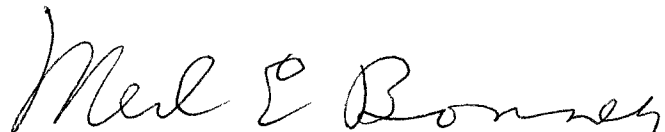


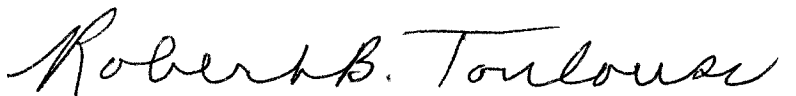
THE RELATIONSHIP OF ANXIETY TO CRITICAL THINKING

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A vast amount of literature has been written concerning the relationship of anxiety to various dimensions of behavior over the past twenty years. Various investigations in the areas indicate that not only does anxiety affect numerous other variables but that the relationship may be curvilinear, more specifically, an inverted-U shape. This suggests that anxiety increases drive level and will at first lead to an increased level of performance and then, as drive level continues to rise, to a decrease in performance. There seems to be an optimal level condition for best performance. On either side of this point, performance is relatively impaired. However, nothing has been done to explore directly its relationship to critical thinking ability. The purpose of this study was to investigate that relationship.

Students enrolled in Education 343 and 331, introductory courses for teacher education at North Texas State University, consisting of 249 females and 107 males, 117 elementary education and 198 secondary education majors, were utilized as subjects. All students were of at least junior standing and had a minimum grade

point average of at least 2.0 on a 4.0 system. An effort was made to survey the entire population as defined above taking into account absences on the testing days. The Watson-Glaser Critical Thinking Appraisal was employed to test the Ss critical thinking ability. This device was routinely used to assess students in the teacher education program. Anxiety was measured by the Taylor Manifest Anxiety Scale.

A product moment correlation and eta were used to test the hypothesis that there would be a significant negative correlation between the two variables and that this relationship would be a curvilinear one as measured by eta.

There was not a significant correlation between anxiety and critical thinking when the scores for males and females were combined although the trend was in the direction hypothesized. Negative signs were in keeping with the hypothesis. A significant correlation was found for males at the .05 level. However, at the statistical level attained, the relationship is slight and of very limited interpretive value. No significant correlations were found when data were analyzed according to the subjects' major fields, elementary or secondary.

When the data were analyzed for curvilinearity, significant results were obtained for the whole group at the .05 level. However,

significance was not attained when data were broken down by sex, nor was it significant for the secondary major grouping. Significance at the .05 level was reached for the elementary major group.

The results of this study lend limited support to the hypothesis that anxiety interferes with critical thinking ability. Several reasons may be offered for finding such ambiguous results. Since anxious individuals do not seem chronologically to carry their anxiety around with them, many Ss may not have minded taking the critical thinking appraisal as an anxiety-provoking situation even though these same Ss may have scored high on the anxiety scale. The anxiety scale was given two weeks before finals. This may have contributed many anxiety scores out of keeping with the Ss normal level due to the nearness of final examinations. Also, an important factor for obtaining curvilinear relationships seems to be how widely scattered the scores are on the two measures used for investigation. It is very possible that this study's sample was too homogeneous to provide relatively trustworthy results.

THE RELATIONSHIP OF ANXIETY TO CRITICAL THINKING

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TABLE OF CONTENTS

	Page
LIST OF TABLES	iv
Chapter	
I. THE RELATIONSHIP OF ANXIETY TO CRITICAL THINKING	1
II. METHOD	11
Subjects	
Apparatus	
Procedure	
III. RESULTS	15
IV. DISCUSSION	20
BIBLIOGRAPHY	23

LIST OF TABLES

Table	Page
I. Correlation of Critical Thinking with Manifest Anxiety	15
II. <u>t</u> Tests of Mean <u>Z</u> Scores on <u>Taylor Manifest Anxiety Scale</u> and <u>Watson-Glaser Critical Thinking Appraisal</u> for Males versus Females .	17
III. <u>t</u> Tests of Mean <u>Z</u> Scores on <u>Taylor Manifest Anxiety Scale</u> and <u>Watson-Glaser Critical Thinking Appraisal</u> for Elementary Versus Secondary Groups	18
IV. Pearson <u>r</u> , Eta, Test of Linearity, Significance of Eta, and Standard Error of Eta for the Anxiety and Critical Thinking Scores	19

CHAPTER I

THE RELATIONSHIP OF ANXIETY TO CRITICAL THINKING

Over the past twenty years, a vast amount of literature has been written on the subject of anxiety and its relationship to various dimensions of behavior. However, little has been done to explore directly its link to critical thinking. The purpose of this research was to examine this unexplored area by investigating the relationship between anxiety and critical thinking ability.

