THE ROLE OF ANXIETY IN SCHOOL ACHIEVENENT by

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## ABSTRACT

Matched groups of Grade VI pupils obtaining low, medium, and high scores on the. Test Anxiety Scale for .Children were compared on the basis of their performances on four school examinations to determine the extent and nature of the relationship between anxiety and school achievement.

Analyses were made of the data pertaining to the performances of the boys and girls together, and of the boys and girls separately, on the four examinam tions, combined, and on each individual examination.

Out of a total of 45 possible differences 6 were found to be statistically significant. Results for the girls were negative throughout but medium-anxious boys were found to do less well than their low- and high-anxious mates on two of the four examinations. Groups of boys and girls together showed differences similar to the boys. Statistically significant differences pointed to a "U" type curvilinear relationship between anxiety and -performance.

An analysis was also made of the power of each of the items on the anxiety scale to discriminate between high- and low-achievers. Twenty-nine of the total of 30 test items failed to discriminate in a statistically significant way between high- and low-achievers.

Findings suggest limitations to the use of individual anxiety scores for interpretive or predictive purposes without further investigation. Revisions of a procedural nature were suggested as possible means of increasing the likelihood of obtaining more meaningful results from an investigation into the effects of anxiety on performance.

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## Chapter I

## THE PROBLEM

The research described in this thesis was undertaken in the hope of gaining additional insight into the role of anxiety in determining the frequent discrepant rates at which school children are able to achieve academically in relation to their assessed intellectual potentiality. Because the rate of a child's progress in school is in large part dependent upon hịs performance in a variety of test situations, examinations are likely to be perceived by the student to have an evaluative purpose and therefore to arouse feelings of anxiety. Anxiety so stimulated has been referred to by Sarason, Davidson, Lighthall, Waite and Ruebush (1960) as "test" anxiety. The present study principally deals with this particular type of anxiety as, at varying levels of strength, it affects the school achievement of children.

It is a general practise within elementary schools to obtain periodically a pupil's intelligence quotient. Such an assessment, if not interpreted in the light of other characteristics which could be either facilitating or inhibiting in their effect, could lead to a misconception of a child's ability to achieve academically, and result in unrealistically high or low expectations
with regard to his level of performance. The manner in which a child is approached in a learning situation can favorably or unfavorably affect his school performance, and attitudes based on misconceptions would be more likely to have the latter effect. Knowledge of a child's consistent level of anxiety in task situations would increase one's understanding of the child and his ability to use his potential, and would result in greater likelihood that the attitude taken toward the child would maximize rather than minimize his school performance. In the cases of children considered to be underachieving, experience has taught us that when pressure to improve is brought to bear, and consequently, anxiety level increased, one child's performance will improve and another's deteriorate; and conversely, that when pressure to improve is removed, or anxiety level reduced, one child will do better academically and another worse. The question arises as to which approach to employ in particular cases. If the concept of anxiety as a drive is accepted, as well as the widely-accepted theory of a curvilinear relationship existing between drive level and strength of response, variations in responses such as those discussed above would be expected. It follows that with information as to a child's consistent or
characteristic anxiety level, a decision to adopt an approach designed either to increase or to decrease drive, whichever results in facilitated performance, could be made with greater certainty.

The importance of determining a child's anxiety level could be stressed for yet another reason. As Sarason suggests, in the case of the intellectually average but anxious child, the estimate of potential based on conventional tests may contain more error than in the case of most other intellectually average children. Broen (1959) has concluded that anxiety is a variable which, because it has similar effects on intelligence-test performance and achievement, aids in the prediction of achievement. Procedures for suppressing anxiety are seen as decreasing the relationship between intelligence-test performance and school achievement.

The implication would seem to be that when prediction of academic achievement is the sole purpose of intelligence testing, group tests, or those more nearly approximating the nature of school examinations, would be preferable to individually-administered tests where anxiety can be controlled more adequately. However, to the extent that group-test scores are used in assessing
a child's intellectual potential for evaluative purposes they would seem less preferable for the very reason that they are better predictors; that is, they do not identify the child whose school achievement seems to be appropriate to his assessed potential but who in reality is an underachieving child whose anxiety has served to artificially depress his intelligence-test score: Some estimate of level of anxiety could prove a valuable aid in identifying highly anxious pupils who are unable to function at their optimum level or whose potentials are greater than their intelligence-test scores would indicate.

The chief purpose of the present study is to determine for interpretive purposes whether, with.IQ and school grade controlled, children ranking low, medium, or high on the Test Anxiety Scale for Children will differ significantly in their performance on school examinations. A second objective is to determine whether the findings will reveal a linear or curvilinear relationship, if any, between school performance and Test Anxiety scores.

A third purpose relates to the discriminatory power of each of the 30 items on the Test Anxiety Scale for Children (hereinafter referred to as the TASC). It is investigator's aim to determine whether or not any or all of the TASC items, on the basis of a "no" or "yes"
answer, discriminates between high and low scholastic achievers. A study of the nature of the discriminating items could increase one's knowledge of possible differences in attitudes of pupils functioning at a minimum and at a maximum level in relation to assessed potential ability.

The originators of the TASC, Sarason et al (1960); have reported a very consistent tendeney for girls to obtain higher anxiety scores than boys. This tendency, they report, was also evident in several studies to which they refer in their review of the literature. It is a little beyond the scope of the present study to discuss the implications of these findings beyond stating that it is not generally believed that girls are in reality more anxious than boys. Rather, differences are attributed to the fact that in our culture we expect and support the admissions of anxiety in girls to a degree and in ways different from boys. Girls do ' not learn that they must or should hide anxiety. They feel freer, therefore, to admit to feelings of anxiety and as a result tend to obtain higher scores on anxiety questionaires.

Haggard (1957) found that boys tended to do better than girls in reading speed and comprehension, whereas
girls tended to excel on the spelling and language tests. McCandless and Castaneda (1956) found that the achievement area most susceptible to the interference of anxiety seemed to be arithmetic computation. Arithmetic would seem to require conceptual and abstract reasoning abilities to a larger extent than do other school subjects such as reading and spelling, and perhaps could be assumed to be more complex. Other investigators including Sarason et al (1960) have found that the effects of anxiety could be more clearly demonstrated in the case of boys than in the case of girls.

