

THE EFFECT OF TIME CONSTRAINTS AND TEST
ANXIETY ON STUDENTS' PERFORMANCE
ON THE ARITHMETIC SUBTEST
OF THE WISC-R

By

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CHAPTER I

INTRODUCTION

Test anxiety has often been defined as an emotional response that is produced by the threat of impending failure (Atkinson, 1964). Anxiety is known to have debilitating results on test and task performance (Lentz, 1975). This expectancy of failure and the resulting test is believed to be a function of past experiences with failure (Parish, Buntman, and Buntman, 1975). This suggests that failure could perpetuate test anxiousness.

Sarason (1963) concludes that situational variables influence test performance. These variables may include body image, peer pressure, hostility, rapport with the tester, etc. (Gaudry and Spielberger, 1971). The relationship between scores on tests and time needed to complete the test is another situational variable that has also been examined (Terranova, 1972). Stewart and Davis (1974) revealed a significantly higher Digit Span score was obtained from those subjects who were allowed a ten second delay between sets of digits. Given this finding, it could be suggested that anxiety, the intervening variable, was able to be reduced through manipulation of this situational variable (i.e., time allowed to take the test). It is the purpose of this investigation to determine if the presence or absence of time constraints affect fourth graders' intellectual performance on the WISC-R arithmetic subtest.

Test Anxiety Affecting Cognitive Performances

Sarason, Hill, and Zimbardo (1964) and Hill and Sarason (1966) reported a negative relationship between test anxiety and school achievement becoming more pronounced as children progress through elementary school. This might suggest that throughout the elementary school years the effects of test anxiety may become increasingly detrimental to adequate school performance or that school performance may increasingly arouse greater amounts of anxiety. Extreme shifts in anxiety are also related to reciprocal changes in intelligence and achievement so that a child who decreased markedly in anxiety level over time showed a corresponding increase in intelligence and school achievement and vice versa (Sarason, Davidson, Lighthall, Waite, and Ruebush, 1960; Biggs, 1962; Taylor, 1956), implying that a significant relationship exists between anxiety and intellectual capacity and anxiety on performance.

Since the presentation of the theory of test anxiety (Mandler and Sarason, 1952; Sarason, Mandler, and Craighill, 1952) hundreds of studies have reported investigations of relationships between test anxiety and a variety of educational variables (see Lentz, 1975). Both school achievement and intelligence test scores are negatively related to test anxiety (Sarason, 1961). Studies on the relationship of anxiety to learning have concluded that school children high in test anxiety surpass those low in test anxiety on simple tasks but prove inferior on complex ones (Castenada, Palermo, and McCandless, 1956). Castenada et al. (1956) demonstrated that performance was inferior on tasks where feelings of inadequacy were experienced. It has been proposed that test anxiety greatly interferes with work in performance on problem solving

tasks (Sarason, Davidson, Lighthall, Waite, and Ruebush, 1960). One hypothesis to explain how this interference operates is that anxiety itself may become a source of information input (Sarason et al., 1960). It was concluded that test-anxious children frequently experience intrusion of irrelevant thoughts. Such additional information may overload short-term memory beyond the limits of human channel capacity (Miller, 1956) or disrupt the organization of remembered information.

(Sarason et al., 1960) concluded that the level of reported anxiety would increase over the elementary school years for the following three reasons: 1) the accumulative detrimental result of test anxiety; 2) the presumed increases in the child's accuracy of self-report of anxiety; and 3) the presumed increases in demands and pressures for academic accomplishment from parents and school personnel.

Plank and Plank (1954) have pointed out the difference between performance in reading and arithmetic is markedly related to factors such as dependency and overprotection. Plank and Plank (1954) have characterized high arithmetic achievers as follows:

The high arithmetic achievers could express their feelings freely and without anxiety or guilt; were emotionally controlled and flexible; and were capable of integrating their emotions, thoughts and actions. Similarly, their intellectual processes tended to be spontaneous, flexible, assertive and creative. Arithmetic achievers show the most independence of thoughts while maintaining contact with reality and avoid being bound by its constraints and could function most effectively in the realm of abstract symbols (Sarason et al., 1960, p. 79).

Characteristics of Test-Anxious Children

The idea that anxiety exerts a constricting influence on behavior is buttressed by studies indicating that the more anxious children score higher on scales measuring "rigidity of thinking" (Kitano, 1960).

These children also show greater rigidity in their drawings (Fox, Davidson, Lighthall, Waite, and Sarason, 1958) and in their behavior (Smock, 1958) and they prefer familiar rather than novel stimuli (Mendel, 1965). Related to this is the finding that dependency characterizes the behavior of anxious children (Sarason, Davidson, Lighthall, and Waite, 1958). It seems dependency and insecurity are interrelated with test-anxious children.

Highly test-anxious children are less popular with peers than children of low test anxiety (McCandless, Castenada, and Palermo, 1956). High test-anxious children have less positive self-concepts (Lipsitt, 1958; Horowitz, 1963); they express more dissatisfaction with themselves and others (Phillips, Hindsman, and Jennings, 1960); and in general they express more negative feelings than less anxious children (Barnard, Zimbardo, and Sarason, 1961).

