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THE EFFECTS OF CERTAIN ANXIETY-PRODUCING TECHNIQUES ON ACHIEVEMENT TESTING AND MOTIVATION IN HIGH SCHOOL GEOMETRY CLASSES

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THE EFFECTS OF CERTAIN ANXIETY-PRODUCING TECHNIQUES ON ACHIEVEMENT TESTING AND MOTIVATION IN HIGH SCHOOL GEOMETRY CLASSES

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THE EFFECTS OF CERTAIN ANXIETY-PRODUCING TECHNIQUES ON ACHIEVEMENT TESTING AND MOTIVATION IN HIGH SCHOOL GEOMETRY CLASSES

CHAPTER I

INTRODUCTION

This study of anxiety is concerned with some of the interactions between organismic and stimulus variables which have for the past decade so engrossed educational psychologists. Anxiety as a variable related to achievement and testing situations recently has been studied (Alpert and Haber, 1960; Hill and Sarason, 1966; Kagan and Moss, 1962; Rosenberg, 1965; Sarason, 1960).

In identifying sensations and passions, the Stoics around the fourth century B. C. classified fear (the expectation of evil) as one of the four passions under which was classed apprehension, hesitation, shame, perplexity, trepidation, and anxiety; the last being a fear of some uncertain event. But only during the last few years have psychologists devised objective scales to measure this "passion" identified so many centuries ago. Presently, there are few

areas of study that can match the prodigious productivity of anxiety-scale output.

The first notable scale, used to measure Hull's Drive in human subjects during learning situations, was Taylor's Manifest Anxiety Scale (MAS), possibly more misused by experimental psychologists and clinicians in checking specific variables such as intellectual performance, the ability to learn, and reactions to stress than any measure of anxiety. Rather than a test for general anxiety, tests for certain factors in the total anxiety pattern were needed. A major aspect of this decade's progress in anxiety studies has been the identification of specific anxieties such as test anxiety, anxiety in children, and social anxiety for which investigators have devised tests better fitted to these particular needs. Through factor analysis, examiners have been able to determine just what each item on a test tends to identify. An example of the increase in the number of anxiety tests is in Buros' Mental Measurements Yearbook (1965). Many of the 267 character and personality tests measure specific as well as general anxiety.

Studies about anxiety have resulted in the evolvement of various definitions since Freud in 1897 described normal anxiety (when he decided "to regard as separate

factors what causes libido and what causes anxiety") as the results from anticipation in which the individual recreates in fantasy a memory of a "previous defeat, utilizing it to experience a dangerous threat to the self" (Freud, 1921). He concluded that any forbidden wish might produce anxiety and that aggression was a decisive factor in the mobilization of anxiety. He considered fear the reaction to a known specific anxiety; while neurotic anxiety, the feeling of terror, was the result of the individual's inability to differentiate between the wish and the action.

Another definition of anxiety is from the Encyclopedia of Psychoanalysis, 1968, pp. 37-38:

> the unpleasure experienced when the object is unknown and the anticipation of being overwhelmed by an internal or external force is present. The emotion of anxiety, along with the secretory and motoric discharge connected with it, is an affect experienced by the total personality.

Recent Relevant Studies on Anxiety

The progress made in several programs of experimental study of human motivation since 1950 deserves the attention of researchers in the field of education. Achievement-motivation analysis has centered at Michigan and Harvard (Atkinson, 1958, 1964; Atkinson and Feather, 1965; McClelland, Atkinson, Clark, and Lowell, 1953; McClelland, 1961), while studies of performance originated

at Iowa (Spence, 1958; Taylor, 1956). These programs represented the beginning of an integration of what Cronbach (1957) called "the two disciplines of scientific psychology" meaning the study of individual differences and the study of the basic process. Both programs have produced valuable instruments for research--the content-analysis method to assess achievement and other important social motives and the self-report tests of anxiety. Each has produced experimental findings showing how motivation affects performance and human learning.

More than a decade ago, studies focused mostly on behavioral consequences of differences in achievement motive until evidence, accumulated usually with the Test Anxiety Questionnaire (Mandler and Sarason, 1952) or the Manifest Anxiety Scale (Taylor, 1953), made it clear that whenever performance was evaluated in relation to some standard of excellence, the desire to achieve for one student posed a threat of failure to another. This tendency to avoid failure associated with anxiety was basically important in achievement-oriented action. This was the conscious experience of anxiety in school situations which inhibited the undertaking of achievement-oriented activities. At times such anticipatory emotional reaction (the fear of

failure) has been equated directly to general anxiety. Since the incentive value of failure was negative, it might act as a shock or a noxious event to be avoided (Atkinson, 1966; Atkinson and O'Connor, 1963).

Maguire (1966) reported that highly anxious students were more rigid in levels of aspiration as measured by an estimation of their scores. Recently Grossman and Clark studied some daily school crises that baffled experienced professionals (1965). Teachers took the roles of "others" in small study groups as school visitor, parents, school psychologist, and tried to view the situation from these various angles. Using a set of guidelines for full observation of classroom occurrences, their attention was focused on prevention or repair of damaged teacher-student relationships. In summation, the investigators reported teachers as being relatively insensitive to subtle aspects of pupil personality and behavior problems. Previously teachers' ratings had involved only one dimension, the reflection of academic performance.

During the sixties, studies produced contradictory results of the effects of anxiety and threat-nonthreat conditions on performance. Sarason and Minard (1962) found significant positive relationships between anxiety and verbal conditioning. High anxiety performance on

verbal-conditioning tasks was inferior to that of low anxiety in threatening experimental situations, but it was superior in nonthreatening experiments (Resnick, 1965). Only the subjects reporting the correct response-reinforcement contingency were influenced by the threat-nonthreat conditions. High-anxiety students performed better than low-anxiety students under nonthreatening conditions.

The bulk of available findings suggested that highly anxious subjects were affected more detrimentally by motivating conditions of failure reports than were the subjects lower in the anxiety-score distribution (Sarason, 1960). Significant interactions were obtained among three variables: MAS scores, reports to subjects of levels of failure, and the speed of presentation of task stimuli by Davidson, Andrews, and Ross (1956). Evidence showed that highly anxious subjects were more self-deprecatory, less content with themselves, and more self-preoccupied than subjects lower in anxiety scores. Ego-involving instructions, such as those used in this study, aroused these tendencies inhibiting task performance. Though Sarason failed to find differences in performances between groups which differed in anxiety in early studies, he did find such differences later under conditions of personal threat (1956, 1957a, 1957b). Recent evidence suggested

that the more directly related the content of items on the anxiety scale was to the situation in which subjects were to perform, the more useful was the anxiety measure in showing interactions between scale scores and differential motivating instructions (Raphelson, 1957; Sarason, 1958, 1959, 1960). Low-scoring anxiety subjects might react to personally threatening conditions with increased efforts, but often high-scoring subjects responded to threat such as stressful classroom situations with self-oriented responses.

In a five-year longitudinal study conducted by Hill and Sarason (1966) the educational consequences of test anxiety were shown. Children who increased in test anxiety gained less in test performance and expressed greater defensiveness than students who decreased in anxiety. Using both specific and general measures of anxiety, several studies showed anxiety levels to be negatively correlated with achievement-test scores (Hill and Sarason, 1966; Rosenberg, 1965). High anxiety was also associated with low achievement motivation (Kagan and Moss, 1962). The highly anxious child experienced the greatest difficulty in "evaluative situations in which he was required to function independently" (Hill and Sarason, 1966, p. 61).

Some Specific Problems in Evaluating Test Anxiety

Another problem in the study of anxiety which was receiving much attention recently was that of the examiner as an agent in creating a threat to the subject, especially during the administration of instructions. MAS originators were interested in relating the test to the concept of the response hierarchy. Montague (1953) used learning of nonsense syllables and found that low-anxious subjects were superior to highly anxious subjects on the most difficult task. However, in simple conditioning Bindra, Paterson, and Strzelecki (1955) did not obtain significant differences between high and low anxious subjects. Korchin and Levine (1957) considered the learning situation not so much a task variable as a stress variable. There was also the dual aspect of task complexity: the difficulty and the threat. The combination of these might lead to larger differences in performance between high and low anxious students than the manipulation of either threat or complexity alone.

In the late 1950s, the sex of the subject and that of the examiner and also their characteristics became variables in integrating anxiety, motivation, and task. The comparison of anxiety to intelligence has long been a topic of conjecture. Usually college students were used as

subjects with the Graduate Record Examination (GRE) or the College Entrance Examination Board Scholastic Aptitude Test (SAT) being compared to scores on general anxiety tests (MAS or TAS). Results ranged from very slightly related to definite positive or negative relationships between anxiety scores and performance scores. Five studies showed that subjects scoring high in test anxiety obtained lower performance scores than the low anxious groups (Cowen, 1957; Mandler and Cowen, 1958; Sarason, 1957b, 1959a; Sarason and Mandler, 1952).

Investigators have also probed into the area of physiological variables related to anxiety (Lacey, 1950; Martin and McGowan, 1955). They learned that there were marked individual differences in subjects' physiological response patterns under stress. However, highly anxious patients in mental hospitals did not always show the same pattern of symptoms nor did they display anxiety symptoms at all times. Cohn (1946) reported two types of EEG (electro-encephalogram) patterns among patients with high-anxious states characterized by excitement, depression, and general irritability. Patients' patterns returned almost to normal when generally tense patients were distracted or relaxed. Finally, examiners have learned that subjects in anxiety studies could bias samples by showing

plus-getting tendencies (tendencies to attribute "bad" characteristics to themselves), negative test-taking attitudes, or unshakeable response sets. Poorly constructed rating scales inevitably lead to low-order relationships. Much work has been undertaken in interrated reliability and bias studies.

Evolvement of a Workable Definition of Test Anxiety As Used in This Paper

Freud, in working with patients making free associations, first hypothesized, in 1921, that anxiety must be a consequence of repressed energy attached to sexuality taking expression in various symptoms serving as defensive mechanisms. Later (1936) he came to regard anxiety as the emotion produced by threats of impending danger or some fearful occurrence. Other psychiatrists, including Horney (1945), extended this concept to include not only feelings of fear consequent to sexual fantasies but also to feelings of aggression, hostility, and loneliness. More recently, O'Connor, Lorr, and Stafford (1956) have factored the Taylor MAS and obtained five correlated patterns--chronic anxiety, increased psychologic reactivity, sleep disturbances associated with inner strain, a sense of inadequacy, and motor tension.

In discussing defense mechanisms, many psychia-

trists classify anxiety generally into two types, "traumatic" (the more primitive form, that of feeling in danger of imminent destruction) and "signal" (a milder experience of uneasiness or tension both conscious and unconscious). Presently, the role of anxiety and of the conscious and unconscious defensive measures utilized to deal with anxiety occupy a central position in analytic thinking.

Implications of such studies made great impact upon recent experimental situational projects piloted by Spence and Taylor. One was the study of the effect of anxiety on a paper-and-pencil test measuring the conditioned eyeblink response. Assuming that anxiety would function to raise drive level, they predicted that high anxiety would improve performance on simple learning and lower performance on more complex learning tasks. Results supported their predictions.

Anxiety was classified by clinicians in abnormal psychology as a feeling or subjective state of discomfort signalling an unresolved internal tension or apprehension about a potentially harmful input from the environment. Anxiety neuroses were moderately severe emotional disturbances characterized by such feelings, which were often overwhelmingly powerful and which frequently swelled into acute "anxiety attacks" associated with sweating, trembling,

palpitation, and other autonomic responses (Encyclopedia Britannica, vol. 18, p. 687).

Generally teachers have recognized that neuroses can develop even in the very young child, and the work of Selye (1969) and others indicated that life stress and anxiety can have wisespread effects on the physiology of the organism. Possibly neurosis can be understood as partly a matter of an altered physiological state. Once such bodily upset occurs, the system may become more sensitive to additional stresses, resulting in an organism so sensitized to further emotional disturbances (as the stressful classroom situation) that it cannot function productively. Despite differences in emphasis, most schools of psychotherapy agreed that mental illnesses were at least in part, expressions of chronic states of anxiety and frustration.

Walter, Denzler, and Sarason (1964) found test anxiety more consistently related to test performances than were the more general anxiety indices. Test anxiety was significantly and negatively related to intelligence test performance but not to grades for boys. For girls, IQ (Intelligence Quotient) and GPA (grade-point average) were both negatively related to TAS (Sarason's Test Anxiety Scale). The four scales used were TAS measuring

anxiety specific to testing, NAS (need for achievement scale) which dealt with the degree to which individuals experience the need to achieve and the anxiety over this need, GAS (a general anxiety scale) which measured anxiety experienced in a variety of situations, and LPS (a lack of protection scale) which showed an individual's separation anxiety.

Lewin (1931, 1935) explained that the behavior that actually emerged would depend not only on the type of conflict but also on the strength of the approach and avoidance forces. Miller (1944, 1951) translated Lewin's theory of conflict into the language of behavior theory. If fear were considered an acquirable drive, then fear would act as motivation and the fear-reduction as reinforcement in the learning of new responses. Fear, or anxiety as it was often called when its source was vague, could be learned as a response to previously neutral cues readily. Miller (1948) called anxiety a drive because it served to motivate learning and performance of new responses in the same way as hunger and thirst.

Amsel (1958) theorized that stimulus conditions associated with frustration (absence of an expected reward) would increase emotional disturbance and drive. Miller's two response tendencies, approach and avoidance, were

recapitulated by Berlyne (1968):

> (1) the strength of the tendency to approach a positive incentive increases with nearness to it, (2) the strength of the tendency to avoid a negative incentive increases with nearness to it, (3) the strength of the avoidance tendency diminishes with increasing distance more steeply than that of the approach tendency, and (4) the strength of an approach or an avoidance tendency at a given distance from the incentive object varies directly with the strength of the relevant drive.