With the above observations in mind the following hypotheses were formulated:

Hypothesis I
When intelligence and school grade are held constant, children ranking low, medium, and high on the TASC will reveal differences in level of performance on school examinations, and the children ranking medium will do better than those ranking either high or low.

## Hypothesis II

Boys ranking low, medium, and high on the TASC will reveal greater differences in their performances than
will the girls ranking low, medium, and high on the TASC, when intelligence and school grade are held constant. Hypothesis III

Differences in the performances of Ss ranking low, medium, and high on the TASC will be greater on the examination involving the greater number of reasoning tasks, i.e. arithmetic, with intelligence and school grade held constant.

REVIEN OF THE LITERATURE

In stating the problem the term "performance". has been purposely chosen in preference to the term "learning" in that the present study concerns learning only as it is inferred from performance. The study does not deal with specific complex processes which are believed to occur when learning takes place. However, reference to studies relating to learning would seem to be appropriate in this chapter since certain of their findings contributed to the development of the problem.

Taylor (1951) was one of the first to study manifest anxiety as a drive variable. Her theory derived from the Hullian conceptualization of response strength (R) as a multiplicative function of a learning factor ( $H$ ) and a drive factor (D). Anxious subjects were assumed to function at a higher drive level and were predicted to learn faster than less anxious subjects. A personality scale of manifest anxiety was developed by Taylor (1953) and it has since been extensively used in investigations into the role of anxiety. Studies by Spence and Farber (1953), Spence and Taylor (1951),: Taylor (1951), and Wenar (1954), showed that on a variety of simple tasks low-anxious subjects performed
better than did high-anxious subjects:
Montague (1953) investigated the effect of anxiety on performance as a function of the relative number and strength of correct and incorrect response tendencies elicited in the experimental situation. Subjects were given three lists of nonsense syllables to learn which were made to vary through manipulation of intra-list similarity and association value. The greater the similarity between the syllables and the lesser the number of associations they stimulated, the more difficult was the task regarded. Results showed that anxious subjects performed less well than nonanxious subjects on the difficult task, improved their performance as the task became easier, and surpassed the nonanxious subjects on the simplest task. It was concluded from these findings that anxiety does not always facilitate verbal learning; but, to the contrary, in some cases interferes with learning.

The Montague study as well as those by Farber and Spence (1953); Maltzman, Fox, and Morrisett (1953); and Ramond (1953), seemed to indicate that, while adequate where simple learning tasks were involved, the Taylor theory was inadequate for more complex tasks. As a consequence, Spence, Taylor, and Ketchel (1956) revised
their theory to predict that anxious subjects should perform more poorly than nonanxious subjects in situations characterized by competing response tendencies. In explanation they state that since performance is assumed to be a function of the magnitude of the difference between excitatory potentials of the correct and incorrect responses, it is obvious that the higher the level of $D$ the greater will be the advantage of the incorrect responses and hence the greater likelihood of the occurrence of such erroneous responses.

While the revised theory has received support from several investigations including those of Castaneda; Palermo, and McCandless (1956), and Taylor and Rechtschaffen (1959), other studies show results which are not consistent with the revised Taylor-Spence theory. On such example is the Saltz and Hoehn (1957) study which predicted that on the basis of the Taylor-Spence theory the anxious subjects in a learning situation should do more poorly on competing material than on noncompeting. The results were contrary to their predictions.

Sarason (1960), commenting on the fact that Bindra, Paterson, and Strzelecki (1955) did not obtain significant differences between high-, and low-anxious subjects in a simple conditioning experimental situation
involving a nondefensive response, suggests that there has perhaps been some confounding of task complexity with task stressfulness. Child (1954) touched on this point when he questioned a theoretical approach which concentrated on the simplicity or complexity of a task without recognizing the effect on performance of responses subjects learn to make to the cues provided by their own anxiety. In other words, the relative complexity of a task in itself is perhaps affecting performance less than is the ego-involved response that is made when low-, and high-anxious subjects are presented with a difficult and stressful problem.

Ruebush (1960), Sperber (1961), Vogel, Baker, and Lazarus (1958), and Wiener (1959), have all presented results which support the belief that the effects of anxiety on performance indeed vary not with task complexity alone but with motive and defense as well. Sarason (1960) has pointed out that complex tasks can be both difficult and emotionally arousing and that both aspects must be considered in investigating the effects of anxiety on performance.

Axelrod, Cowen, and Heilizer (1956) found sex of subject and examiner characteristics to relate more significantly to anxiety than did task complexity, and McCandless and Castaneda (1956) have also reported sex
differences. In addition to task complexity, emotional involvement in the task, and sex of subject, Sarason et al (1960) have pointed out that several other variables such as examiner attitude, encouragement or discouragement of dependent behaviour, and test-like nature of a task can alter the performance of high and low subjects. Sarason (1960) in referring to the unreplicability and inconsistencies of certain reported findings in the area of anxiety, raises still another question, namely, that of the possible unreliability of the anxiety measuring instruments. He does not suggest, however, that inconsistent findings are invariably attributable to unreliability in the anxiety measures, and agrees that they may be due to several "traditional" variables such as those mentioned above.

Theories of Duffy (1957), Hebb (1955), and Malmo (1958) suggest yet another possible explanation for inconsistent findings. Each has stressed the likelihood of an inverted "U" function of anxiety. That is; they have observed that to a certain degree anxiety can be facilitating in its effect on task performance, and beyond that degree, inhibiting. Acceptance of this theory makes it possible to visualize the alternating positions of the high-, and low-anxious subjects as regards level of performance, as test conditions serve
to increase or reduce anxiety or stress. Focusing now on the measure of anxiety used in this study, the originators of the scale consider anxiety a drive in that the organism presumably strives to avoid the feeling of unpleasantness it creates. They have, however, presented a more complex theory for explaining the role of anxiety in performance, taking into consideration the subject's response to his own anxiety. As explained by Mandler and Sarason (1952) it is assumed that two kinds of anxiety responses are aroused by a testing situation, those which are egodefensive and those which are task-relevant. High anxiety subjects are assumed to make more ego-defensive responses (which interfere with task completion) than low anxiety subjects, and in their investigations they predicted that anxiety would adversely affect performance. A negative linear relationship between anxiety and performance would seem to be implied.

