of significant mean differences directly attributable to anxiety on this criterion the general trend was for high anxious normals and alcoholics to get higher total error scores than low anxious normals and alcoholics. The trend was similar for shock error scores. But an analysis of the ratio of cumulative mean total error scores to cumulative mean shock error scores expressed as a shock error ratio again illustrates the tendency for high anxious normals and alcoholics to get a lower percentage of shock errors than low anxious normals and alcoholics. Table XXVIII, page 94, shows these relationships quite clearly. Thus, all comparisons between low and high anxious groups show the trend for high anxious groups to obtain relatively lower

Table XXVII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Shock Errors, Anxiety Being Measured by Criterion 5, MAL-K Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	34	81.74	51.69	1.04
High Anxious	16	98.87	53.74	
Alcoholics	50			
Low Anxious	20	128.40	74.61	.66
High Anxious	30	114.07	72.11	
Low Anxious	54			
Normals	34	81.74	51.69	2.41[b]
Alcoholics	20	128.40	74.61	
High Anxious	46			
Normals	16	98.87	53.74	.79
Alcoholics	30	114.07	72.11	
All Subjects	100			
Low Anxious	54	99.02	65.21	.73
High Anxious	46	108.76	66.70	
All Subjects	100			
Normals	50	87.22	52.96	2.52[b]
Alcoholics	50	119.80	73.46	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

Table XXVIII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Stroke Error Ratio, Anxiety Being Measured by Criterion 5, MMPI-7 Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	16	.3198	.077	1.60
High Anxious	34	.3585	.080	
Alcoholics	50			
Low Anxious	30	.3105	.057	2.47[b]
High Anxious	20	.3501	.052	
Low Anxious	46			
Normals	16	.3198	.077	.41
Alcoholics	30	.3105	.057	
High Anxious	54			
Normals	34	.3585	.080	.45
Alcoholics	20	.3501	.052	
All Subjects	100			
Low Anxious	46	.3137	.064	2.96[c]
High Anxious	54	.3554	.075	
All Subjects	100			
Normals	50	.3461	.083	1.34
Alcoholics	50	.3264	.066	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

shock error ratios than high anxious subjects. The comparison of low to high anxious alcoholics and that of all low to all high anxious subjects illustrates this ratio difference to a statistically significant degree. None of the individual group ratios were found to be significantly different from random expectancy, however.

The results of differences in massed trial performance for all low versus high anxious subjects is presented in Table XXIX, page 96, for the manifest task. As shown, mean differences are in the expected direction with high anxious subjects receiving higher total error scores throughout the massed trials than low anxious subjects. But only the first five trials show a significant difference (t is 2.40, P is beyond the .02 level). All remaining differences are negligible.

The results of an analysis of mean differences in massed trial performance for low versus high anxious subjects on the latent task is shown in Table XXX, page 97. Here all mean differences are insignificant throughout the performance curve. These results appear to be in keeping with the tendency for high anxious subjects, both alcoholics and normals, to obtain relatively lower shock error ratios. Apparently high anxious subjects, even though they show greater detrimental performance on the manifest task in comparison to low anxious subjects, still are able to

Table XXIX.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Total Errors, Anxiety Being Measured by Criterion 5, MMPI-k Scale.

Massed Trials	Low Anxious(N=54) Mean	SD	High Anxious(N=46) Mean	SD	t[a]
1-5	90.22	31.56	104.48	27.47	2.40[b]
6-10	60.13	33.27	71.48	37.85	1.42
11-15	45.87	37.67	55.93	36.56	1.32
16-20	35.00	34.26	45.96	39.00	1.46
21-25	27.80	32.37	39.52	36.16	1.56
26-30	20.43	28.43	27.33	33.05	1.06

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

Table XXX.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Shock Errors, Anxiety Being Measured by Criterion 5, MMPI-k Scale.

Massed Trials	Low Anxious(N=24) Mean	SD	High Anxious(N=46) Mean	SD	t[a]
1-5	33.20	11.36	36.09	10.44	1.31
6-10	21.70	13.57	22.93	13.69	.44
11-15	16.70	14.42	16.03	13.15	.04
16-20	11.74	12.08	13.30	12.77	.62
21-25	9.09	10.77	11.30	12.61	.92
26-30	6.57	10.10	8.33	10.15	.65

a All t values are based on raw scores.

appreciably reduce their shock errors to the point where differences between their performance and that of low anxious subjects on the latent task is almost absent.

Figure 5, page 99, illustrates the massed trial learning performance mentioned above for low and high anxious subjects as well as for normals and alcoholics for both the manifest and the latent tasks.