Since likely the conflict would cause discomfort, the individual needed to acquire behavior patterns capable of averting or resolving such conflict. Such patterns could be learned, reducing the frustration and avoiding the establishment of chronic anxiety through the use of the reinforcement value of conflict reduction. Discussing a stimulus-response analysis of anxiety and its role as a reinforcing agent, Mowrer (1939) was one of the first psychologists to put forward the hypothesis that fear or anxiety as he called it operated as a drive, and fear reduction as a reward.

Sahakian (1968) believed that hostile behavior had early roots, that neurosis was learned, and that it could be unlearned. Since conflicts were constant accompaniments in all lives at all ages, social training in thinking must begin early for the proper responses to occur, thus allaying fears. Direct instrumental

responses to internal drives or external cue-producing responses might fail to occur because they were inhibited by competing thoughts or have not been learned. More severe conflicts often arose because of the punishment methods employed in the American culture for angry attitudes or hostile behavior. Sahakian proposed that some individuals were "predisposed" to stronger primary drives and stronger inhibitions, while some were able to use higher mental processes to resolve traumatic tension.

However, the problem arose about how to distinguish neurotic behavior. An objective test definition of anxiety and neurosis was needed. Pioneers in this area were Cattell and Eysenck whose chief dispute in factorial approaches to anxiety seemed to be only a matter of words; Eysenck's neuroticism closely corresponded to Cattell's anxiety. Nevertheless, Cattell argued that other factors were involved in distinguishing neuroticism, as discussed in Adcock (1965):

> Eysenck argues that extraversion-introversion should not be considered as a factor related to neuroticism but here superficial evidence may be misleading since his centroid factors are necessarily orthogonal while Cattell's second-order factor (anxiety) is in some degree related.

Possibly the second-order factor (anxiety) was a measure of emotional reactivity largely determining the degree of

guile proneness, ego strength, and ergic tension, being itself a direct contribution to neurosis. Anxiety could be related to effects rather than to causes of neuroticism. Shyness and protension (suspiciousness) could operate either as cause or effect (Adcock, 1965).

Cattell and colleagues have studied bodily reactions to stress-induced disturbances. Cattell examined nine hypotheses concerning the essential nature of anxiety. Cattell's questionnaire factor, Anxiety (UI 24), correlated with such factors as more susceptibility to annoyance, willingness to admit common frailties, and greater tendency to agree (Cattell and Scheier, 1961). They labeled this factor Free Anxiety after closely examining these nine hypotheses. In judging the effect of anxiety on retention, psychologists were not agreed on a definition of emotion suitable to the field, but most agreed that differences in strengths of emotional states did exist. While Hastings (1944) suggested that "tension" was a better label for that condition preceding an examination (emotion carried the implication of stronger affective states), Lund (1930) described emotion as a strongly affective state involving diffuse somatic reactions which could precede testing.

Recently Odom and Attwell (1965) discussed degrees progressing from tension to emotional stress to anxiety, as a state of precipitous fear, and fear as the highest level of emotional reaction. Earlier Skinner (1953) had described emotion as dealing with tension, stress, anxiety, and fear as a set of emotional predispositions attributed to any individual being confronted by aversive stimuli of increasing strength along the continuum of tension to fear. Using the IPAT (Institute for Personality and Ability Testing Anxiety Scale, Odom showed that heightened anxiety was a condition found related to test taking. All subjects experienced above average anxiety throughout the experiment as revealed by the sten scores on A and B sections of the IPAT scale, producing inhibition of test performance evidenced by differences between the posttest scores of the control and experimental groups.

Haywood and Dobbs (1964) found the usual negative correlation between manifest anxiety and verbal intelligence in working with high school boys; but there was a significant positive correlation between manifest anxiety and the avoidance factor (inventory of anxiousness). Students high in motivation orientation sought

tension-inducing situations.

In forming a workable definition for test anxiety, Gotts (1967 Symposium) maintained that school anxiety fell at some intermediate position between general anxiety and specific anxiety with test anxiety being one component of school anxiety. The close link between defenses and traits made the establishment of anxiety difficult, but in predictable school stress situations, the child could be expected to present particular qualities of personal behavior. Probably a better policy would be to associate anxiety with personality style, which was less a function of particular defenses.

The relationship of performance to the organism's level of activation was best described by the inverted-U hypothesis (Malmo, 1959). Now the inverted-U has been combined with adaptation levels to produce a representation of the relationship of anxiety and external pressure to performance (Cronbach, 1962). Each task had an optimum tension level, which approximated the Mandler-Sarason emphasis on the task-relevant-irrelevant dimension for responses evoked by a particular drive stimulus. In Cronbach's study of fifth graders, boys were less anxious than girls both in subgroups and compositely. Thus, the

aggressive characteristic of high school-anxiety (HSA) subjects' responses suggested a more adaptive wholesome picture than that usually associated with neurotic anxiety.

To Taylor, Gotts, and others, drive conception suggested that anxiety scores were related to emotional responsiveness which contributed to overall drive level. Evidence from classical defense conditioning studies generally supported drive conception with primary emphasis given to motivational rather than cue properties. Ruebush (1963) demonstrated that subjects with a high manifest anxiety conditioned more readily than did those of low anxiety. High drive will be associated with high performance except in complex learning situations, as geometry test taking, where emitting incorrect responses by highly anxious persons might interfere with learning.

Test-taking ability was adversely affected by test anxiety. Drive theory, like personality theory, contributed a trait-like quality to anxiety considering it a stable aspect of an individual's function (Ruebush, 1963). Phillips (1967) favored the trait interpretation while recognizing the situational aspects of testing itself. Gotts further suggested that it might be useful in this connection to imagine a continuum of anxiety manifestations extending from those relatively continuous or

trait-like to those which appear only in the presence of state-like, particular stress.

Taylor was the chairman of a symposium on school anxiety held at Washington, D. C., in September, 1967. A questionnaire of 105 items was formed to check five types of school anxiety--test anxiety, recitation anxiety, report-card anxiety, failure anxiety, and achievement anxiety. In testing fourth, fifth, and sixth graders, examiners found no IQ or age differences in regard to anxiety, but there were sex differences with boys showing a slightly higher anxiety rating than girls. In summation, the psychologists agreed that the questionnaire had potential usefulness for the study of children's school anxiety because it allowed investigation of what might be called a profile of school anxiety, it produced scores which, in spite of relatively short length, had reasonable reliability, and it produced validity coefficients that, though not phenomenally large, were somewhat larger than those ordinarily reported in anxiety literature.

The next step in the research project will be the attempt to identify behavioral correlates of children's test and recitation anxiety, analyzing tapes of recordings to identify overt behavioral and anxiety reaction indices

in test and recitation situations. Response bias on such questionnaires has long plagued testers as Bergan (1967) who devised a special scoring procedure for minimizing response bias on school anxiety questionnaires. After using his bias adjustment scale, he made the following assumptions: anxiety was common to everyone, there were individual differences among persons in the kinds of situations which will elicit anxiety; and if persons were placed in a series of similar and potentially stressful situations, individual overall anxiety reactions for all the situations would be maximal. Persons who tended to react with anxiety in the first situation, would so act again in other situations; persons who did not react with anxiety in initial situations would tend not to exhibit anxiety in remaining situations.

School anxiety, as identified by Phillips (1968), was a function of the disposition to be anxious and was considered a function of the anxiety evoking potential of school situations. In developing the concept of test anxiety, the Yale group emphasized the role of evaluation in test and test-like situations. Since most school situations were explicitly or implicitly evaluation-oriented, essentially the same theoretical framework could be applied to the concept of school anxiety. Measuring

eight behavior variables in relation to coping style and school anxiety, experimenters saw anxiety actions decrease when children were placed in nongraded schools but did not find the decrease among children remaining in the graded systems. School anxiety in the fourth grade could be predicted as early as first grade. School anxiety appeared also to be related to underachievement (Adams and Phillips, 1968). They found that birth order made no difference in school anxiety between first born and later born. Differences in anxiety (as averaged over a two-year period) led to differences in school achievement and aptitude behavior.

Otto (1966) reported after testing fourth, fifth, and sixth graders in an all-white, rural-suburban school that anxiety level became potent only after the critical level of motivation had been reached. High motivational instruction produced motivation beyond the critical level, but data offered no means of locating this point on a continuum. The nature of interaction between anxiety levels and motivational levels needed clarification. When given high motivational instruction, highly anxious subjects' initial performance on a digit printing task was depressed by extreme nervousness (as observed by particular behavior during the test). As performance improved, it was depressed by accumulative reactive

inhibition. There was more poor achievement among the highly anxious students, but the highly motivated poor achievers did produce results remarkably similar to those produced by the highly anxious performers (Otto, 1965).

Among non-Anglos and boys, school anxiety was not associated with the experience of school failure to the same degree that it was among Anglos and girls (Phillips, 1968). Such evidence could indicate that school anxiety scores of non-Anglos and boys did not have the same degree of validity that they had for Anglos and girls. Success might not be as important for boys and non-Anglos. The middle-class and feminine-oriented elementary school alienated boys and non-Anglos making failure more acceptable to them. Evidence that boys and non-Anglos responded more aggressively and less constructively to school frustration pointed toward aggression's anxiety-reducing properties.

Sassenrath (1967) found factors constituting test anxiety have little in common with those constituting general anxiety. He examined multiple correlations of test anxiety, general anxiety, aptitude and GPA. He evaluated test anxiety as a response to stimuli which the subject previously had learned were threatening. Learned anxiety responses interfered with the responses relevant to

completing a task. Test anxiety presumably had motivating properties also. TAQ (Sarason's Test Anxiety Questionnaire similar to the questionnaire formulated by experts at the Washington School Anxiety Symposium) showed small negative correlations with GPA and aptitude test scores.

Children must adapt adequately to social requirements of schooling before they can adapt adequately to its academic requirements (Thelen, 1959). School anxiety was significantly influenced by early school experiences; for instance, listening to and carefully following verbal instructions and being able to screen out distracting influences were not only important aspects of school socialization but also were essential in functioning effectively in test situations (Thelen, 1959). In identifying anxiety as a function of early school experience, Phillips (1968) called school anxiety that anxiety function related to school situations in which a high degree of threat, uncertainty, and failure were experienced, as differentiated from neurotic anxiety (generalized or chronic) and school anxiety which was more situational and objective in nature.

Therefore, within the profusion of several definitions of specific anxiety, one has evolved that can be

used as the definition of test anxiety for this paper. This state is especially aroused when the subject knows that such a test will be evaluated, posing a high degree of threat to the ego. Therefore, test anxiety is that specific state of disquietude associated with the situation of taking examinations.

CHAPTER II

ACHIEVEMENT AND SOCIALIZATION AS RELATED TO SPECIFIC MEASURES OF ANXIETY

Introduction

The relation of achievement to anxiety has received a great deal of attention since Davis's initial essay on the development of social anxiety for effective learning (1944). Sarason for many years has studied the educational consequences of test anxiety. His five-year longitudinal study with Hill (1966) yielded cross-sectional negative correlations between test-taking ability and anxiety which increased during the years, on all ability levels. Those children who increased in test anxiety gained less on the average in overall test performance and showed greater defensiveness. Elder (1968) maintained that variations in task performance came from two sources: genetic and environmental with a third source being the developed characteristics of the child from the transactions of the first two sources. The largest proportion of variance in academic achievement

was traced to a major environment source, family socialization and structure.

Sources of Variations in Achievement Behavior

Personal characteristics, as low anxiety, a sense of personal worth, and a belief in internal rather than external control on one's environment, facilitate high academic performance (Lavin, 1965). Lavin, who reported an average correlation of $r = .60$ between intelligence tests in high school and grades, said that failure tended to be a self-confirming process among boys. High anxiety was associated with low self-esteem and unhappiness.

Kahl's analysis (1965) of the Mastery factor indicated a belief in a controllable future, trust in people and the independence of family (expressed in rejection of statements such as "Nothing in life is worth the sacrifice of moving away from your parents," and occupational primacy (Elder, 1968, p. 317). Earlier Rosen (1956) using independence from family, deferred gratification, and mastery, found this index moderately related to college aspirations. Feather assumed in a 1959 study that pride in difficult achievement was associated with testing situations in a way that fun in winning games was not. Using achievement orientation ("this is a test") versus

relaxed orientation ("this is a game"), he asked sixth-grade boys which prize on the two levels of difficulty would be more pleasing to win. Those subjects under the achievement orientation preferred the prize from the difficult task while those under the relaxed condition were less unanimous about the prize winning under difficult conditions.

Stix (1967) investigated the interrelationship between two personality variables--anxiety and repression, and achievement. The relationship of anxiety with achievement depended on the mediating effect of the level of defensiveness (repression). Results did not support the assumption that the level of anxiety was inversely related to complex learning, rather a moderate level of anxiety was conducive to first-semester overachievement for female college students. When anxiety was combined with excessive defensiveness, it was disruptive. He discovered a curvilinear relationship between achievement and anxiety. Harleston (1962) noted that sex must be considered in predicting relationships between anxiety and complex learning. The effects of anxiety upon any problem-solving task must be viewed in light of the type of the task, the situation, and the sex of the subject. This echoed Bindra's assumption (1959) that maximal performance might be associated

with an optimum range of the level of arousal. Present-day curricula subject the students to such disparate levels of difficulty that anxiety effects on achievement may vary from one college sample to another. Other personality variables, as repression, are often viewed in concert with anxiety effects on learning.

Assuming that the probabilities of success and failure were approximately equal to 1.00, the tendency to avoid failure was most strongly aroused when the probability of success was intermediate and was stronger the stronger the motive (Atkinson and O'Connor, 1966). As assessed by TAQ the effect of differences in disposition to anxiety was more apparent in tasks of intermediate difficulty, much as the achievement motive, showing multiplicative interaction between the personality disposition and the situational determinants.