The authors of the Watson-Glaser Critical Thinking Appraisal (Watson and Glaser, 1964) view critical thinking as a composite of attitudes, knowledge, and skills. More specifically this composite includes the following:

- (1) attitudes of inquiry that involved an ability to recognize the existence of problems and an acceptance of the general need for evidence in support of what is asserted to be true;
- (2) knowledge of the nature of valid inferences, abstractions, and generalizations in which the weight or accuracy of different kinds of evidence are logically determined;
- (3) skills in employing and applying the above attitudes and knowledge.

In addition to this general definition, a brief list of critical thinking abilities can be added.

1. The ability to define a problem.
2. The ability to select pertinent information for the solution of a problem.
3. The ability to recognize stated and unstated assumptions.
4. The ability to formulate and select relevant and promising hypotheses.
5. The ability to draw conclusions validly and judge the validity of the inferences.

With these points in mind, it appears that critical thinking has commonalities with many diverse fields. An attempt will here be made to bring together tangential literature and relate it to the present study.

Numerous investigations have been done studying the relationship between intelligence and anxiety. Kerrick (1955) found that anxiety correlated significantly with general ability and intelligence measures. However, the bulk of the literature does not support Kerrick's findings. Sarason (1959), who has made extensive studies of anxiety, found no tendency for anxiety scores to correlate with intellectual measures. Similarly, Farber and Spence (1953) state that over a period of years, they have been unable "to find any relationship between anxiety scores of college students and conventional measures of intellectual ability, such as entrance examination scores and grade

point average." In another study (Mayzner, Sersen and Tresselt, 1955), the experimenters failed to find a significant correlation between anxiety and academic performance, indicating that poor academic performance cannot be attributed to lower intelligence alone. Using a design which attempts to control such variables as heterogeneity of intelligence, education, and presence of psychopathology, Dana (1957) concluded that considerable caution must be exercised in interpreting any relationship between intelligence and manifest anxiety. Other studies (Speilberger, 1958; Sarason, 1963; McCandless and Castaneda, 1956; Feldhusen and Klausmeier, 1962) came to similar conclusions. Costello (1968), utilizing the semantic differential, found that intelligence does not affect discriminations, whereas anxiety is positively related to discrimination. This again illustrates the significant absence of an interrelationship between the two factors under discussion.

Evidence such as reported above helps clarify the part anxiety might play in critical thinking procedures. A negative correlation between the two variables under consideration could be interpreted with a reasonable amount of confidence without having to take into account intelligence as an intervening variable. This appears to be a viable conclusion, since, as the majority of the literature indicates, anxiety and intelligence show no consistent relationship.

Of course, if this is to be presumed, an effort should be made to hold intelligence constant. Here it should be pointed out that although Watson and Glaser (1964) report a moderate correlation between their test of critical thinking and several well known measures of intelligence, they insist that critical thinking ability is not contingent upon intelligence.

Anxiety and general achievement is another related area. Sarason (1957) has found that anxiety scores tended to correlate negatively with measures of academic achievement, although with an increase in number of years in college the negative correlation disappeared. A related inquiry (Walters, Densler and Sarason, 1964) revealed a consistent relationship between test performance and test anxiety in a negative manner. Cox (1964), in an examination of anxiety and achievement behavior, found that a negative relationship between anxiety and arithmetic, a complex task requiring comprehension and ability to manipulate abstractions, appears to exist. An Indian study of manifest anxiety and school achievement of adolescents by Sharma (1970) also lend supportive testimony to the existence of a negative correlation between anxiety and achievement. The investigation administered an anxiety scale under non-stress conditions about four months before the administration of the university achievement examination. After the university

examination, the anxiety and achievement scores were correlated. The eta coefficients for the whole group and for the males were significant beyond the .01 level while the eta coefficient for the females was significant at the .05 level, pointing to a high correlation between anxiety and school achievement.

