THE RELATIONSHIP OF MANIFEST ANXIETY, WAYS OF HANDLING ANXIETY, TASK DIFFICULTY, AND TASK EVALUATION TO PERFORMANCE ON AN INTELLECTUAL TASK

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THE RELATIONSHIP OF MANIFEST ANXIETY, WAYS OF HANDLING ANXIETY, TASK DIFFICULTY, AND TASK EVALUATION TO PERFORMANCE ON AN INTELLECTUAL TASK

By

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ABSTRACT

The major problem of this study was to examine the effects of varying levels of manifest anxiety upon intellectual performance. Particular emphasis was placed on the subjects' methods of dealing with anxiety.

Eighty subjects, forty High Anxious and forty Low Anxious, were asked to solve two sets of twelve anagrams (subdivided into three difficulty levels with four anagrams at each level). Immediately following completion of a set, each subject evaluated his work and compared it with his subjective assessment of the other subjects' work. After the first set, the investigator systematically gave either a positive or a negative evaluation of the subject's performance.

The differences in performance between High and Low Anxious groups, at each of the difficulty levels, were not statistically significant. However, the direction of each difference was in accord with the theoretical formulation as to interplay between task-relevant and task-irrelevant responses at different intensities of anxiety. As expected, neither the High nor the Low Anxious group was consistently superior at all anagram difficulty levels. The Low group was

superior at the easiest and at the most difficult level, and the High group was superior at the intermediate difficulty level.

The interaction between investigator's evaluation and anxiety level was significant. Negative evaluation (frustration) tended to improve performance of the High Anxious when the task was more difficult, while examiner "approval" tended to elicit poorer performance. Comparable examiner evaluations of Low Anxious groups yielded a contrasting picture (beyond the easy anagram level). Negative evaluation was followed by minimal or no change, while "approval" tended to improve performance. Both negative and positive evaluations were followed by significantly poorer performance in both groups on the easy anagrams.

A bow-type function was obtained, for the most part, between degree of manifest anxiety and grade-point average (N = 173). Only female members of the lowest anxiety group deviated from this pattern, since they achieved the highest grade-point average of any subgroup. Aside from this single discrepancy, an intermediate level of anxiety resulted in the best academic performance.

It was found that variations in the anxiety index proved insufficient to account for performance differences on both grade-point average and anagram rigidity. The habit pattern, characteristic of

each subject's method of handling anxiety, appeared to be important in determining his generalized intellectual efficiency. The characteristic ways of handling anxiety were inferred from the M.M.P.I.--combinations of peak-scores or the Welsh Internalization ratio. High internalization (for Anxious subjects only) was associated with greater intellectual efficiency.

The data obtained from each subject's evaluation of his performance tended to validate the notion of generalized manifest anxiety. The fact that the High Anxious tended to underestimate their achievement level and overestimated, significantly more than the Low Anxious, the amount of effort they had to expend as compared with others was considered validating evidence.

The present findings indicate that the relationship between manifest anxiety and intellectual performance is complex. Ways of handling anxiety, examiner evaluation, and task difficulty all influence this relationship.

ACKNOWLEDGMENTS

The author wishes to express his sincere thanks to Dr. M. Ray Denny, without whose encouragement and mature guidance this investigation may never have reached fruition.

He is also greatly indebted to his guidance committee--Dr. Duane Gibson of the Sociology Department, and Drs. James S. Karslake, Albert I. Rabin, and Milton Rokeach of the Psychology Department.

Last of all, he would like to dedicate this work to his wife, Bryna, and to their son, Matthew.

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CHAPTER I

HISTORICAL BACKGROUND: STATEMENT OF THE PROBLEM

Manifest anxiety, as represented by a score on a paper and pencil scale, has been used as a measure of drive since 1949 when Taylor (22) studied the relationship between anxiety and the conditioned eyelid response. She was concerned with the role of drive in performance and assumed that variations in drive level in an individual are synonymous with variations in level of internal anxiety or emotionality.