Atkinson (1964) said that achievement-oriented behaviors (assuming all individuals have acquired motives to achieve and avoid failure or a capacity for interest in achievement and/or anxiety about failure) are expressed in any situation when the individual knows that his performance will be evaluated. Here was the approach-avoidance conflict as one of these motives produced a tendency to undertake an activity (excitatory) while the other

produced a tendency to avoid the undertaking (inhibitory). These two might combine additively to yield an achievement-oriented tendency which was either excitatory or inhibitory in character with a strength depending upon the relative strength of the motive to achieve and the motive to avoid failure. Either might dominate depending on intrinsic and extrinsic components. Atkinson (1964) found the final strength of the tendency to undertake activities in the intermediate range of difficulty. The anxiety-prone person preferred to avoid all activities with questionable outcomes, but chose either the very difficult or very easy task because the final strength of his multidetermined tendency was stronger than at the point of maximum threat where the subjective probability of success was near .50 (Atkinson, 1965). The person with a strong inhibitory tendency (expressed in anxiety) appeared at times to have a very high level of aspiration. He compromised between avoiding failure and the sum total of extrinsic motivation. He was totally inhibited except for other sources of positive motivation which overcame his inhibition. "The price paid for achievement-oriented action is the experience of anxiety . . . proportionate to the strength of inhibitory resistance that is overcome" (Atkinson, 1966, p. 37).

These implications about avoidance and anxiety departed from the often accepted view that anxiety is a source of excitation or responses and that anxiety-reduction makes for reinforcement. There should have been no anxiety when the person performed an act with no anticipation of a negative consequence (giving a rationale for using a self-report anxiety test). The amount of anxiety experienced by a person in a competitive situation is assumed to be proportionate to the strength of his tendency to achieve. When he reported his anxiety during test taking, he was telling of the strength of his resistance to achievement-oriented action.

The Effects of Social Pressure and Instruction upon Students

In 1966 Yamamoto reported on the effects of three sets of test instructions on the scores of an intelligence test. Social pressure of one form or another affected subjects' reactions to test questions. However, the hypothesis that the more test-anxious and dependency-prone pupils would show higher sensitivity to social pressure, transmitted through test instructions, than their less-anxious and low-dependency-prone peers was not supported by the evidence. The conclusion was drawn, nevertheless, that highly dependent children, under ambiguous instruc-

tions, reacted with more attention and were highly motivated to make a better record, while the low-dependency-prone student was less restricted by teacher influence. In 1953 Ausubel, Schiff, and Gasser found differences between anxious and non-anxious subjects on improvement in task performance, and in 1968 Jones and Cobes discovered greater discrepancies between levels of aspiration and performance for highly anxious subjects than for those with low level of anxiety. The presence of a strange audience was anxiety-provoking and exerted pressure on individuals, influencing the levels of aspiration and performance. Group instruction did give rise to anxiety in the Jones and Cobes' study, but a child working alone with an instructor might set unrealistic goals and study inefficiently also.

Gagné (1964) suggested that instructions be viewed as independent variables which enter into the experimental question when they constitute background variables in research. Concept-attainment researchers often manipulate instruction. In 1964 Laughlin varied instructions as to the number of card choices and speed. For the groups instructed to attain concepts rapidly the time-to-criterion scores were significantly lower. Studying the effects of instruction, sex, and stimulus variables

upon concept attainment, Tagatz (1966) stated no significant differences existed between the following three variables upon concept attainment: (1) male or female subjects, (2) modes of information presentation, and (3) ordered or random stimulus displays. Klausmeier (1964) reported the amount of instructions to be significant in judging the efficiency of attaining concepts. The process of concept attainment has been regarded in various ways by renowned examiners; Bruner (1960) viewed it as information processing, while Miller (1960) attributed to subjects the employment of global strategies and others considered it as mere operant conditioning with negative instances being non-reinforcing.

Much more exploration is needed into the study of persuasion-anxiety relationships combining personality characteristics with such variables as yieldingness, influenceability, and receptivity. Positive relationships have been found between suggestibility and mental age, between the years of education and indoctrination, and between persuasion and intelligence where receptivity was made the problem (Sternlicht and Wanderer, 1963; Hovland, Lumsdaine, and Sheffield, 1949; Murphy, Murphy, and Newcomb, 1937, respectively).

If the theory were accepted that anxiety had drive value (Brown, 1961) rather than just the cue aspect (elicitor of task interference), then an intermediate level of anxiety would be optimal for reception, with a negative relation existing only in high ranges between the reception mediator and anxiety. With the increase of levels of induced anxiety, an increase in hostility to the communicator was likely. Anxiety could serve as a negative reinforcement with hostility acting as a resistant force to the influence of instructions. Janis (1954) discovered that students chronically high on neurotic anxiety symptoms were less persuasible, but others have found little or no such evidence when manipulating anxiety levels.

Appeals which were made by a highly credible source and which the listener highly valued produced greater attitude change than appeals eliciting only mild tension (Hewgill and Miller, 1965). Fallout shelters had so much potential for arousing anxiety that the difference was not between messages of high and low anxiety but rather between high levels that varied in strength (Powell, 1965). Different degrees of high anxiety were explicitly directed to the listener himself or at those with whom he was personally and closely involved.

In a study of frustration and language to influence attitude change, the focus of often-quoted experts in social psychology, Weiss and Fine (1956) centered upon subjects that had been deliberately frustrated but prevented from aggression toward the frustrating agent. The highly provoked subjects changed attitude significantly more in response to punitively oriented communication than the nonfrustrated subjects. According to this activation theory, subjects increased and decreased activation levels depending upon what level was appropriate to the time of day and the task at hand. The language of the message must be relevant and appropriate regardless of the degree of intensity. The most anxious subjects conformed to advocated behavior more readily when exposed to maximal fear than when less aroused (Weiss and Fine, 1956).

Schultz, Firetto, and Walker (1969) have just completed a study of the relationship of parental assessment and anxiety in high school freshmen. Personal development was most strongly influenced by the environment, namely social and home contacts. Concerning the interactions in the genesis of emotional disorders, current theory gives emphasis to family backgrounds (Fleck, 1966).

Major personality theorists talk about emotional malady almost always in terms of anxiety. Maladaptive behavioral bases through neurosis and psychosis were related, usually complexly, to anxiety, according to Jenkins (1966). Actual research relating anxiety to negative or positive parental assessment has been quite limited. Jenkins used Taylor's Manifest Anxiety Scale and the Cooper Parent Evaluation Scales. Results yielded a negative correlation between the anxiety scales' scores of students and father-mother assessments.

Personality composition and parental attitudes were important factors of college success, Knight and Chansky (1964) discovered. The writers, in testing seventh graders, found discrepancy in reading, arithmetic, and language correlations with study problems and anxiety scores. Using the Brown-Holzman Counseling Key, the California Achievement Test, and the Children's Manifest Anxiety Scale, they found anxiety negligibly related to achievement measurements, but there was some correlation between predicted academic achievement and psychological needs. If scholastic ability tests were confounded by personality variables, it would be more difficult to find personality tests that could predict college success as added to already used intelligence tests.

In 1962 Spielberger commented that students often used test-anxiety scores as vehicles for a rationale of poor performance; those who did poorly blamed high anxiety. There was a complex relationship among scholastic ability, anxiety scores, and measures of academic performance. Only those male students in the broad middle range of scholastic ability demonstrated significant relationships between anxiety-scale scores and achievement scores.

Social psychologists Meunier and Rule (1967) learned that low test-anxious persons were less persuasible than the highly test anxious. Pressures, as experimenters' statements about time and transcripts, led to doubt about competence. Examination of the findings in the performance of complex learning tasks and conformity suggested that one of many self-oriented components might involve the cognitive factor, confidence in performing the task. With highly test-anxious college students responsive to evaluative instructions, the effect of instructions might be to stimulate a re-evaluation of the person's own likelihood of success and failure.

In a later study involving underachievers and overachievers, manifest anxiety and test anxiety were not identical (Davids, Sidman, and Silverman, 1968). For underachievers, age, IQ, and anxiety were not associated

with performance, but there were consistent significant correlations among latencies and error scores on experimental tasks. For high achievers, manifest anxiety was significantly correlated with speed of performance. Underachievers showed significantly higher scores on both manifest and test anxiety scales.

Atkinson (1965) asked subjects to estimate the expectancy of success and recommend suitable monetary penalties for failure at tasks which differed in difficulty. Failing at easy tasks proved a great source of embarrassment causing Atkinson to state that the repulsiveness of failure was greater the easier the task (Atkinson, 1956, p. 33).

Checking for relationships among anxiety, neuroticism, intelligence, and extraversion, Ley and Spelman (1966) concluded that the results did not support their hypothesis that regression of intelligence-test scores on anxiety and neuroticism was curvilinear and in the form of an inverted-U or that extraversion was negatively correlated with intelligence. However, curvilinear relationships between anxiety and intelligence were found by Sarason and Mandler (1952) and Lynn and Gordon (1961). Ley and Spelman used the Maudsley Personality Inventory (MPI), IPAT Anxiety Scale, the Taylor MAS, and the 16 PF

Questionnaire, Form C. All significant correlations between extraversion and intelligence were positive but the authors intimated other personality factors could have entered here.

Eysenck (Adcock, 1965) always stressed the homogeneity of test items and the length of the test in personality questionnaires, so Ley and Spelman et al. (1966) held that the tests might not have been long enough to build up inhibition sufficient to cause decrement in test performance. Possibly also the extraverts really were brighter than the introverts, and this factor masked the effect of differential decrement.

The aim of this section has been to show both consistencies and inconsistencies in research. Discrepant findings pointed to the need for further research in this area.

CHAPTER III

A DISCUSSION OF THE TESTS USED IN THE PILOT STUDY

Introduction

Much preliminary work was done even before the pilot study began in order to acquire two groups of high school students as homogeneous as possible. Cumulative folders of some 500 students were examined in detail for achievement score and IQ score similarities, using groups with the same geometry instructor. From 123 students of one male instructor, 40 boys and 40 girls were selected. All these 80 tenth-graders have decided to attend college. All were taught the full school year by the same teacher with the same lectures, assignments, class time, tests, and texts for both groups. On the Otis Quick-scoring Mental Ability Test, the boys' mean IQ score was 111.4 and the girls' mean IQ score was 113.0. Chronological ages ranged from 15 years and five months to 16 years and five months for girls and from 15 years and six months to 16 years and eight months for boys. On the standardized geometry semester test of 100 points, the boys' mean raw

score was 77.33 and the girls' was 76.59 with a range of 58 to 98. The range of IQ scores was from 105 to 120 for the 80 subjects. These students attended a middle-class-oriented, small-city, public high school with an average daily attendance of 1,500.

Tests Used in the Pilot Study

The rationale for the selection of the three tests used, Zuckerman's and Lubin's Multiple Affect Adjective Check List (MAACL, 1965), Alpert's and Haber's Achievement Anxiety Test (AAT, 1960), and Costello's Two Scales to Measure Achievement Motivation (1967), in the pilot study was based on the supposition that those scoring high on the need to be a success would likewise be identified by the AAT as high scorers, while those scoring highest on the MAACL would also be identified by the AAT as debilitators and facilitators. In ranking by mean scores the four personality types on all three tests, the examiner found no such relationships (Table 11, Appendix A).

Costello's test has 10 items in Scale I and 14 items in Scale II each balanced with keyed yes-no responses. Factoring suggested that Scale I was measuring motivational dispositions of individuals who wanted to do a job well, whereas Scale II measured the dispositions of persons

desiring to be successful, Costello concluded. His inventory was first administered to 191 men and 191 women, ages 17 to 59, in groups from 10 to 115 subjects. Split-half reliability on a new sample of 264 college students equally distributed by sex for Scale I was r = .82 and for Scale II was r = .73 using the Pearson product-moment coefficient and corrected by the Spearman-Brown Prophecy Formula. Correlations with the Maudsley Personality Inventory, the Brengelmann Drive Scale, and Taylor's MAS ran from negligible with the Maudsley to r = .66 with the MAS.

In addition to reliability, another reason for choosing the Costello test over others, such as the MAS or Sarason's General Anxiety Scale (1957), was Suinn's suggestion (1967), that, after many factor analyses of several anxiety tests, removal of certain items could eliminate social desirability and response-set influences on the MAS, GAS (Sarason, 1957), and the TAS (Sarason, 1961). Also in a study of sex differences, Jahnke was analyzing why on MAS women often received higher scores than men. He concluded that this might be the result of sex bias in response to certain items on the test or it might be conformity of MAS to cultural patterns of women as more anxious than men. Because of this sex bias, caution should be exercised in the use of the MAS. Sole use might include

disproportionately more women than men at higher MAS-score levels and fewer women at lower levels.

MAACL (Zuckerman's and Lubin's Multiple Affect Adjective Check List) yields three scores: anxiety, depression, and hostility. It was chosen partly because reviews in Buros' Mental Measurements Yearbook indicated that it had been used many times with college students as subjects. Also many studies on its reliability and validity have been published (Zuckerman, Lubin, and Robins, 1965; Fogel, Curtis, Kordasz, and Smith, 1966; Levitt and Persky, 1962; Winter, Ferreira, and Ransom, 1963). Correlations of MAS and MAACL Anxiety Scale, General Form, were r = .57 for a group of 246 college students and r = .58 for another group of 32. Correlations of the MAACL Anxiety Scale (General) with the Welsh Anxiety Scale were r = .65 with 283 college students and r = .49 with 229 high school students. Using the two scales, General Anxiety and Today Anxiety of the MAACL, Zuckerman found retest reliability (seven-day interval) of r = .68 for General and r = .31 for Today. Since subjects' moods change from day to day, the Today test was not expected to be as reliable. Using 46 college students, reliabilities (odd versus even items) on the Today scale were r = .79 for the Anxiety subscale, r = .92 for the Depression subscale, and r = .90 for the Hostility subscale.

MAACL also filled the need for a brief, self-administering group test on anxiety with simple words (all the vocabulary was at the eighth-grade reading level or less). The interest here was in checking anxiety as a state rather than a trait, so the "Today" form of the MAACL was used just before a unit test in geometry (Tables 7 and 8, Appendix A).