In investigations related to academic performance (Sarason and Palola, 1960), a significant interaction was revealed between test anxiety, instructions, and task difficulty. In addition, Katz and Greenbaum (1969) stated that anxiety and other motivational factors may strongly influence test taking behavior. A final quotation sums up the majority of the literature in the field of intellectual performance (Sarason, Davidson, Lighthall, Waite, and Rucebush, 1960): "In view of the quantity and quality of the evidence, we feel that the hypothesis that anxiety does have some type of interfering effect upon intellectual performance (i.e., achievement) is justifiable."

Studies concerning anxiety and complex learning tasks shed light on a possible relationship between anxiety and critical thinking if one views critical thinking as a complex task. In an experiment (Farber and Spence, 1953) concerned with complex learning and conditioning as a function of anxiety, it was hypothesized that nonanxious subjects would be superior in learning a complex task to anxious subjects in a simple learning task. The results tended to support the theory and hypothesis purported by the authors. A work by Meisels,

Yousseff, and Doran (1967) supported the same hypothesis that high anxiety subjects would perform better on a simple performance task than low anxiety subjects but would perform worse on the initial trials of a complex task. Similarly, the findings of Longnecker's (1962) investigation supported the belief that anxiety functions as a negative drive stimulus which interferes with performance on a problem solving task. In a study (Castaneda, Palermo and McCandless, 1956) concerned with complex learning performance as a function of anxiety in children and task difficulty, high anxious children performed better on easy combinations, but more poorly on the difficult combinations. It was found that performance of the high anxious children appeared to be more affected by the differences in difficulty than that of the low anxious children. These findings lend support to the hypothesis that anxiety interferes with complex cognitive processes such as critical thinking.

Representative studies concerned with anxiety and reaction to stimuli also reveal another aspect of the relationship proposed in the present study. Kochin (1964) in a discussion of anxiety and cognition suggested that a major effect of anxiety is a narrowing and focusing of the field of attention and heightened responsiveness to central cues and reduced responsiveness to more incidental cues. Wachtel (1968), in a study of anxiety, attention, and coping with

threat, drew conclusions compatible with the hypothesis that anxiety deriving from a threat that cannot be reduced by the individual reduces responsiveness to peripheral stimuli. The experimenter stated that,

. . . it still remains to be answered whether anxiety reduces responsiveness only to stimuli in the physical periphery of the visual field, or whether stimuli which become peripheral are determined by a more complex psychological process involving the conceptual structure of the task and the needs of the subject (p. 77).

This and the former investigation raise an interesting question pertaining to critical thinking. If anxiety reduces responsiveness to cues or stimuli on the periphery of attention, then what would be its effect in a critical thinking situation requiring attentions not only to main concepts but also attention to more esoteric aspects of the problem?

Also relevant to this question is an interesting study concerning anxiety and novelty preference (Srgypek, 1969). In this inquiry there was found a high negative correlation between both preference for novelty and for complexity and the pretest scores of the Anxiety Differential. These data indicate that the more anxious a person is, the less likely he is to choose novel versus familiar or complex versus simple stimuli. Once again by viewing critical thinking as a complex task, it could be seen how anxiety would interfere in a situation requiring critical thinking ability.

Conflict solution can also be linked to critical thinking in

that in critical thinking one is required to make judgments on several elements to their relevancy, importance, etc. (Watson and Glaser, 1964). It was found, through analysis of the relation of ego disjunction and manifest anxiety to conflict resolution (Kamano, 1963), that subjects high in both ego disjunction (defined as antagonistic response tendencies within an individual) and manifest anxiety required significantly more time to resolve approach-approach and avoidance-avoidance conflicts than subjects low in both.

Another area lightly touched on also lends support to a proposed relationship between anxiety and critical thinking. This is the study of anxiety and "intolerance of ambiguity." Smock (1957) felt the findings of his study suggested that anxiety is an important determinant of "intolerance of ambiguity." This fits into the present argument in the sense that in a critical thinking situation where "right" and "wrong" (Watson and Glaser, 1964) are not clearly defined, a certain amount of ambiguity is present. In such a situation it would be expected that the adverse effects of anxiety would be most readily apparent.

