ANXIETY, N ACHIEVEMENT AND PROBABILITY PREFERENCES: A STUDY OF DIGIT SYMBOL PERFORMANCE

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CHAPTER I

INTRODUCTION AND REVIEW OF THE LITERATURE

In recent years a number of studies have been reported on the effect of motivational variables on performance. A number of these studies have indicated that task performance may be a function of achievement motivation (Atkinson & Reitman, 1956; French, 1955; Karolchuck & Worell, 1956; Lowell, 1952; Worell, 1960). In the majority of these studies superior performance has been associated with subjects (Ss) who score high on achievement indices when compared to Ss who score low on measures of achievement motivation. Achievement measures have included assessment of Thematic Apperception Test (TAT) themes (McClelland, Clark, Roby, & Atkinson, 1949), the Iowa Picture Interpretation Test (Hedlund, 1953), the French Test of Insight (French, 1955, 1958), and the Edwards Personal Preference Schedule (EPPS) (Edwards, 1954).

Some studies, on the other hand, have investigated the construct of anxiety as a motivational variable. In these studies the direction of the performance differences between high and low levels of anxiety has been found to be contingent upon the complexity of the task and the nature of the instructional conditions (Sarason, Mandler, & Craighill, 1952; Sarason, 1957a; Taylor, 1958; Wiener, 1959). The two primary instruments employed to assess anxiety have been the Test Anxiety Scale (TAS) (Mandler & Sarason, 1952; Sarason, 1958), and the Taylor Manifest Anxiety Scale (MAS) (Taylor, 1953).

The present study employed three motivational conditions as independent variables. These included measures of n Achievement (n Ach) (Worell, 1965), test anxiety (Sarason, 1958), and manifest anxiety (Taylor, 1953). Since the effect of these motivational variables on measures of digit symbol performance and probability preferences was investigated, the following section will present a selective review of the literature with special attention devoted to a discussion of the theoretical and empirical correlates of n Ach, TAS, and MAS. In addition, a brief consideration of the historical conception of these motivational constructs will be given. Finally, studies relating anxiety to digit symbol performance will also be reviewed.

Review of the Literature

n Achievement

A theoretical antecedent to the concept of achievement motivation may be found in the writings of Adler (1930).

According to Adler, the "will-to-power" is the dominant psychogenic need of man: "one always moves along the lines of that upward tendency. . . . The origin of humanity and the ever repeated beginning of infant life rubs it in with every psychic act: 'Achieve! Arise! Conquer!'." (Adler, 1930, pp. 99-100).

Historically, however, achievement motivation has its origin in the work of Murray and his associates (Murray, 1938). Murray's description of n Ach includes the following characteristics:

> To accomplish something difficult. To master, manipulate or organize physical objects, human beings, or ideas. To do this as rapidly, and as independently as possible. To overcome obstacles and attain a high standard. To excel one's self. To rival and surpass others. To increase self-regard by the successful exercise of talent.
>
> (1938, p. 164)

Murray lists the following as behavioral correlates of n Ach:

> To make intense, prolonged and repeated efforts to accomplish something difficult. To work with singleness of purpose towards a high and distant goal. To have the determination to win. To try to do everything well. To be stimulated to excel by the presence of others, to enjoy competition. To exert will power; to overcome boredom and fatigue.
>
> (1938, p. 164)

In an early discussion of secondary motivation, Sears (1942) suggested that common to all learned drives which may be subsumed under the label n Ach is the notion that the feeling of success depends on the gratification of the achievement drive, and failure results from its frustration.

In the late 1940's serious empirical attention was devoted to the study of achievement motivation by McClelland and his associates (McClelland et al., 1949). In a more recent discussion McClelland presents a motivational model in which a motive is considered to be the redintegration by a cue of a change in an affective condition (McClelland et al., 1953). According to McClelland, the outline of the model is this:

> Certain stimuli or situations involving discrepancies between expectation (adaptation level) and perception are sources of primary, unlearned affect, either positive or negative in nature. Cues which are paired with these affective states, changes in these affective states, and the conditions producing them become capable of redintegrating a state (A') derived from the original affective situation (A), but not identical with it.
>
> (McClelland et al., 1953, p. 28)

McClelland feels that motives should be distinguished primarily in terms of the type of expectations involved and secondarily in terms of actions. His definitive statement of achievement motivation is simply in terms of affect in connection with evaluated performance. Since McClelland's assessment of n Ach relies upon TAT themes, the crucial aspect in scoring stories is detecting affect in connection with evaluation. (McClelland et al., 1953).

Although the variety of techniques which have been developed to assess achievement motivation have yielded results indicating that performance may be a function of n Ach, there is a growing body of research which indicates that these techniques have low and insignificant correlations. For example, Bendig (1957) reported insignificant correlations between McClelland's projective measure of n Ach and the objective n Ach scale of the EPPS. Bendig's results were supported by Himelstein, Eschenbach, and Carp (1958) who found insignificant relationships between the n Ach scale of the EPPS, French's Test of Insight and McClelland's n Ach index. In separate investigations, McClelland (1958) and Melikian (1958) have further substantiated the above findings.

These insignificant relationships indicate that achievement scales are measuring quite independent traits. As Worell (1960) points out, clear predictions cannot be made between n Ach and other variables for any one measure of n Ach on the basis of results obtained with other indices of achievement motivation. In addition to this empirical independence among achievement scales, the lack of conceptual clarity concerning the theoretical properties of n Ach suggests that some redefinition of the construct is necessary.

The n Ach measure employed in the present study, which will be described in the method section, was based upon an unpublished revision of the EPPS (Worell, 1965). Elsewhere, in a study using the n Ach scale of the EPPS, Worell (1960) reported significant differences between Ss differentiated on the basis of high and low achievement on a paired-associates learning task.

Test Anxiety

The TAS, developed by Mandler and Sarason (1952), is specifically concerned with the Ss' attitudes and experiences in a testing situation. In their conception of the TAS, Mandler and Sarason have emphasized the selective function of internal stimuli that accompany and identify the fear response. The internal cues accompanying the arousal of the fear response are said to elicit many different kinds of "task-irrelevant" responses which in the past have been reinforced by reduction of fear. According to this conception of the problem, task-irrelevant habits are more strongly aroused in high anxious Ss. These tendencies conflict with the task-relevant tendency producing a decrement in performance of task-relevant responses. Mandler and Sarason suggest that these inappropriate responses may be manifested as feelings of inadequacy, helplessness, and heightened somatic reactions (Mandler & Sarason, 1952).

The results of studies investigating the TAS have indicated that high levels of anxiety retard performance (Mandler & Sarason, 1952; Sarason, Mandler, & Craighill, 1952; Wiener, 1959). This research indicates that the results are affected by instructions designed to induce stress. For example, Mandler and Sarason reported that significant differences appeared between high and low anxious groups on a Kohs Block Design task represented as an intelligence test. These results indicated that the performance of high test anxious (TA) Ss was impaired in comparison to the performance of low TA Ss. Mandler and Sarason concluded that "the optimal conditions for a high anxiety group are those in which no further reference is made to the testing situations, and that the optimal conditions for a low anxiety group are those in which the subjects are given a failure report." (Mandler & Sarason, 1952, p. 173).

A related study by Sarason, Mandler, and Craighill (1952) provided results supporting the preceding investigation. This study, employing a digit symbol task and a stylus maze, likewise suggests that stress producing instructions can have opposite effects with different Ss, depending on the anxiety level in the testing situation.

Wiener (1959) studied the effects of anxiety, stress instructions, and difficulty level and reported that high TA Ss suffer a performance decrement as a function of increasing task complexity. However, stress instructions and increasing the difficulty level of a task appeared to enhance the performance of low TA Ss.

In summarizing the above studies, the magnitude of performance differences between high TA Ss and low TA Ss appears more acute as a function of stress instructions and task difficulty. In making predictions on the basis of Ss differentiated on the TAS, one must be cognizant of the instructional influences and the complexity of the task which is employed.

Manifest Anxiety

Historically, the MAS was developed to test certain Hullian notions concerning the relationship between performance in learning situations and drive level (Taylor, 1956). As Spence (1956) points out, the concept of drive level is one of the important intervening variables determining response strength in S-R theory. According to Hullian theory (Hull, 1943), reponse strength or excitatory potential (E) is determined by the multiplicative combination of drive (D) level with all habits (H) activated in a given situation. The formal notation for this expression is $E = f(H \times D)$. The construction of the MAS was based on two assumptions: first, that this drive level is related to the individual's level of internal anxiety or emotionality, and second, that the intensity of this drive could be assessed by a paper and pencil instrument (Taylor, 1953).

Studies employing the MAS have indicated that anxiety facilitates performance in simple noncompetitional situations involving only a single habit tendency (Spence, Farber, & McFann, 1956; Spence, Taylor, & Ketchel, 1956; Taylor & Chapman, 1955; Taylor & Spence, 1952). These results conform to theoretical expectations. Since response strength is determined by the multiplicative relationship between D and H, it follows that in situations where the dominant response is relatively free from competing responses that superior performance will be associated with Ss who manifest higher levels of D.

However, the above prediction does not necessarily follow in more complex situations involving competition among responses. In situations where the correct response is initially weaker in habit strength than competing responses, or where there are such a large number of competing responses so that there is a greater probability of an incorrect response (H) being dominant in the response hierarchy of the subject, increases in motivation should lead to performance decrements. This is because a high drive would contribute inappropriately to the desired response strength by combining with the competing habit values so that larger differences in excitatory potential would favor the incorrect responses.