The check list of the MAACL is on one page containing 21 anxiety items, 40 depression items, and 28 hostility items. The total score on each scale is the number of + items checked added to the number of 0 items not checked. Several reports are available on examination anxiety using the Today MAACL. Using a nontest school day as a baseline, the authors found that students increased in anxiety significantly when the Today MAACL was given just prior to achievement tests. The rise was significantly greater for students who obtained low grades on the achievement examination than for students who obtained high grades. Students who rated themselves as more worried about the examination showed significantly greater increases than students who rated themselves as less worried. Both anxiety and depression scales reflected a response to low grades given back after the examination.

In studying the measurement of experimentally

induced effects, the authors administered the MAACL on three baseline days a week apart. On the fourth week an examiner gave an unscheduled achievement examination. This unannounced test threat was to elicit hostility. During the final week, falsified low grades were returned just prior to taking the MAACL. All three scales were significantly affected by the examination threat and the low-grades' stress.

The AAT contained 19 items, which identified four test-taking anxiety personality types. The AAT is a 1960 variation of the TAQ (Mandler and Sarason's Test Anxiety Questionnaire, 1952); the intermingled items of two separate subtests, the facilitating and debilitating scales, satisfied the need in the study for a scale to measure anxiety as a situational reaction. The five-point continuum under each item was numbered evenly and altered throughout the test hopefully to allay response set. TAS was not chosen by the writer of this paper to accompany the AAT because the tests were similar in purpose; furthermore, Silverton and Mohan (1969) have published a critique of TAS. Using TAS for children changing the yes-no format to a four-point response, Sarason, Davison, Lighthall, and Waite, (1958) classified the test as not unidimensional for either retarded or normal children. With 80 mentally

retarded school children, they found TAS more suitable as a test of general school anxiety than specific test anxiety. The Phi coefficient was used and factoring showed that the test covered anxiety in settings spatially or temporally remote from school, school in general, and recitation anxiety was well as test anxiety. Therefore, since AAT has proven itself consistently as a useful tool for identifying types of test-anxiety-prone individuals, it was chosen over several others.

Also in the pilot study for this paper, an effort was made, in addition to comparing subjects' hostility, aggression, anxiety, and motivation indices, to obtain some background material on each subject in the form of a college-attendance questionnaire. Since all students tested expressed a desire to attend college, it could be assumed that this background about their intentions would prove helpful to this study by showing similarities and differences in college interests.

Only 27 (11 boys and 16 girls) of the 80 were the oldest in their families. Thirteen boys and 11 girls indicated that both parents had attended college. More than half (48) already had the financial means provided so that they can attend. Only 22 (11 boys and 11 girls) showed that college attendance would depend upon the receipt of a

scholarship. Sixty-two (31 of each sex) were looking forward to the enjoyment of some extra-curricular activities. Fifty-four subjects (25 boys and 29 girls) had tentatively selected an occupation. Presumably, this occupation should require college training. Fifty-three (27 boys and 26 girls) planned to work part time in order to attend college. These results tended to indicate that these young people have considered college attendance seriously and were motivated to attend. In assuming that motivation for attendance was present, one could imagine that an arousal of anxiety occurred when attendance was threatened through the suggestions and actions of the examiner.

In ranking the four personality types, facilitators, debilitators, high affecteds, and low affecteds, with the Costello test and the MAACL, only two definite trends were observed. Debilitating boys ranked first (highest) on all three subscales of the MAACL, anxiety, depression, and hostility. Facilitating boys ranked fifth on the MAACL anxiety, depression, and hostility subscales. Low-affected girls ranked lowest on anxiety and depression and next to lowest on hostility. The most unusual result on the Costello ranking was facilitating boys' scores versus debilitating girls' scores. The facilitating boys ranked first on Scale I (the drive to

do well at a task) and last on Scale II (the desire to be a success), while debilitating girls ranked opposite, lowest on Scale I and highest on Scale II (Table 11, Appendix A).

A comparison of the mean scores of the 40 girls and 40 boys to the college norms on the MAACL indicated that the subjects were not highly anxious when anticipating a unit geometry test, since all six student means fell below the college norms. The boys' mean on the anxiety scale was 5.42 with a standard deviation of 3.12, and the girls' mean was 3.25, $\underline{s}$ = 3.03, (college norms were 6.9, $\underline{s}$ = 3.3, and 6.3, $\underline{s}$ = 4.0, respectively). The college norms on depression were a mean of 14.7, $\underline{s}$ = 7.4, as compared to the boys' mean of 9.6, $\underline{s}$ = 7.365, and a mean of 13.6, $\underline{s}$ = 6.9, as compared to the girls' mean of 6.375, $\underline{s}$ = 4.66. The hostility scale had a mean of 8.5, $\underline{s}$ = 4.0, for college males compared to 7.0, $\underline{s}$ = 4.16, for the boys' mean and a mean of 7.2, $\underline{s}$ = 3.8, for college females compared to 5.425, $\underline{s}$ = 3.53, for the girls' mean. Subjecting MAACL data (anxiety scale) and item difficulty sequence to analysis of variance with achievement test data, Smouse and Munz (1968) found no interaction between the two variables (anxiety treatments and difficulty orders), but they concluded that the subjects were extremely

anxious since their mean anxiety score was 11.2, $\underline{s}$ = 4.59, as compared to the college norm of 6.6, $\underline{s}$ = 3.7, on the MAACL.

CHAPTER IV

THE FINAL STUDY

The Problem and Purpose

The major problem of this study was the comparison of subjects with four levels of test anxiety in a normal school-testing situation and a high anxiety-provoking situation in which a standardized geometry test was used for the performance criterion. In view of the findings in the pilot study and the outcomes of validation studies by Dember, Nairne, and Miller (1962), the Alpert-Haber Achievement Anxiety Test was used in classifying the four anxiety-achievement types: facilitators, debilitators, high affecteds, and low affecteds. The purpose of this study was to learn more about anxiety-building actions and statements of the examiner in the high stress condition versus the normal classroom atmosphere and the effects of these upon achievement anxiety types during a complex task (academic test performance, specifically testing performance on geometry).

Operational Definitions

The definitions of terms used in this study were defined as follows:

1. Four Anxiety Personality Types

a. Facilitators were the 10 boys and 10 girls in a geometry class in the middle-sized, typical high school in south central Oklahoma who had the highest scores on the AAT after the debilitating scores were subtracted from the facilitating scores. The 19-item questionnaire had nine items scored on a five-point continuum positively (facilitating scale) and 10 items scored negatively (debilitating scale).

b. Debilitators were the 10 boys and 10 girls whose scores were lowest on the AAT after the debilitating scores were subtracted from the facilitating scores.

c. High-affecteds were the 10 boys and 10 girls with the highest scores after the facilitators and debilitators had been selected and the remaining scores were ranked by absolute value (the facilitating and debilitating scores were added regardless of sign).

d. Low-affecteds were the 10 boys and 10

girls with the lowest absolute-value scores.

2. AAT was the abbreviation used for the Achievement Anxiety Test (Alpert and Haber, 1960).

a. AAT- was the subscale which measured the debilitating effects of test anxiety.

b. AAT+ was the subscale which measured the facilitating effects of test anxiety.

3. Anxiety Treatments

a. High (experimental group) anxiety was caused by the actions and instructions of the examiner.

b. Normal (control group) anxiety was caused only by the usual routine of taking a test in school.

Hypotheses

Hypothesis 1: Under the high anxiety treatment, all four types and both sexes obtain a significantly lower mean score on the geometry test than those in the normal (control) group.

Hypothesis 2: There is no interaction between treatments and anxiety types if scores in the control group are consistently higher.

Hypothesis 3: The overall difference of boys'

mean achievement scores compared to girls' mean achievement scores is not significant in either the control group or the experimental group.

Hypothesis 4: As a main effect, the four type reactions to test-taking anxiety significantly affect the criterion scores.

Hypothesis 5: As a main effect, the two treatments significantly affect criterion scores.

Hypothesis 6: Debilitators and high affecteds of both sexes make significantly lower scores in the experimental group than in the control group.

Hypothesis 7: Facilitators of both sexes and of both treatments make significantly better scores than do the debilitators, high affecteds, and low affecteds.

Procedures and Measurements Used in This Study

The examiner's college-attendance questionnaire and the three anxiety scales were given to 80 (40 of each sex) students on the same day immediately preceding a unit test in geometry. After analyzing data from these four assessments, the AAT was used to assign scores indicative of four test-taking anxiety types of personality. Types were then randomly assigned to one of the two groups, experimental and control, by sex. The standardized

geometry test score was the dependent variable.

Instruments Used

The criterion test, the Mid-Year Geometry Test (Harcourt, Brace and World, 1968) was standardized as a part of the Orleans-Hanna Geometry Prognosis Test study of predictive validity. This two-year longitudinal research program was conducted in seven states with 698 students. Norm tables with percentile ranks and stanines were presented after a careful item analysis determining discrimination values, content and objective description for each item, and the percentage of students marking each of the five response positions. Another useful feature was the expectancy table showing the numbers and percentages of students earning each final course grade in geometry at successive score intervals of the Mid-Year Geometry Test. Content validity was judged by an analysis of the relationship of the test's content and objectives with several beginning geometry courses and texts. As for concurrent and predictive validity, the test correlates with the Orleans-Hanna Geometry Prognosis Test (r = .65) and several other measures as mid-year grades and final grades. Predictive validity coefficients are r = .70 and r = .54 for the Mid-Year Geometry Test with

the Howell Geometry Test and end-of-year geometry grades, respectively. Split-half reliability (r = .84), corrected by the Spearman-Brown Prophecy Formula, was between scores on the odd-numbered items and scores on the even-numbered items.

The AAT was a specific measure of test anxiety which by means of two subscales in a 19-item questionnaire showed the presence of the debilitating and facilitating results of test-taking anxiety. For some individuals, taking an examination would facilitate their performance, while such a task might depress performance in other subjects. The authors found that test-retest reliabilities for a 10-week interval were r = .83 and r = .87 for the facilitating subscale and the debilitating subscale, respectively. The test-retest reliabilities over an eight-month period were r = .75 for the facilitating subscale and r = .76 for the debilitating subscale (Alpert and Haber, 1960).

Subjects and Treatments

The 80 subjects for this study were selected after the comparison of some 500 scores on the basis of similar semester test scores, IQ scores within a range of 105 to 120, and similar age, grade, and instruction.

Fourteen days prior to the criterion examination, the students, all of whom had the same text, class time, instructor, assignments, and tests, were selected and asked to take the MAACL, AAT, Costello, and the examiner's questionnaire.

By way of introduction the examiner explained:

> I am engaged in a research project at the University of Oklahoma. Your principal has given me permission to administer these tests. If you will cooperate in this project, it will help us as instructors to understand your problems and enable us to assist you more effectively when you enter college.
>
> This information is strictly confidential and will not affect your grade in any way. The scores will be used only in the research study. The tests are now before you. Please fill out blanks on the blue sheet (MAACL). This is just to identify you. Are there any questions?

Each student's AAT- was subtracted from his AAT+ in order to divide the subjects into four personality types. The 10 boys and 10 girls having the highest score after subtraction were classified as facilitators, while the 10 boys and 10 girls with the lowest AAT- scores were debilitators. Then the scores of the remaining 40 students were summed (absolute value) and ranked. The high affecteds were those with the highest absolute score (10 boys and 10 girls). The low affecteds were those with the lowest absolute scores (10 of each sex).

The two methods (anxiety treatments) occurred at

regular class times, the control group preceding the experimental in order to protect the scheme. This back-to-back arrangement prevented any transfer of information.

The treatment for the control group was conducted under a simple test-taking situation except for one minor change--the examiner monitored the test. Since the regular teacher was ill at times and substitute teachers were used, the students readily accepted this change without incident or comment. The examiner simply monitored the test since the instructor was absent. The instructions were read verbatim from the manual. Throughout the examination, the class was watched from a podium in front of the classroom.

The treatment for the experimental group was conducted in the most anxiety-provoking situation that the examiner could devise. As the students entered the classroom, the examiner paced back and forth in front. Even before the bell rang, the examiner looked stern and warned the students that the test was long and that they might run out of time. As soon as the bell rang, booklets were passed out in a frenzied manner. The following instructions were recited verbatim except for parentheses:

> Let's get settled quickly. We may run short of time on this test (the clock had been disconnected). This is a geometry test (they knew they would be

> taking a test but they expected some more of the personality scales previously given). I represent the University of Oklahoma. Since O.U. is a desirable and greatly favored institution for higher learning, the administrators there must discriminate among students, so the scores on this geometry test will be placed on your transcript and may largely determine acceptance to any college of your choice wherever that may be. So many students wish to go to college now (according to the questionnaire all these 80 students expressed a desire to attend), that we are having to limit our enrollment at most colleges rather drastically.
>
> In addition, your instructor informs me that he will not be able to make out your semester test this spring, so this test will be substituted for your final exam in geometry, which I understand comprises one-third of your total grade.
>
> This is a rather difficult test and should be a good indication of whether you are of college caliber. Be sure to try all problems to give an indication of your effort although you probably won't have time to finish it all.

For about 20 seconds there was complete silence while mouths dropped open. Suddenly, as if on cue, a flood of questions rose and became louder. Typical comments were, "Well, I'll be _____, I just don't believe a teacher could do this, can I call my mother about this transcript thing, she'll have a fit . . . ." One burly six-footer stood up demanding to see his teacher and saying he would not take the test. In response to this, the examiner (a veteran of 18-year's teaching experience) deepened her voice to its gruffiest and said, "Sit down and be quiet," which he did, and test taking proceeded.

Both the control and experimental groups had exactly 45 minutes of working time exclusive of instructions, but in the experimental group the examiner reminded the students of the time on five different occasions. She also walked the aisles, constantly frowning and peering over shoulders. When one girl began to cry, the examiner seriously considered abandoning the whole project, but it was only 10 minutes before the bell, so she persevered until the end of the period.

Desensitization

Desensitization has been a topic of much discussion in contemporary psychology. Several methods have been proposed since Jones (1924) presented one of the earliest examples of therapy. In discussing anxiety, Wolpe (1958) stated that neurotic individuals had learned unadaptive habits of reacting anxiously to situations objectively nondangerous. Probably the most effective technique for unlearning of anxiety reactions has been desensitization (Hafner, 1966). This represented an attempt to substitute a muscular relaxation response for the tense response. The set of operations Hafner used was training in deep muscle relaxation, constructing of anxiety hierarchies, and systematically presenting each

item on the anxiety hierarchies to the relaxed patient.