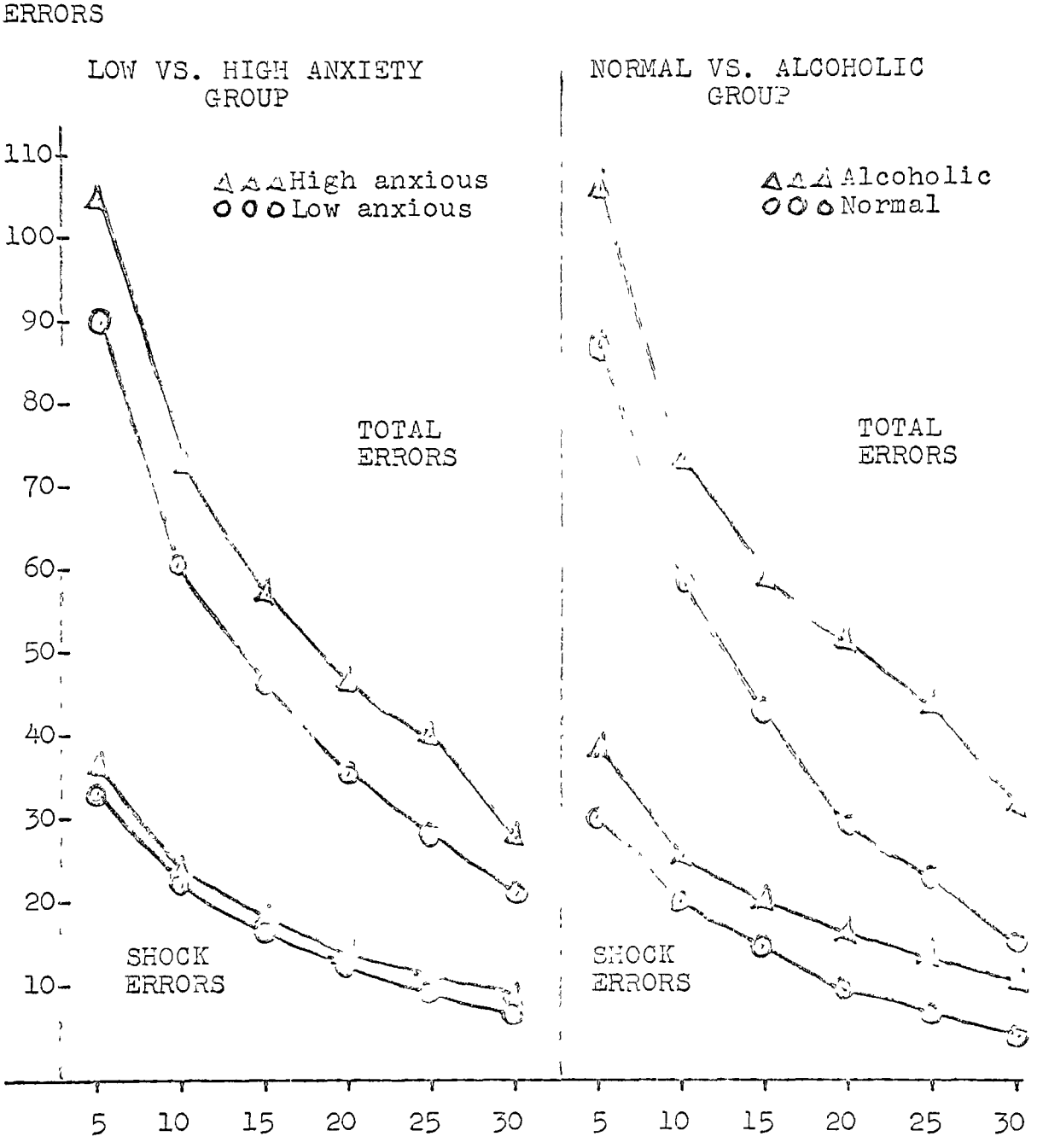

Figure 5.- Mean total error and shock error avoidance learning curves for low anxious vs. high anxious S's (left) and normals vs. alcoholics (right). Anxiety was measured by Criterion 5 (Minnesota Multiphasic Personality Inventory - K Scale).

Criterion 6: Minnesota Multiphasic Personality Inventory-Social Introversion.- The results of the analysis of means, standard deviations and significance of difference between means for various sub-groups in terms of performance on cumulative total errors (manifest task) is presented in Table XXXI, page 101. Here it may be observed that when anxiety is defined in terms of the excitation-inhibition dimension as measured by criterion 6, no significant differences are found except for those occurring as a result of the normal versus alcoholic dichotomy. Thus, low anxious normals and alcoholics and all subjects dichotomized as normals and alcoholics show significant mean differences in the expected direction. However, all mean differences based upon a low versus high anxious classification result in no significant differences, although all differences are in the expected direction. Nevertheless, low anxious normals with a mean total error score of 227.25 represent the most efficient learners while high anxious alcoholics with a mean total error score of 372.00 represent the group with the greatest detrimental performance.

The results of the analysis of means, standard deviations and significance of difference between means for cumulative shock errors (latent task) as measured by criterion 6 is shown in Table XXXII, page 102. Mean differences for various sub-groups found here are negligible except for the now

Table XXXI.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Total Errors, Anxiety Being Measured by Criterion 6, MMPI-Bf Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	28	227.25	130.25	1.41
High Anxious	22	289.59	166.83	
Alcoholics	50			
Low Anxious	20	352.60	211.00	.31
High Anxious	30	372.00	207.02	
Low Anxious	48			
Normals	28	227.25	130.25	2.30[b]
Alcoholics	20	352.60	211.06	
High Anxious	52			
Normals	22	289.59	166.83	1.56
Alcoholics	30	372.00	207.02	
All Subjects	100			
Low Anxious	48	279.48	179.67	1.52
High Anxious	52	337.13	195.34	
All Subjects	100			
Normals	50	254.60	150.69	2.98[c]
Alcoholics	50	364.24	208.87	

a All t values are based on raw scores.

b Significant between the .05 and .01 levels of confidence.

c Significant beyond the .01 level of confidence.

Table XXXII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Cumulative Shock Errors, Anxiety Being Measured by Criterion 6, MMPI-81 Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	28	78.86	52.95	1.26
High Anxious	22	97.86	41.03	
Alcoholics	50			
Low Anxious	20	119.05	75.50	.06
High Anxious	30	120.30	72.06	
Low Anxious	48			
Normals	28	78.86	52.95	2.00[b]
Alcoholics	20	119.05	75.50	
High Anxious	52			
Normals	22	97.86	41.03	1.29
Alcoholics	30	120.30	72.06	
All Subjects	100			
Low Anxious	48	95.60	66.36	1.14
High Anxious	52	110.81	64.96	
All Subjects	100			
Normals	50	87.22	52.96	2.52[b]
Alcoholics	50	119.80	73.46	

a All t values are based on raw scores.

b Significant between .05 and .01 levels of confidence.

usual significant differences between certain normals and alcoholics. In Table XXXII these significant differences are between low anxious normals and alcoholics and the already reported difference between all normals and all alcoholics.

A comparison of total errors to shock errors in terms of comparative shock error ratio between groups also produces no significant differences between sub-groups. As will be observed in Table XXXIII, page 104, most shock error ratios come very close to the .3333 ratio based on random expectancy, thus, no significant individual group differences are to be expected.

Further evidence of the absence of significant differences between low and high anxious subjects on this criterion anxiety variable is contained in Tables XXXIV and XXXV, pages 105 and 106. The massed trial error reduction performance curves shown in these tables for total errors and shock errors between low and high anxious subjects contain no significant differences between groups at any trial point throughout the curves on either performance task.

Figure 6, page 107, illustrates the massed trial learning performance analyzed in the above tables. The learning curves for normals and alcoholics is also included for purposes of comparison.

Table XXIII.-

Means, SDs, and Significance of Difference Between Means of Selected Groups for Shock Error Ratio, Anxiety Scale, Measured by Criterion 6, MMPI-Ot Scale.

Group	(N)	Mean	SD	t[a]
Normals	50			
Low Anxious	28	.3398	.086	.60
High Anxious	22	.3541	.077	
Alcoholics	50			
Low Anxious	20	.3336	.068	.67
High Anxious	30	.3216	.044	
Low Anxious	48			
Normals	28	.3398	.086	.27
Alcoholics	20	.3336	.068	
High Anxious	52			
Normals	22	.3541	.077	1.72
Alcoholics	30	.3216	.044	
All Subjects	100			
Low Anxious	48	.3372	.061	.12
High Anxious	52	.3354	.065	
All Subjects	100			
Normals	50	.3461	.083	1.34
Alcoholics	50	.3264	.060	

a All t values are based on raw scores.

Table XXXIV.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Total Errors, Anxiety Being Measured by Criterion 6, MMPI-Si Scale.

Massed Trials	Low Anxious(N=48) Mean	SD	High Anxious(N=52) Mean	SD	t[a]
1-5	91.79	30.38	101.38	28.27	1.61
6-10	59.37	35.10	70.87	35.76	1.60
11-15	46.83	38.96	53.88	35.79	.93
16-20	33.94	33.18	45.67	39.26	1.60
21-25	27.79	31.00	38.17	38.78	1.47
26-30	19.75	28.14	27.15	32.71	1.20

a All t values are based on raw scores.