Several paired-associates studies have supported the prediction that high levels of anxiety lead to performance decrements when the dominant response is inappropriate to the task at hand (Spence, Farber, & McFann, 1956; Spence, Taylor, & Ketchel, 1956). However, elsewhere in the literature are studies which do not support this prediction. For example, Grice (1955) found that the superiority of a low anxious group on a complex reaction-time task could be explained on the basis of intellectual differences rather than to differences in levels of anxiety. Daily (1953) found no significant differences between high anxious and low anxious college students in a verbal conditioning study. Buss and Gerjuoy (1957) using psychiatric patients replicated the findings of Daily. Axelrod, Cowan, and Heilizer (1956) failed to replicate the results of the stylus maze study of Farber and Spence (1953) in which the latter reported performance impairment in high anxious Ss. Using a paired-associates learning task, Besch (1958) reported results which were inconsistent with the findings obtained by Spence, Farber, and McFann (1956).

Thus, although the majority of MAS studies involving simple learning problems have conformed to theoretical expectations, the results of studies employing complex tasks have been contradictory. As the above studies illustrate, a body of literature exists which is at discord with S-R predictions. The inconsistent results concerning complex tasks suggest that some reformulation of S-R theory may be necessary. Of course, the adequacy of present S-R theory must await for future investigations which control the complexity of the task and hopefully identify the nature of the competing responses.

In addition, some studies have indicated that instructions which have reference to stress influence the performance of MAS Ss (Sarason 1957a, 1957b; Taylor, 1958). Elsewhere, Grice's (1955) report indicating that MAS results may be confounded by intelligence differences has received additional support (Matarazzo, Ulett, Guze, & Saslow, 1954; Rankin, 1965). This latter group of studies indicates that in future MAS investigations it may be well to control for intelligence.

Anxiety and Digit Symbol Performance

In the preceding sections the theoretical and empirical problems associated with the three independent variables of the present study were discussed. Since these variables were employed in the present study to determine their relationship to digit symbol performance, a brief review on the effects of two of these measures, TAS and MAS, on digit symbol performance will follow.

Briefly described, the digit symbol test requires the subject to associate certain symbols with certain other symbols, and the speed and accuracy with which this is done serves as a measure of intellectual ability (Wechsler, 1958).

Wechsler has reported that neurotic and unstable individuals tend to do rather poorly on digit symbol tests.

This observation suggests that motivational factors may contribute in part to the variance between Ss in a substitution task of this type. In discussing this possibility, Wechsler reviewed the conclusions of Tendler (1923) who suggested that the inferiority of neurotic subjects on tests of this kind may be due to some sort of "associative inflexibility in the subject, and a tendency toward mental confusion" (Wechsler, 1958, p. 81). However, Wechsler's position is that the performance decrement of neurotic Ss is a result of difficulty in concentration coupled with emotional reactivity to any task requiring persistent effort. Rather than reflecting an impairment of intellectual ability, the poor performance of the neurotic on a digit symbol test represents a lessened mental efficiency (Wechsler, 1958).

In general, studies investigating the relationship between digit symbol performance and anxiety have yielded inconsistent and often contradictory results. For example, Mandler and Sarason (1952) reported nonsignificant differences between high TA Ss and low TA Ss on six trials of a digit symbol test of one minute duration each. Inspection of their data, however, indicates, as a function of trials, an increase in variability among high TA Ss and a decrease in variability among low TA Ss.

In a related study, Mandler, Sarason, and Craighill (1952) investigated the relationship between high and low

TA Ss on a digit symbol task under varying instructional conditions. In this study two high and two low TA groups were subdivided and given different instructions. One high TA group and one low TA group were told that they were expected to finish the digit symbol task. The other high and low TA groups were given instructions that they were not expected to finish the task. The results indicated that both high TA groups performed significantly poorer than the low TA expected to finish group on the first trial. Further, on the fifth trial the performance of the low TA expected to finish group was superior to all other groups.

In a study investigating digit symbol performance as a function of differing levels of MAS, Matarazzo and Phillips (1955) extended the conventional 90 second time limit of the WAIS to 3 minutes. Their results reflected significant differences between low and intermediate levels of anxiety. The direction of this difference was in terms of a performance decrement for Ss whose MAS scores were in the low interval between 0 and 5. Matarazzo and Phillips interpreted their results in terms of a nonlinear function and suggested that the maximum performance on a digit symbol task appears in the middle ranges of anxiety, with lower scores at the extremes.

Although Goodstein and Farber (1957) failed to replicate the results of Matarazzo and Phillips, they reported that the women's mean performance was significantly better than the men's on a digit symbol test. Since the differences between anxiety levels did not approach significance, Goodstein and Farber concluded that "there was thus no reason to suppose that any relation, curvilinear, nonmonotonic, or any other kind obtained between anxiety and performance in the Digit Symbol Task" (1957, p. 153).

Two other investigations are worth noting. A correlational study between the Wechsler-Bellevue Intelligence Test and the MAS reported a negative but insignificant relationship between the Digit Symbol test of the Bellevue and the MAS (Calvin, Koons, Bingham, & Fink, 1955). A similar correlational study by Matarazzo (1955) confirmed this lack of relationship between the MAS and digit symbol performance.

Because of these equivocal results it is apparent that one cannot readily anticipate the empirical relationship between digit symbol performance and indices of TAS and MAS. Rather than using the previous findings cited above as a basis for prediction, the approach employed in the present study was to anticipate the relationship between digit symbol performance and the independent variables on the basis of the theoretical properties associated with n Ach, TAS, and MAS.

CHAPTER II

THE PROBLEM

Since the studies reviewed in the previous chapter were apparently tapping motivational dispositions, a brief definitive treatment of this construct seems necessary. In a discussion related to the present question, Farber (1955) has suggested that the concept of motivation lies in the definitional distinction between associative and nonassociative properties. The associative function of a motive is assumed to be identified in terms of its tendency to facilitate a limited class of responses. Presumably, the associative property of a motive reflects a steering or directional function. This associative function leads to the consideration of motives as having a given habit strength in respect to specific responses.

On the other hand, the nonassociative function of a motive is distinguished on the basis of its tendency to energize all response tendencies existing in a given situation. In other words, the drive or nonassociative function of a motive impels action generally, whereas the associative function leads to differential response. This dichotomous classification into associative and nonassociative functions provides a parsimonious means of describing the dominant property of a particular motive. As Farber (1955) has presumed, motives have both associative and nonassociative functions, and if a variable clearly does not have both, its status as a motive is questionable.

Purpose of the Study

In relation to Farber's classification of motives into associative and nonassociative functions, studies regarding the theoretical properties of achievement motivation have indicated this motive to be primarily associative in function (Atkinson, 1957; Edwards, 1954; McClelland et al., 1953). Likewise, Mandler and Sarason (1952) have suggested that the TAS reflects in large measure associative functions. On the other hand, MAS results are attributed to a nonassociative conception of drive where all response dispositions are energized (Spence, 1958; Taylor, 1956).

The conflicting findings reported in the previous chapter suggest that a review of the functions associated with the TAS and MAS may be necessary. In view of these findings, and in light of Farber's insistence of a conceptual dependence among associative and nonassociative functions, it appears plausible that neither a nonassociative nor an associative classification of the MAS and

TAS is entirely correct. For example, MAS studies involving noncompetitional situations suggest that high levels of anxiety enhance performance in much the same manner as achievement motivation leads to performance increments. Similarly, the performance of high TA Ss seems to parallel the performance of Ss who score low on measures of achievement motivation.

One of the purposes of the present study was to determine if there is any interaction between the TAS (Sarason, 1958) and n Ach (Worell, 1965), and between the MAS (Taylor, 1953) and n Ach (Worell, 1965) on digit symbol performance.

Moreover, in the achievement and anxiety studies reported in the preceding chapter no effort was made to control other motivational variables. Apparently the assumption was taken that other motivational variables operate randomly in groups differentiated on measures of achievement or anxiety. A position, however, which attempts to account for both anxiety and achievement variables is represented by Atkinson (1960b).

Atkinson assumes that in competitive achievement situations two different motives are aroused by cues that elicit expectancies of success and failure--the achievement motive and the motive to avoid failure. Atkinson (1960b) assumes that the TAS assesses the motive to avoid failure. According to Atkinson's view: Motivation = f(Motive x

Expectancy x Incentive).

Within this theoretical framework, it is assumed that the incentive value (I_s) of success is in inverse linear function of the strength of the expectancy (P_s) of success, i.e. $I_s = 1 - P_s$. On the other hand, it is assumed that the (negative) incentive value (I_f) of failure varies directly with the strength of the expectancy of success, i.e. $I_f = -P_s$. In other words, the incentive value of failure is greater the easier the task. Table I illustrates the strength of motivation to approach success and motivation to avoid failure as a function of motive, expectancy, and incentive.

Atkinson has predicted that individuals having high levels of achievement motivation will prefer situations of intermediate risk ($P_s = .50$) to a greater extent than individuals having either low n Achievement scores or high TAS scores. This prediction is predicated upon the assumption that <u>S</u>s whose motive to avoid failure is greater than their motive to achieve should avoid tasks of intermediate difficulty ($P_s = .50$) where the arousal of anxiety about failure is greatest. Such <u>S</u>s should select either the easiest ($P_s = .90$) or the most difficult task ($P_s = .10$); the strength of avoidant motivation is weakest at these two points (Atkinson, 1957).