No evidence has been found in the literature to date by the writer that the possibility of a curvilinear relationship obtaining between scores on the TASC and school achievement has been investigated. If, in fact, the TASC is measuring all levels of anxiety, greater differences may occur between the performances of the low-, and medium-anxious subjects and between
the inedium- and high-anxious subjects, than occur between the performances of the low- and high-anxious subjects. Knowledge regarding the performance of the children whose scores on the TASC fall within the central portion of the distribution as compared with those at either extreme would be essential if maximum use is to be made of anxiety scores in individual cases.

In summary it could be said that in the earliest investigations of anxiety as a drive variable it was predicted that increased drive would result in a higher level of performance. It then began to appear that under certain conditions, for example, on complex tasks, low-anxious subjects frequently did better than-highanxious subjects. The focus of interest gradually widened to encompass such variables as task stressfulness, emotional involvement, sex of subject, examiner attitude, encouragement or discouragement of dependent behaviour, and test-like nature of a task, all of which were found to affect the performance of low- and highanxious subjects. The theory was advanced that there were two types of anxiety responses, task-relevant, which were facilitating in their effect on performance, and ego-defensive, which were inhibiting in their effect. A concept of a linear relationship between anxiety and performance seemed to be maintained. Other investigators,
while agreeing that anxiety could be both inhibiting and facilitating in its effect on performancè, reported findings which suggested that the relationship between anxiety and performance was not linear, but curvilinear in the shape of an inverted "U". It is the purpose of the present study to compare the performances of low, medium-, and high-scoring subjects on the TASC; and to determine whether a linear or curvilinear relationship, if any, exists between TASC scores and performance on school examinations.

## Chapter III

## METHOD

Selection and Grouping of Subjects
The total number of 194 pupils, making up the six Grade VI classrooms of two schools selected at random from among a total of 35 City of Victoria elementary public schools, were asked to complete the TASC in accordance with instructions provided by Sarason and co-originators of the test. Questions such as "Do you worry a lot before you have taken a test?" and "Do you worry a lot after you have taken a test?" comprised the scale. Scores were derived by totalling the number of "yes" answers to the questions. Possible minimum mark was 0 and possible maximum mark was 30. Distribution of scores was fairly symmetrical with a range of from 0 to 30 and a median of 13 .

Two separate sample groups were selected from among the total number of 194 pupils completing the TASC. Making up the first sample were 8 boys and 8 girls with anxiety scores of 8 or less (low-anxious group), matched on the basis of $I Q$ with 8 boys and 8 girls with anxiety scores of from 11 to 15 (medium-anxious group), and with 8 boys and 8 girls with anxiety scores of over 18 (high-anxious group). IQs ranged from 94 to 135 . Findings for this group were not found to be
statistically significant. Individual raw marks obtained by the subjects on each of the examinations differed at most 22 points and more frequently not more than from 12 to 14 points. In view of the wide range in IQs such a small range in raw marks was thought insufficient to reveal variations in level of performance resulting from differences in anxiety level over and above variations resulting from differences in intellectual potential. This first sample was therefore abandoned and a second selected which offered a wider range in examination marks in relation to range in intellectual potential.

The alternate sample included the total number of ${ }^{-}$ 59 pupils having IQs within 5 percentiles of (less than 1 standard deviation from) a population mean of lll. Within this group were 26 boys and 33 girls. Eleven boys and 9 girls (roughly one-third the total number) had anxiety scores of less than 12 and were labeled lowanxious; 8 boys and 12 girls had scores of from 13 to 17 and were labeled medium-anxious; and 7 boys and 12 girls had scores of over 18 and were labeled highanxious. These 59 subjects were used exclusively throughout the remaining portions of the present study. In investigating the discriminatory power of each of the items on the TASC, subjects were grouped and regrouped 30 times according to whether they answered:
each question "no" or "yes". In other words, subjects were grouped according to what feeling, attitude, or behaviour they admitted with respect to the particular possibility or situation which was the focus of each question, i.e. "Are you afraid of school tests?". Control of Variables

Measures were taken to control four variables believed to affect performance on school examinations. These were intelligence, school grade, extent and method of instruction, and the examiner variable.

1. The method employed to control the intelligence variable was to match subjects or groups on the basis of their scores on a group test of general intelligence. All Grade VI pupils under the Victoria Public School Board had been asked a few weeks prior to this investigation to complete the Otis Self-administering Tests of Mental Ability, and IQs so derived were made available to the investigator by the Department of Tests and Measurement.
2. School grade was controlled by limiting the selection of subjects to those of the sixth grade at the time of this study.
3. As regards the instruction variable, assurance was received from the school principals concerned that course content, hours of instruction, and method of
teaching were, to all intents and purposes, similar in each of the six classrooms from which the subjects were selected.
4. The fact that each classroom received instruction from a different teacher posed a problem in that his or her attitude could serve to increase or reduce the overall anxiety level of the pupils, particularly around test situations at which times teachers are in effect examiners. An attempt was therefore made to control the examiner variable, and an analysis of variance was calculated from the TASC scores. Results are shown in Table 1. The analysis revealed no statistical differences between the classes as regards over-all level of anxiety. It was assumed, therefore, that differences were attri-. butable to chance rather than to systematic differences in teaching, and to this extent the fourth variable was considered controlled. Also, purely objective tests were used as a basis for comparing performances of experimental groups in order to avoid possible examiner bias in grading the examination paperso.

The age variable was left uncontrolled in order to avoid possible exclusion from the sample groups of the type of pupil who is the principal focus of interest in this study, namely, those who are achieving academically at a pace that would not be considered average in rela.

Table 1

## P Distribution of TASC Scores

 of Six Grade 6 Classrooms Victoria Public Schools| Source of | Sum of | df | Mean | F |
| :--- | :--- | ---: | :--- | ---: |
| Variance | Squares |  | Squares |  |
|  |  |  |  |  |
| Between | 353.41 | 5 | 70.68 | 1.89 |
| Within | 7183.89 | 187 | 37.22 |  |
| Total | 7537.30 |  |  |  |

tion to their assessed intellectual potential.