She found that college students who scored High Anxious on the test conditioned more rapidly and extinguished more slowly than did Low Anxious subjects. Welch and Kubis (25) reported a similar effect of anxiety when they found that the PGR conditioned faster in High Anxious subjects than in Low Anxious persons. Bitterman and Holtzman (1), although critical of the use of the Taylor scale as a measure of anxiety, apparently agreed with the concept of anxiety as a drive state. They reported comparable differences in conditioning and extinction of the galvanic skin response within a group of engineering students who were divided according to a clinical

appraisal of anxiety. However, Hilgard, Jones, and Kaplan (10) found no significant relationship between anxiety, as measured by the Taylor scale, and simple eyelid conditioning. They also found that High Anxious were poorer than Low Anxious in a differential conditioning situation. Their interpretation of these results was that the anxious subjects reacted more in terms of their own apprehensions (inappropriate response) than in terms of carefully discriminated environmental objects and relationships.

Other studies indicate that anxiety elicits inappropriate as well as appropriate responses. Taylor and Spence (23) and Montague (14) explored more complex learning situations than classical conditioning. They observed that as more possibilities for competing responses were introduced into the situation (more difficult tasks) the High Anxious group performed less efficiently. In further studies, Spence and Farber (19, 7) examined the role of appropriate and inappropriate responses in anxiety. They concluded that whether or not facilitation or inhibition of performance occurred depended upon the nature of the task involved. For example, anxious subjects are superior to nonanxious in conditioning and inferior to nonanxious in maze performance.

From the discussion thus far one can theorize about the relationship between anxiety and performance. Let us consider performance as a resultant of the competition between responses appropriate to a task and responses inappropriate to the task. Both kinds of responses will be evoked or partially evoked by anxiety. Beyond a certain level of anxiety the interfering or inappropriate responses will predominate and performance will decline. In other words, it is assumed that up to a point the curve describing the rate of increase of inappropriate response is positively accelerated and the curve for appropriate response is negatively accelerated. This may be attributed to the fact that inappropriate response has a higher evocation threshold and a higher maximum output than appropriate response. This theoretical position is graphically presented in Figure 1. The implications to be drawn from this figure are discussed below.

For a group performing under initially heightened tension (anxiety) the curve of appropriate response should run its course more quickly than for a group with less initial anxiety. Consequently, this group should show better performance at moderate levels of stimulation (intermediate task difficulty) than a group under low initial anxiety. It also follows that the more anxious group should

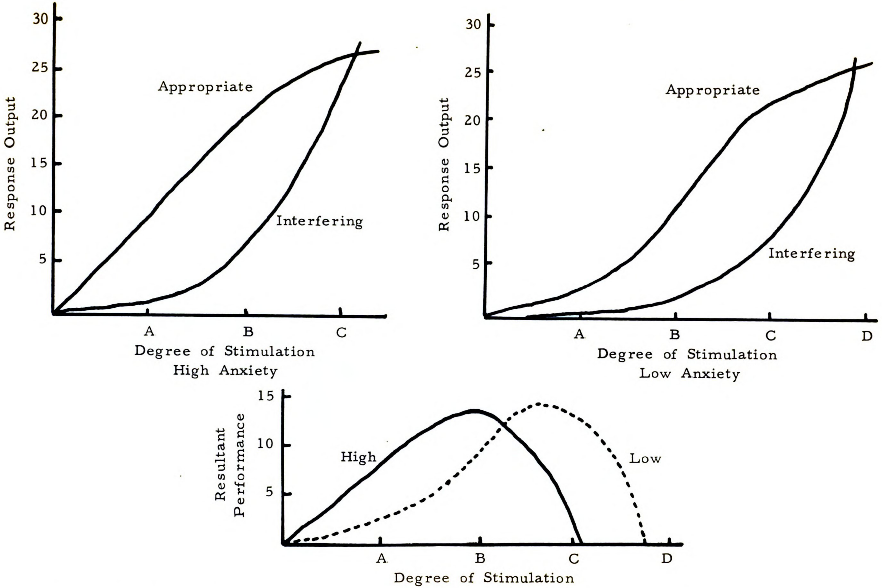

Figure 1. A graphic presentation of the theoretical resultant performance by High Anxious and Low Anxious subjects after summation of the theoretical task-appropriate and task-interfering responses expected from each group.