Several studies (Atkinson, 1960a, 1960b) have confirmed the prediction that achievement oriented individuals,

TABLE I

AROUSED MOTIVATION TO ACHIEVE (APPROACH) AND TO AVOID FAILURE (AVOIDANCE) AS A FUNCTION OF MOTIVE (M), EXPECTANCY (P), AND INCENTIVE (I) WHERE $I_s = (1 - P_s)$ AND $I_f = (-P_s)$ (Atkinson, 1957, p. 352)

Motivation to Achieve

	M_s	x P_s	x I_s	= Approach
Task A	1	.10	.90	.09
Task B	1	.20	.80	.16
Task C	1	.30	.70	.21
Task D	1	.40	.60	.24
Task E	1	.50	.50	.25
Task F	1	.60	.40	.24
Task G	1	.70	.30	.21
Task H	1	.80	.20	.16
Task I	1	.90	.10	.09

Motivation to Avoid Failure

	M_f	x P_f	x I_f	= Avoidance
Task A	1	.90	-.10	-.09
Task B	1	.80	-.20	-.16
Task C	1	.70	-.30	-.21
Task D	1	.60	-.40	-.24
Task E	1	.50	-.50	-.25
Task F	1	.40	-.60	-.24
Task G	1	.30	-.70	-.21
Task H	1	.20	-.80	-.16
Task I	1	.10	-.90	-.09

as assessed according to McClelland's TAT procedure, prefer situations where uncertainty regarding the outcome is greatest. However, the dependent variables employed in these studies have included shuffleboard games and ring toss tasks. It is questionable if performance and probability preferences on game type tasks parallel performance and probability preferences in achievement oriented learning and testing situations. For example, the college athlete may excel at athletic tasks but perform in a mediocre manner in the classroom. Empirical support for this contention is lent by Feather (1963). Feather, employing an anagrams test labeled "Word Puzzle" under instructions designed to induce stress, found that the prediction that probability estimates and n Ach should intercorrelate positively was not supported by the data.

The second purpose of this study was to determine if there were any differences in probability preferences in an achievement situation represented as an "intelligence" test within two groups of Ss selected on the basis of n Ach (Worell, 1965), TAS (Sarason, 1958), and MAS (Taylor, 1953).

Predictions

Before delineating the predictions made in the present study, a brief description of the dependent variables will follow. As previously noted, the dependent variables consisted of measures of digit symbol performance and stated expectancies of success.

Since previous research indicates that TAS and MAS results may be a function of task complexity, two measures of digit symbol performance designated Task A and Task B were employed in the present investigation. In terms of difficulty level, Task A was assumed to be the easier of the two tasks. Task B, which was administered after six trials of Task A, consisted of the same symbols but reversed in direction from those used in Task A. In accord with Farber and Spence's (1953) definition of difficulty as a function of the number of incompatible and competing response tendencies present in a given situation, Task B was assumed to represent a greater level of difficulty than Task A.

Prior to the beginning of Tasks A and B, the Ss were instructed to state the number of digit symbols they expected to complete on the first trial of each task. These stated expectancies of success, described more completely in the following chapter, were the other dependent variables used in this study.

The predictions made in the present study were derived from the theoretical positions of Spence (1958) and Taylor (1956), Mandler and Sarason (1952), and Atkinson (1957, 1960b).

The following predictions for digit symbol performance were made:

1. High n Achievers will perform better than low n Achievers on both digit symbol tasks.

2. Providing that Task A does not involve incompatible and competing response tendencies, high MAS Ss will be superior on Task A but inferior on Task B when compared with low MAS Ss.

3. High TAS Ss will be inferior in performance on both Task A and Task B when compared with low TAS Ss.

4. There should be an interaction between MAS and n Ach on Task A, but not on Task B. On the other hand, no interaction should occur on either digit symbol task between TAS and n Ach.

The hypothesis for probability preferences was as follows:

5. Tasks of intermediate difficulty ($P_s = .50$) should be selected more often by Ss scoring low on the anxiety scales and high on the achievement measure when compared with Ss whose motivation scores reflect high levels of anxiety and low levels of n Ach.

The rationale underlying these predictions will now be briefly examined. Although one must keep in mind the empirical independence among various indices of n Ach, the majority of achievement measures reviewed in the preceding chapter nevertheless indicate that performance increments tend to be associated with Ss classified high in achievement motivation. Since there is an absence of data concerning the empirical correlates of the achievement scale used in the present investigation, the prediction that superior performance will be associated with higher levels of achievement motivation is based upon a construct validity approach (Cronbach & Meehl, 1955).

The second hypothesis is based upon the S-R theory outlined in the previous chapter. Briefly, if the contingency is true that Task A involves noncompetitional response dispositions, then higher levels of drive should lead to superior performance in comparison to lower drive levels. On the other hand, since Task B presumably introduces incompatible and competing response tendencies, high MAS Ss should suffer a performance decrement on this task in comparison to low MAS Ss.

The third prediction is relatively straightforward. This prediction that high levels of TAS will lead to performance decrements on both tasks is based on the theoretical conception underlying the TAS and on the evidence cited in the preceding chapter. It may be recalled that this evidence indicated that inferior performance is associated with high levels of TAS as a function of task complexity and stress. On the other hand, the performance of low TAS Ss seems to be enhanced as a function of stress and task complexity.

The fourth prediction is based on consideration of empirical results suggesting that high MAS drive levels are associated with superior performance in simple noncompetitional situations. As previously noted, high levels of achievement motivation also lead to enhanced performance.

Since on the one hand the MAS is regarded as reflecting primarily nonassociative functions, and on the other that n Ach is largely associative in nature, it seems reasonable to expect an interaction of these functions in simple noncompetitional learning situations. However, on Task B this interaction should dissipate as a function of task complexity, since higher levels of drive should theoretically lead to task impairment.

The prediction that digit symbol performance is not a function of an interaction between TAS and n Ach is based on Atkinson's theoretical conception of these two variables. Within this framework the motive to approach success and the motive to avoid failure are regarded as independent. Presumably, high levels of n Ach indicate a stronger tendency to approach a task with the intent of doing well than do low levels of n Ach. In contrast to this n Ach conception of approach motivation, the TAS supposedly reflects relative strengths of avoidant motivation. As such, high levels of TAS represent a greater tendency to avoid or withdraw from a task than do low TAS levels. In addition to these theoretical considerations, the zero order correlation reported by Atkinson (1960b) between TAS and n Ach leads to the prediction that digit symbol performance should not be a function of the combined influence of TAS and n Ach.

The hypothesis for probability preferences is also based upon the work of Atkinson (1957, 1960b). However, it should be kept in mind that the achievement index employed in the present study is not the same as Atkinson's measure of achievement which relies upon the assessment of TAT themes. Because of the correlational independence between these measures one cannot readily anticipate the relationship between probability preferences and the n Ach scale of the "Preference and Behavior Inventory" on the basis of the results obtained by Atkinson. However, presumably both achievement indices are derivatives from the achievement concept originated by Murray (1938), and since the TAS used in the present study is similar to the one employed by Atkinson, the predictions for probability preferences were consequently made in accord with the theoretical system generated by Atkinson.

CHAPTER III

METHOD

Subjects and Experimental Design

The present investigation can be thought of as two separate studies (Figure 1). The Ss, consisting of 40 males and 40 females from introductory psychology classes at Oklahoma State University, were selected on the basis of two factors--TAS (Sarason, 1958) and n Ach (Worell, 1965), and MAS (Taylor, 1953) and n Ach (Worell, 1965). The classification of these Ss was made in accord with the criteria discussed below.

All Ss were given the MAS and TAS under the title "Biographical Inventory". The n Ach scale was administered under the title "Preference and Behavior Inventory". These titles were used in an effort to mask the true nature of the scales.

The "Biographical Inventory" consisted of 50 MAS items. The 21 items of the TAS were randomly interspersed with the MAS items. In addition, the inventory included items from the MMPI K and L scales. The item total was 110.

The "Preference and Behavior Inventory" was a revision

Levels of TAS-n Ach			
High-High	High-Low	Low-High	Low-Low
N = 10	N = 10	N = 10	N = 10

Levels of MAS-n Ach			
High-High	High-Low	Low-High	Low-Low
N = 10	N = 10	N = 10	N = 10

Figure 1. Experimental Design of the Study.

of the EPPS. The revision consisted of several parts. First, some items were rematched in terms of social desirability. Second, the 120 items of the scale were divided in half so that the content of each item appeared twice. One set of items was prefaced by the words "I most prefer to . . . ." The other set of items was prefaced with the words "I most frequently . . . ." Both sets of items were randomly assigned throughout the scale and matched with other scale items within the same set. The n Ach scale of the present study contained 20 statements from the "preference" item set.

The "Biographical Inventory" and the "Preference and Behavior Inventory" were initially given to a sample of approximately 450 Ss. Following the administration of these instruments, Ss were selected for the present study on the basis of their endorsement of the TAS, MAS, and n Ach items. The approximate upper and lower thirds of the distribution of scores were used to designate the high and low levels of these three factors.

The distribution of the n Ach scores was as follows: the low level consisted of scores in the interval 3 - 11; the upper level of n Ach was designated by scores 16 and above. If a S's score was within these intervals he was considered for the experiment if either his MAS or TAS scores reflected high or low levels of anxiety. The low level of TAS scores ranged from 0 to 5. A high level of

TAS was indicated by a score of 10 or above. Similarly, a low level of MAS was reflected by scores of 13 or less, with the high level consisting of scores above 21.

In cases where a S's scores indicated he could be placed into either the TAS or MAS groups, his experimental classification was determined by randomization. As a control procedure, Ss whose L score on the "Biographical Inventory" was above 4 were not considered for the experiment. In addition, each cell of both designs contained 5 males and 5 females.

Apparatus

The digit symbol task was largely adopted from the Wechsler Adult Intelligence Scale (Wechsler, 1955). Seven of the eight digit symbols in Form A are to be found in the Wechsler subtest (Appendix A). As previously noted, Form B consisted of the same symbols, except they were reversed in direction from Form A (Appendix B). Otherwise, Form A and Form B were identical with respect to the sequence of numbers in the corresponding rows of each form. Two tests appeared on each of the six mimeographed pages. Since there was a possibility that Ss might copy their previous performance from the top of the page, the sequence of numbers was altered between tests appearing on the same page.

Procedure

As an attempt to create a competitive achievement atmosphere, the Ss were tested in groups whose mean size was approximately seven. Because some Ss failed to show up at the appropriate time, several Ss were tested individually. All Ss were told that they had been randomly selected to participate in the experiment. Apparently no S made the connection that he was selected on the basis of the inventories administered at least three weeks previously.