Measurements

1. A standardized, purely objective set of examinations which included vocabulary, reading, mathematical reasoning and computational arithmetic tests, were written by Grade VI pupils within a few weeks of the administration of the TASC. Raw marks obtained by the students were made available to the investigator by the Department of Tests and Measurement, Victoria Public School Board. These marks served as the basis of. comparison of performances of low-, medium-, and highanxious subjects. Examinations of varying content were selected with a view to presenting to the subjects tests which would provide some variation in difficulty, a variable which some observers have found to be operative in studies relating to the performance of high-, and low-anxious subjects. Each test item on each of the four examinations was given a value of 1 mark for a correct response, and a zero value for an incorrect response. Maximum possible scores ranged from 36 to 48. As an equalizing measure, scores, where necessary, were pro-rated to permit a possible maximum of 48 points.
2. In investigating the discriminatory power of the TASC items, level of achievement was based on a
subject's raw mark on the computational arithmetic examination, as findings pertaining to the principal investigation revealed that it was the most discriminating of the four examinations. Also, a study of the raw marks of the total population of Victoria Grade VI public school children showed it to have the most symmetrical distribution and the widest range.

Analysis Procedure

1. In determining the differences, if any, in level of performance between the low-, medium-, and high-anxious subjects, raw marks obtained by each subject were first totalled. That is, raw marks obtained on each of the four examinations were total. led for each subject. Comparisons were made between the performances of the groups of boys together with the girls, and secondly, of the groups of the boys and then of the girls separately. Similarly, comparisons were made of the low-, medium-, and high-anxious subjects on the basis of their performance on each individual examination. The statistical measure employed in each case was the "t" test for means. Owing to the exploratory nature of this study, two-tailed tests of significance were used throughout the analyses.e.
2. Two-tailed "t" tests for means were also employed in determining the power of each TASC item to
discriminate between the high-achievers and lowachievers. :Mean performance of all subjects answering a question "no" was first compared with the mean performance of those subjects answering the same question "yes". Comparisons were then made between the mean performances of the boys and of the girls separately.

Summary
A first sample of 48 subjects selected from within a population of Grade VI pupils was discarded because of a lack of range in experimental test marks. A second sample was selected which comprised 59 pupils having IQs within 5 percentiles of the mean IQ of lll, and on the basis of their TASC scores 20 subjects were placed in the low-anxious group, 20 subjects in the medium-anxious group, and 19 subjects in the highanxious group. Each of the three groups were then separated into groups of boys only and groups of girls only. Performances of the boys and girls as combined groups, and as separate groups, were then compared on the basis of total marks obtained on all four examinations and on each examination separately. Similar comparisons were made of performances of subjects grouped as to whether a "no" or "yes" answer was given to each item on the TASC, using the raw marks obtained
on the computational arithmetic examination, to determine the power of each item to discriminate between the high-achievers and low-achievers.

## Chapter IV

## RESULTS

In order to present the results as clearly and concisely as possible, the main groups of low, medium, and high-anxious boys together with the girls will hereafter be referred to as LA, MA, and HA. Low-, medium-, and high-anxious groups of boys only, and of girls only, will be referred to as LA boys, MA boys, and HA boys (or girls).

The hypotheses were partially supported by the findings for the boys and girls together, and for the boys only, but were not supported by the findings for the girls only. Achievement means for all groups on each examination are presented in Table 2. Mean differences between the low-, medium-, and high-anxious groups are presented in Tables 3, 4, and 5. The findings as they relate to each hypothesis are outlined below.

Hypothesis I
On the basis of individual total marks on all four examinations combined, mean differences between the LA , MA, and HA groups were not statistically significant,

Achievement Means for LA, MA, and HA Groups of Boys and Girls; LA, MA, and HA Boys; and LA, MA, and HA Girls


Boys and Girls

| LA: | 34.05 | 39.00 | 39.00 | 42.30 | 154.35 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| MA: | 30.40 | 37.95 | 39.02 | 40.00 | 147.55 |
| $H A$ | 34.26 | 37.26 | 40.00 | 40.94 | 150.68 |

Boys

| LA: | 35.45 | 39.36 | 40.63 | 43.00 | 158.45 |
| :--- | :--- | :--- | :--- | :--- | :--- |
| MA | 28.88 | 39.12 | 37.62 | 38.50 | 144.12 |
| HA | 35.55 | 38.42 | 36.84 | 41.42 | 152.38 |

Girls
LA
32.33
38.55
37.00
41.44
149.33

MA
31.41
37.16
$40.25 \quad 41.00$
149.83

HA
33.41
36.58
$39.00 \quad 40.66$
149.75

Table 3

Low-, Medium-, and High-anxious Grade 6 Pupils ${ }^{\text { }}$ Mean Achievement Differences

| Examination | Possible Total Marks | N | Mean HA-LA | Differ MA:-LA | ces $M A-H A$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Combined | * |  |  |  |  |
| Computational Arithmetic | = |  | ; |  |  |
| Arithmetical |  |  |  |  |  |
| Reasoning |  |  | * |  |  |
| Reading |  |  |  |  |  |
| Vocabulary | 196 | 59 | 3.67 | 6.80 | 3.13 |
| Computational | 48 | 59 | 21 | ** | 86* |
| Arithmetical |  |  |  |  |  |
| Reasoning | 48 | 59 | 1.74 | 1.05 | . 69 |
| Reading | 48 | 59 | . 79 | . 02 | .81 |
| Vocabulary | 48 | 59 | 1.36 | 2030\% | . 94 |

* Significant at the .05 level
** Significant at the ©Ol level


## Table 4

Lown, Medium, , and Highmanxious Grade 6 Boys' Mean Achievement Differences

| Examination | Possible <br> Total <br> Marks | N | Mean HA-LA | Differen MA-LA. | ces $\mathrm{MA}-\mathrm{HA}$ |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Combined Computational |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
| Arithmetical |  |  |  |  |  |
| Reasoning. |  |  |  |  |  |
| Reading |  |  |  |  |  |
| Vocabulary | 196 | 26 | 6.14 | 14.33 | 8.16 |
| Computational |  |  |  |  |  |
| Arithmetic | 48 | 26 | .10 | 6.57\% | 6.67** |
| Arithmetical |  |  |  |  |  |
| Reasoning | 48 | 26 | . 94 | . 24 | .70 |
| Reading | 48 | 26 | 3.78 | 3.01 | .77 |
| Vocabulary | 48 | 26 | 1.58 | 4.50\% | 2.92 |
| * Significant at the . 05 level |  |  |  |  |  |
| ** Significan | nt at the |  | level |  |  |