Table XXXV.-

Means, SDs, and Significance of Difference Between Means of Low and High Anxious S's on Error Reduction Learning Curves for Shock Errors, Anxiety Being Measured by Criterion b, MMPI-Pt Scale.

Massed Trials	Low Anxious(N=46) Mean	SD	High Anxious(N=22) Mean	SD	t[a]
1-5	32.44	11.56	36.46	10.15	1.62
6-10	20.10	14.66	24.27	13.15	1.51
11-15	16.23	14.67	17.25	12.01	.36
16-20	10.92	11.66	13.80	12.01	1.19
21-25	8.67	10.39	11.25	12.69	1.02
26-30	7.04	9.59	7.69	10.66	.32

a All t values are based on raw scores.

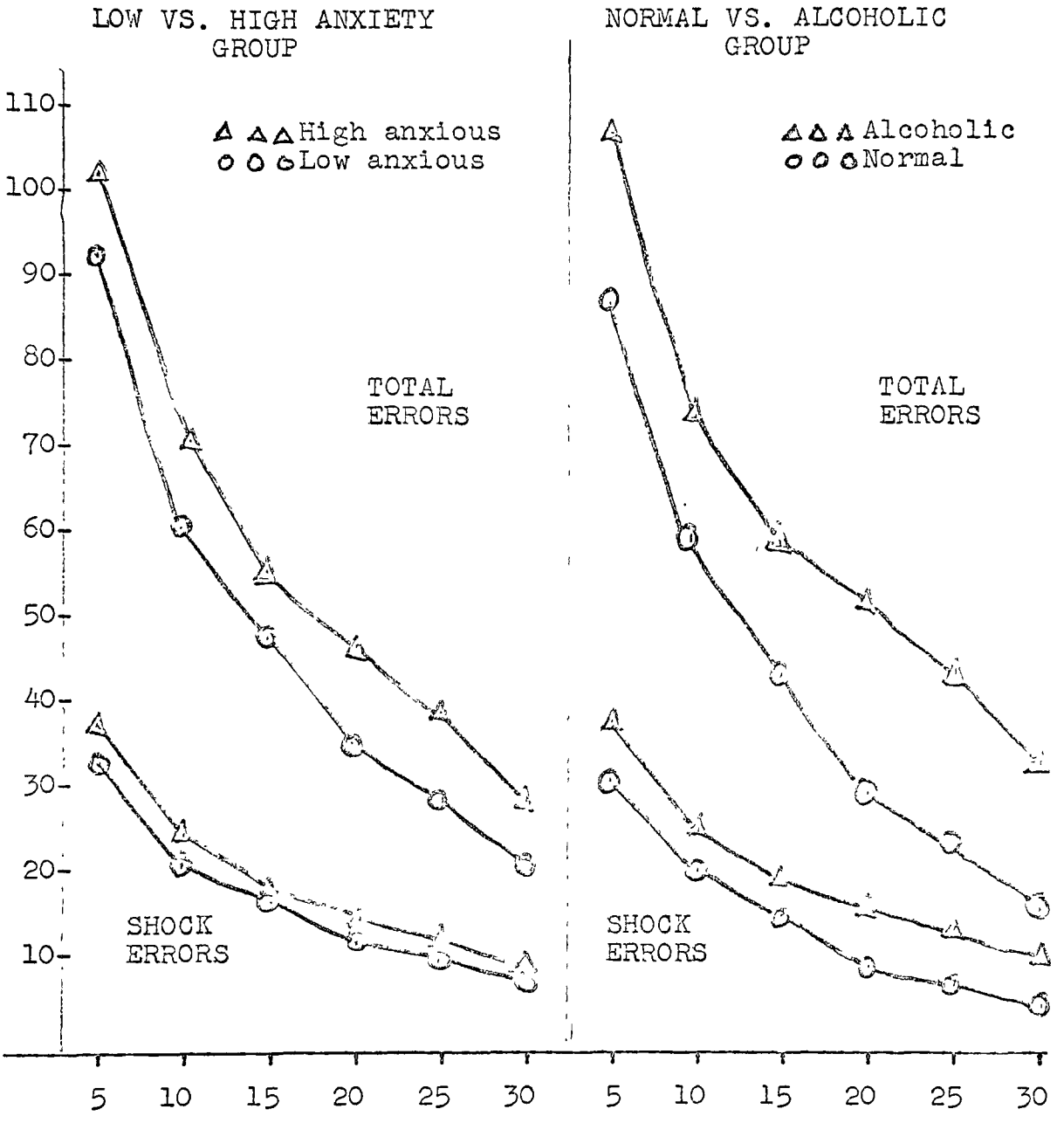

Figure 6.- Mean total error and shock error avoidance learning curves for low anxious vs. high anxious S's (left) and normals vs. alcoholics (right). Anxiety was measured by Criterion 6 (Maudsley Personality Inventory - Social Introversion).

CHAPTER V

DISCUSSION OF RESULTS

In this research as in most conditioning or trial and error learning studies using human subjects, variability in performance was large for all measured groups. Alcoholics showed the greatest variability in performance on all criterion learning measures. The extensive dispersion about mean performance scores for all subjects may explain why sub-groups with small N's, even when showing consistent expected anxiety to performance relationships, frequently did not achieve statistically significant difference levels on most performance criteria.

With respect to performance deficit on either the manifest or the latent task the findings clearly demonstrate that alcoholics as a group obtained the greatest performance deficit of all measured groups. As a consequence, the discriminating factor of normal versus alcoholic was, in this study at least, the single best predictor of deficit avoidance learning performance.

While unknown determiners of behavior may have been present in the dichotomy normal versus alcoholic the fact remains that the observed deficit in learning performance found among alcoholics can best be accounted for in terms of their significantly higher scores than normals on the four

neuroticism dimension anxiety variables ($P=<.01$). Thus, anxiety level as measured by these criteria appears to be the significant demonstrable factor associated with the detrimental manifest task performance observed among alcoholics. It may also be concluded from the differences found between various groups with respect to latent task performance that when anxiety reaches the level obtained by the alcoholic group it very likely renders them incapable of selectively attending to the latent task. Thus, primarily because of high anxiety, alcoholics are found in comparison to subjects with lower anxiety levels to show a more thoroughly debilitated performance on both aspects of the avoidance learning task.

The most discriminating anxiety variables with respect to performance on the manifest task for all subjects was any one of the neuroticism dimension criteria, MPI-N, MAS, or MMPI-Pt. Each of these anxiety scales was able to successfully differentiate all high anxious from all low anxious subjects on the manifest task at beyond the $P=.02$ level of confidence.