Approximately half of the Ss were given Form A first; the other half received Form A preceded by Form B. After six one minute trials on the initial task a rest interval of approximately two minutes was employed. After the rest interval the alternate form of the digit symbol task was administered. This form also consisted of six one minute trials. In both tasks a rest interval of approximately ten to fifteen seconds was used between trials. On the third trial of each form the rest interval was extended to approximately twenty seconds.

Before beginning each form the Ss were instructed to state the number of symbols they expected to successfully complete on the first trial of the respective tasks. Probabilities of obtaining a particular score were provided the Ss. These probabilities, representing the chances of a S equalling or excelling a particular score, were presented in the form of decile equivalents based upon the performance of 130 introductory psychology students.

Prior to the beginning of the experiment, each S was presented the following written instructions which he was asked to read along with the experimenter:

> You are being asked to take a brief intelligence test. This test, which has been abstracted from the Wechsler Adult Intelligence Scale, is a very sensitive test. This is because the test is relatively culture free, since your score does not depend on how much you know.

At this point the experimenter showed the Ss a WAIS Record Form and briefly discussed some of the subtests placing special emphasis upon the Digit Symbol Test. The instructions continued:

> Results of this test give a very good indication of a person's intelligence and of the likelihood of career success (Ferguson, 1962). Since this is a study on the relationship between intelligence and learning, there will be two sections to the test. It is important that you follow the directions of the experimenter correctly. Do not make any marks on the test until you are told to do so. Open the test to page 1.

At this point the experimenter explained how the Ss were supposed to fill in the correct symbols under the appropriate numbers. An example, using symbols different from those appearing on the Ss test, was placed on the blackboard so that all Ss understood how they were to fill in the symbols upon being instructed to do so. The Ss were then told to turn back to the instruction page. The instructions continued:

> Before you begin the test you are to fill in the blank below that states: Expected Score ____. This is the number of boxes that you *expect* to successfully complete. To give you an idea of the probability of obtaining a particular score, look at Table I.
>
> Expected Score: ____ Expected Score: ____

Table I

Probability	Score
.10 or 1/10	50+
.20 " 2/10	47
.30 " 3/10	44
.40 " 4/10	41
.50 " 5/10	39
.60 " 6/10	37
.70 " 7/10	35
.80 " 8/10	33
.90 " 9/10	31

Table II

Probability	Score
.10 or 1/10	52+
.20 " 2/10	50
.30 " 3/10	48
.40 " 4/10	45
.50 " 5/10	43
.60 " 6/10	41
.70 " 7/10	39
.80 " 8/10	36
.90 " 9/10	34

> For example, if you expect to obtain a score of 47, you will notice that the probability of obtaining such a score is .20, or 2 chances out of 10. This means that if you do obtain a score of 47, then your score is equalled or

excelled by only 20% of college students. Eighty percent of college students score below you. If you expect to obtain a score of 35, this means that your chances of obtaining that score are 7 out of 10. To put this another way, this means that the chances of failing to obtain such a score are 3 out of 10. Of course, if you do obtain a score of 35 this means that 70% of college students equal or excel your score, and that 30% of college students rank below you. Now indicate the score you expect to receive in the blank above Table I.

When the experimenter tells you to begin, start at the first row and fill in as many squares as you can <u>without</u> skipping any. Do <u>not</u> omit any squares. When you complete the first row proceed to the second row and on to the third row when the second row is finished. It is important that you do not make any errors when recording the marks, since errors count against you. When the experimenter says stop, immediately raise the hand with which you are writing.

If you have any questions, please ask them now.

Upon completion of the first six trials the experimenter read to the Ss the instructions for the last six trials. These instructions, not written for the Ss, were read as follows:

On this section of the test the symbols have been altered. You are to fill in the appropriate mark under the correct number just as in the first section. Again, you are asked to fill in the score you expect to receive on the first trial of this task. Table II provides the probabilities of obtaining a particular score and is read in the same manner as Table I. Work as rapidly as possible. Do not skip any squares, and do not make any errors when recording the marks.

CHAPTER IV

RESULTS

Since each S was given six one minute trials on both Tasks A and B, the mean score on each task for each treatment group was computed for purposes of statistical analyses. The score on each trial was defined as the number of symbols completed without error. The Ss stated expectancies of success on the first trial of each task was the other response measure used in the study.

Two categories of analyses will be considered. First, preliminary analyses examining the possibility that factors other than anxiety and achievement may account for performance differences between groups will be presented. These preliminary analyses will be followed by analyses crucial to testing the main hypotheses of the study.

Preliminary Analyses

Two preliminary analyses were performed. One testing the assumption that Forms A and B did not differ in initial difficulty; the other testing the possibility that performance differences may be a function of aptitude differences between Ss.

In order to determine if performance differences could be attributed to unequal degrees of difficulty between Forms A and B, an analysis of variance was performed for the first trial of the experiment (Table II). This analysis indicated that Forms A and B did not differ in initial difficulty.

Two other preliminary analyses were employed to determine if performance differences may be associated with differences in aptitude between treatment levels. Composite ACT standard scores were available for 29 Ss in the TAS-n Ach group, and for 32 Ss in the MAS-n Ach group. Analyses of variance were performed for these standard scores within both groups (Table III and Table IV). The only significant effect reflected superior aptitude associated with low TAS Ss as compared with high TAS Ss. This effect was significant beyond the .01 level. This difference in aptitude between high and low levels of TAS has been supported elsewhere (Sarason, 1957c). Although this difference in aptitude could conceivably lead to performance differences, the main analysis revealed a nonsignificant relationship between TAS and digit symbol performance.

Finally, a product-moment correlation was computed between ACT scores and the mean performance scores on the first six digit symbol trials. For this analysis, TAS and MAS Ss were combined resulting in a total of 61 Ss. The

TABLE II

AOV ON TWO FORMS OF DIGIT SYMBOLS

Source	SS	df	MS	F
Treatments (bet Ss)	8.2025	1	8.2025	2.0318
Error (with Ss)	314.8965	78	4.0371	---
Total	323.0990	79		

TABLE III

AOV OF ACT STANDARD SCORES AS A FUNCTION OF TAS AND N ACH

Source	SS	df	MS	F
Test Anxiety	124.6168	1	124.6168	9.5350*
n Achievement	16.8144	1	16.8144	1.2866
TAS X n Ach	41.6987	1	41.6987	3.1906
Error	362.7322	25	13.0693	---
Total	545.8621	28		

*Significant at the .01 level.

TABLE IV

AOV OF ACT STANDARD SCORES AS A FUNCTION OF MAS AND N ACH

Source	SS	df	MS	F
Manifest Anxiety	19.2176	1	19.2176	1.3484
n Achievement	3.6254	1	3.6254	.2544
MAS X n Ach	3.6014	1	3.6014	.2527
Error	399.0556	28	14.2520	---
Total	425.5000	31		

obtained correlation, .09, was not significant. This result suggests that when considering both TAS and MAS groups, factors other than aptitude contribute to performance differences between subjects on a digit symbol test.

Main Analyses

For convenience, the analyses testing digit symbol performance will be followed by those testing stated expectancies of success.

A Lindquist Type III (1953) analysis of variance was performed for the TAS-n Ach group. This analysis partially supported the hypotheses (Table V). The prediction that high levels of n Ach will be associated with superior performance was confirmed for the first six trials. This result was significant at the .05 level. On the other hand, when the competing task was introduced at Trial 7, the high n Ach group failed to maintain their superior performance on the remaining six trials (Figure 2). On these last six trials no significant difference appeared between high and low levels of n Ach. Consequently, the prediction that high n Ach should lead to superior performance on these trials was not supported.

Analysis of the performance of high and low TAS Ss failed to approach significance. This result, of course, is not in accord with the prediction of superior per-

TABLE V

AOV OF DIGIT SYMBOL PERFORMANCE AS A FUNCTION OF TAS, N ACH, AND TRIALS

Source	SS	df	MS	F
Test Anxiety	208.5288	1	208.5288	2.8018
n Achievement	350.8706	1	350.8706	4.7144*
TAS X n Ach	3.9427	1	3.9427	.0530
Error (bet)	2679.3318	36	74.4259	---
Trials	48.7656	1	48.7656	5.4106*
Tr. X TAS	3.1205	1	3.1205	.3462
Tr. X n Ach	10.8277	1	10.8277	1.2013
Tr. X TAS X n Ach	31.5997	1	31.5997	3.5060
Error (with)	324.4679	36	9.0130	---
Between Subjects	3242.6379	39		
Within Subjects	418.7814	40		
Total	3661.4193	79		

*Significant at the .05 level.