show decline in performance sooner than the less anxious group as task difficulty, or level of stimulation, is increased. This means that the Low Anxious group should perform better than the High Anxious when task difficulty is great. At the lowest level of stimulation (easy task) better performance could go to either group. If heightened anxiety (nonappropriate stimulation) were so strong as to elicit transient interfering responses and if performance were measured over a very short period of time, performance should be poorer for the High Anxious group. Like the speedy base-runner who *overslides* a base only to be put out, the High Anxious person may not be able to profit from heightened drive on a simple task.

One quickly recognizes that the above formulation is in keeping with Courts' (5) classic finding. He reported that a curvilinear function existed between speed of learning and degree of hand dynamometer tension. Learning progressively improved with increases in tension to an optimum point. After this increased tension yielded decline in performance. The added features in these studies and in the present theoretical analysis are (a) that the tension variable is endogenous as well as exogenous and (b) that for different levels of endogenous tension (manifest anxiety) there will be a different rate

for both growth and decline of performance (see lower half of Figure 1). Malmo (12) has reported such differences in rate.

Let us examine the applicability of this analysis. The Spence and Farber (19, 7) studies, for example, have shown that the nature of the task is an important factor in the relation between anxiety level and performance. Sarason, Mandler, and Craighill (16) have shown that the nature of the investigator's attitude (stress instructions) influences High Anxious subjects differently than Low Anxious subjects, for identical instructions yield opposite effects. The High Anxious group responds predominantly with task-irrelevant response (becomes more anxious) and performs poorer than the Low Anxious group which responds with more task-relevant response.

Another very recent trend in the literature has been to make a more detailed analysis of the anxiety-ridden person. Personality variables or generalized habit patterns adopted by the subjects for dealing with anxiety are getting more recognition. This approach developed when an explanation was being sought for results which were inconsistent with predictions based upon Hullian drive theory. Criticism was leveled at treating degree of anxiety as synonymous with intensity of drive. In this connection, Deese, Lazarus, and Keenan (6) feel that the drive concept alone is too simple an

explanation of Taylor's results. They suggest that personality variables explain certain results better than the drive concept. Wesley (27) reports that the subjects in her study whose measured manifest anxiety score was low, but whose rigidity behavior was high, must actually be considered anxious. The difference between rigid and anxious groups, she felt, was not in terms of drive but in terms of the habits associated with the basic anxiety state.

Similarly, Sarason and Mandler report:

> . . . subjects differ not in the strength of their anxiety responses, but in the ways in which they defend themselves against recognition and expression of such response. . . . The possibility cannot be overlooked, however, that in some cases a Low Anxiety score might also be related to the need for defense. [15, pp. 810-817 passim.]

They felt that a study of the nature and strength of defense mechanisms would be a fruitful approach for explaining some of the individual differences in reaction to anxiety level.

These results, which suggest that personality variables can account for the failure of the drive concept to fully explain obtained results, demonstrate the need for the present study. In our study an attempt will be made, not only to explore the impact of different levels of manifest anxiety upon performance, but also to determine if different "patterns of personality adjustment" (as measured

by the Minnesota Multiphasic Personality Inventory) coincide with differences in intellectual performance.

CHAPTER II

HYPOTHESES

The problem, as stated at the very end of the previous chapter, will now be subdivided into a series of specific subproblems and related hypotheses.

Subproblem A. Relationship between degree of manifest anxiety and intellectual performance.

Hypothesis 1. High Anxious subjects will perform differently on the anagram task than will Low Anxious subjects (see theoretical formulation, pages 3-6).

a. On the easiest task the High and Low Anxious will perform approximately the same.

b. On the anagrams of intermediate difficulty the High Anxious will perform better than the Low.

c. On the more difficult anagrams the High Anxious will perform poorer than the Low.