While two of these three neuroticism dimension anxiety variables did not differentiate the performance of high versus low anxious subjects on the latent task at statistically significant levels, and the third at only a relatively low level of confidence, this phenomenon seems to

have occurred precisely because high anxious subjects as measured by this dimension selectively sacrificed manifest task performance in order to facilitate latent task performance. As a consequence of this selective discrimination high anxious subjects tended to obtain far higher total error scores than low anxious subjects, yet simultaneously their shock error scores were found not to be significantly higher than those obtained by low anxious subjects. Thus, it may be concluded that high anxious subjects as measured by these neuroticism dimension criteria cannot be said to simply perform more detrimentally than low anxious subjects on a complex avoidance learning task. Rather, at least for this study, it may be concluded that high anxious subjects seem to perform more detrimentally in comparison to low anxious subjects on a complex instrumental avoidance learning task because they have selectively focused attention on the incidental anxiety-provoking, pain avoidance aspects of the total task.

The obtained results on criterion 5 (MMPI-K Scale) appears to be a special case of the selective phenomenon noted above. High anxious subjects on this scale did show some performance deficit on both the manifest and the latent task in comparison to low anxious subjects, but the differences were not significant. Yet the high anxious subjects here did obtain a significantly lower shock error ratio than

the low anxious subjects ($P=<.01$). This finding suggests that a relatively high level of shock error discrimination was being practiced by the high anxious subjects, but without it seriously impairing their manifest task performance.

Based upon the above tentative findings the relationship between anxiety and certain aspects of behavior pathology seem obvious. On one level of analysis much of the observable behaviors found in functional mental illness may be conceptualized as well developed and selectively adaptive learned avoidance responses. Perhaps even though the highly anxious subject wants to attend to more significant aspects of a given reality situation he might, over time, increasingly and selectively turn to whatever adaptive behavior is available to avoid what to him might be intense feelings of anxiety. And, in time, such behavior could take on more and more of the observable characteristics associated with formal behavior pathology, i.e. not coping with reality, defensive behavior, preoccupied with incidental anxiety-provoking aspects of the total situation.

The finding that both anxiety variables (MPI-E, MMPI-Si) identified with the introversion-extraversion dimension of personality did not significantly differentiate between high and low anxious subjects on total errors, shock errors or shock error ratio suggests that, in avoidance learning at least, this dimension cannot as yet be used either

as a practical differential variable or as a theoretical explanatory concept.

In terms of the general findings in this study it appears to be quite plausible to accept the hypothesis that high anxious subjects as measured by the neuroticism dimension show detrimental performance effects on the manifest task primarily because of stress factors, particularly the intermittent noxious stimulation produced by the shock errors. The fact that high anxious subjects selectively attempted to avoid the shock errors adds credence to this hypothesis. But it is something else again to explain logically how low anxious subjects, particularly low anxious normals with their comparatively superior manifest task performance efficiency, succeeded in obtaining shock error ratios higher than would be anticipated in terms of random expectancy. One tentative hypothesis would be that high anxious subjects are on one extreme of a continuum represented by persons who are anxious, fearful and inhibited, while low anxious normals may represent persons on the opposite end of the same continuum who might be described as adventurous, uninhibited and curious. These non-anxious subjects, then, might look upon the experience of shock as stimulating or exciting rather than as threatening or stressful. Perhaps certain of these low anxious subjects could even have personality characteristics associated with sociopathic personality disturbance. Such speculation, of course, awaits further research.

Concerning further research in the areas explored in this study several recommendations come to mind. Certainly further attempts should be made to replicate the finding that alcoholics show a relatively detrimental adaptation to stress in a complex avoidance learning situation. The finding that high anxious subjects do selectively focus attention on the incidental pain avoidance aspects of a complex task could also be more clearly analyzed by modifying an avoidance learning situation so that the opportunity to selectively attend to a latent task would be more readily accessible. From the findings in the present study it would seem plausible to assume that high anxious subjects would have attended to the avoidance of shock errors even more extensively than they did if the design of the experiment had been less complex. Also, since there are questionnaire anxiety constructs too numerous to mention, it is possible that any number of them could be found to be good predictors of avoidance learning performance. Another good predictor of behavior in a complex stress learning test might simply be the verbal reports made by the subjects. This comment is made because the naive experimenter used in the present study was convinced that he could distinguish alcoholics from normals simply by the larger number of self critical comments made by the alcoholics while taking the avoidance learning test as compared to the relative absence of such comments made by the normal group.

He also observed that even though the normal subjects complained about the shock early in the experiment, they seemed to forget about it as they became involved. Alcoholics, on the other hand, continued to complain about the shock throughout the experiment and to show considerable relief when it was finished.

SUMMARY AND CONCLUSIONS

The immediate purpose of this study was to investigate the functional relationships, if any between a particular category of conditioning, namely, complex instrumental avoidance (stress) learning, and two orthogonal dimensions of personality considered to be alternative anxiety constructs derived from drive theory (neuroticism) and excitation-inhibition theory (extraversion).

The problem which presented itself may be stated as follows: Can the theoretical postulates and empirical findings underlying the relationship between anxiety and various forms of conditioning and learning in human subjects be extended to apply to complex instrumental avoidance learning? And, if certain relationships are found, which of two major alternative theoretical anxiety constructs, drive theory or excitation-inhibition theory, will best account for any functional relationships observed.

Further, no distinction has yet been made between differences in avoidance learning performance as a function of personality when such differences are related to the response competition between the incidental pain avoidance response (latent task) aspects of performance and the appropriate response (manifest task) aspects of performance. For example, it may be that highly anxious subjects tend to show performance detriment on appropriate task elements of a

complex task because motivation is focused primarily on the defensive or avoidance aspects of the task, while low anxious subjects may show somewhat reversed motivation and comparatively altered behavior.

The immediate purpose of this experiment, then, was to determine both the manifest and latent task performance differential between high and low anxious subjects in a complex instrumental avoidance learning situation.

A second purpose of this experiment related to the clinical hypothesis that alcoholics have a heightened responsiveness to threat or a lower tolerance for stress or conflict situations than normals. In short, that they are highly anxious individuals who use alcohol, at least initially, as an instrumental anxiety reducing technique. It has never been experimentally determined, however, whether alcoholics do actually differ from normals in terms of experimental performance under stress. Further, if alcoholics do differ from normals in terms of performance under stress, is the difference related to or a function of personality? Thus, a second purpose of this experiment was to determine the manifest and latent task performance differential between alcoholics and normals, and high and low anxious subjects both alcoholic and normal, in a complex instrumental avoidance learning situation.

1. Method.

The alcoholic group consisted of fifty abstinent volunteer male problem drinkers drawn from the membership of several alcoholic subcultures of two large metropolitan and suburban areas. Evidence of alcoholism was determined by membership in Alcoholics Anonymous or previous or current treatment for problem drinking.

The normal control group consisted of fifty males drawn from the same approximate geographic area.