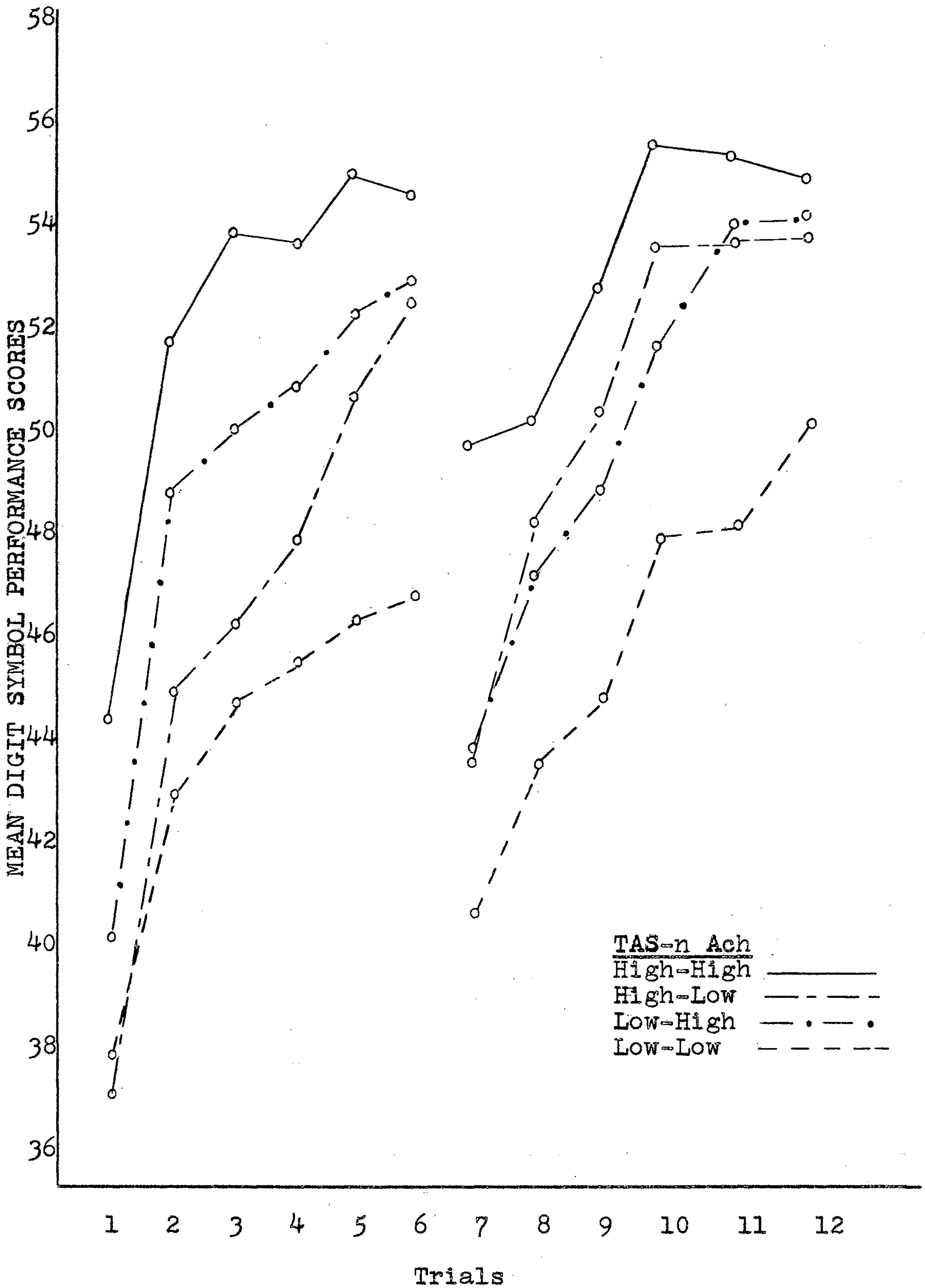

Figure 2. Digit Symbol Performance of TAS-n Ach Groups.

formance being associated with low levels of TAS. However, examination of Table V confirms the prediction that no interaction was anticipated on either task between TAS and n Ach. Apparently, these motives operate independently of one another.

In addition, a significant effect was associated with trials at the .05 level. It was assumed that Trial 7 would introduce incompatible and competing responses. As such, it was anticipated that the last six trials would represent a greater level of difficulty than the first six trials. As Figure 2 illustrates, this assumption was only partially supported. In comparison with the last trial on the initial task, and the first trial of the competing task, all Ss suffered a performance decrement. Presumably competing tendencies were operative at this point. However, inspection of the data indicates that the performance on Trial 7 in no case deviated below the Ss initial performance on Trial 1. Further, as a function of trials, all groups obtained a higher level of performance on the last six trials than on the first six trials.

A Lindquist Type III analysis of variance was also performed for the MAS-n Ach group. Again hypotheses concerning digit symbol performance were only partially supported. This analysis revealed a significant main effect at the .01 level for differentiating levels of MAS (Table VI). However, as in the previous analysis this

TABLE VI

AOV OF DIGIT SYMBOL PERFORMANCE AS A FUNCTION OF MAS, N ACH, AND TRIALS

Source	SS	df	MS	F
Manifest Anxiety	562.0120	1	562.0120	7.4652**
n Achievement	35.9925	1	35.9925	.4781
MAS X n Ach	21.0125	1	21.0125	.2791
Error (bet)	2710.2352	36	75.2843	---
Trials	28.8000	1	28.8000	4.3299*
Tr. X MAS	13.3335	1	13.3335	2.0046
Tr. X n Ach	14.7233	1	14.7233	2.2135
Tr. X MAS X n Ach	8.2047	1	8.2047	1.2335
Error (with)	239.4527	36	6.6515	---
Between Subjects	3329.2522	39		
Within Subjects	304.5142	40		
Total	3633.7664	79		

*Significant at the .05 level.
**Significant at the .01 level.

effect was maintained for the first six trials, dissipating for trials 7 through 12. More striking is that an analysis of the simple effects revealed that superior performance was associated with Ss classified low in MAS. This result was contrary to the prediction that high levels of MAS would lead to superior performance on the first six trials. Likewise, since no significant differences appeared between MAS Ss on the last six trials, the prediction was not confirmed that high levels of MAS would lead to performance decrements in comparison to low MAS Ss.

A more unexpected finding was that no significant differences emerged between the high and low n Ach groups. Clearly, the prediction that Ss classified high in n Ach should perform in a superior fashion on both tasks is not supported by the data. This evidence is in complete discord with the results of the TAS-n Ach group which revealed a significant relationship between n Ach and digit symbol performance.

In relation to the anticipated interaction between MAS and n Ach on the first six trials, analyses of the data indicated a nonsignificant relationship between these two variables. On the other hand, the prediction that MAS and n Ach should not interact on the last six trials was supported.

As in the case of the TAS-n Ach group, a significant trials effect was obtained. Figure 3 illustrates the

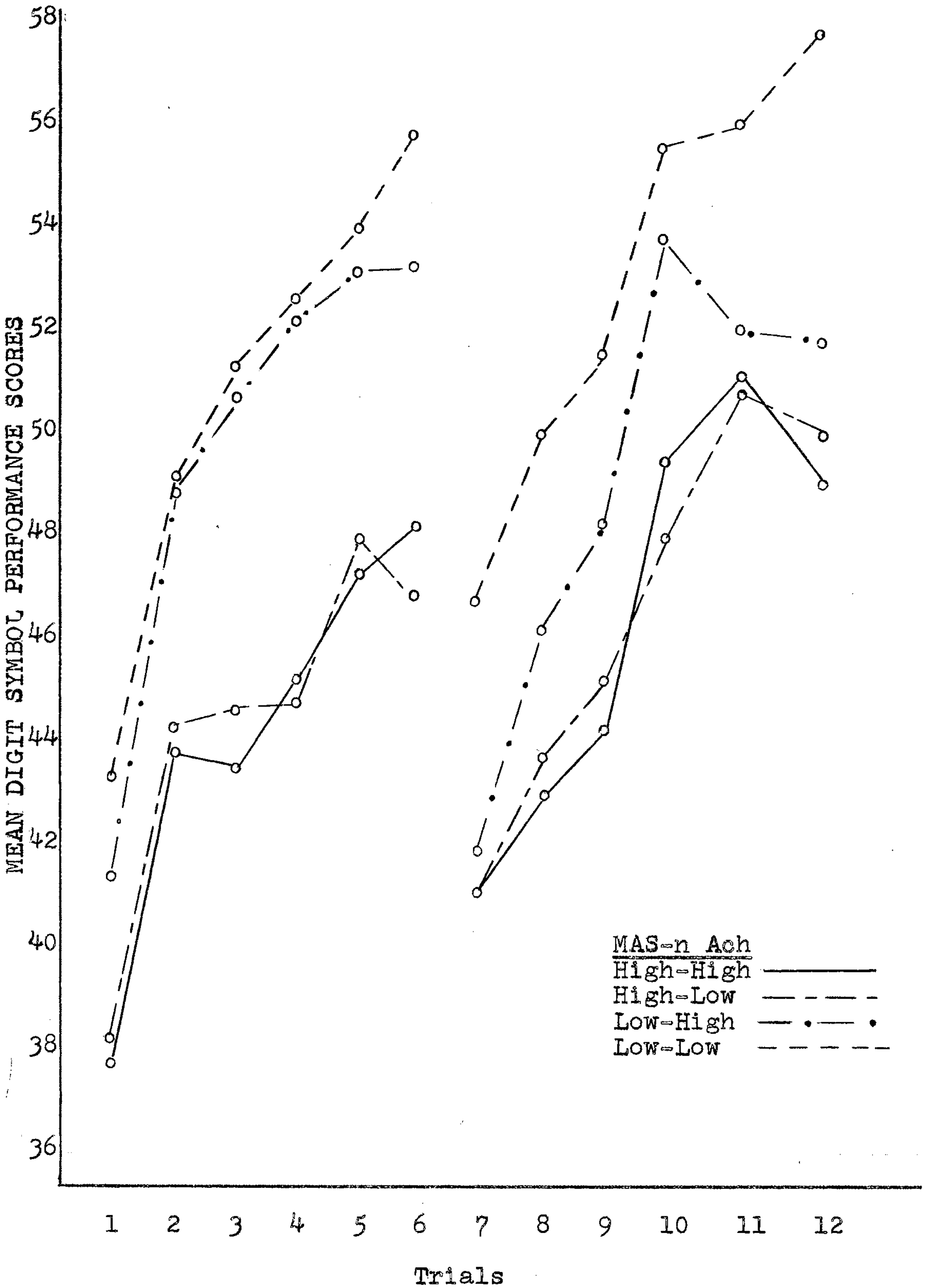

Figure 3. Digit Symbol Performance of MAS-n Ach Groups.

nature of this relationship. Again, performance decrements were associated with all groups as a function of the transition between Trials 6 and 7. The performance level of all groups on Trial 7 also exceeded their performance on Trial 1. Moreover, the performance of all groups was enhanced during the last six trials in comparison to the first six trials. Although the performance of the low anxious-low achievement group continued to rise over the last six trials, Figure 3 illustrates that the performance of the other three groups suffered a decrement on the final trial.