Another investigation of problem solving rigidity and personality structure (Cowen and Thompson, 1951) provides indirect support to the idea of a connection between anxiety and critical

thinking. Personality factors related to the experimenters' measure of rigidity were

. . . limited productivity and imaginativeness; diminished responsefulness, inability to perceive complex relationships and to integrate constructively; a generalized suppression of emotional expression with respect to both rich inner creativity and interaction with the outer environmental reality; an inability and hesitancy to enter psychologically new situations, combined with a feeling of uncertainty and lethargy when actually in such situations; a tendency to "leave the field" when the going gets difficult; a restricted range of interests and narrower sphere of function, and a poor adjustment to society (p. 166).

In one way or the other, all the above named characteristics apply to an anxious individual. Such a person is rigid and noncreative in his problem solving and other intellectual processes (Sarason et al., 1960). In a situation calling for a creative and original synthesis of material as in critical thinking, it seems obvious that anxiety would have a prominent influence.

Taylor (1966) found evidence in a study of the relationship of logical reasoning and anxiety that anxiety interferes with an individual's ability to reason logically. This particular study gives perhaps the strongest and most direct support to the hypothesis tested here, since logical reasoning is a concept closely akin to critical thinking.

Finally, it has been shown in at least two recent inquiries (Fein, 1963; and Sharma, 1970) that the shape of the anxiety curve is that of an inverted-U. This suggests that anxiety increases drive level and will at first lead to an increased level of performance and then, as drive level continues to rise, to decrease in performance. There seems to be an optimal condition or point of activation for best performance. On either side of this point, performance is relatively impaired.

Both Fein (1963) and Sharma (1970) reported statistically significant curvilinear relationships between anxiety and achievement. In addition to these findings, many other psychologists, such as Malmö (1957), Duffy (1962), and Wood and Hokanson (1965), have cited data to suggest the inverted-U function as describing the relationship between drive level and performance. The present inquiry focuses on the relationship between anxiety and critical thinking ability. Considering the foregoing findings, it is hypothesized that a significantly negative correlation exists between the two variables as measured by Pearson's r and that the correlation is a curvilinear one as measured by η^2 . This is an area in which no research has thus far been attempted.

CHAPTER II

METHOD

Subjects

All students enrolled in Education 343 and 331, introductory courses for teacher education at North Texas State University, were selected as subjects. This population numbered 356 students, 249 females and 107 males. Of this group, 117 were elementary education majors and 198 were secondary education majors. All students were of at least junior standing and had a minimum grade point average of 2.0 on a 4.0 system. An attempt was made to survey the entire population taking into consideration absences on the testing day. The subjects took the anxiety scale voluntarily, although they were required to take the critical thinking appraisal by the education department.

Apparatus

The Watson-Glaser Critical Thinking Appraisal was employed to test critical thinking ability. This test has several sections designed to assess the subject's critical thinking abilities. The first section deals with inference as defined as a conclusion a

person draws from certain observed or supposed facts. After a brief passage is read, students are asked to mark "true," "probably true," "insufficient data," "probably false," or "false" with respect to several statements. The questions in the interpretation section require students to judge whether or not each of the proposed conclusions logically follows beyond a reasonable doubt from the information given in a brief preceding paragraph. Another part of the Appraisal is called "Recognition of Assumptions." An assumption is defined as something presupposed or taken for granted. A statement is given and followed by several other statements which may or may not be assumptions underlying the original statement. The student is to indicate whether each potential assumption is really an assumption underlying the preceding statement or not. A fifth section of the Appraisal is called "Evaluation of Arguments." In this section, each group of questions is preceded by an issue. Judgments are to be made with respect to several statements. Each statement includes a "yes" or "no," followed by a reason. Subjects are to distinguish between strong arguments and weak arguments by designating each one as strong or weak.

The authors of the test report a reliability coefficient for liberal arts freshmen and college seniors of .85 for both studies (odd-even split-half reliability coefficients corrected by Spearman-

Brown formula). Concerning the construct validity of the Appraisal which the authors suggest is a more appropriate concept to consider when psychological aspects are being considered, factor analytic studies (Rust, 1960; 1962) have demonstrated the existence of discrete subdivisions of critical thinking as measured by the Appraisal.

Anxiety was measured by Taylor's (1953) Manifest Anxiety Scale, a well known scale, originally developed from the Minnesota Multiphasic Personality Inventory. This is not a time-consuming scale, and since time had to be taken from the subjects' regular education courses to administer the test, it was advantageous to utilize the scale.