Coyle (1968) used the "in vivo" method of systematic desensitization with an eighth-grade girl who had experienced anxiety over oral reading to the point of panic. He employed the response hierarchy and relaxation with the Spache Diagnostic Reading Test to increase the grade-level difficulty in reading while decreasing the anxiety.

Katahn (1968) advocated three methods: systematic desensitization, group discussion, and identification with leaders as models. He began with deep breathing exercises and relaxation of select muscles. Then groups, while visualizing anxiety-arousing situations even when so extreme as to be accompanied by skin rashes, nausea, and insomnia, constructed anxiety hierarchies and practiced relaxing after each during the last 15 or 20 minutes of the class period.

As a result of this training, students have reported reduced anxiety in real-life situations and 75 percent showed a significant academic improvement. The highly anxious students reported difficulty in starting to study and organizing daily activities because they were anxious about academic matters. He taught his students to make relaxing responses to any feeling of tension. In

testing the highly anxious students, he learned that they had a poor approach to study itself usually compounded by poor reading habits. They were more sensitive to threatening instructors and suffered from a lack of clear-cut academic goals.

Carmichael and Cronkhite (1965) suggested that no matter which of the variables, confounded or not, is responsible for significant results, the unintentional frustration of a captive audience is a condition that future experimentalists should either avoid or control. In recruiting subjects, the choice is between allowing them to volunteer, in which case self-esteem may bias samples, and required participation, in which case subjects may be frustrated. Either procedure, without some method of control, restricts the population about which research workers can generalize.

A reduction of anxiety-producing factors presently contributing greatly to the inhibition of performance could alleviate some student problems. Spielberger (1962) suggested that the grading system might be negating high purposes of education. The motivational system in both elementary and secondary schools of measuring learning by letter grades causes much anxiety among parents as well as students.

A combination of methods was employed to desensitize the subjects in this study. As soon as the time for testing was over, the examiner smilingly suggested that all students stretch and raise their arms above their heads stretching their fingers stiff for a moment and then relaxing all muscles. She asked them to try to feel how each muscle was relaxing. Then she told them that this test was given to determine how well they could withstand stresses that might confront them in college. She, joined by the regular instructor, assured them that the scores on the geometry test would not be used in any way at their high school or at any college, nor would the test have any bearing on their geometry grade.

Both the instructor and examiner assured the students in the experimental group that they were pleased with the way they conducted themselves and withstood the stress. The following week the test items were discussed as a practice exercise in class. The students at that time were again reminded that these scores would not be used against them in any way whatsoever.

CHAPTER V

ANALYSIS OF DATA

Design

The data were analyzed by utilizing the analysis-of-variance technique on obtained scores from the geometry test with a four by two by two design (the four anxiety test-taking types by sex by treatment) followed by comparisons of cells within the variances, the t test, and also the Newman-Keuls Test for differences between means (Kirk, 1968, 91-93). T tests, NKT, and analysis of variance were made in view of the outcome of testing the underlying assumptions pertinent to the analysis.

The dependent measure analyzed in the present study was the Mid-Year Geometry Test. After the subjects were categorized into anxiety types according to the AAT and the variances showed homogeneity, the scores were ranked within each category (boys separate from girls) and the corresponding geometry-test score was recorded for each subject. The three-way analysis of variance

yielded statistically significant differences among the three main effects (Table 1, p. 65). A significant effect of personality types on performance scores was found (F=5.70, df=3/64, $p < .005$). The analysis revealed a statistically significant difference between the two test treatments (F=77.98, df=1/64, $p < .001$) and also a significant difference between the two sexes (F=4.56, df=1/64, $p < .05$). The NKT showed that the facilitators scored significantly higher than the other three types (Table 2, p. 67). These overall differences corroborate Berger's findings (1968) that facilitators scored significantly higher than debilitators, high-affecteds, and low-affecteds. However, Smouse and Munz (1968) found differences significant only between facilitators and debilitators and between facilitators and low-affecteds.

Neither the three two-way interactions nor the one three-way interaction was significant at the .05 level; however, types by treatment revealed nonsignificant interaction (F=2.07, df=3/64, $.10 < p < .20$). Therefore, no further interactions' checks were undertaken since the three-way interaction produced an F of less than one, as did the sex by treatment interaction. This was to be expected since it was theorized that anxiety arousal would lower cell mean scores significantly and consistently in

Table 1

Analysis of Variance Summary Table of Performance Scores As a Function of Treatment, Personality Type, and Sex

Source of Variation	df	MS	F	p
Personality Types (A)	3	102.51	5.70	$< .005$
Sex (B)	1	82.01	4.56	$< .05$
Treatments (C)	1	1402.81	77.98	$< .001$
A X B	3	24.11	1.34	$> .25$
A X C	3	37.25	2.07	$.10 < p < .20$
B X C	1	2.12		
A X B X C	3	4.94		
Error	64	17.99		
Total	79			

the experimental group regardless of personality type or sex.

Because all four types and both sexes obtained a statistically significant lower mean score on the geometry test than those in the normal group, Hypothesis 1 was supported. The mean score for girls in the experimental group was 21.975, while it was 30.025 in the control group. Likewise, the change for boys was quite marked, with a mean score of 23.65 in the experimental group and 32.375 in the control group (Table 17, Appendix A). Since all cells have the same number of cases and since $F=t^2$, it is computationally more convenient to use F rather than t in finding differences between mean scores of only two groups when the analysis of variance has already yielded all totals (Ferguson, 1966, pp. 295-296). The F ratio of the grand mean for the experimental group versus the grand mean for the control group was 30.6 with $df=1/64$ exceeding significance at the .001 level of 11.97. The Scheffé method (explained later in this chapter) of comparing four grand means, boys' and girls' in experimental and control groups, yielded an F of 28.44, $df=3/76$, exceeding significance at the .001 level, $F'=18.51$, (Lindquist, 1956, 41-44). Likewise, obtaining differences between paired cell means showed significance for all types at the .05 level except

Table 2

Newman-Keuls Test on the Four Ordered Means for Personality Types Main Effect

	Debilitator (A) 24.85	Low-affected (B) 26.10	High-affected (C) 26.85	Facilitator (D) 30.15
(A)	---	1.25	2.00	5.30**
(B)	---	---	.75	4.05*
(C)	---	---	---	3.30*

Note.--n=20; $MS_{error} = \sqrt{17.99/20}$; at .05, r^4=3.55; r^3=3.25; r^2=2.69; at .01, r^4=4.36; r^3=4.06; r^2=3.57.

Table 3

Girls' Mean Scores Ordered for the Newman-Keuls Test

	High-affected (A) 24.40	Debilitator (B) 24.70	Low-affected (C) 25.80	Facilitator (D) 29.20
(A)	---	.30	1.40	4.80
(B)	---	---	1.10	4.50
(C)	---	---	---	3.40

Table 4

Boys' Mean Scores Ordered for the NKT

	Debilitator (A) 25.00	Low-affected (B) 26.40	High-affected (C) 29.40	Facilitator (D) 31.30
(A)	---	1.40	4.40	6.30**
(B)	---	---	3.00	4.90*
(C)	---	---	---	1.90

Note.--n=10; $MS_{error} = \sqrt{17.99/10}$; at .05, r^4=5.01; r^3=4.556; r^2=3.79; at .01, r^4=6.05; r^3=5.735; r^2=5.038, for Tables 3 and 4.

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

for the debilitating boys' mean scores in the control group as compared with the debilitating boys' mean scores in the experimental group (Table 16, Appendix A). Therefore, the hypothesis that all four types by sex under the high anxiety treatment will obtain significantly lower mean scores on the geometry test than those in the control group was supported. The only exception was the pair of male debilitators in which the mean scores were not significantly different.

Since scores in the control group were consistently higher, Hypothesis 2 was supported. There was practically no interaction among the three two-way factors (types by treatment yielded $.10 < p < .20$), while the one three-way interaction yielded an $F < 1.00$.

The overall difference of boys' achievement scores compared to girls' achievement scores was statistically significant (the sex main effect yielded $F=4.56$, $df=1/64$, $p < .05$). (This is in the analysis-of-variance summary, Table 1, p. 65). This finding corroborates Chansky's study on the relationships between anxiety, intelligence, and achievement involving ninth-grade algebra students. He found that anxiety and aptitude influenced achievement differently in boys and girls. There was a tendency for highly anxious girls to do more poorly in

algebra than less anxious girls (1966). The hypothesis that there would be no statistically significant sex differences in mean achievement was not supported because the boys' cell mean scores were higher than the girls' cell mean scores for all comparisons except in comparing debilitators in the control group in which both cell means were the same ($\bar{x}$=27.6). However, when the overall means for sex and type were compared in both the experimental and control groups, nonsignificant values were revealed (total experimental means, boys' compared with girls' means, F=.39, df=1/64, $p > .20$). In checking boys' mean scores against girls' mean scores for the control group, a nonsignificant F ratio (F=.77, df=1/64, $p > .20$) was found. (These ratios are illustrated in Figure 4, Appendix A, and see Table 17 where these means are listed). It must be remembered that these comparisons included type and sex confounded.

The four type reactions to test-taking anxiety significantly affect criterion scores as a main effect, and so Hypothesis 4 is supported (F=5.70, df=3/64, $p < .005$, as shown in Table 1, p. 65). Most of the studies with students using the AAT have been with college students (Alpert and Haber, 1960; Dember, Nairne, and Miller, 1962; Smouse and Munz, 1968; Sweeney, 1968). Although the

motivational and intellectual levels between high school and college students may vary, all the subjects in this study were college bound, so likely their desires and motives would closely parallel those found among college students. In both the experimental and control groups facilitators of both sexes were significantly higher as a group than any of the other types, according to NKT ranking (a pairwise comparison with means arranged in order of increasing size) in Table 2, p. 67. In comparing girls' mean scores, facilitators had 29.2; low-affecteds, 25.8; debilitators, 24.7; and high-affecteds, 24.4, with no significant differences between pairs (Table 3, p. 67). However, there are statistically significant differences in boys' group means between facilitators and debilitators and between facilitators and low-affecteds (Table 4, p. 67). Facilitator's mean scores are significantly higher in both instances.

As a main effect, the two treatments significantly affected criterion scores (those obtained on the Mid-Year Geometry Test) as stated in Hypothesis 5 ($F=77.98$, $df=1/64$, $p<.001$). (See Table 1, p. 65). The control group means were always higher. In cell mean comparisons, debilitating boys' mean in the experimental group did not differ significantly from the debilitating boys' mean in the control

group (F=1.43, df=1/64, $p > .05$, in Table 16, Appendix A). All other comparisons between control and experimental cells were significant at .05 level or less, the higher mean scores invariably being in the control cells. Debilitators and high-affecteds of both sexes made significantly lower scores in the experimental group than in the control group, according to the overall statistical analysis, thus supporting Hypothesis 6 (see Table 16, Appendix A). In comparing ordered group means for the four personality types with the NKT, significantly lower scores for debilitators, low-affecteds, and high-affecteds were found as compared to facilitators, but these first three types were not significantly different from each other in ranked pairs. When the boys' and girls' mean scores were compared separately by types, only the facilitating boys' mean was significantly different from the debilitating and low-affecteds boys' mean scores (Table 4, p. 67). There were no such significant differences among girls' mean scores in the NKT analysis (Table 3, p. 67). The high-affecteds' mean scores of both sexes (using the Scheffé method) were significantly higher in the control group than in the experimental group (F=159.11, df=3/76, $p < .001$, as in Table 17, Appendix A). Also with sex combined, the debilitators' mean scores were significantly higher in the control group (F=33.79, df=3/76,

$p < .001$, Table 16, Appendix A). However, the boy debilitators' mean scores were not significantly lower in the experimental group. This was the only exception in all the cell mean score comparisons. Therefore, Hypothesis 6 was supported in the overall analysis as was predicted.

Since facilitators of both sexes and both treatments made significantly better scores than debilitators, high-affecteds, and low-affecteds, Hypothesis 7 seemed tenable. This evidence was provided by the NKT analysis in which means for the four types were compared by ordered pairs (Table 2, p. 67). The facilitators' mean was significantly higher than the other three at .05 level of 5.30 with $r^4=3.55$ with the debilitators' mean, $r^3=3.25$ with the low-affecteds' mean, and $r^2=2.69$ with the high-affecteds' mean.

In order to apply a more rigorous test for the significant differences between the experimental and control mean scores for the four types, the Scheffé method of comparing four means simultaneously was employed (Ferguson, 1966, pp. 296-297). To apply this method, F ratios were first calculated as in the *a priori* comparison method using $F=t^2$ and expanded to compare four groups at once. In this instance, the first two means are the boys' and

girls' means in the control group. The second two means are the boys' and girls' means in the experimental group. The formula was used for each of the four types. The S_w^2 is

$$F = \frac{(X_{1+2} - X_{3+4})^2}{S_w^2/(n_1+n_2)+S_w^2/(n_3+n_4)}$$

the mean square error term from the analysis of variance (17.99). The n is five in each instance. The value of F required for significance at .01 is obtained from the F table for $df_1 = k - 1$ and $df_2 = N - k$. A quantity F', which is $k - 1$ times the F required for significance at .01, so $F' = (k - 1)F$. When comparing F and F' values, F must be greater than or equal to F' to be significant. In this study $df_1 = 3 = (k - 1)$; $df_2 = 76 = (N - k)$; thus, at.001, 6.17 X 3 = 18.51. The two means of the debilitators in the control group were combined as were those in the experimental group. These two sums were subtracted yielding an F ratio of 33.79, considerably above the F' of 18.51 at .001. Likewise, in using the same formula, the sum of the high-affecteds' means in the experimental group was subtracted from the sum of the high-affecteds' means in the control group yielding the most significant F ratio of all subgroup comparisons, $F = 159.11$.