Finally, to test the expectancy hypotheses the Mann-Whitney U Test was employed. For these analyses the Ss stated expectancies of success were converted into absolute deviation scores. These deviations away from the fiftieth percentiles presented in the instructions were used to test the hypothesis that Ss classified high in achievement motivation or low in anxiety would prefer tasks of intermediate difficulty more often than Ss classified low on the achievement or high on the anxiety indices.

In order to make meaningful comparisons, separate analyses were performed for n Ach and anxiety. The comparison between high and low achievement was made while holding the anxiety level constant. Similarly when either TAS or MAS Ss were compared, the levels of n Ach were held constant. Since there were two deviation scores per S and four anxiety and achievement levels within each design, eight comparisons were possible within the TAS-n Ach and MAS-n Ach groups.

The results of the TAS-n Ach group will be considered first. In relation to n Ach levels, no significant differences were found with TAS held constant (Table VII). Similarly, when n Ach was held constant, differences between levels of TAS were not significant (Table VIII). In neither case did the analyses approach significance. These results clearly do not support the predictions.

Analyses of the MAS-n Ach group likewise reflected nonsignificant differences between levels of achievement (Table IX). However, when low achievement was held constant, a significant difference was found to be associated with MAS (Table X). This difference, significant at the .05 level, indicated that low MAS Ss were more avoidant on the first trial of the intermediate difficulty range (i.e. 50th percentile) than Ss classified high in MAS. Although significant, this result was directly opposite from the prediction that low MAS Ss would more often select the intermediate level of difficulty. The remaining three anxiety comparisons did not approach significance.

Since the Mann-Whitney U Test is unable to detect differences in expectancies between trials, a Lindquist Type III analysis was performed on the stated expectancies of success. This analysis permitted a test of interaction

TABLE VII

MANN-WHITNEY U TEST OF PROBABILITY PREFERENCES FOR N ACH WHILE HOLDING TAS CONSTANT

Achievement Comparisons	Trial 1	Trial 2
High-High vs. High-Low	U = 38.0	U = 39.5
Low-High vs. Low-Low	U = 48.0	U = 45.0

$p \leq .05$ when $U \leq 27$

TABLE VIII

MANN-WHITNEY U TEST OF PROBABILITY PREFERENCES FOR TAS WHILE HOLDING N ACH CONSTANT

Test Anxiety Comparisons	Trial 1	Trial 2
High-Low vs. Low-Low	U = 36.5	U = 42.5
High-High vs. Low-High	U = 33.0	U = 41.0

$p \leq .05$ when $U \leq 27$

TABLE IX

MANN-WHITNEY U TEST OF PROBABILITY PREFERENCES FOR N ACH WHILE HOLDING MAS CONSTANT

Achievement Comparisons	Trial 1	Trial 2
High-High vs. High Low	U = 34.0	U = 35.5
Low-High vs. Low-Low	U = 47.5	U = 38.0

$p \leq .05$ when $U \leq 27$

TABLE X

MANN-WHITNEY U TEST OF PROBABILITY PREFERENCES FOR MAS WHILE HOLDING N ACH CONSTANT

Manifest Anxiety Comparisons	Trial 1	Trial 2
High-Low vs. Low-Low	U = 27.0*	U = 43.5
High-High vs. Low-High	U = 47.0	U = 37.5

*Significant at the .05 level.

between achievement and anxiety, along with an examination of changes in expectancies as a function of trials. In order to perform this analysis, the _S_s stated expectancies originally given in the form of percentiles, were transformed into _z_ equivalents.

Considering the TAS-n Ach group, a significant main effect at beyond the .001 level was found for trials (Table XI). This result, in Figure 4, indicated that all groups initially expected to perform above the 50th percentile. However, on the seventh trial the expectancies of all groups lowered significantly, with the expectancies of three groups deviating below the 50th percentile.

In addition, the trials by achievement interaction was significant at the .05 level. This result reflected that on the second expectancy trial (the seventh performance trial) the expectancies of the two high achievement groups were closer to the fiftieth percentile than the expectancies of the two low achievement groups who selected the 39th percentile as being preferred. The expectancies for the two high achievement groups were the 48th and 59th percentiles respectively.

An analysis of variance for the expectancies of the MAS-n Ach group lent results similar to those reported above. Again the trial effect was significant beyond the .001 level (Table XII). As illustrated in Figure 5, all groups exhibited a downward linear trend in stated

TABLE XI

AOV OF PROBABILITY PREFERENCES AS A FUNCTION OF TAS, N ACH, AND TRIALS

Source	SS	df	MS	F
Test Anxiety	.2611	1	.2611	1.2299
n Achievement	.8426	1	.8426	3.9689
TAS X n Ach	.6072	1	.6072	2.8601
Error (bet)	7.6441	36	7.6441	---
Trials	1.2375	1	1.2375	14.3229**
Tr. X TAS	.0357	1	.0357	.4132
Tr. X n Ach	.4336	1	.4336	5.0185*
Tr. X TAS X n Ach	.0349	1	.0349	.4039
Error (with)	3.1095	36	.0864	---
Between Subjects	9.3550	39		
Within Subjects	4.8512	40		
Total	14.2062	79		

*Significant at the .05 level.
**Significant at the .001 level.

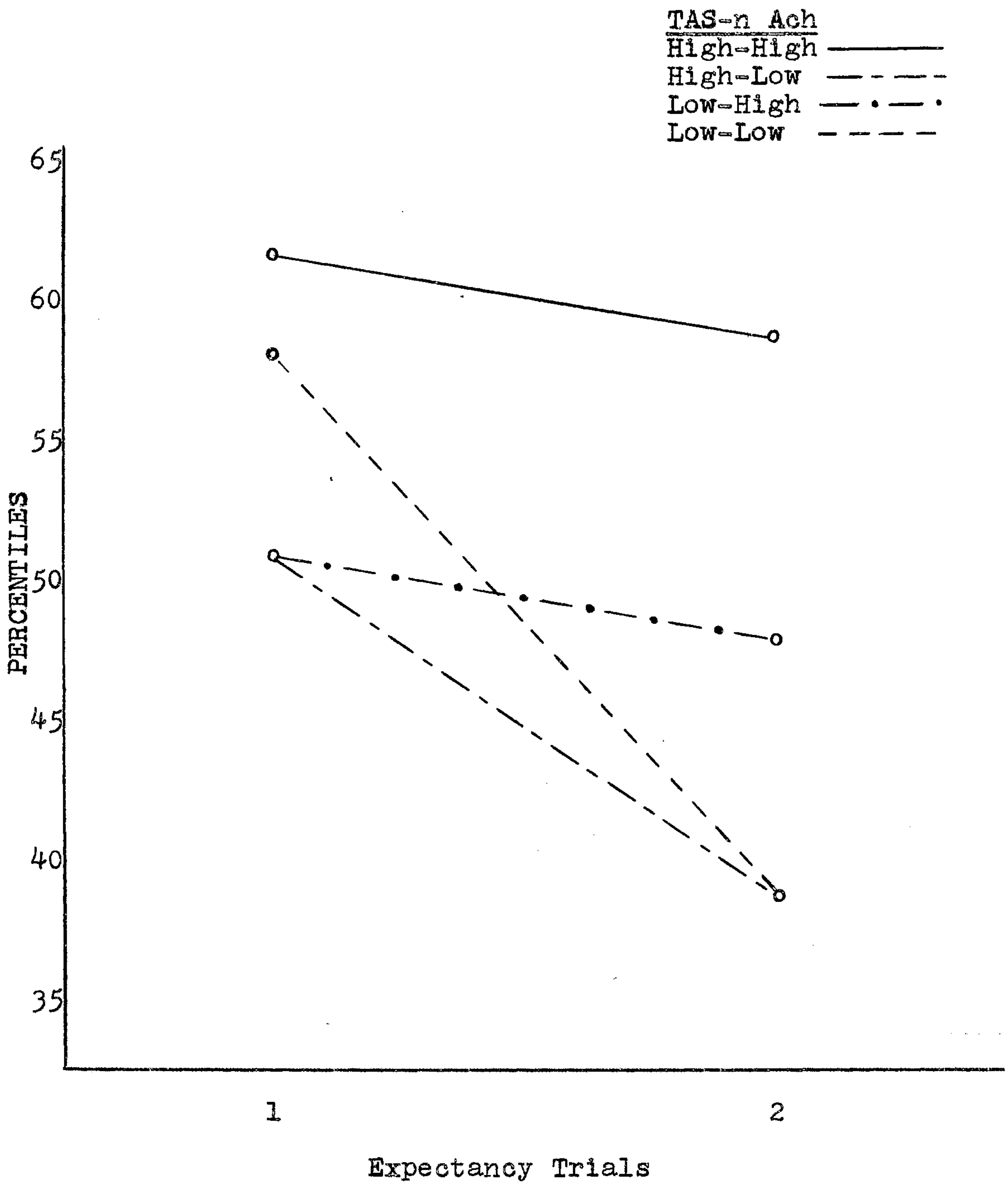

Figure 4. Mean Probability Preferences of TAS-n Ach Groups.

TABLE XII

AOV OF PROBABILITY PREFERENCES AS A FUNCTION
OF MAS, N ACH, AND TRIALS

Source	SS	df	MS	F
Manifest Anxiety	.3328	1	.3328	1.0339
n Achievement	.0480	1	.0480	.1491
MAS X n Ach	1.6647	1	1.6647	5.1715*
Error (bet)	11.5885	36	.3219	---
Trials	1.6820	1	1.6820	14.0167**
Tr. X MAS	.2102	1	.2102	1.7517
Tr. X n Ach	.0015	1	.0015	.0001
Tr. X MAS X n Ach	.3431	1	.3431	2.8592
Error (with)	4.3209	36	.1200	---
Between Subjects	13.6340	39		
Within Subjects	6.5577	40		
Total	20.1917	79		

*Significant at the .05 level.
**Significant at the .001 level.