Test Anxiety Scale

The Test Anxiety Scale for Children (TASC) was developed to measure the levels of anxiety that are aroused in children by tests or test-like situations (Sarason, 1960). This focus on test anxiety was determined, in part, by the fact that test situations are frequently encountered by almost all members of our society. Sarason et al., (1960) concluded persons perceiving the testing situation to have an evaluative or assessment purpose feel it is important to do well because in our culture the lives of people are very frequently affected by their test performance. (See Appendix).

According to Sarason's theory on test anxiety:

1. In general, high levels of test anxiety will interfere with

performance on school tests or in situations which are test-like.

2. Reduction in the test-like characteristics of a task should reduce the impairing effects of test anxiety. This might be brought about by eliminating time limits or by giving cues to the correct answers.
3. The greater the test-like characteristics of the task, the more the child's anxiety will be manifested and the more it will interfere with his performance.

Thus, it is the purpose of this investigation to test the following hypotheses:

1. High test-anxious subjects who are given no time constraints in responding to the arithmetic subtest of the WISC-R should perform significantly better than HTA subjects who are administered the arithmetic subtest of the WISC-R with the required time constraints imposed.
2. Low test-anxious subject's performance on the arithmetic subtest of the WISC-R are hypothesized to not be affected by the imposition or the lack of any imposition of time constraints.

CHAPTER II

METHOD

Subjects

A total of 58 fourth grade students, 24 females and 34 males, were selected from three classes at Will Rogers Elementary School in Stillwater, Oklahoma.

Procedure

All subjects were classified as either exhibiting high levels of test anxiety (HTA) or low levels of test anxiety (LTA) as indicated by performance on the Test Anxiety Scale for Children (TASC). One to fifteen "yes" responses to the TASC constituted placement in the LTA group. Sixteen to thirty "yes" responses constituted placement in the HTA group. For the HTA group the $\bar{X} = 22.56$ and the $SD = 4.20$ while for the LTA group the $\bar{X} = 10.19$ and the $SD = 2.73$. Each anxiety group was further subdivided into an experimental and a control group.

All subjects were presented the arithmetic subtest of the Wechsler Intelligence Scale for Children in the revised edition as outlined by Wechsler (1974) over a three-day period. The testing procedure consisted of individualized testing using time constraints on the control and no time constraints on the experimental groups. The subjects were

randomly selected within each level of anxiety for each testing day. The subjects were tested behind a partition dividing them from the rest of the class. They were not tested in a separate room due to the crowded conditions of the school. The subjects were told that their mathematical skills were going to be tested. The question was raised by the children if this evaluation would affect their grade. The examiner felt ethically bound to respond to this question prior to testing. The subjects were told that the evaluation would not affect their grade. This may have caused a reduction in the subjects' level of anxiety. The purpose of this procedure was to not perpetuate further feelings of anxiety thus debilitating their performance.

Experimental Design

A two-way unweighted means analysis of variance was employed in the statistical analysis. The treatment variable (time restraints vs. no time restraints) was compared to anxiety levels (high anxiety vs. low anxiety) with regard to scores obtained on the arithmetic subtest of the WISC-R. Table I will aid in understanding the treatment design, as well as provide a summary of means of the arithmetic performance of the children at the two levels of test anxiety.

TABLE I
 TREATMENT COMBINATION MEANS AND STANDARD DEVIATIONS
 OF WISC-R SCORES

	Time Constraints	No time Constraints
High Anxiety	M = 6.21	M = 6.46
	SD = 1.87	SD = 1.91
	N = 14	N = 13
Low Anxiety	M = 6.73	M = 8.06
	SD = 2.24	SD = 1.80
	N = 15	N = 16

* The analysis of the WISC-R arithmetic subtest was undertaken in the above fashion.

CHAPTER III

RESULTS

The results of the statistical analyses are presented in Table II

With regard to the number of correct responses on the arithmetic subtest of the WISC-R, the analysis of variance failed to reveal any significant effect of treatment on performance ($F = 1.70$, $df = 1/52$, $p > .05$) and of anxiety level ($F = 3.03$, $df = 1/52$, $p > .05$) on performance. The treatment by level of anxiety ($F = .77$, $df = 1/52$, $p > .05$) also failed to reveal any significance. Thus, this statistical analysis failed to support the hypotheses that time constraints would significantly affect performance of high test anxious subjects on the arithmetic subtest of the WISC-R and the anxiety level would significantly interact with the treatment variable. Notably, the anxiety level did not significantly affect scores on the arithmetic subtest. The results failed to significantly demonstrate that varied levels of test anxiety, coupled with time constraints, are influential on cognitive performance on the arithmetic subtest of the WISC-R, in relation to time constraints.