Independent Variables.- The neuroticism dimension was measured by each of the following personality questionnaires: Maudsley Personality Inventory-Neuroticism Scale; Taylor Manifest Anxiety Scale; Minnesota Multiphasic Personality Inventory-Psychasthenia Scale and Minnesota Multiphasic Personality Inventory-K Scale. The introversion-extraversion personality dimension was measured by the Maudsley Personality Inventory-Extraversion Scale and the Minnesota Multiphasic Personality Inventory-Social Introversion Scale.

Dependent Variables.- The actual instrumental avoidance learning apparatus was contained in a rectangular metal box 15 x 14 x 10 inches. The front panel showed a row of four toggle switches with a red shock light on the left side and a green advance light on the right side of the front panel. The center panel contained an easily read error counter as well as a receptical for the shocking electrode.

A shock error counter was located on the back of the apparatus and was not visible to the subject. At the time of testing the shock electrode was attached to the first and third fingers of the subject's non-dominant hand. Shocks were administered instrumentally at a consistent level of 240 volts.

The actual manifest task which the subjects performed consisted of learning by trial and error which one of the four toggle switches would light the green advance light. The other switches, when pressed cumulated errors on the error counter. Once the advance switch was found its location was automatically changed and the subject proceeded to find the next advance toggle switch, etc., until he had completed one trial involving the locating of twenty different and randomly located advance switches. The subject repeated these trials for a maximum of thirty trials always seeking to get a perfect score--that is, avoiding all error switches per trial and depressing only the advance switches. Meanwhile his errors cumulated on the error counter.

In the course of accomplishing the manifest task the subject was also exposed to response competition in the form of receiving a shock when certain randomly distributed shocking error switches were depressed. He was told that this was to remind him that he made another error. Thus, at any given time or choice point a subject could attend selectively to

the fact that one switch was a non-error advance switch and the other three were error switches or he could focus on the fact that at any given time one of the three error switches produced shock. By definition the avoidance of errors was the manifest task goal while the avoidance of shock errors was the latent task goal. But the subject was only instructed to achieve the manifest task.

The task was designed as indicated above in order to maximize those factors presumably detrimental to high anxious subjects, namely: 1) task complexity, 2) response competition, 3) noxious stimuli, and 4) failure report.

The criterion measures for the avoidance learning test consisted of 1) the total errors recorded cumulatively on the error counter observable to the subject over each trial and over all trials (manifest task), 2) the total shock errors recorded cumulatively on the error counter not observable to the subject over each trial and over all trials (latent task), and 3) the ratio of shock errors to total errors per trial and over all trials.

Controls.- In order to avoid experimenter bias a naive assistant administered all tests and read specific instructions to all subjects taking the avoidance learning test.

In order to control for extraneous variables only males were used and the normal subjects were group matched

with the alcoholic subjects for age, education and intelligence.

Age, education and intelligence were also correlated with both the manifest and latent task performance of all subjects. Here it was found that although all of these variables were significantly correlated with the manifest and the latent performance tasks for both normals and alcoholics, all correlations were uniformly low. While none of these correlations were high enough to appreciably account for observed performance differences they all appeared, nevertheless, to be associated with optimum cortical functioning. Considering the complex nature of the task such findings were expected.

2. Avoidance Learning Performance Results Obtained by Selected Sub-Groups.

Normals vs. Alcoholics.- When all normals were compared to all alcoholics, the latter showed significantly greater detrimental performance effects than normals on the manifest task ($P=<.01$). The same relationship was found for these two groups on the latent task, with the alcoholic group again showing significantly greater detrimental performance ($P=<.01$). Although there was a tendency for the alcoholic group to get a lower shock error ratio than the normal group it was not statistically significant. In all comparisons

analyzed throughout the study, regardless of principle of classification, alcoholics consistently obtained significantly higher total errors and shock errors than any other group with which they were compared.

When error reduction learning curves were constructed showing mean total error and mean shock error massed trial performance over thirty trials, performance differences for normals versus alcoholics were also clearly and significantly demonstrated throughout the curves.

Verbal reports made by alcoholics throughout the learning test when compared to comments made by normals also showed a greater tendency for alcoholics to make self-critical comments and to be more greatly concerned with the intermittent shock.

Criterion 1: MPI-N.- When anxiety was defined in terms of the neuroticism dimension as measured by MPI-N, high anxious subjects both alcoholics and normals showed significantly greater detrimental performance effects than low anxious subjects on the manifest task ($P = <.02$). On the other hand, high anxious subjects did not differ significantly from low anxious subjects on the latent task, that of avoiding shock errors. When comparisons were made between these two groups in terms of ratio of shock errors to total errors, high anxious subjects obtained a significantly lower ratio of shock errors than low anxious subjects ($P = <.02$). These

results suggest that high anxious subjects as defined by MPI-N tended to focus attention on the avoidance of shock rather than on the manifest task aspects of performance.

Criterion 2: MAS.- When anxiety was defined in terms of the neuroticism dimension as measured by MAS, high anxious subjects both alcoholics and normals showed significantly greater detrimental performance effects than low anxious subjects on both the manifest ($P^{m}<.02$) and the latent task ($P^{m}<.05$). While there was a tendency for high anxious subjects to get a lower shock error ratio than low anxious subjects it was not significant.

Criterion 3: MMPI-Pt.- When anxiety was defined in terms of the neuroticism dimension as measured by MMPI-Pt, high anxious subjects both alcoholics and normals showed significantly greater detrimental performance effects than low anxious subjects on the manifest task ($P<.02$). High anxious subjects did not differ significantly from low anxious subjects, however, on the latent task. When comparisons were made between these groups on ratio of shock errors to total errors high anxious subjects obtained a significantly lower ratio of shock errors than low anxious subjects ($P^{m}<.01$). These findings again suggest that high anxious subjects tend to focus attention selectively on the latent task aspects of performance rather than on the manifest task.

Criterion 5: MMPI-k Scale.- When anxiety was defined in terms of the neuroticism dimension as measured by the MMPI-k Scale, high anxious subjects both alcoholics and normals did not show significant differences in performance on either the manifest or the latent task in comparison to low anxious subjects. All differences were in the direction of higher anxiety more detrimental performance, however. Yet when comparisons were made between these two groups in terms of ratio of shock errors to total errors, high anxious subjects obtained a significantly lower ratio of shock errors than low anxious subjects ($P = < .01$). Thus, once again high anxious subjects were found to focus attention selectively on the avoidance of shock to a significantly greater degree than low anxious subjects. However, in the present comparison they successfully succeeded in doing so without significantly increasing their manifest task error scores at the expense of selectively avoiding shock errors.

Criterion 4: MPI-E and Criterion 6: MMPI-Si.- Both of these introversion-extraversion dimension variables were found not to discriminate between high and low anxious subjects on either the manifest task or the latent task. This is revealed in the absence of significant differences on total error scores, shock error scores and ratio of shock errors to total errors. It may be noted, however, that criterion 6 did show consistent trends in the expected

direction on all criterion measures of avoidance learning.