In summation, the analysis of variance yielded statistically significant differences among all three main effects of personality types, sex, and treatment with the greatest difference being between the two treatments showing that high anxiety provocation does affect sex and personality type adversely as was expected in setting up this type of study. There was no significant interaction as was predicted in view of the anxiety-provoking effects. Facilitators in an overall analysis did better than the other three types as was expected.

CHAPTER VI

SUMMARY AND CONCLUSIONS

The Process

This was a study of the effects of anxiety types on achievement scores under two stress treatments. In detail the study consisted of the administration of an achievement test (Mid-Year Geometry Test, Form A, Grades 8-12) with a total of fifty items. The study took into consideration not only sex but also differential reactions to test-taking situations (that of anxiety-arousal and the normal testing conditions). The differential reactions to the two test-taking conditions (facilitators, debilitators, high affecteds, and low affecteds) were determined on the basis of the AAT (Achievement Anxiety Test, Alpert and Haber, 1960).

The subjects were 80 high school sophomore geometry students enrolled in a middle-sized, urban high school in south central Oklahoma. Fourteen days before the actual experimental procedure, the AAT, the Costello test, and the MAACL, and the examiner's questionnaire were admin-

istered to all subjects as a basis for classifying the four personality types of test-taking anxiety. When correlations were found to be low, only the Alpert and Haber (AAT) categories were used for anxiety-type identification. Each of these achievement anxiety types was then randomly assigned to one of the two treatments. The dependent variable was the score obtained on the geometry test. Both groups had the same test forms, the same classroom, and the same time period with the manipulative variable being the differential behavior of the examiner to create the arousal of anxiety in the experimental group and to maintain the usual test-taking atmosphere in the control group.

Findings

After the data had been carefully scored and rechecked, the scores on the achievement test were then subjected to a four by two by two analysis of variance (anxiety types by sex by treatments). The significance to two main effects, types and treatments, was predicted, but the effect of sex was unexpected since homogeneous samples were so carefully selected in regard to background, intelligence, and achievement. The three-way analysis produced statistically significant main effects for all

three variables: sex, types, and treatments. However, there was no significant interaction, either two-way or three-way.

The question of why the low affecteds were shocked enough to suffer lower scores in the experimental group can be answered theoretically by considering the general surprise and panic that followed the instructions about lack of sufficient time and the recording of grades on transcripts, which posed a large threat to future college careers, many of which have been financed since the birth of the subjects. Not only was the subject personally threatened but also the downfall of 80 sets of hardworking parents struggling to finance higher education for their offspring could be imagined. In questioning the girl who cried (a low-affected), the examiner learned that the girl's future schooling was being financed by monthly bank deposits from both her working parents. The examiner could not foresee such an extreme effect nor could the instructor who said that these students were the most status conscious of any with whom he has worked. Perhaps, the low affecteds became upset by seeing the consternation of their classmates. Both boys and girls of all four types made lower scores in the experimental group.

Conclusions

The major conclusions to be drawn from this study were that differential reactions to test-taking anxiety do have a significant effect on achievement-test performance, that there were also sex differences in performance, and that anxiety provocation significantly lowers scores for all four personality types. Facilitators' mean scores in the overall analysis were significantly higher than any of the other three: the debilitators, high affecteds, and low affecteds. This was to be expected, but the extent of lower scores for the low affecteds in the experimental group was unexpected.

Considering the harsh effect that the anxiety treatment produced on many of the students in the experimental group, it was deemed extremely important to plan a desensitization procedure immediately following the treatment (as was done in this study). Several expressions of comfort and reassurance were necessary after the treatment.

Implications and Recommendations

These findings have a direct relation to classroom testing situations, particularly to the complex tasks of high school students. Considering the limitations

imposed by the design of this experiment, the mean performance of all four types as judged by AAT can be lowered significantly by manipulating the anxiety level upward, particularly by the drastic treatment employed in this study. The mean performance scores under the normal treatment afford a lesser amount of variance attributable to personality factors. Further research is needed to determine how anxiety in the classroom is aroused and what variables, such as teachers' personality factors, motivational attributes of both students and teachers, the school plant, the tone or wording of instructions, and references made to time and speed, both consciously and unconsciously evoked, are contributable.

Most of the anxiety studies heretofore (with the exception of many Sarason research projects) have been with college students. Further studies between high school and college students may show that age-level differences have far-reaching implications. Since in the present study it was believed by the subjects in the experimental group that the outcome of the test had a direct bearing on their future careers, this might be the factor most responsible for the difference between the significant overall drop in scores from the control group to the experimental group. From this present study, it can be concluded that there

are significant differences in achievement-test scores obtained by different anxiety types (corroborating Berger's findings with high school students in 1968 showing that facilitators scored higher than the other types and partially corroborating findings of Smouse and Munz (1968) of significant differences between facilitator and debilitator scores and between facilitator and low-affected scores). Differences in interests between high school students and college students might account for some discrepancies, there being probably more variation in test-taking ability and motivation among high school students than college students. Similar studies could be made with other populations, such as junior college students.

By analyses of several such groups of data, the most troublesome factors in classroom situations can be determined and methods sought to correct these stressful conditions. Reactions of each of the various personality types as identified by Alpert and Haber's test need to be analyzed in relation to several levels of anxiety. The present study, when replicated in several high schools using the same severity that almost precipitated a riot, might possibly determine whether a drop in scores for all four types is evident with both sexes.

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APPENDIX A

FIGURES AND TABLES

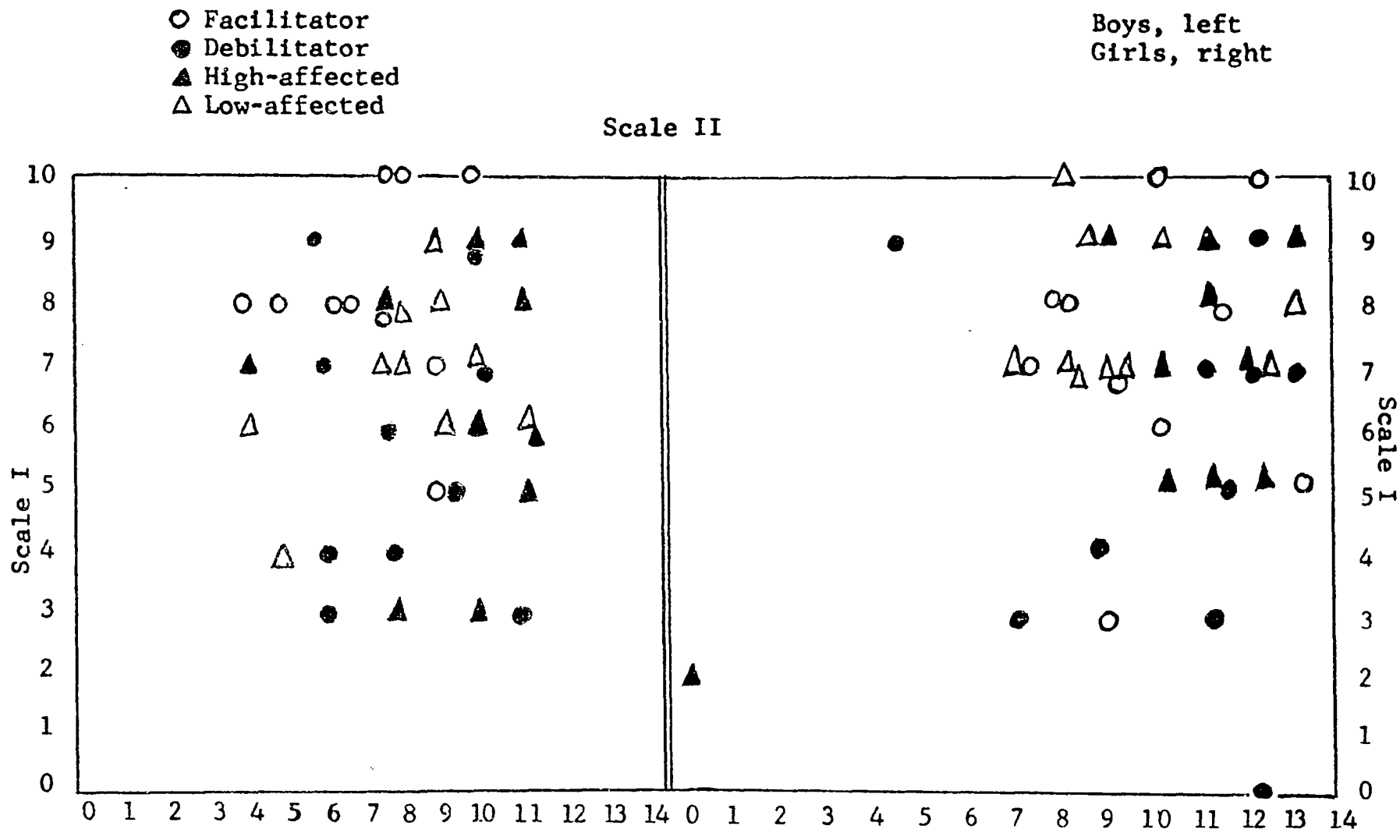

Fig. 1.--Scattergrams of boys' and girls' raw scores on the two scales of the Costello test.

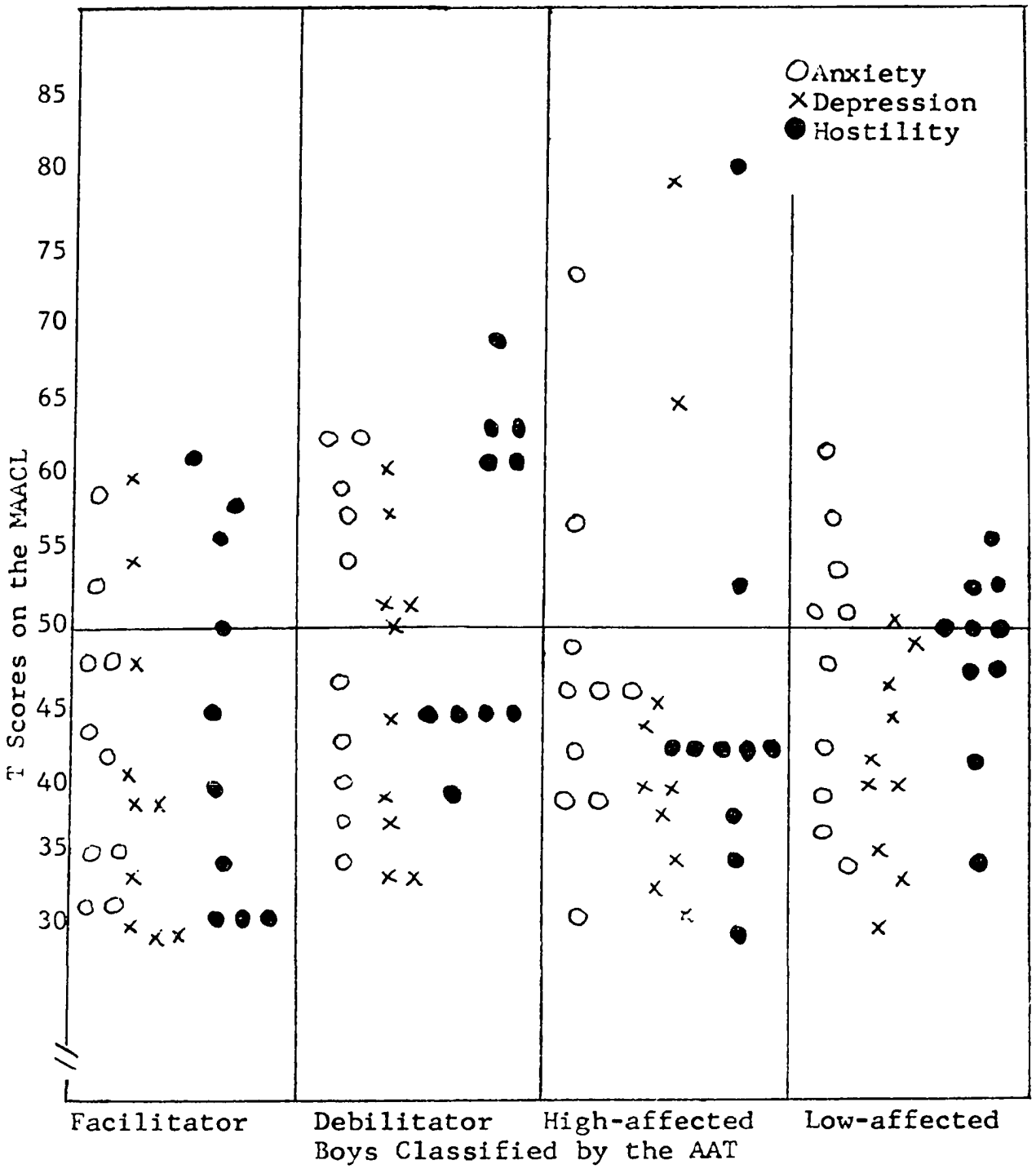

Fig. 2.--The three subscale T scores of the MAACL as scored by the four personality types.