Procedure

The Watson-Glaser Critical Thinking Appraisal is administered to all students entering the teacher education program as a part of the teacher admissions procedure. The subjects were given the Taylor Manifest Anxiety Scale in their classes. Although no specific instructions accompany the scale, the following instructions were read to the subjects to clarify any misunderstanding they might have as to the purposes of the test:

This examination is part of a broad, on-going study of the admissions program. The results will be strictly confidential and will not be used for appraisal or admissions purposes. You are requested to print your name,

course and section number at the top. This information is needed to correlate this score with your other test scores; it will not be used to single out individuals for study. You may take as much time as you need. Circle your answers either true or false. Please respond to all questions.

The fact that the test of anxiety would not be used to evaluate the subjects was stressed so that the subjects would not feel it necessary to "fake" answers and give only acceptable sounding answers in order to improve their chances of being accepted into the teacher education program.

A Pearson's r and eta were computed. This was to test the null hypothesis that no correlation exists between anxiety, as measured by the Taylor Manifest Anxiety Scale and critical thinking, as measured by the Watson-Glaser Critical Thinking Appraisal.

CHAPTER III

RESULTS

The outcome of the statistical analysis can be seen in the following table which reports the Pearson's Product Moment Correlations for the two variables under consideration.

TABLE I
CORRELATION OF CRITICAL THINKING WITH
MANIFEST ANXIETY

Group	Number	<u>r</u>
Total Population	356	- 0.0827
Females	249	- 0.0247
Males	107	- 0.2334*
Elementary	117	- 0.0768
Secondary	198	- 0.1195

p < .05

As indicated in Table I, there was not a significant correlation between anxiety and critical thinking when the scores for males

and females were combined although the trend of the correlation was in the direction hypothesized. Negative signs were in keeping with the hypothesis that the relationship would be negative.

A significant negative correlation was found for males, however, indicating that as anxiety as measured by the Taylor Manifest Anxiety Scale increases, ability to think critically, as measured by the Watson-Glaser Critical Thinking Appraisal, decreases. It should be pointed out, however, that correlations at this level, although statistically significant, show only a very slight relationship between the two variables. A correlation at this level indicates that only a little over 4 per cent of the variance in the two measures correlated is common to both. On the other hand, correlations in this range have meaning in exploratory research where relationships are being sought (Borg, 1963). With this in mind, it does not seem justified to make individual predictions if the results reported here are used as a guideline.

No significant correlations were found when the data were analyzed according to the subjects' major fields, elementary or secondary education. There is a more pronounced trend for secondary, however. This can probably be attributed to the large number of men in the secondary population while there was almost none in the elementary population. Once again it should be pointed out that

although these correlations did not reach significance, the negative trends were in the direction hypothesized.

Table II compares males and females for differences between means for the two groups.

TABLE II
t TESTS OF MEAN Z SCORES ON TAYLOR MANIFEST ANXIETY SCALE AND WATSON-GLASER CRITICAL THINKING APPRAISAL FOR MALES VERSUS FEMALES

Measure	Male (N = 107)		Female (N = 249)		<u>t</u>
	M	SD	M	SD	
Manifest Anxiety	13.21	8.04	14.63	7.50	- 1.60
Watson-Glaser	69.40	11.45	71.04	11.86	- 1.20

Although the means for the males are lower than those for the females, t tests computed between the variables did not reveal any significant variation.

The findings presented in Table III compare elementary majors with secondary majors for difference between means between the two groups. Although some variation is apparent between the two groups, t tests did not demonstrate a significant difference between these groups.

TABLE III

t TESTS OF MEAN Z SCORES ON TAYLOR MANIFEST ANXIETY SCALE AND WATSON-GLASER CRITICAL THINKING APPRAISAL FOR ELEMENTARY VERSUS SECONDARY GROUPS

Measure	Elementary (N = 117)		Secondary (N = 198)		<u>t</u>
	M	SD	M	SD	
Manifest Anxiety	14.18	7.56	14.01	7.80	.20
Watson-Glaser	70.50	11.81	71.73	10.44	.90

From Table IV it can be seen that significant results were obtained for the whole group at the .05 level. A test of linearity for the combined groups provides similar conclusions. Further, the standard error of the eta coefficient for this group shows that the amounts of correlations are rather close to population correlations. When the data were analyzed according to male and female groupings, significance was not attained. It seems worthwhile to note, however, that the results in both instances indicate a tendency toward curvilinearity. When the data were then broken down by an elementary-secondary grouping, significance at the .05 level was reached for the elementary group but not for the secondary group. These rather