In general it may be concluded that the theoretical postulates and empirical findings underlying the relationship between drive theory (neuroticism) and conditioning and learning may be extended to apply to instrumental avoidance learning according to this study. The dimension of personality usually defined as neuroticism was found to be significantly related to performance in complex instrumental avoidance learning. The dimension of personality usually defined as introversion-extraversion was not found to be functionally related to this type of learning. Avoidance learning may be differentiated into appropriate (manifest) task variables and incidental (latent) pain-avoidance task variables. High anxious subjects as defined by the neuroticism dimension tended to show significant performance deficit on appropriate task elements of performance because motivation was selectively focused on the incidental pain-avoidance aspects of performance. Alcoholic subjects tended to show significant performance deficit on both appropriate and incidental elements of task performance in comparison to normals suggesting a more debilitating or heightened response to stress, probably the result of anxiety.

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APPENDIX 1

INSTRUCTIONS GIVEN BY EXPERIMENTER TO EACH SUBJECT FOR AVOIDANCE LEARNING TEST

APPENDIX 1

INSTRUCTIONS GIVEN BY EXPERIMENTER TO EACH SUBJECT FOR AVOIDANCE LEARNING TEST[1]

Obtain name, check for physical illness.

PLEASE BE SEATED....HERE.

ARE YOU LEFT OR RIGHT HANDED?

THIS IS THE APPARATUS WE WILL USE IN THIS TEST.

(Point to machine.)

BUT FIRST I AM GOING TO ATTACH THIS WIRE TO A COUPLE OF YOUR FINGERS.

(Attach electrode terminals to the first and third finger of subject's non-dominant hand by using the electrode jelly and adhesive plasters provided.)

THIS IS A TEST TO SEE HOW WELL AND HOW RAPIDLY YOU CAN LEARN. I WILL EXPLAIN WHAT YOU ARE TO DO FIRST AND THEN YOU MAY ASK QUESTIONS IF YOU WISH AFTERWARDS IN CASE YOU DO NOT UNDERSTAND.

(Push red reset button to clear machine. Set front panel error counter at zero.)

THE PURPOSE OF THIS TEST IS TO SEE HOW WELL AND HOW FAST YOU CAN LEARN WHICH OF THESE FOUR SWITCHES IS THE

(point to switches)

CORRECT ONE TO BE PRESSED.

---

1 All capitalized statements are read verbatim to subject. All other comments are instructive to experimenter.

ONE OF THESE FOUR SWITCHES, IF PRESSED, WILL LIGHT THIS GREEN ADVANCE LIGHT.

(Point to switches and point to light.)

THAT SWITCH WILL BE THE CORRECT ONE. NONE OF THE OTHER THREE SWITCHES IF PRESSED WILL LIGHT THE GREEN ADVANCE LIGHT.

WHICH SWITCH IS THE RIGHT ONE TO PRESS? THAT IS WHAT YOU MUST LEARN FOR YOURSELF BY TRIAL AND ERROR.

WHAT WILL HAPPEN IF YOU PRESS THIS SWITCH (#4)?

TRY IT AND SEE.

NOTICE, IT DID NOT LIGHT THE GREEN LIGHT, AND THIS ERROR COUNTER TELLS YOU THAT YOU MADE ONE WRONG CHOICE.

(Point to error counter.)

NOW PRESS THIS WTICH AND SEE WHAT HAPPENS (#2).

NOTICE, IT DID NOT LIGHT THE GREEN LIGHT AND THE ERROR COUNTER AGAIN TELLS US THAT YOU MADE ANOTHER WRONG CHOICE. NOW PRESS THIS SWITCH AND SEE WHAT HAPPENS (#1).

NOTICE THAT YOU HAD A SLIGHT SHOCK AND THE RED SHOCK LIGHT WENT ON.

(Make sure subject did get a shock.)

IT WILL NOT HURT YOU; IT IS JUST A REMINDER THAT YOU MADE ANOTHER WRONG CHOICE. THE ERROR COUNTER TELLS US ALSO THAT YOU MADE ANOTHER MISTAKE.

NOW WHICH SWITCH MUST LIGHT THE GREEN LIGHT?

THAT'S RIGHT (#3). THIS SWITCH LIGHTS THE GREEN LIGHT.

(Subject should press #3 switch and green light should go on.)

IF YOU WOULD HAVE TRIED IT FIRST YOU WOULD NOT HAVE MADE ANY MISTAKES OR BEEN SHOCKED.

NOW TRY IT AGAIN, BUT REMEMBER EACH TIME YOU PRESS THE CORRECT SWITCH WHICH LIGHTS THE GREEN ADVANCE LIGHT THE SWITCH SETTINGS ARE AUTOMATICALLY CHANGED. THIS MEANS THAT YOU HAVE ADVANCED TO ANOTHER CHOICE POINT AND ONCE AGAIN YOU MUST FIGURE OUT WHICH IS THE CORRECT CHOICE TO MAKE.

CAN YOU FIND THE SWITCH WHICH WILL LIGHT THE GREEN ADVANCE LIGHT THIS TIME? PRESS ANY SWITCH YOU WANT.

(Make appropriate responses for whatever switch is pressed, continue until subject presses the #4 switch and lights the green advance light.)

(Then explain):

SEE, THIS TIME THE #4 SWITCH WAS THE CORRECT ONE. IT MADE THE GREEN ADVANCE LIGHT GO ON.

NOW, IF YOU WERE TO START ALL OVER FROM THE BEGINNING YOU WOULD FIND THAT THE #3SWITCH ALWAYS LIGHTS THE GREEN ADVANCE FIRST. THEN THE #4 SWITCH LIGHTS THE GREEN ADVANCE LIGHT AT THE SECOND CHOICE POINT, BUT YOU STILL DON'T KNOW WHICH SWITCH WILL BE THE CORRECT ONE AT THE NEXT CHOICE POINT.

YOUR TASK IS TO START AT THE BEGINNING AND LEARN WHERE EACH OF THE TWENTY DIFFERENT GREEN LIGHT, OR ADVANCE SWITCHES ARE LOCATED.

REMEMBER, WHENEVER YOU PRESS THE CORRECT SWITCH THE GREEN ADVANCE LIGHT WILL GO ON TELLING YOU THAT IT WAS THE CORRECT CHOICE.

WHENEVER YOU PRESS A WRONG SWITCH AN ERROR WILL BE RECORDED HERE, AND OCCASIONALLY, YOU MAY GET A SLIGHT SHOCK (Point to error counter.)
ONCE IN A WHILE WHEN YOU SEE THE RED LIGHT GO ON WHEN YOU MAKE A MISTAKE.

REMEMBER THAT YOUR TASK IS TO START AT THE BEGINNING, GO AS FAST AS YOU CAN AND LEARN WHERE EACH OF THE TWENTY DIFFERENT GREEN LIGHT SWITCH SETTINGS ARE LOCATED. EACH TIME YOU PRESS THE CORRECT SWITCH WHICH LIGHTS THE GREEN ADVANCE LIGHT THE SWITCH SETTINGS ARE AUTOMATICALLY CHANGED. THIS MEANS THAT YOU HAVE ADVANCED TO ANOTHER CHOICE POINT AND ONCE AGAIN YOU MUST FIGURE OUT WHICH IS THE CORRECT CHOICE TO MAKE.