Hypothesis 2. The investigator's disapproval of subject's anagram performance will produce a subsequent change in performance which will be different than the change following approval. No specific hypotheses with reference to anxiety level or difficulty of task are offered.

Hypothesis 3. A bow-type relationship will hold between grade-point average and degree of manifest anxiety; that is, the moderately anxious subjects will

perform better than either very Low or very High Anxious subjects.

Subproblem B. Relationship between mechanisms for handling anxiety and intellectual performance.

Hypothesis. Differences in characteristic ways of handling anxiety (as inferred from the M.M.P.I.) will be related to differences in intellectual performance.

Subproblem C. Relationship between degree of manifest anxiety and the subject's motivational attitudes toward the anagram task.

Hypothesis 1. All subjects will experience difficulty and feel they worked hard and did poorly on the anagram task.

Hypothesis 2. When they compare themselves with others, the High Anxious group will feel that they worked harder and did more poorly than will the Low Anxious group.

Hypothesis 3. The investigator's approval or disapproval of subject's anagram performance will alter his subsequent evaluation of performance.

CHAPTER III

PROCEDURE

Selection of the Population

The abbreviated Minnesota Multiphasic Personality Inventory was administered to 243 students enrolled in undergraduate psychology courses at Michigan State College during the summer session of 1952. An additional 33-item supplement[1] was added to provide 15 Taylor anxiety scale items which were not included in the first 366 items of the booklet. The instructions below were read to the classes prior to the test administration:

> As you may know, standardization of any kind of test requires that many people be tested and that they come from a wide range of geographic areas and occupations. The inventory which you have before you has test results for college students almost exclusively from the University of Minnesota. Since this sampling is local, there is some question about how widely these standards can be used. We are, therefore, asking you to cooperate in the task of collecting norms for wider groups of college students. For your results to be helpful it is essential that you answer each item as honestly and frankly as possible. Your opinion is the best answer for each item. Move quickly from one item to the next and answer with your first

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[1] See Appendix B, pages 115-116.

> reaction. You will not be asked to go through the entire booklet. Use the booklet for the first 366 items and use the supplement which is inserted in your booklet for items 367-399. If you work steadily you can finish in one hour.

Identifying data were also requested. The subjects were told that the investigator was also performing an individual experiment on the problem of "thinking" and that some of them would be called according to a random selection plan. Only one subject failed to identify himself.

Forty-one subjects were eliminated for various reasons: twenty-four returned M.M.P.I. records which were invalid on either the F, L, or K (validity scale) score; eight subjects were over 40 years of age; six subjects' scales were incomplete; and three foreign student subjects had a language problem.

Choice of Manifest Anxiety Measure

The remaining 202 M.M.P.I. scales were scored and the Welsh Anxiety Index as well as the Taylor Manifest Anxiety scores were computed. At the time of this research the Welsh index (26) appeared to this investigator to have more clinical validation than the Taylor scale[2] and therefore was used for selection of the eighty experimental subjects.

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[2] Since the initiation of this study, Taylor (20) has stated that the findings of Hedlund, Farber, and Bechtoldt on the normative characteristics of the manifest anxiety scale suggest that a person who

The biserial r between extreme High and extreme Low anxiety as measured on the Welsh Index and anxiety as measured on the Taylor scale (for the eighty subjects of the individual experiment) was 0.817 ± 0.064. The Pearson product-moment r between anxiety on the Welsh Index and anxiety on the Taylor scale was 0.58 ± 0.046 (for all 202 subjects in the selection population).

Table I presents the division of the subjects into the anxiety-level categories used in this research.

Subjects were summoned for the individual part of this experiment if they fell into either one of the extreme anxiety groupings. Following is the request made of the subjects:

> The following named students have been selected to take part in an experiment on thinking. I urgently request your co-operation in signing up for one of the listed times on the sign-up sheet. It is important that all of the listed people be contacted in order to fulfill the procedural requirements of this experiment. I plan to pick up and to deliver evening volunteers if it is too inconvenient for you to get to South Campus.
>
> Please place your phone number in the designated place so that I might give you a reminder call. If you cannot come

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takes a full M.M.P.I. instead of the Biographical Inventory (Taylor's scale and filler items) is confronted with a sufficiently radical change in filler items to exert a definite and significantly different influence on the anxiety scores. Although this investigator did not use the full M.M.P.I., the form he did employ had over 170 additional filler items beyond the 225 items employed by Taylor in the Biographical Inventory.