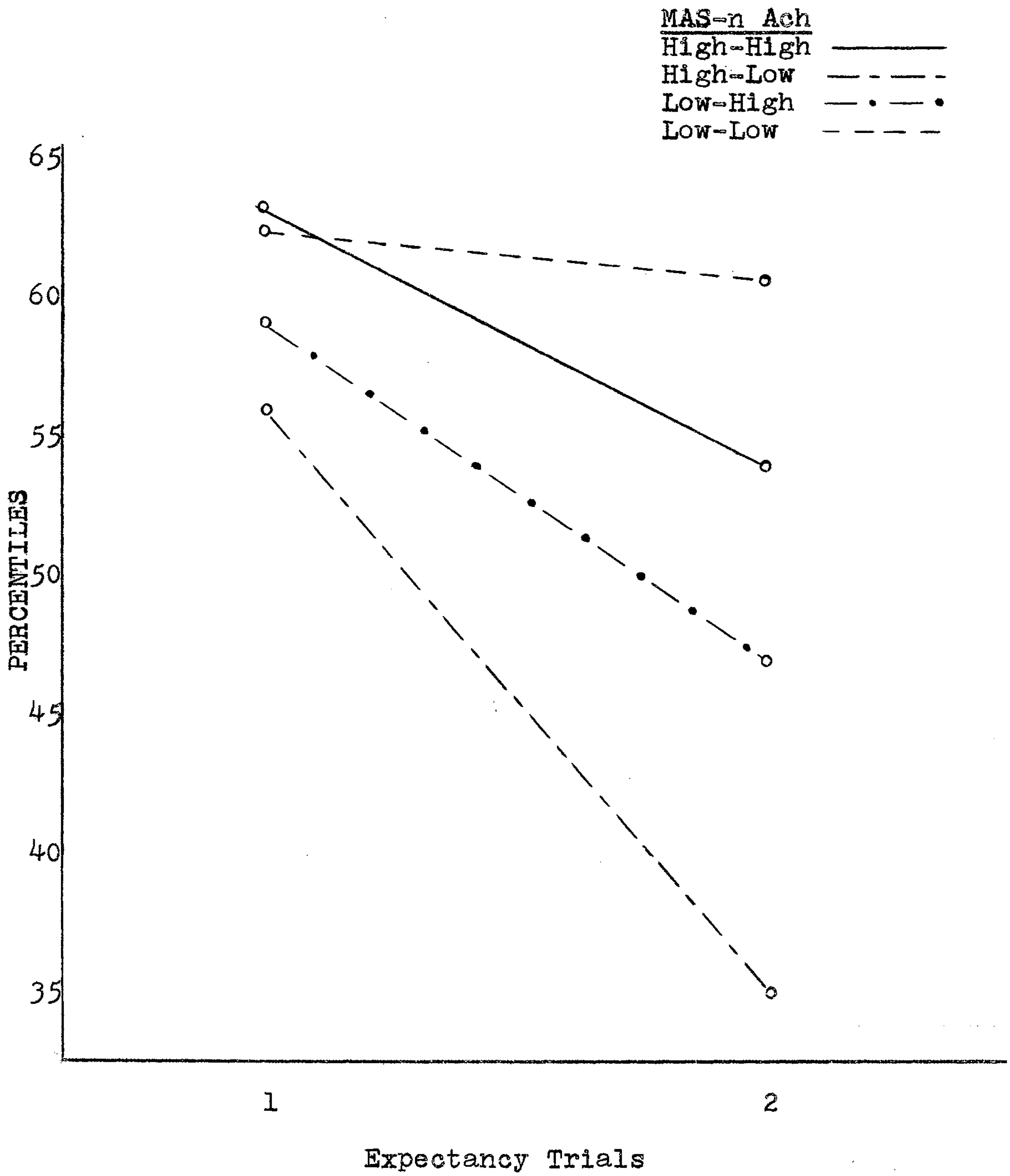

Figure 5. Mean Probability Preferences of MAS-n Ach Groups.

expectancies. The expectancies of two of these groups again went below the 50th percentile.

The interaction between MAS and n Ach was also significant at the .05 level. The groups simultaneously classified high-high and low-low in MAS and n Ach did not differ as much from their initial expectancy as the groups classified low anxious-high achievement and high anxious-low achievement. As noted above, the expectancies of these latter two groups deviated below the 50th percentile on the seventh trial.

As Figure 5 illustrates, on the second expectancy trial the preferences of the two high achievement groups are closer to the 50th percentile than the two low achievement groups. On this trial the expectancies selected by the two high achievement groups are the 54th and 47th percentiles, whereas the two low achievement groups selected the 61st and 35th percentiles respectively.

CHAPTER V

DISCUSSION

The purpose of this study was to explore the relationship between anxiety and achievement variables to measures of digit symbol performance and probability preferences. Specific hypotheses were formulated on the basis of the theories generated by Spence and Taylor, Mandler and Sarason, and Atkinson. Since the major finding is that these theories were only partially confirmed, data supporting and refuting the theories will be discussed below.

Mandler and Sarason's "test anxiety" theory was not supported by the data. In both tasks the relationship between TAS and digit symbol performance did not approach significance. The failure to obtain a significant relationship between anxiety and digit symbol performance suggests that a revision of the theoretical properties associated with TAS may be necessary.

The first digit symbol task reflected significant performance differences in accord with Spence and Taylor's "drive theory." However, the superior performance on this task by the low MAS groups was not anticipated. It may be recalled that the predicted superior performance associated with high anxiety levels was based upon the assumption that this initial task did not involve incompatible and competing response tendencies. However, inspection of Figure 3 suggests that this assumption is questionable. For example, when comparing the first trial of the initial task with the first trial of the competing task all groups exhibited a higher level of performance on the latter task. Moreover, all groups obtained a higher level of performance on the six trials of the competing task than on the preceding six trials of the first task. Together this indicates that the first six trials reflected a greater level of difficulty presumably because incompatible responses were operative. In view of this finding it is not surprising that superior performance was found to be associated with low MAS Ss. This result is congruent with drive theory expectations, since high drive levels should lead to performance decrements under conditions involving competing habits. However, the failure of the low anxious groups to maintain their superiority over the last six trials was not anticipated.

In regard to the interactions between TAS-n Ach and MAS-n Ach, three of the four hypotheses were confirmed. That no interaction was anticipated between TAS and n Ach on both tasks was supported. On the other hand, contrary to the prediction, a nonsignificant interaction was found between MAS and n Ach on the first six trials. However, the nonsignificant interaction between these two variables on the last six trials was in agreement with the hypothesis.

Of theoretical interest was the discrepancy in achievement results between the MAS and TAS groups. Although the more parsimonious explanation of these findings is to attribute them to sampling error, these results also appear interpretable in terms of an "optimal" notion of drive. Such an optimal notion of drive has been considered elsewhere (Sarason, 1956; Yerkes and Dodson, 1908). It may be recalled that n Ach and TAS have been regarded as reflecting primarily associative functions, whereas MAS is presumably nonassociative in function. Regardless of this classification, all motives reflect both functions.

It is probably correct to assume that high levels of TAS and n Ach do not reflect the same magnitude of drive associated with high MAS levels. Consequently, for purposes of theoretical argument TAS and n Ach levels will arbitrarily be assigned a numerical value equal to half the drive level associated with the corresponding MAS levels. The optimal drive notion considered here presumes that the nonassociative combination of achievement and anxiety variables is additive. Tables XIII and XIV illustrate this additive relationship between the nonassociative functions of MAS-n Ach and TAS-n Ach. On the basis of the empirical findings of this study, it is assumed that maximum performance is associated with drive levels

TABLE XIII

THEORETICAL DRIVE VALUES OF THE COMBINED NONASSOCIATIVE FUNCTIONS OF MAS AND N ACH WITH AN ASSUMED PERFORMANCE ASYMPTOTE WITHIN THE RANGES 3 - 4

MAS-n Ach Levels	Drive Values MAS n Ach	Expected Performance Rank
High-High	4 + 2 = 6	4
High-Low	4 + 1 = 5	3
Low-High	2 + 2 = 4	2
Low-Low	2 + 1 = 3	1

TABLE XIV

THEORETICAL DRIVE VALUES OF THE COMBINED NONASSOCIATIVE FUNCTIONS OF TAS AND N ACH WITH AN ASSUMED PERFORMANCE ASYMPTOTE WITHIN THE RANGES 3 - 4

TAS-n Ach Levels	Drive Values TAS n Ach	Expected Performance Rank
High-High	2 + 2 = 4	1
High-Low	2 + 1 = 3	2.5
Low-High	1 + 2 = 3	2.5
Low-Low	1 + 1 = 2	4

having asymptotes within the range between 3 and 4.

Now by assuming that n Ach also energizes all habits existing in a given situation, one would expect that a combination of high levels of this function with high MAS levels to lead to performance decrements in situations where competing responses are present. Inspection of Figure 3, Chapter IV, indicates that the high-anxious high-achievement group is retarded in their performance to all other groups in eight of the twelve trials. Likewise, on the basis of the drive values presented in Table XIII, one would expect the low-achievement low-anxious group to be superior to all other groups since low drive levels should lead to superior performance in situations where response competition is present. This expectation is confirmed by Figure 3 which illustrates that this group maintained their superiority on all twelve trials. Since the two remaining groups would represent intermediate levels of drive, one would expect these groups to perform between the other two groups. More specifically, in relation to Table XIII and considering the asymptotic range suggested previously, the performance of the low-anxious high-achievement group should be superior to the performance of the high-anxious low-achievement group. Again Figure 3 supports this expectation.