YOU CAN TELL WHEN YOU HAVE REACHED THE END OF THE SERIES BECAUSE THE GREEN ADVANCE LIGHT WILL REMAIN LIGHTED. THIS IS THE SIGNAL TO START OVER AGAIN FROM THE BEGINNING.

EACH TIME THAT YOU GO THROUGH THE SERIES I WILL COUNT ALL OF YOUR ERRORS. IT DOES NOT MATTER HOW MANY MISTAKES YOU MAKE THE FIRST TIME BECAUSE YOU MUST LEARN BY TRIAL AND ERROR, BUT THE NEXT TIME YOU GO THROUGH THE SERIES YOU SHOULD MAKE FEWER ERRORS. EACH TIME YOU GO THROUGH THE SERIES I WILL COUNT HOW MANY MISTAKES YOU MAKE.

REMEMBER, THE GOAL IS TO BE ABLE TO GO THROUGH THE COMPLETE TEST WITHOUT MAKING ANY MISTAKES. THIS CAN ONLY BE DONE BY PRESSING THE CORRECT SWITCH FOR EACH GREEN ADVANCE LIGHT SETTING IN THE SERIES AND NEVER MAKING ANY MISTAKES.

THIS IS WHAT YOU ARE SUPPOSED TO LEARN. YOU WILL BE GIVEN THIRTY TRIALS TO DO THIS. DO YOU UNDERSTAND.

(Reset both error counters and push red reset button.)

NOW BEGIN: GO AS FAST AS YOU CAN: TIME IS IMPORTANT SO WORK AS FAST AS YOU CAN. REMEMBER, YOU CAN TAKE UP TO

(Observe time and record.)

THIRTY TRIALS TO LEARN THE SERIES.

Note:

If subject does not understand and indicates this before starting the test an explanation is given which describes the machine as a maze in which one must learn which is the correct pathway to take; or an analogy is used in which a room is described with four doors in it. It is explained that only one of the doors will lead into another room and that in that other room he will again find four doors where once more he must find the door that will again lead into another room, etc.

After completing the test all subjects will be reassured that they did well regardless of actual performance. But during the test proper no ego-supportive reassurance will be given. Because the test is stressful and complex, however, certain subjects who do not wish to continue at any point will be told that they can learn the test if they try, etc., etc.

APPENDIX 2

SUMMARY DATA TABLES

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SUMMARY DATA TABLES

This section contains a summary of the raw data used in computing means, standard deviations and significance of difference between means of various groups on total errors and shock errors for each anxiety variable.

Symbols used to identify various sub-tables are defined below:

A1	- Low Anxiety
A2	- High Anxiety
B1	- Normals
B2	- Alcoholics
C1	- Massed trials 1-5
C2	- Massed trials 1-10
C3	- Massed trials 11-15
C4	- Massed trials 16-20
C5	- Massed trials 21-25
C6	- Massed trials 26-30

ABC Summary Table for Criterion 1 Showing ΣX and ΣX^2.

	A1				A2			
	B1		B2		B1		B2	
	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
Total Errors								
C1	3066	278256	1519	172751	1269	132901	3804	440632
C2	2003	139917	1049	96629	900	77444	2583	239799
C3	1389	86449	681	66735	739	54461	2041	164069
C4	913	48715	749	71277	547	37463	1795	139263
C5	685	33541	707	68927	455	32831	1472	101056
C6	416	16618	483	44641	332	16120	1129	71381
	8492	2599452	5388	2905166	4242	1779064	12824	5909652
Shock Errors								
C1	1112	36580	558	23396	451	16723	1332	54716
C2	687	18427	406	15276	311	9479	823	29253
C3	506	12612	316	11654	233	5919	619	16877
C4	316	6220	246	8046	160	3496	522	13202
C5	217	3573	244	8172	136	2626	414	9346
C6	139	2013	105	3505	69	1369	329	6779
	2981	339581	1955	362247	1360	185034	4039	605171

ABC Summary Table for Criterion 2 showing Σx and Σx^2.

	A1				A2			
	B1		B2		B1		B2	
	Σx	Σx^2	Σx	Σx^2	Σx	Σx^2	Σx	Σx^2
Total Errors								
C1	3673	343473	1679	102617	602	67764	3644	430966
C2	2420	100312	1145	104967	483	37049	2467	233661
C3	1750	117266	919	60901	376	25644	2003	171963
C4	1102	67656	701	61197	276	10322	1763	149343
C5	916	54406	672	53008	224	11966	1507	117771
C6	607	29023	460	33086	141	5715	1132	82136
Σ	10468	357630	5676	269650	2106	160210	12516	1284268
Shock Errors								
C1	1315	44195	593	22953	248	9100	1297	55161
C2	849	23439	382	12332	148	4467	847	26199
C3	616	15248	295	9179	125	3203	640	19552
C4	373	7089	227	6137	101	2631	541	15111
C5	275	4961	211	4257	78	1428	447	12263
C6	179	2661	146	3354	49	721	364	9010
Σ	3807	416739	1854	296624	754	103676	4136	676794

ABC Summary Table for Criterion 3 showing ΣX and ΣX^2.

	A1				A2			
	B1		B2		B1		B2	
	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
Total Errors								
C1	3385	301253	2237	252755	970	109934	3086	360828
C2	2240	156210	1555	139619	663	61151	2077	199009
C3	1665	104017	1257	1[illegible]03	523	30093	1665	150721
C4	1154	57632	1038	71842	406	28146	1506	136698
C5	761	39069	673	52657	379	27303	1306	118126
C6	465	19371	606	34206	283	15367	1[illegible]66	91736
Σ	9510	2942652	7566	3336560	3224	143[illegible]604	10[illegible]46	9[illegible]4256
Stoc. Errors								
C1	1248	41522	815	33[illegible]05	515	11701	1075	44129
C2	772	21232	761	19053	206	5674	804	21470
C3	592	15[illegible]19	445	13471	149	3521	490	15260
C4	364	7252	330	8136	114	2464	430	13112
C5	255	4439	295	6131	98	1962	303	11309
C6	160	2422	216	4636	60	980	294	7675
Σ	3411	309591	2666	424710	950	131024	3324	962705

ABC Summary Table for Criterion 4 showing ΣX and ΣX^2.