TABLE IV

PEARSON r , ETA, TEST OF LINEARITY, SIGNIFICANCE OF ETA,
AND STANDARD ERROR OF ETA FOR THE ANXIETY AND
CRITICAL THINKING SCORES

Group	N	r	Eta	F		Standard Error of Eta
				Test of Linearity	Significance of Eta	
Whole	356	-.083	.291	1.93*	1.97*	0.049
Males	107	.235	.419	1.14	1.53	0.080
Females	249	.025	.300	1.569	1.48	0.058
Elementary	117	.077	.440	1.83*	1.73*	0.075
Secondary	1198	.120	.339	1.60	1.70	0.063

* $p < .05$

contradictory results will be more thoroughly reviewed in the following chapter of discussion.

CHAPTER IV

DISCUSSION

The results of this study lend limited support to the hypothesis that anxiety interferes with critical thinking ability. Several reasons might be put forth as to why less ambiguous results were not obtained.

It has been argued (Mednick, 1957) that the high scorer on the Taylor Manifest Anxiety Scale does not chronically carry his anxiety around with him but that it must be specifically elicited by some stress situation. With this in mind, it could be postulated that performing on the critical thinking appraisal was not perceived as a stressful, anxiety-provoking situation by many subjects, especially the female subjects who nonetheless had high scores on the anxiety scale.

A complicating factor contributing to the puzzling results could be the time at which the anxiety scale was administered. It was not given until the last regular class week of the term. Because of this, many subjects' anxiety level may have been elevated well beyond its normal level due to the nearness of final examinations.

Such high anxiety scores by persons not normally impeded by anxiety may have confounded the findings, obscuring the relationship between the two variables. A more ideal situation would have been to gather the data on anxiety at a less stressful time, although not necessarily at the same time as the administration of the Watson-Glaser Critical Thinking Appraisal, since this test is used by the education department as a part of its screening process of applicants to the teacher education program. Because the subjects realized the importance of performing well on the appraisal, this testing session might also be just as stressful as the time prior to final examinations. A day or two before or after administration of the Appraisal would, no doubt, be a more advantageous time to measure the individual subject's level of anxiety as it normally is.

Sharma (1970) speculated that an important factor for obtaining curvilinear relationships seems to be how widely scattered the scores are on both anxiety and critical thinking continua. It is very possible that the sample for this study was too homogeneous to provide relatively trustworthy results. One might speculate that education students possess characteristics that, when measured as some level of anxiety, tend to fall into one general level. The same undoubtedly would also hold true for their scores on a critical thinking appraisal. The evident confusion in the present study may

well be attributed to the lack of regard for different absolute levels in various groups. This implies that this anxiety-critical thinking curve badly needs strengthening at its ends by using a more heterogeneous sample with a large number of subjects at the extremes.

REFERENCES

- Castaneda, A., Palermo, D.S., and McCandless, B.R. Complex learning and performance as a function of anxiety in children and task difficulty. Child Development, 1956, 27, 327-332.
- Costello, C.G. Anxiety, intelligence, and discrimination. Journal of Abnormal Psychology, 1968, 73 (6), 594.
- Cowen, E.L., and Thompson, G.C. Problem solving rigidity and personality structure. Journal of Abnormal and Social Psychology, 1951, 46, 165-176.
- Cox, F.N., Test anxiety and achievement behavior systems related to examination performance in children. Child Development, 1964, 35, 909-916.
- Dana, R.H., Manifest anxiety, intelligence, and psychopathology. Journal of Consulting Psychology, 1957, 21, 38-40.
- Duffy, E. Activation and Behavior. New York: John Wiley & Sons, 1962.
- Farber, I.E., and Spence, K.W., Complex learning and conditioning as a function of anxiety. Journal of Experimental Psychology, 1953, 45, 120-125.
- Farber, I.E., and Spence, K.W., Main and interactive effects of several variables on reaction time. U.S. Naval Reserve Technical Report, No. 3, Contract N9 onr-93802, State University of Iowa, March 1, 1955, 10.
- Fein, L.G., Evidence of a curvilinear relationship between IPAT anxiety and achievement at nursing school. Journal of Clinical Psychology, 1963, 19, 374-376.
- Feldhusen, J.F., and Klausmeier, H.J., Anxiety, intelligence, and achievement in children of low, average and high intelligence. Child Development, 1962, 33, 403-410.