## Table 5

Low-, Medium-, and High-anxious Grade 6 Girls'
Mean Achievement Differences

| Examination | Possible <br> Total <br> Marks | N | Mean Differences |  |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Combined <br> Computational <br> Arithmetic <br> Arithmetical <br> Reasoning |  |  |  |  |  |
| Reading <br> Vocabulary | 196 | 33 | .42 | .50 | .08 |
| Computational <br> Arithmetic | 48 | 33 | 1.08 | .92 | 2.00 |
| Arithmetical <br> Reasoning | 48 | 33 | 1.97 | 1.39 | .58 |
| Reading | 48 | 33 | 2.00 | 3.25 | 1.25 |
| Vocabulary | 48 | 33 | .78 | .44 | .34 |

nor were the differences between the LA, MA, and HA: girls and LA, MA, and HA boys. However, the MA group and the MA boys obtained significantly lower marks than the LA group and the LA boys respectively on the computational arithmetic and vocabulary examinations. Also, the MA group and the MA boys obtained significantly lower marks than did the HA group and HA boys respectively on computational arithmetic. Performances of the LA, MA, and HA girls failed to differ significantly on any of the four individual examinations. The prediction that children ranking low, medium, and high on the TASC would reveal differences in level of performance on school examinations could be said to be partially supported, but the prediction that subjects ranking medium would do better than those ranking either high or low was not supported.

## Hypothesis II

LA, MA, and HA girls showed no statistically significant differences in their mean scores on any of the examinations individually, or on the four examinations combined. However, LA and HA boys did better than the MA boys on computational arithmetic, and LA boys did better than the MA boys on vocabulary. In these three instances the boys showed greater differences between
their performances than did the girls, and to this extent it could be said that Hypothesis II has been supported by the findings.

Hypothesis III
This hypothesis was not supported by the findings for the girls but was partially supported by the findings for the boys in that the low-, medium-, and high-anxious groups showed greater differences in their performances on the examination believed to present the greatest number of reasoning tasks (i。e. computational arithmetic) than on any of the other examinations. As has been previously stated, significant mean differences between the groups of boys and girls together could perhaps be attributed to the performance of the boys.

Discriminatory Power of the TASC Items
The mean computational arithmetic marks obtained by subjects answering "no" and by those answering "yes" to each item on the TASC are presented in the Appendix. The mean marks obtained by the boys as separate from the girls, and by the girls as separate from the boys, are also presented in the Appendix. Item 22 (After you have taken a test do you worry about how well you did on the test?) was the only item to differentiate between
the high-, and low-achievers at the . 05 level of significance: When differences for the boys and girls were calculated separately, findings were significant in relation to the boys but not in relation to the girls. Subjects answering Item 22 in the affirmative tended to obtain higher mean marks than did those answering in the negative.

Summary
With respect to Hypothesis I, Hypothesis II, and Hypothesis III, no statistically significant differences were found between the performances of the LA, MA, and HA girls. The significant differences which were found between the performances of the boys and girls together are perhaps attributable to the performances of the boys. LA, and HA boys did better than the MA boys on computational arithmetic; and LA boys did better than MA boys on vocabulary as well. Contrary to expectations, where significant differences were found, the NA groups obtained the lower mean marks. Computational arithmetic means showed a "U" type relationship to anxiety rather than an inverted "U" type relationship. Item 22 was the only item on the TASC to differentiate between the low-, and high-achievers in arithmetic.

Subjects responding "yes" to Item 22 did better than those responding "no". Findings impose limitations to the use of individual test anxiety scores for interpretive purposes without further investigation.

## Chapter Vi

## DISCUSSION

Significance of Positive Findings
The statistically significant differences between the performances of the low-, medium-, and high-anxious boys on the computational arithmetic and vocabulary examinations point to a "U" shaped curvilinear relationship between anxiety and school achievement, in some areas at least. Lack of stringent controls, however, could have distorted the results, and this possibility is discussed in the ensuing pages. On the other hand, it is possible that distortion may not have occurred, and another explanation should perhaps be offered as to why the medium-anxious boys tended to do less well than the low-, and high-anxious boys.

It may be that low-anxious sübjects experience little anxiety that is inhibiting and may make few responses that are not task relevant, so that in a test situation they are able to show good results. Mediumanxious subjects are likely to make a greater number of task relevant responses but at the same time are likely to make many ego-defensive responses which interfer with task completion, so that the net result is a
poorer performance than that given by the low-anxious subjects. The high-anxious subjects could be expected to make a still greater number of ego-defensive responses but it is possible that their high anxiety motivates them to make a sufficiently greater number of task relevant responses which more than compensate, so that their net result is a higher level of performance than that given by the medium-anxious subjects. Although low-, and highmanxious subjects may have done equally well on certain tests, it may be that the amount of effort expended was considerably greater for the highanxious subjects than for the lownanious subjects. $A$ repeat of the present study using more stringent controls would be indicated, however, before further consideration could be given to the possibility that mediumanxious children as a rule perform less well than do the low, and high-anxious children.

In view of several methodological weaknesses which could have served to reduce the possibility of obtaining more positive results in the present study, the lack of findings to support the hypotheses should not be interpreted as cause to critically view the TASC as an instrument by which to measure anxiety level in children. At the same time, there are several problems to overcome
in the construction and use of an anxiety questionaire before a measurement of anxiety sufficiently valid for evaluative or predictive purposes can be obtained. Discussion of certain of these problems will follow the immediate discussion of problems relating to procedure.