TABLE II
ANALYSIS OF VARIANCE TABLE FOR WISC-R SUBTEST SCORES

Source	df	MS	F*
WISC-R Arithmetic Subtest			
Treatment	1	.63	1.70
Anxiety Level	1	1.12	3.03
Interaction	1	.28	.77
Error	54	.37	--

*No values were significant at .05 level

CHAPTER IV

DISCUSSION

The findings of the statistical analyses failed to support the contention of the experimental hypotheses; namely, that lack of time constraints do significantly affect mathematical skills in evaluative procedures. Rather, presence or absence of time constraints did not significantly affect scores between the experimental or control HTA groups on the arithmetic subtest of the WISC-R. From these results it might be appropriate to conclude that lack of time constraints do not significantly affect test performance of fourth graders at Will Rogers on the subtest of the WISC-R.

While previous research has produced significant results concerning the effect of test anxiety on problem-solving tasks (e.g., Stewart and Davis, 1974; Terranova, 1972; Davis, 1969), the results in the present study failed to substantiate these findings. Perhaps this can be attributed to the fact that anxiety does not have a common core definition which remains stable across studies (Forhertz, 1969). Since time constraints is only one situational variable influencing test performance it may be one situational factor that may not remain stable over a variety of studies.

Perhaps the subtest itself (i.e., arithmetic subtest) facilitated the results obtained in this study. Maybe if another area of academia had been tested, the results would have been different. Sarason et al.,

(1960) concluded that there was a consistent tendency for test anxiety scores of boys and girls to be more strongly and negatively associated with reading subtest scores than with arithmetic subtest scores. This consistent finding is interpreted to be the result of two factors each assumed to enhance the interfering effects of anxiety, that operate more strongly in the reading than in the arithmetic area in the early and middle elementary school grades (Sarason, Hill, and Zimbardo, 1964). In the elementary classroom situation, children are often urged and required to engage in independent activity more in the area of reading than the arithmetic area. Secondly, in the primary grades, reading activities and problems are more complex and intellectually demanding than arithmetic problems (Sarason et al., 1964). Perhaps since reading problems and activities are far less structured, correct answers are often less easily verified. In the area of arithmetic there might be greater retention and recall since there are numerous absolutes. Since arithmetic possesses absolutes, the subjects in this investigation might have felt more comfortable with this test despite the enforced time restraints.

The results of this study supports the contention that the interaction between experimenter and various treatment conditions should be given considerably more attention than it has received in the past (Sarason, 1963). In performing this investigation, perhaps the examiner informing the subjects that their grade would not be affected by their performance on the math subtest of the WISC-R significantly influenced the results. Further research is apparently needed, however, in order to validate these inferences.

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APPENDIX

APPENDIX

TEST ANXIETY SCALE FOR CHILDREN*

1. Do you worry when the teacher says that he is going to ask you questions to find out how much you know?
2. Do you worry about being promoted, that is passing from the 4th to the 5th grade at the end of the year?
3. When the teacher asks you to get up in front of the class and read aloud, are you afraid that you are going to make some bad mistakes?
4. When the teacher says that he is going to call upon some boys and girls to answer arithmetic problems out loud, do you hope that he will call upon someone else and not you?
5. Do you sometimes dream at night that you are in school and cannot answer the teacher's questions?
6. When the teacher says that he is going to find out how much you have learned, does your heart begin to beat faster?
7. When the teacher is teaching you about arithmetic, do you feel that other children in the class understand him better than you?
8. When you are in bed at night, do you sometimes worry about how you are going to do in class the next day?
9. When the teacher asks you to write on the blackboard in front of the class, does the hand you write with sometimes shake a little?

*Reliability was computed to be .55.

10. When the teacher is teaching you about reading, do you feel that other children in the class understand him better than you?
11. Do you think you worry more about school than other children?
12. When you are at home and you are thinking about your arithmetic work for the next day, do you become afraid that you will get the answers wrong when the teacher calls upon you?
13. If you are sick and miss school, do you worry that you will be far behind the other children when you return to school?
14. Do you sometimes dream at night that other boys and girls in your class can do things you cannot do?
15. When you are home and you are thinking about your reading group for the next day, do you worry that you will do poor work?
16. When the teacher says that he is going to find out how much you have learned, do you get a funny feeling in your stomach?
17. If you did very poorly when the teacher called on you, would you probably feel like crying even though you would try not to cry?
18. Do you sometimes dream at night that the teacher is angry because you do not know your work?
19. Are you afraid of tests in school?
20. Do you worry a lot before you take a test?
21. Do you worry a lot while you are taking a test?
22. After you have taken a test do you worry about how well you did on the test?
23. Do you sometimes dream at night that you did poor work on a test you had in school that day?
24. When you are taking a test, does the hand you write with shake a little?

25. When a teacher says that he is going to give the class a test, do you become afraid that you will do poor work?
26. When you are taking a hard test, do you forget some things that you knew very well before you started taking the test?
27. Do you wish a lot of times that you didn't worry so much about tests?
28. When the teacher says that he is going to give the class a test, do you get nervous and a sort of funny feeling?
29. While you are taking a test do you usually think you are doing poor work?
30. While you are on your way to school, do you sometimes worry that the teacher may give the class a test?
31. When you are at home, do you think about your school work?
32. Do you sometimes dream at night about school?

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