This combination of nonassociative functions could conceivably lead to the nonsignificant achievement effect within the MAS-n Ach group. Inspection of Table XIII indicates that the two high levels of n Ach are either at the presumed asymptote or above it. The combined drive value of the high-anxious high-achievement group is above the optimal range and presumably contributed to the impaired performance of this group. It may be noted that one of the drive values of the two low-achievement groups also extended beyond the optimal performance range. Thus, it is not surprising that nonsignificant differences were obtained between achievement levels in this group. On the other hand, such an interpretation could account for the significant MAS effect. Again Table XIII illustrates that the two low-anxious groups were in the optimal drive interval with values of 3 and 4, whereas the two high-anxious groups have drive values above the asymptote.

When considering the significant achievement effect of the TAS-n Ach group the same reasoning applies. As previously noted both variables seem to reflect predominantly associative functions. Thus one would assume that the nonassociative components of TAS and n Ach would be less than their corresponding MAS level. In view of preceding considerations superior performance should be associated with the high-anxious high-achievement group since their additive drive value is within the optimal performance range (Table XIV). On the other hand, the group classified low-anxious low-achievement should be retarded in their performance as a result of their combined drive level deviating below the asymptote (Table XIV). Inspection of Figure 2, Chapter IV, confirms these expectations. On all twelve trials the performance of the high-anxious high-achievement group was superior to all other groups, whereas the performance of the low-anxious low-achievement group remained consistently inferior to the other three groups. In addition, since the combined drive values of the high-low and low-high groups were equal, according to the present position their performance levels should also be equal. Figure 2 again indicates that the performance of these two groups closely approximated one another throughout the entire twelve trials.

Although the validity of the preceding interpretation may be questioned on the basis of a posteriori considerations and the arbitrary assignment of empirical constants, it does not appear to be logically sound to assume that a unidimensional measure such as the MAS can adequately tap all of the relevant sources of drive which contribute to performance differences. Conceivably this lack of accounting for other sources of drive could in part explain the conflicting research reviewed in Chapter I. Rather than rely on the MAS as an adequate assessment of drive, perhaps future investigators can develop an instrument representing in addition to anxiety other sources of secondary motivation. Such a "global" instrument could subsequently be used as a more reliable index of total effective drive.

Finally, in relation to Atkinson's "expectancy-incentive" theory, the data indicated that high-achievers do not initially prefer intermediate levels of difficulty to a greater extent than low-achievers. However, on the second stated expectancy trial, there was a definite tendency for high achievement levels of both TAS and MAS groups to prefer ranges of intermediate difficulty. On this trial, expectancies of the high-achievement groups were closer to the 50th percentile than those of the low-achievement groups. These findings suggest that Atkinson's theory perhaps needs to be modified in terms of specifying the situational influences under which high-achievers prefer intermediate tasks to a greater extent than low-achievers. The present data indicate that one condition leading to intermediate preferences of a high-achievement group is repeated experience with a task or similar task after which preferences are assessed.

In relation to Atkinson's avoidant motivation hypothesis, neither TAS nor MAS levels were associated with differences in stated expectancies in the predicted direction. These latter results did not support the contention of a relationship between stated expectancies and avoidant motivation. As used in this context, the construct "avoidant motivation" lacks conceptual clarity. The present results suggest that some redefinition and more precise specification of this term may be necessary. Further, the contingent relationship between expectancy and incentive in Atkinson's model does not contribute to useful predictions. An independent assessment of both expectancy and incentive would perhaps lead to the development of a more pragmatic model. Such a model, of course, must await future research.

CHAPTER VI

SUMMARY

This investigation was concerned with testing the theories of Spence (1958) and Taylor (1956), Mandler and Sarason (1952), and the expectancy-incentive theory of Atkinson (1957;1960b). Specific hypotheses formulated in accord with these theories were tested on two behavioral measures: digit symbol performance and probability preferences. The independent variables were TAS (Sarason, 1958), MAS (Taylor, 1953), and n Ach (Worell, 1965).

A survey of the literature revealed significant performance differences being associated with Ss classified high in achievement motivation. However, a general finding indicated that different measures of n Ach have a low and insignificant correlation among one another. Studies reviewed concerning the TAS (Mandler & Sarason, 1952; Sarason, 1958) indicated that performance decrements were associated with Ss classified high in test anxiety. On the other hand, the literature reviewed on the MAS (Taylor, 1953) indicated performance differences between anxiety levels was a function of task complexity. Studies involving simple learning problems reflected superior performance

being associated with high anxious Ss. However, the results of studies using complex tasks were somewhat contradictory. Several of these studies indicated superior performance to be associated with low MAS Ss as a function of task complexity. On the other hand, some studies failed to support the finding of impaired performance being associated with high levels of anxiety as a function of increasing the difficulty level of a task. In addition, studies relating anxiety to digit symbol performance were reviewed. These results were contradictory; the majority indicating no relationship between anxiety and digit symbol performance.

Since the studies reviewed did not control for other motivational variables, the question was raised as to whether consideration of both anxiety and achievement variables would lead to increased predictive efficiency on a digit symbol task. A position which attempts to account for both anxiety and achievement variables (Atkinson, 1960b) was considered in light of the aims of the present study.

This investigation employed two 2 x 2 factorial designs. One group of Ss was classified on the basis of TAS and n Ach; a separate group was selected on the basis of MAS and n Ach. The digit symbol test consisted of two tasks, A and B. All Ss were given six one minute trials on Task B which was preceded by six one minute trials on

Task A. The symbols used in Task B were identical with those of Task A, except the symbol direction was reversed on Task B. As such, it was assumed that Task B represented a greater level of difficulty by introducing response competition. Analysis of the data, however, only partially supported this assumption.

The prediction that high TAS Ss should perform in an inferior fashion when compared to low TAS Ss on both digit symbol tasks was made in accord with Mandler and Sarason's position (1952). The data, however, did not support this prediction.

On the other hand, a significant relationship was found to be associated with MAS and digit symbol performance on the initial six trials. During these trials superior performance was associated with low anxious Ss, the effect disappearing on the last six trials. Although this effect was opposite to the hypothesis, analysis of the difficulty level of the first six trials suggested that the result was congruent with drive theory expectations. Evidence cited in favor of this interpretation was the significant trials effect found for both MAS-n Ach and TAS-n Ach groups. This effect indicated that on the last six trials performance level of all groups tended to increase over their performance on the preceding six trials. This finding was interpreted as suggesting that the first six trials involved incompatible response dispositions and represented a greater level of difficulty than the last six trials.

Predictions were also made for interactions between the anxiety and achievement variables. The nonsignificant interaction found between TAS and n Ach on both tasks supported the hypothesis. However, it was anticipated that MAS and n Ach would interact on the initial six trials of the digit symbol task. The data revealed a nonsignificant interaction. On the other hand, the prediction of a nonsignificant interaction on the last six trials between MAS and n Ach was confirmed.

The performance of the TAS-n Ach group revealed a significant achievement effect for the first six digit symbol trials only. However, analyses of the achievement variable of the MAS-n Ach group did not lend significant results. Although these results could be a function of sampling error, they were interpreted in light of an "optimal" notion of drive. This discussion of an "optimal" drive level supported the major contention of the study that performance differences could more adequately be explained by taking into account both anxiety and achievement variables. Suggestions were made that future investigators should consider the possibility of developing an instrument which would more adequately assess the drive level of the <u>S</u>s than does the present MAS.

Finally, hypotheses related to Atkinson's "expectancy-value" theory were tested. All groups were provided with probabilities of obtaining a particular score on the first trial of each task. These probabilities were presented in the form of deciles on the basis of the previous performance of introductory psychology students. The Ss stated probability of success on the initial trial of each task consisted of the expectancy measure. The results only partially confirmed the expectation that Ss classified high in achievement motivation would prefer tasks of an intermediate difficulty. The results indicated that high n Ach Ss preferred tasks of intermediate difficulty only after experience with the task after which expectancies were assessed. This finding was discussed in light of the necessity of formulating boundary conditions specifying the extent to which one can anticipate selection of intermediate difficulty levels by high-achievers.

However, predictions were not supported that high levels of MAS and TAS reflect avoidant motivation and thus such Ss should avoid the intermediate difficulty range where the arousal of anxiety is presumably greatest. It was suggested that the lack of conceptual clarity concerning approach and avoidant motivation within the framework of Atkinson's model precluded useful prediction. A discussion of the dependent relationship between the expectancy and incentive constructs of this theory was presented. The suggestion was made that future studies should consider developing a means by which expectancies and incentives can be assessed independently of one another.

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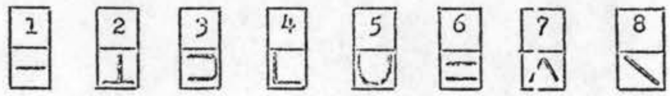
APPENDIX A

DIGIT SYMBOL TEST: FORM A



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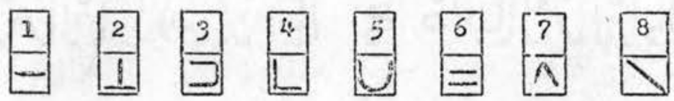

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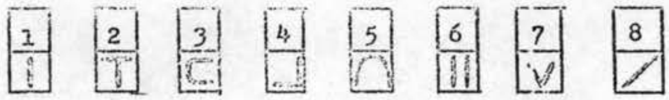
APPENDIX B

DIGIT SYMBOL TEST: FORM B



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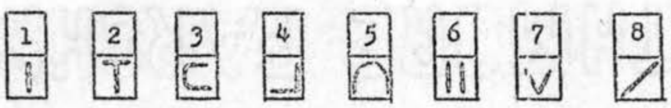

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4	7	3	8	2	4	1	5	2	6	7	3	6	4	5	1	6	2	7	3	8	4	2	5	6

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