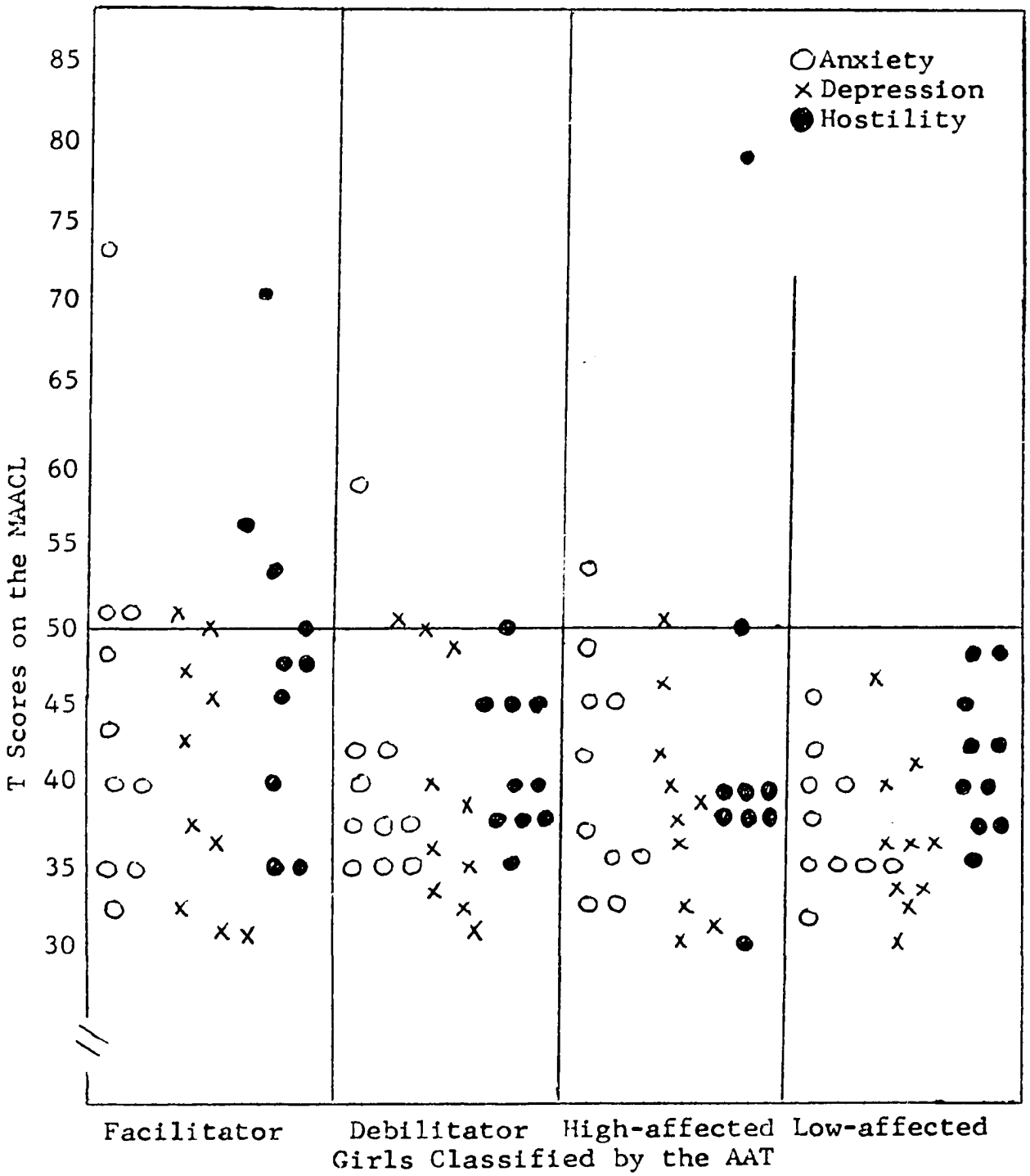

Fig. 3.--The three subscale T scores of the MAACL as scored by the four personality types.

Table 5

Raw Score Data on Three Anxiety Tests Used in the Pilot Study

Boys		Alpert Deb.	Alpert Fac.	Alpert Diff.	Costello I	Costello II	MAACL Anx.	MAACL Dep.	MAACL Host.
	*1	19	37	+18	8	5	1	2	4
	2	17	32	+15	8	7	6	13	12
	3	18	31	+13	10	8	4	6	6
	4	18	30	+12	8	8	0	0	1
Facilitator	5	21	30	+9	10	10	1	1	1
	*6	19	28	+9	10	8	6	6	8
	*7	17	26	+9	7	9	8	18	10
	*8	26	34	+8	8	4	4	8	2
	9	21	29	+8	8	7	0	0	1
	*10	30	38	+8	5	9	10	21	11
	*1	39	17	-22	5	9	3	5	6
	2	31	10	-21	4	8	10	21	13
	3	42	21	-21	9	10	4	3	6
	4	41	21	-20	3	6	11	19	15
Debilitator	*5	36	17	-19	9	6	9	16	12
	6	39	23	-16	6	8	1	3	6
	7	38	24	-14	7	6	8	16	12
	*8	35	22	-13	3	11	2	6	6
	*9	37	25	-12	7	10	5	10	4
	*10	24	13	-11	4	6	11	15	13

*Experimental Group

Table 5 (Continued)

Raw Score Data on Three Anxiety Tests Used in the Pilot Study

Boys		Alpert			Costello		MAACL		
		Deb.	Fac.	Absol.	Sc. I	II	Anx.	Dep.	Host.
High-affected	1	33	29	62	6	10	5	10	5
	2	29	31	60	5	11	6	8	9
	*3	34	25	59	3	10	3	3	5
	4	32	26	58	9	10	0	1	5
	5	28	29	57	6	11	4	4	5
	*6	30	26	56	8	11	3	2	2
	*7	31	25	56	9	11	5	8	3
	*8	30	26	56	7	4	9	25	0
	9	26	30	56	3	8	15	34	19
	*10	29	27	56	8	8	5	6	5
Low-affected	*1	30	25	55	7	8	8	4	8
	2	30	25	55	7	10	7	12	8
	*3	25	26	51	9	9	1	1	2
	4	28	22	50	8	8	9	11	8
	5	25	25	50	4	5	2	9	7
	6	20	26	46	7	8	3	3	5
	*7	25	21	46	6	9	7	8	10
	*8	27	18	45	6	11	4	8	9
	*9	20	20	40	6	4	6	13	9
	10	14	21	35	8	9	11	15	7

*Experimental Group

Table 6

Raw Score Data on Three Anxiety Tests Used in the Pilot Study

Girls		Alpert			Costello		MAACL		
		Deb.	Fac.	Diff.	I	II	Anx.	Dep.	Host.
Facilitator	*1	23	35	+12	7	9	15	15	16
	2	16	26	+10	8	8	7	11	9
	3	24	30	+6	10	12	1	1	2
	*4	28	33	+5	8	11	0	1	4
	5	24	29	+5	6	10	3	5	7
	*6	12	17	+5	7	7	3	9	6
	*7	22	26	+4	5	13	6	12	8
	*8	27	30	+3	10	10	1	2	2
	9	29	31	+2	3	9	4	6	10
	10	24	26	+2	8	8	7	14	7
Debilitator	*1	56	19	-37	3	11	1	2	3
	2	37	14	-23	7	13	1	1	2
	*3	40	18	-22	3	7	10	14	4
	4	39	17	-22	0	12	4	15	8
	*5	40	20	-20	5	11	4	7	3
	*6	34	19	-15	7	11	2	6	6
	*7	36	21	-15	4	9	2	3	6
	8	35	21	-14	9	12	1	2	3
	9	34	20	-14	7	12	2	4	4
	10	31	20	-11	2	9	3	13	6

*Experimental Group

Table 6 (Continued)

Raw Score Data on Three Anxiety Tests Used in the Pilot Study

Girls		Alpert			Costello		MAACL		
		Deb.	Fac.	Absol. Sc.	I	II	Anx.	Dep.	Host.
High-affected	*1	34	26	60	7	10	6	12	7
	2	30	29	59	9	9	1	0	3
	*3	31	27	58	2	0	5	9	19
	4	31	26	57	8	11	8	15	8
	5	34	23	57	9	11	0	1	0
	6	28	28	56	7	12	5	8	4
	*7	28	26	54	9	13	4	6	4
	*8	32	21	53	6	7	2	2	3
	9	32	21	53	5	12	1	5	4
	*10	30	23	53	5	11	0	7	3
Low-affected	1	27	26	53	7	9	1	3	5
	*2	32	21	53	7	8	2	4	4
	3	25	27	52	7	8	1	3	3
	*4	29	22	51	7	12	0	4	5
	*5	27	23	50	8	13	4	7	7
	6	27	21	48	7	7	1	2	6
	7	24	20	44	9	10	3	4	3
	*8	24	18	42	7	9	5	12	7
	9	19	19	38	10	8	1	0	2
	*10	14	16	30	9	9	3	8	4

*Experimental Group

Table 7

Scores on Today Form of MAACL Subtests

Personality Types	Boys	Anxiety Raw	Anxiety T	Depression Raw	Depression T	Hostility Raw	Hostility T
Facilitator	1	1	35	2	33	4	40
	2	6	48	13	48	12	61
	3	4	43	6	38	6	45
	4	0	32	0	30	1	32
	5	1	35	1	31	1	32
	6	6	48	6	38	8	50
	7	8	54	18	55	10	56
	8	4	43	8	41	2	35
	9	0	32	0	30	1	32
	10	10	59	21	60	11	58
Debilitator	1	3	40	5	37	6	45
	2	10	59	21	60	13	63
	3	4	43	3	34	6	45
	4	11	62	19	57	15	68
	5	9	57	16	52	12	61
	6	1	35	3	34	6	45
	7	8	54	16	52	12	61
	8	2	37	6	38	6	45
	9	5	46	10	44	4	40
	10	11	62	15	51	13	63

Table 7 (Continued)

Scores on Today Form of MAACL Subtests

Personality Types	Boys	Anxiety Raw	Anxiety T	Depression Raw	Depression T	Hostility Raw	Hostility T
High-affected	1	5	46	10	44	5	43
	2	6	48	8	41	9	53
	3	3	40	3	34	5	43
	4	0	32	11	45	5	43
	5	4	43	4	36	5	43
	6	3	40	2	33	2	35
	7	5	46	8	41	3	38
	8	9	57	25	65	0	30
	9	15	73	34	78	19	79
	10	5	46	6	38	5	43
Low-affected	1	8	54	4	36	8	50
	2	7	51	12	47	8	50
	3	1	35	1	31	2	35
	4	9	57	11	45	8	50
	5	2	37	9	43	7	48
	6	3	40	3	34	5	43
	7	7	51	8	41	10	56
	8	4	43	8	41	9	53
	9	6	48	13	48	9	53
	10	11	62	15	51	7	48

Table 8

Scores on Today Form of MAACL Subtests

Personality Types	Girls	Anxiety Raw	Anxiety T	Depression Raw	Depression T	Hostility Raw	Hostility T
Facilitator	1	15	73	15	51	16	71
	2	7	51	11	45	9	53
	3	1	35	1	31	2	35
	4	0	32	1	31	4	40
	5	3	40	5	37	7	48
	6	3	40	9	43	6	45
	7	6	48	12	47	8	50
	8	1	35	2	33	2	35
	9	4	43	6	38	10	56
	10	7	51	14	50	7	48
Debilitator	1	1	35	2	33	3	38
	2	1	35	1	31	2	35
	3	10	59	14	50	4	40
	4	4	43	15	51	8	50
	5	4	43	7	40	3	38
	6	2	37	6	38	6	45
	7	2	37	3	34	6	45
	8	1	35	2	33	3	38
	9	2	37	4	36	4	40
	10	3	40	13	48	6	45

Table 8 (Continued)

Scores on Today Form of MAACL Subtests

Personality Types	Girls	Anxiety Raw	Anxiety T	Depression Raw	Depression T	Hostility Raw	Hostility T
High-affected	1	6	48	12	47	7	48
	2	1	35	0	30	3	38
	3	5	46	9	43	19	79
	4	8	54	15	51	8	50
	5	0	32	1	31	0	30
	6	5	46	8	41	4	40
	7	4	43	6	38	4	40
	8	2	37	2	33	3	38
	9	1	35	5	37	4	40
	10	0	32	7	40	3	38
Low-affected	1	1	35	3	34	5	43
	2	2	37	4	36	4	40
	3	1	35	3	34	3	38
	4	0	32	4	36	5	43
	5	4	43	7	40	7	48
	6	1	35	2	33	6	45
	7	3	40	4	36	3	38
	8	5	46	12	47	7	48
	9	1	35	0	30	2	35
	10	3	40	8	41	4	40

Table 9

Group Means of Achievement Anxiety Personality Types for Boys in Experimental and Control Groups

Achievement Anxiety Personality Types	AAT	Costello I	Costello II	MAACL Anx.	MAACL Dep.	MAACL Host.
Facilitator	9.9	8.2	7.4	4.0	7.5	5.6
Debilitator	-16.9	5.7	8.0	6.4	11.4	9.3
High-affected	57.6	6.4	9.4	5.5	11.1	5.8
Low-affected	47.3	6.8	8.1	5.8	8.4	7.3
Grand Mean		6.78	8.22	5.42	9.6	7.0

Table 10

Group Means of Achievement Anxiety Personality Types for Girls in Experimental and Control Groups

Achievement Anxiety Personality Types	AAT	Costello I	Costello II	MAACL Anx.	MAACL Dep.	MAACL Host.
Facilitator	4.4	7.2	9.7	4.7	7.6	7.1
Debilitator	-19.3	4.7	10.7	3.0	6.7	4.5
High-affected	56.0	6.7	9.4	3.2	6.5	5.5
Low-affected	46.1	7.8	9.3	2.1	4.7	4.6
Grand Mean		6.6	9.78	3.25	6.38	5.43

Table 11

Ranking of Personality Types with the Costello and MAACL

Types	Sex	Costello I	Costello II	MAACL Anx.	MAACL Dep.	MAACL Host.
Facilitator	M	1	8	5	5	5
	F	3	2	4	4	3
Debilitator	M	7	7	1	1	1
	F	8	1	7	6	8
High-affected	M	6	3.5	3	2	4
	F	5	3.5	6	7	6
Low-affected	M	4	6	2	3	2
	F	2	5	8	8	7

Note.--n = 10; 1 = highest score.