	A1				A2			
	B1		B2		B1		B2	
	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
Total Errors								
C1	1516	101020	2519	203775	2439	229409	2004	329000
C2	1264	85412	1765	169179	1639	121942	1067	169445
C3	638	47002	1416	123736	1290	85900	1500	129060
C4	509	34415	1231	109073	971	51763	1313	101467
C5	431	29397	1057	98387	709	36975	1122	79896
C6	250	14060	719	59879	490	20678	693	60343
Σ	5208	1760030	8707	4306203	7446	2610460	9599	4506531
Shock Errors								
C1	711	24753	1007	35463	852	28550	1013	42651
C2	446	12692	903	19263	550	19214	646	21240
C3	272	9662	410	12406	469	12069	717	16325
C4	186	3004	347	9723	292	9912	421	11428
C5	141	2007	317	9509	212	3594	341	7935
C6	70	1124	225	5519	136	2270	269	6845
Σ	1020	206330	2777	4500.9	2533	314277	3213	531363

ABC Summary Table for Criterion 5 showing Σx and Σx^2.

	A1				A2			
	B1		B2		B1		B2	
	ΣX	X^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
				Total Errors				
C1	1574	164990	3232	371040	2701	246247	2091	241743
C2	1126	98202	2160	202754	1775	119159	1472	135874
C3	886	79100	1667	141343	1242	70662	1235	111461
C4	602	38462	1512	120672	955	47716	1032	81063
C5	511	32849	1307	105991	629	33523	872	64792
C6	327	16941	937	66026	421	18197	662	47994
Σ	5023	2601340	10820	5231642	7709	2377168	7384	3571176
				Shock Errors				
C1	531	19003	1125	45041	1024	34220	765	32273
C2	353	10475	762	22992	845	17431	527	17939
C3	265	6405	504	14403	476	12046	426	14248
C4	177	3831	435	11129	301	9035	333	9423
C5	151	2797	369	10395	202	3604	209	7139
C6	101	1453	282	6472	127	1949	220	5892
Σ	1582	2626340	3422	246346	2775	3179601	2560	4410772

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ABC Summary Table for Criterion 6 showing ΣX and ΣX^2.

	A1				A2			
	B1		B2		B1		B2	
	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2	ΣX	ΣX^2
Total Errors								
C1	2363	214477	2043	234277	1992	196760	3200	379306
C2	1443	96435	1402	131006	1461	120923	2224	206732
C3	1024	71937	1164	102210	1044	78768	1756	146596
C4	660	33622	663	74201	794	52556	1481	136039
C5	491	21609	643	61503	649	44683	1336	109200
C6	317	12363	631	44357	431	22355	961	71665
Σ	6303	1921225	7052	3377514	6371	2457291	11160	5437304
Shock Errors								
C1	639	27591	710	29376	724	25732	1172	48744
C2	472	11996	493	16007	526	15903	736	23724
C3	366	10266	391	12651	353	6251	544	15776
C4	231	4543	293	7643	247	5173	475	13405
C5	162	2710	264	6246	191	3691	374	11274
C6	116	1416	222	4466	112	1506	268	7396
Σ	2206	252982	2301	377479	2153	76754	3669	589939

Summary Table for Error Ratio Showing Σx and Σx^2.

Criterion	Code	Σx	Σx^2
1	A1B1	12.963	4.733395
	A1B2	5.301	2.001653
	A2B1	4.404	1.600637
	A2B2	10.409	3.493967
2	A1B1	14.963	5.466913
	A1B2	5.473	1.629149
	A2B1	2.344	.867666
	A2B2	10.647	3.666469
3	A1B1	14.503	5.439168
	A1B2	7.502	2.695074
	A2B1	2.724	.994423
	A2B2	9.730	2.799504
4	A1B1	7.747	2.867606
	A1B2	7.654	2.512720
	A2B1	9.566	3.406366
	A2B2	8.666	2.962910
5	A1B1	5.117	1.732106
	A1B2	9.317	3.[illegible]1129
	A2B1	12.196	4.601006
	A2B2	7.043	2.504[illegible]59
6	A1B1	9.525	3.44[illegible]03
	A1B2	8.672	2.32[illegible]14
	A2B1	7.752	2.66[illegible]
	A2B2	9.646	3.17[illegible]124

APPENDIX 3

ABSTRACT OF

Personality Correlates of Complex Instrumental Avoidance Learning

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ABSTRACT OF

Personality Correlates of Complex Instrumental Avoidance Learning[1]

The purpose of this study was to investigate the relationships between complex instrumental avoidance stress learning and two orthogonal dimensions of personality considered to be alternative anxiety constructs derived from drive theory and excitation-inhibition theory.

Fifty normal and fifty alcoholic males matched for age, education and intelligence were given four questionnaire tests representative of the neuroticism dimension and two questionnaire tests representative of the extraversion dimension. In addition all subjects were given a complex instrumental avoidance learning performance test designed to maximize those task factors presumably detrimental to high anxious subjects. A naive experimenter administered all tests.

Performance variables on the avoidance learning test included number of total errors, number of shock errors and ratio of shock errors to total errors.

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1 Daniel J. Anderson, doctoral thesis presented to the Faculty of Psychology and Education of the University of Ottawa, Ontario, 1966, xiii-145.

Although age, education and intelligence were statistically correlated with performance variables for both alcoholics and normals, all correlations were uniformly low and did not appreciably account for performance differences.

In comparison to normals, alcoholics were found to obtain significantly higher neuroticism scores and learning error scores for both total and shock errors. It was concluded that alcoholics show significantly greater performance avoidance learning because of their significantly higher anxiety level.

As measured by three of the neuroticism dimension variables, all high anxious subjects were found to obtain significantly higher total error scores than low anxious subjects. While high anxious subjects tended to obtain more shock errors than low anxious subjects the differences were not significant and the trend was for high anxious subjects to perform almost as well as low anxious subjects in avoiding shock errors. It was concluded that high, in comparison to low, anxious subjects showed significantly detrimental total error performance because they attended to the avoidance of shock errors rather than total errors.

Both of the introversion-extraversion criteria were found not to significantly discriminate between high and low anxious subjects on total errors, shock errors or shock ratio.

Although age, education and intelligence were statistically correlated with performance variables for both alcoholics and normals, all correlations were uniformly low and did not appreciably account for performance differences.

In comparison to normals, alcoholics were found to obtain significantly higher neuroticism scores and learning error scores for both total and shock errors. It was concluded that alcoholics show significantly greater performance deficit than normals on a complex measure of instrumental avoidance learning because of their significantly higher anxiety level.

As measured by three of the neuroticism dimension variables, all high anxious subjects were found to obtain significantly higher total error scores than low anxious subjects. While high anxious subjects tended to obtain more shock errors than low anxious subjects the differences were not significant and the trend was for high anxious subjects to perform almost as well as low anxious subjects in avoiding shock errors. It was concluded that high, in comparison to low, anxious subjects showed significantly detrimental total error performance because they attended to the avoidance of shock errors rather than total errors.

Both of the introversion-extraversion criteria were found not to significantly discriminate between high and low anxious subjects on total errors, shock errors or shock ratio.

Within the limits of this study it was concluded that alcoholics and high anxious subjects show significant performance detriment in comparison to normals and low anxious subjects in a complex instrumental avoidance learning test.