Suggested Revisions in Procedure
Of vital concern in studying differences in the performances of individuals is the control of the intelligence variable. In the present study circumstances demanded the use of a group test of intelligence as a basis for matching subjects, whereas the use of an individually administered test appears to have been warranted. The relatively high correlations between the TASC scores of the 194 pupils and their IQs as measured by the Otis Self-administered Test of Mental Ability ( -047 ), and between their IQs and examination marks ( $\not \subset .69$ ), strongly suggests that the anxiety variable was operative when the IQs were derived. As a result much of any difference between the performances of individuals rated low-, medium-, or high-anxious would have been incorporated into their scores on the intelligence test and would not appear in an analysis of data relating to performance. Essential to investigations such as the present one would seem to be the stringent control of anxiety during
the administration of intelligence tests when the matching of subjects is to be based on the results. A. suggested revision in the methodology of the present study is that IQs be derived from individually adminis. tered tests in a situation which permits maximum rapport between examiner and subject and minimizes the test-like attributes of the test situation. Of pertinent interest perhaps, would be an investigation into the differences between low-, medium-, and high-anxious children in performances on an individually administered test of intelligence and on a group test of intelligence.

In arranging subjects in three groups according to level of anxiety another problem of major proportion arises in that level of anxiety in subjects could vary between the time of their performance on the TASC and their performance on the experimental tests (in this case, school examinations). In other words, there is no guarantee that the anxiety level of each subject will remain as evaluated by his performance on the TASC, to the time of, and throughout his performance in the experimental situation. For example, subjects could view a particular examination with varying degrees of relief or alarm depending on how well they believed themselves prepared to complete the examination, and it
is conceivable that occasionally the positions of the low-, and high-anxious groups would be reversed. Even in a study in which subjects were tested on a list of nonsense syllables which had been to the same extent learned by the experimental subjects; there would still be present the problem of the subjects' subjective evaluations of their preparedness for the test. In order to preserve the homogeneity of groups as regards level of anxiety it would perhaps prove necessary to measure anxiety level by physiological means at the commencement of, and at various intervals throughout, an examination. Subjects would then be grouped and re-grouped as frequently as necessary to preserve the homogeneity of the groups. Performances would of necessity be studied piecemeal. The problem of obtaining a measurement of intellectual potential independent of the effects of anxiety, and a measure of anxiety independent of a task or test, would appear to be a difficult one to overcome.

Even in such cases as it may be assumed that level of anxiety has been accurately measured by means of a questionaire such as the TASC and has not appreciably altered up to and during the time of the test performance, there still remains the difficult problem of
determining which range of scores represent a low level of anxiety, which a medium level, and which a high level. In the present study, owing to the relatively small population from which the sample was derived, the total number of 59 pupils with IQs ranging from 106 to 116 were used as experimental subjects with one third comprising each of the three groups. Such a division was purely arbitrary and perhaps inappropriate in that approximately 83 percent of the pupils obtained anxiety scores within one standard deviation of the mean, and relatively few obtained either very low or very high: scores. This was perhaps to be expected in view of the fact that in the average classroom relatively few pupils present a major underachievement problem as a result of anxiety or other types of interference. Working with a population of several hundred pupils and using only the extreme ends of a distribution, plus a. like number from the mid portion, could perhaps sub. stantially increase the possibility of obtaining significant results in a study of this nature.

In bringing to a close the discussion relating to procedural points, one other question is raised. It concerns the discriminatory power of the experimental test material. In the present study three of the four
examinations used were decidedly positively skewed, and while they may have adequately served the purpose for which they were intended, test results appeared to reveal only gross differences in intellectual ability and would therefore not be expected to reveal differences attributable to varying levels of anxiety as well. Computational arithmetic marks were more symmetrically distributed and the examination could be regarded as more discriminating. However, each test question had a value of one mark for a correct response, and a zero for an incorrect response, and it may be that a finer system of grading would be required to reveal differences in performance due to anxiety. If so, this would reduce further the likelihood of obtaining positive results in the present study. It could be argued, perhaps, that if school examinations fail to pick up the effects of anxiety further investigation into the relationship between anxiety and school achievement is unwarranted. This would seem to merely beg the question, but it may develop that differences should be studied in terms of extent of effort in relation to achievement rather than in terms of achievement alone.

Validity of Anxiety Measure
While there remains an apparent lack of clearly
defined criteria to which to predict in the case of anxious and non-anxious persons, validity of an anxiety questionaire will prove difficult to establish. Sarason and his colleagues claim construct validity for their scale on the grounds that it enabled them to predict behaviour correctly. in a number of different but relevant situations. They were able, for example, to predict a negative correlation between IQ and anxiety, and to show that the relationship was primarily due to the effects of anxiety on intelligence rather than visa versa. However, when subjects were matched on the basis of sex, IQ and age, differences in the performances of the highw, and low-anxious subjects in a learning situation were not statistically significant。" Two explanations were offered by Sarason and his group for lack of positive findings, one relating to order of presentation of learning material, and one relating to examiner instructions. In addition to these difficulties, plus others relating to methodology which have been discussed in the present chapter as they apply to the Sarason study, a possible explanation for lack of positive findings could perhaps be found in the area of the TASC itself - more precisely, in its validity or lack of validity.

It has been suggested that the most parsimonious statement that can be made as regards anxiety scales is that they measure the extent to which a subject is able to admit his feelings of anxiety. As stated earlier, cultural attitudes seem to allow greater freedom to girls to express their feelings of anxiety; and as a group girls have consistently been found to obtain higher scores than boys on anxiety questionaires. This difference has been attributed to the difference in cultural attitude toward the expression of anxiety in boys and in girls, and it has not been shown that anxiety level is actually higher in girls than in boys. The problem has thus far been dealt with by treating them as separate groups in experimental situations. The point serves to illustrate, however, that the questionaire method of assessing anxiety level is subject to certain inaccuracies due to the apparent inability of a percentage of subjects to admit anxiety. A reverse tendency has been noted in other subjects who seem to exaggerate their symptoms.