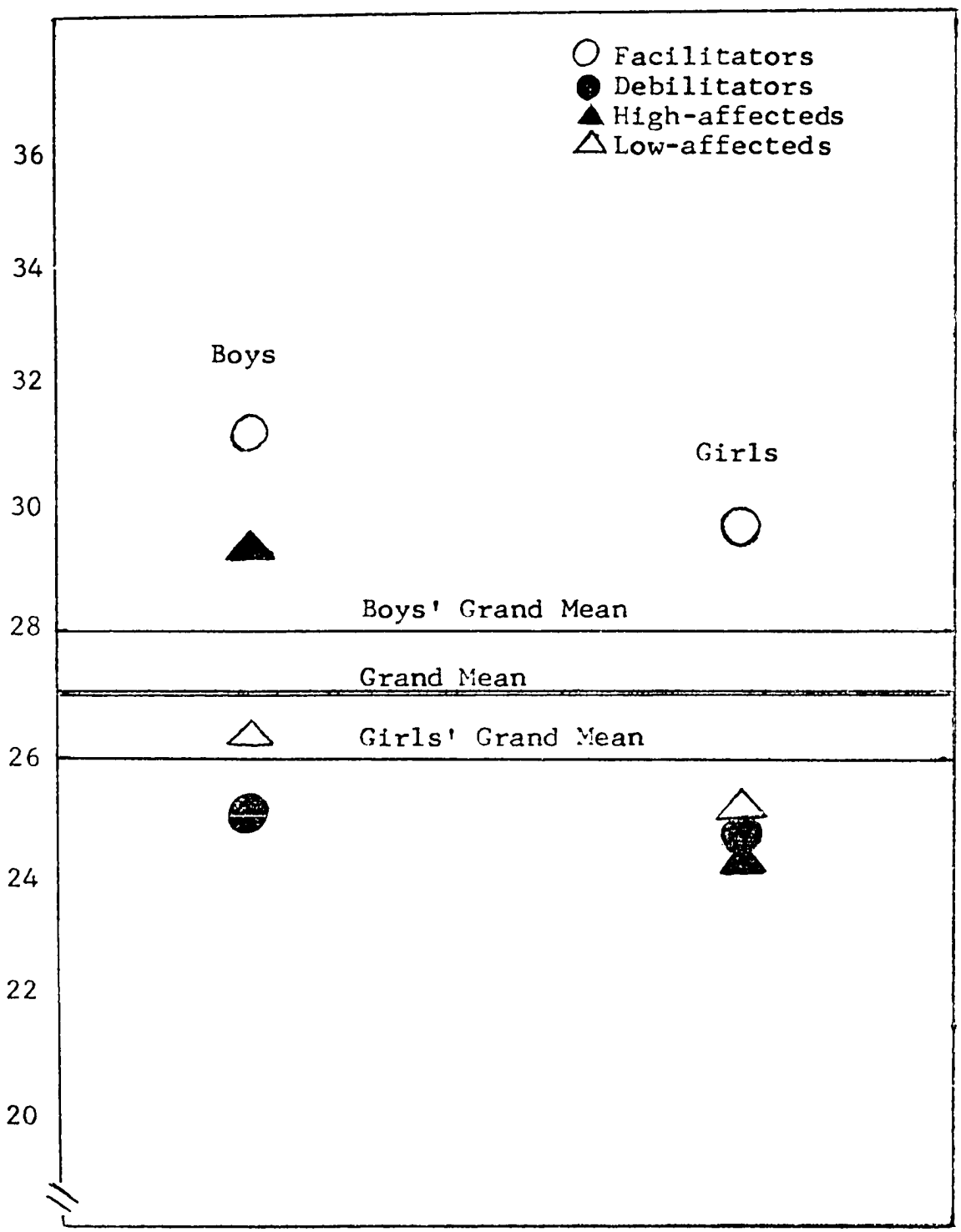

Fig. 4.--Boys' scores for both treatments plotted against girls' scores for both treatments on the Mid-Year Geometry Test.

Table 12

Analysis of Variance with Means and Standard Deviations

Achievement Anxiety Personality Types	Anxiety Treatments			
	Control		Experimental	
	Boys	Girls	Boys	Girls
Facilitator	$\bar{x}$=35.5 SD= 2.56	$\bar{x}$=33.8 SD= 2.91	$\bar{x}$=27.0 SD= 2.24	$\bar{x}$=24.5 SD= 3.87
Debilitator	$\bar{x}$=27.6 SD= 3.88	$\bar{x}$=27.6 SD= 4.91	$\bar{x}$=24.4 SD= 4.51	$\bar{x}$=21.8 SD= 3.81
High-affected	$\bar{x}$=36.2 SD= 5.25	$\bar{x}$=29.5 SD= 3.60	$\bar{x}$=22.6 SD= 5.96	$\bar{x}$=19.2 SD= 2.23
Low-affected	$\bar{x}$=30.2 SD= 5.41	$\bar{x}$=22.6 SD= 1.57	$\bar{x}$=29.2 SD= 2.54	$\bar{x}$=22.4 SD= 2.38

Note.--k=16; n=5.

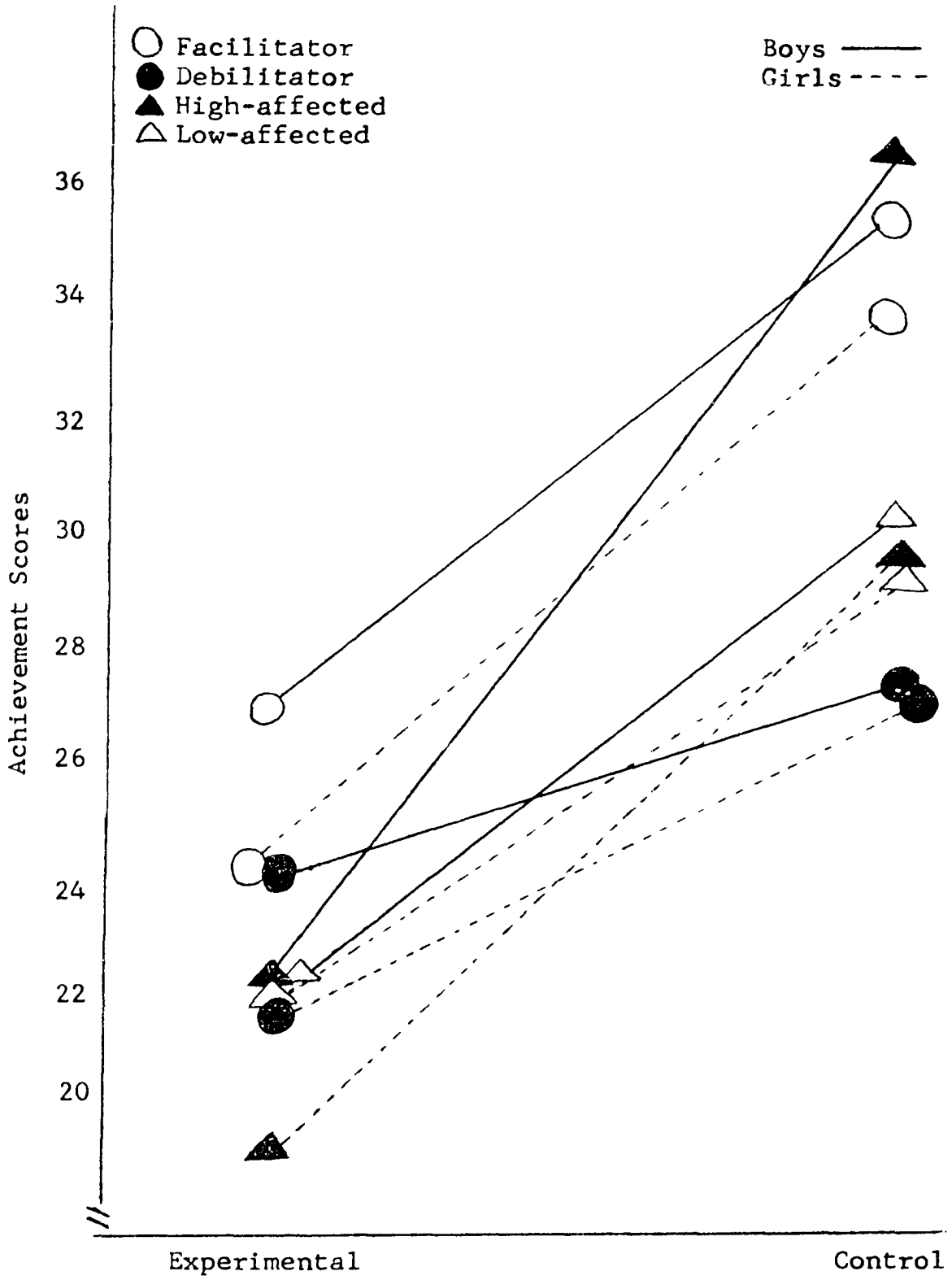

Fig. 5.--The achievement scores for the four personality types identified by the AAT for boys and girls in the experimental and control groups.

Table 13

Raw Scores, Percentiles, and Stanines of Boys on the Criterion Geometry Test in the Control and Experimental Groups

Personality Types		Raw Score (E)	%ile	Aver. %ile	Sta.	Raw Score (C)	%ile	Aver. %ile	Sta.
Facilitator	1	30	77	65	7	39	97	91	9
	2	29	74		6	37	95		8
	3	27	66		6	36	93		8
	4	25	57		5	33	86		7
	5	24	52		5	32	83		7
Debilitator	1	28	70	44	6	32	83	66	7
	2	24	52		5	31	80		7
	3	24	52		5	28	70		6
	4	20	31		4	25	57		5
	5	16	14		3	22	42		5
High-affected	1	31	80	45	7	41	99	90	9
	2	26	62		6	40	98		9
	3	22	42		5	40	98		9
	4	21	36		4	32	83		7
	5	13	5		2	28	70		6
Low-affected	1	25	57	45	5	37	95	74	8
	2	25	57		5	36	93		8
	3	24	52		5	28	70		6
	4	20	31		4	27	66		6
	5	19	26		4	23	47		5

Note.--The control group had no anxiety arousal. The experimental group had high anxiety arousal. Percentiles are to the nearest whole number.

Normal Distribution of Stanines

Stanine	Rating	No. of Students
1	Poor	0
2-3	Below Average	2
4-6	Average	23
7-8	Above Average	11
9	Superior	4

None rated as poor. One high-affected and 1 debilitator in the experimental group are below average. Sixteen in the experimental, 7 in the control, are average. Two in the experimental, 9 in the control are above average.

Table 14

Raw Scores, Percentiles, and Stanines of Girls on the Criterion Geometry Test in the Control and Experimental Groups

Personality Types		Raw Score (E)	%ile	Aver. %ile	Sta.	Raw Score (C)	%ile	Aver. %ile	Sta.
Facilitator	1	32	83	52	7	39	97	87	9
	2	24	52		5	34	89		8
	3	23	47		5	33	86		7
	4	22	42		5	33	86		7
	5	21	36		4	30	77		7
Debilitator	1	26	62	41	6	33	86	65	7
	2	26	62		6	33	86		7
	3	21	36		4	28	70		6
	4	20	31		4	22	42		5
	5	16	14		3	22	42		5
High-affected	1	21	36	28	4	35	91	73	8
	2	21	36		4	31	80		7
	3	21	36		4	29	74		6
	4	17	18		3	28	70		6
	5	16	14		3	24	52		5
Low-affected	1	25	57	44	5	31	80	74	7
	2	24	52		5	31	80		7
	3	23	47		5	29	74		6
	4	22	42		5	28	70		6
	5	18	22		3	27	66		6

Note.--The control group had no anxiety arousal. The experimental group had high anxiety arousal. Percentiles are to the nearest whole number.

Normal Distribution of Stanines

Stanine	Rating	No. of Students
1	Poor	0
2-3	Below Average	4
4-6	Average	24
7-8	Above Average	11
9	Superior	1

None rated as poor. One debilitator, 2 high-affecteds, and 1 low-affected are below average. Fifteen in the experimental, 9 in the control, are average. One in the experimental, 10 in the control, are above average. One in the control group is superior.

Table 15

Raw Data for the Three-way Analysis of Variance Summary

	ABC				
Personality Types	Boys (E)	Boys (C)	Girls (E)	Girls (C)	Total
Facilitator	135	177	122	169	603
Debilitator	112	138	109	138	497
Hi-affected	113	181	96	147	537
Lo-affected	113	151	112	146	522
Total	473	647	439	600	2159

AB			
Types	Boys	Girls	Total
Fac.	312	291	603
Deb.	250	247	497
Hi-A.	294	243	537
Lo-A.	264	258	522
	1120	1039	2159

AC			
Types	E	C	Total
Fac.	257	346	603
Deb.	221	276	497
Hi-A.	209	328	537
Lo-A.	225	297	522
	912	1247	2159

	BC		
Sex	E	C	Total
Boys	473	647	1120
Girls	439	600	1039
Total	912	1247	2159

Table 16

Differences in Mean Scores between the Experimental and Control Groups (Scheffé Method)

Personality Types	F	p
Facilitator	88.25	<.001
Debilitator	33.79	<.001
High-affected	159.11	<.001
Low-affected	57.91	<.001

Differences in Mean Scores between the Experimental and Control Groups

Sex	Personality Types	F	p
Boys	Facilitator	10.09	<.005
	Debilitator	1.43	> .20
	High-affected	25.69	< .001
	Low-affected	8.06	< .01
Girls	Facilitator	10.68	< .005
	Debilitator	4.69	< .05
	High-affected	14.81	< .001
	Low-affected	6.45	< .025

Table 17

Summary Table of Mean Scores for the Experimental and Control Groups

Personality Types	Boys		Girls	
	E	C	E	C
Facilitator	27.0	35.5	24.5	33.8
Debilitator	22.4	27.6	21.8	27.6
High-affected	22.6	36.2	19.2	29.5
Low-affected	22.6	30.2	22.4	29.2
Total Average	23.65	32.375	21.975	30.025

Note.--The total girls' mean = 26.001.
The total boys' mean = 28.01.
The total grand mean = 27.005.
The Scheffé method for differences between the four personality types (experimental compared with the control group) are: Facilitator, F = 88.25; Debilitator, F = 33.79; High-affected, F = 159.11; Low-affected, F = 57.91; all significant at .01.

Differences between boys' and girls' total experimental means (F=.39, df=1/64, $p > .20$) and between boys' and girls' total control means (F=.77, df=1/64, $p > .20$) were nonsignificant.