- Kamano, D.K., Relationship of ego disjunction and manifest anxiety to conflict resolution. Journal of Abnormal and Social Psychology, 1963, 66 (3), 281-284.
- Katz, I., and Greenbaum, C., Effects of anxiety, threat, and racial environment on task performance of negro college students. Journal of Abnormal Psychology, 1969, 73 (3), 405-409.
- Kerrick, J.S., Some correlates of Taylor Manifest Anxiety Scale. Journal of Abnormal and Social Psychology, 1955, 50, 75-77.
- Korchin, S.J., Anxiety and cognition. In C. Scheerer (ed.), Cognition: Theory, Research, Promise. New York: Harper and Row, 1964, pp. 58-78.
- Longnecker, E.C., Perceptual recognition as a function of anxiety, motivation, and the testing situation. Journal of Abnormal and Social Psychology, 1962, 64 (3), 215-221.
- Malmo, R.B., Anxiety and behavior arousal. Psychological Review, 1957, 64, 276-286.
- Mayzner, M.S., Sersen, E., and Tresselt, M.E., The Taylor Manifest Anxiety Scale and intelligence. Journal of Consulting Psychology, 1955, 19, 401-404.
- McCandless, B.R., and Castaneda, A., Anxiety in children, school achievement and intelligence. Child Development, 1956, 27, 379-382.
- Mednick, S.A., Generalization as a function of manifest anxiety, and adaptation to psychological experiments. Journal of Consulting Psychology, 1957, 21, 491-494.
- Meisels, M., Youseff, Z., and Doran, M. Levels of anxiety, dominant tendency and mirror tracing performance. Psychonomic Science, 1967, 9, 193-194.
- Rust, V.I., Factor analysis of three tests of critical thinking. Journal of Experimental Education, 1960, 29, 177-182.
- Rust, V.I., A factor-analytic study of critical thinking. Journal of Educational Research, 1962, 55, 253-259.

- Sarason, I.G., Test anxiety, general anxiety and intellectual performance. Journal of Consulting Psychology, 1957, 21, 485-490.
- Sarason, I.G., Intellectual and personality correlates of test anxiety, Journal of Abnormal and Social Psychology, 1959, 59, 272-275.
- Sarason, I.G., Test anxiety and intellectual performance. Journal of Abnormal and Social Psychology, 1963, 66, 73-75.
- Sarason, S.B., Davidson, K.S., Lighthall, F.F., Waite, R.R., and Rucebush, B.K. Anxiety in Elementary School Children. New York: Harper and Row, 1960.
- Sarason, I.G., and Palola, E.G., The relationships of test and general anxiety, difficulty of task, and experimental instruction to performance. Journal of Experimental Psychology, 1960, 59, 185-191.
- Sharma, S., Manifest anxiety and school achievement of adolescents. Journal of Consulting and Clinical Psychology, 1970, 34 (3), 403-407.
- Skrgypek, G.J., Effect of perceptual isolation and arousal on anxiety, complexity preference, and novelty preference in psychopathic and neurotic delinquents. Journal of Abnormal Psychology, 1969, 74 (3), 321-329.
- Smock, C.D., The relationship between "intolerance of ambiguity," generalization and speed of perceptual closure. Child Development, 1957, 28, 27-36.
- Spielberger, C.D., On the relationship between manifest anxiety and intelligence. Journal of Consulting Psychology, 1958, 22, 220-224.
- Taylor, I.C., The Interference of Anxiety in Logical Reasoning. Ph.D. dissertation, university of Colorado, Colorado Springs, Colorado: University Microfilms, 1966.
- Taylor, J.A., A personality scale of manifest anxiety. Journal of Abnormal and Social Psychology, 1953, 47, 561-565.

- Wachtel, P. L., Anxiety, attention, and coping with threat. Journal of Abnormal Psychology, 1968, 73 (2), 137-143.
- Walter, D., Denzler, L. S., and Sarason, I. G., Anxiety and intellectual performance of high school students. Child Development, 1964, 35, 917-926.
- Watson, G., and Glaser, E.M. Watson-Glaser Critical Thinking Appraisal. New York: Harcourt, Brace and World, 1964.
- Wood, C.G., Jr., and Hokanson, J.E., Effects of induced muscular tension on performance and the inverted U function. Journal of Personality and Social Psychology, 1965, 1, 506-510.