Discriminatory Power of TASC. Items
If, in fact, high anxiety does interfere with performance, an analysis of the findings might have been
expected to reveal a tendency for the high-achievers. to answer an item "no", and for the low-achievers to answer "yes". Means and mean differences between the "no" and "yes" groups in their performances on computational arithmetic do not reveal such a trend. Approximately half of the groups of boys and girls who answered various questions "no" obtained lower grades than did those who answered "yes". Question 22 was the only item to differentiate in a statistically significant way between the "no" and "yes" groups, the latter obtaining the better grades. In view of the fact that 51 subjects out of the total number of 59 responded positively to the item its value in the questionaire would appear to be limited, and this may also be said of approximately eight other items to which two-thirds or more of the subjects responded in the affirmative.

Without benefit of substantiating evidence through scientific investigation, and purely from speculation, it might be said that several of the items on the TASC are of a nature to prompt a "yes" answer from a pupil who could perhaps be better described as well motivated than anxious. Worded differently, some items appear to be picking up the type of anxiety which would be likely to promote task relevant responses while others
would appear to be picking up the type of anxiety which would be likely to promote task irrelevant responses. Combined in a questionaire one could be seen as cancelling out the other. An extension of the present study would involve investigation into the possibility that medium-anxious pupils tend to respond to the so-called "motivational" items in the negative. Could this be shown it would support the conjecture that mediumanxious pupils do less well than high-anxious pupils because they lack the degree of motivation which enables a high-anxious pupil to increase his efforts sufficiently to compensate for his task-irrelevant responses by making a greater number of task-relevant responses. Conclusions

It may be that anxiety has several components, some of which facilitate optimum use of potential while others inhibit optimum use of potential. If the various components of anxiety were all tapped by a questionaire such as the TASC it would seem necessary to give some questions a negative value and some a positive value in order for the final score to reflect the degree to which a subject's performance would likely be in keeping with his intellectual potential. The construction of such a scale would necessarily entail a vast amount of research
into the types of responses each component of anxiety provokes, as well as the interaction between the components. It would also entail investigation into the interrelationships between these various components of anxiety and such variables as were mentioned in reviewing the literature, namely, examiner variables, task complexity, encouragement or discouragement of dependency, and test-like nature of a task.

Cattell (1957) in developing the IPAT as an anxiety measure seems to have been mindful of the above problems. This scale reportedly provides some measure of covert as well as overt anxiety, and the items have been designed to explore an individual's response in a number of situations. The IPAT items inquire into the extent of an individual's concern regarding the attitudes of others toward him, his ease of verbalizing, his sense of being needed, his behaviour in emergency situations, his response to criticism, his concern with health, forgetfulness, social competence, and problem-solving behaviour. The scale would seem to be measuring "general" anxiety, however, and whether it would be the most suitable instrument for school purposes may be problematical in view of the findings of Sarason et al (1960) that measures of general anxiety do not neces-
sarily reflect accurately the levels of anxiety aroused in test situations. The IPAT does', nevertheless, provide a good example of a scale which gives recognition to the complexity of the intrinsic and extrinsic characteristics of anxiety.

Lack of more precise knowledge which future research may provide has perhaps contributed largely to any failure thus far to construct an anxiety scale useful for evaluation or prediction in individual cases. However, scales such as the TASC are serving a useful purpose in the field of research and have contributed a great deal toward a better appreciation and understanding of the complex nature and function of anxiety.

## Summary

This study was an investigation of the relationship between anxiety and test performance. Subjects were Grade VI boys and girls whose IQs ranged from 106 to ll6. Comparisons were made of the low-, medium-, and high-anxious groups on the basis of their performances on four school examinations. The mediumanxious boys did less well on computational arithmetic than either the low-, or high-anxious boys, and less well on
vocabulary than the low-anxious boys. The direction of differences suggested a mu" type curvilinear relationship between anxiety and test performance. Findings must be regarded as inconclusive and the study purely exploratory because of a failure to use, if such exist, a measure of intellectual potential which is independent of the effects of anxiety, and a measure of anxiety which is independent of a task or test.

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## Àppendix

Computational Arithmetic Mean Achievement and Mean Differences Between Rupils who Answered "no" and Pupils who Answered "Yes" on each TASC Item

| TASC Item | Mean Achievement |  |  |  | Mean |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | "No" Ss | N | "Yes" Ss | N | Difference |
| One | 24.00 | $(26)$ | 23.57 | $(33)$ | .43 |
| Two | 25.64 | $(17)$ | 24.28 | $(42)$ | 1.36 |
| Three | 24.68 | $(25)$ | 24.38 | $(34)$ | .38 |
| Four | 25.00 | $(30)$ | 24.34 | $(29)$ | .66 |
| Five | 24.67 | $(51)$ | 25.00 | $(8)$ | .33 |
| Six | 24.00 | $(18)$ | 24.53 | $(41)$ | .53 |
| Seven | 24.53 | $(30)$ | 24.82 | $(29)$ | .29 |
| Eight | 25.05 | $(19)$ | 24.50 | $(40)$ | .55 |
| Nine | 24.73 | $(42)$ | 24.52 | $(17)$ | .21 |
| Ten | 24.62 | $(45)$ | 24.85 | $(14)$ | .23 |
| Eleven | 25.20 | $(35)$ | 22.90 | $(23)$ | 2.30 |
| Twelve | 25.29 | $(41)$ | 22.16 | $(18)$ | 3.13 |
| Thirteen | 24.22 | $(22)$ | 24.86 | $(37)$ | .64 |
| Fourteen | 24.28 | $(35)$ | 25.00 | $(24)$ | .72 |
| Fifteen | 24.58 | $(50)$ | 25.22 | $(9)$ | .64 |
| Sixteen | 25.50 | $(18)$ | 24.31 | $(41)$ | 1.19 |
| Seventeen | 24.92 | $(40)$ | 24.15 | $(19)$ | .77 |
| Eighteen | 24.87 | $(40)$ | 24.15 | $(19)$ | .72 |
| Nineteen | 25.10 | $(34)$ | 24.35 | $(25)$ | .75 |


\left.| TASC Item | Mean Achievement |  |  | Mean |
| :--- | :--- | :--- | :--- | :--- |
|  | "No" Ss | N | "Yes" Ss | N |$\right)$ Difference

Significant at the . 05 level

Computational Arithmetic Mean Achievement and Mean Differences between Girls who Answered "No" and Girls who Answered "Yes" on each TASC Item

| TASC Item | Mean Achievement |  |  | N | Mean <br> Differences |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | "No" Ss | N | "Yes" Ss |  |  |
| One | 24.53 | (13) | 24.15 | (20) | . 38 |
| Two | 25.00 | (9) | 24.04 | (24) | .96 |
| Three | 24.20 | (15) | 23.72 | (18) | . 48 |
| Four | 24.44 | (16) | 24.18 | (17): | . 26 |
| Five | 24.10 | (29) | 25.75 | ( 4) | 1.65 |
| Six | 22.12 | ( 8) | 24.20 | (25) | 2.08 |
| Seven | 23.60 | (20) | 25.38 | (13) | 1.78 |
| Eight | 23.44 | ( 9 ) | 24.63 | (24) | 1.19 |
| Nine | 24.42 | (24) | 24.00 | (9) | . 42 |
| Ten | 24.37 | (27) | 24.00 | (.6) | .37 |
| Eleven | 24.95 | (20) | 23.07 | (13) | 1.88 |
| Twelve | 24.38 | (23) | 22.10 | (10) | 2.28 |
| Thirteen | 24.07 | (14) | 24.47 | (19) | - 30 |
| Fourteen | 23.35 | (17) | 25.31 | (16) | 1.96 |
| Fifteen | 24.32 | (28) | 24.20 | ( 5) | .12 |
| Sixteen | 24.40 | (10) | 24.26 | (23) | .14 |
| Seventeen | 25.37 | (19) | 22.86 | (14) | 2. 51 |
| Eighteen | 23.92 | (25) | 25.50 | ( 8 ) | 1.58 |
| Nineteen | 25.47 | (15) | 23.33 | (18) | 2.14 |
| Twenty | 23.78 | ( 9 ) | 24.50 | (24) | .72 |


| TASC Item | Mean Achievement |  |  | Mean |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | "No" Ss | N | "Yes" Ss | N | Differences |
| Twenty-one | 24.06 | $(13)$ | 23.45 | $(20)$ | .61 |
| Twenty-two | 21.60 | $(5)$ | 24.78 | $(28)$ | 3.18 |
| Twenty-three | 23.12 | $(16)$ | 25.41 | $(17)$ | 2.29 |
| Twenty-four | 24.13 | $(23)$ | 24.70 | $(10)$ | .57 |
| Twenty-five | 24.85 | $(13)$ | 23.95 | $(20)$ | .90 |
| Twenty-six | 27.50 | $(2)$ | 24.10 | $(31)$ | 3.40 |
| Twenty-seven | 24.00 | $(4)$ | 24.36 | $(29)$ | .36 |
| Twenty-eight | 24.08 | $(12)$ | 24.43 | $(21)$ | .35 |
| Twenty-nine | 23.71 | $(17)$ | 24.94 | $(16)$ | 1.17 |
| Thirty | 23.92 | $(28)$ | 26.40 | $(5)$ | 2.48 |

Computation Arithmetic Mean Achievement and Mean Differences Between Boys who Answered "No" and Boys who Answered "Yes" on each TASC Item

| TASC Item | Mean Achievement |  |  |  | Mean |
| :---: | :---: | :---: | :---: | :---: | :---: |
|  | "No" Ss | N | "Yes" Ss | N | Difference |
| One | 23.45 | (13) | 22.69 | (13) | .76 |
| Two | 26.37 | ( 8) | 24.61 | (18) | 1.76 |
| Three | 25.40 | (10) | 25.00 | (16) | $.40^{\circ}$ |
| Four | 25.64 | (14) | 24.58 | (12) | 1.03 |
| Five | 25.32 | (22) | 24.25 | ( 4) | 1.07 |
| Six | 25.50 | (10) | 25.06 | (16) | . 44 |
| Seven | 26.40 | (10) | 24.38 | (16) | 2.02 |
| Eight | 26.50 | (10) | 24.31 | (16) | 2.19 |
| Nine | 25.17 | (18) | 25.12 | ( 8) | .05 |
| Ten | 25.00 | (18) | 25.50 | ( 8 ) | . 50 |
| Eleven | 25.53 | (15) | 22.45 | (11) | 3.08 |
| Twelve | 26.44 | (18) | 22.24 | ( 8) | 4.20 |
| Thirteen | 24.50 | ( 8) | 25.44 | (18) | . 94 |
| Fourteen | 25.50 | (18) | 24.37 | ( 8 ) | 1.1 .3 |
| Fifteen | 24.91 | (22) | 26.50 | ( 4 ) | 1.59 |
| Sixteen | 26.87 | (8) | 24.39 | (18) | 2.48 |
| Seventeen | $24 \cdot 52$ | (21) | 27.80 | ( 5) | 3.28 |
| Eighteen | 26.47 | (15) | 23.18 | (11) | 3.29 |
| Nineteen | 24.84 | (19) | 26.00 | (7) | 1.16 |


| TASC Item | Mean Achievement |  |  | Mean |  |
| :--- | :---: | :---: | :---: | :---: | :---: |
|  | "No"Ss | N | nYes" Ss | N | Differences |
| Twenty | 25.25 | $(8)$ | 25.11 | $(18)$ | .14 |
| Twenty-one | 24.78 | $(19)$ | 26.14 | $(7)$ | 1.36 |
| Twenty-two | 21.00 | $(4)$ | 27.27 | $(22)$ | $6.27 \%$ |
| Twenty-three | 24.24 | $(17)$ | 26.79 | $(9)$ | 2.55 |
| Twenty-four | 24.82 | $(22)$ | 27.00 | $(4)$ | 2.18 |
| Twenty-five | 25.13 | $(15)$ | 25.18 | $(11)$ | .05 |
| Twenty-six | 25.00 | $(4)$ | 25.18 | $(22)$ | .18 |
| Twenty-seven | 23.60 | $(5)$ | 23.61 | $(21)$ | .01 |
| Twenty-eight | 23.92 | $(12)$ | 26.21 | $(14)$ | 2.29 |
| Twenty-nine | 24.38 | $(13)$ | 25.92 | $(13)$ | 1.54 |
| Thirty | 24.35 | $(20)$ | 27.66 | $(6)$ | 3.31 |

* Significant at the .05 level