TABLE I

THE DIVISION OF THE SUBJECTS ACCORDING TO THE WELSH MANIFEST ANXIETY INDEX

Group	Welsh Index	N	Per Cent
High Anxiety	69-108	42	20.8
High Intermediate	57-68	40	19.8
Middle	49-56	39	19.3
Low Intermediate	37-48	39	19.3
Low Anxiety	19-36	42	20.8
Total		202	100.0

> come at any of the designated times, please put your phone number down next to your name and we can try to arrange a time more to your convenience.

Composition and Description of the Population

Eighty of the eighty-four persons in the extreme categories (forty in each group) were seen within a 23-day period in individual sessions. The sessions were scheduled for 90 minutes. Although the average anagram working time was approximately 40 minutes, the remaining time was used to enable the subjects to ventilate much of the tension which appeared to build up over their "felt" inefficiency in "thinking." Most of the subjects used the entire scheduled time.

Ten of the twenty-four High Anxious Males used were married. Ten of the twenty-two Low Anxious Males were married. Two of the sixteen High Anxious Females were married, and five of the eighteen Low Anxious Females were married. The average age of the High Male was 22 years and 11 months. The average age for the Low Male was 23 years and 10 months. The females averaged 21 years and 2 months for the High group and 21 years and 6 months for the Low.

Class standing was also reasonably controlled. The High and the Low groups had the following class distribution: Freshman, 4

and 2; Sophomore, 14 and 10; Junior, 10 and 9; Senior, 9 and 16; and Special Student, 3 and 3.

Order of Assignment to Experimental Groups

The procedure below was followed during the anagram-solution phase of the experiment. Subjects were taken in the order in which they signed on the circulated sign-up sheet. Assignment to the anagram list order and to the investigator report of positive or negative evaluation was made so that the following cycle would be completed evenly and independently for both the men and the women:

1. List A : positive evaluation : List B
2. List A : negative evaluation : List B
3. List B : positive evaluation : List A
4. List B : negative evaluation : List A

Each of four consecutively tested members of a given anxiety group of like sex drew a different assignment. When forty of the eighty subjects were seen, nineteen High Anxious and twenty-one Low Anxious had made their appearance. These were distributed evenly among the sexes--twenty and twenty. Thus, the rate at which the groups were seen was constant.

Control of the Intelligence Variable

The intellectual nature of academic work and of the task of solving anagrams suggested that the intelligence level of the groups be controlled. A.C.E. scores were available for 176 of the students. Table II presents a comparison of the Mean A.C.E. score among the five anxiety level groups listed in Table I (see page 14). Table III is also included to present the comparisons with male and female members combined at all levels. The A.C.E. scores are given in decile units.

The only significant variation in Mean decile score on the A.C.E. was between the Middle Male group and the High Intermediate group. More important for this study, however, was the fact that 27 of the 28 possible comparisons and particularly those between the High, Middle, and Low Anxious groups were not significantly different from one another. Furthermore, the extreme high and extreme low A.C.E. Means were not significantly different from the Mean A.C.E. score of the total group. Consequently, the conclusion may be advanced that no real difference in intellectual level existed between the groups studied and that any significant differences obtained between the experimental groups on the dependent variables could not reasonably be attributed to differences in intelligence.

TABLE II

COMPARISONS OF A.C.E. AVERAGE SCORES BETWEEN GROUPS OF VARYING LEVELS OF ANXIETY

Group	N	Mean	Group[1]			
			L.M.	L.F.	L.I.	M.M.
Low Male	22	5.23		0.814	0.477	1.680
Low Female	17	5.94			0.362	0.825
Low Intermediate.	29	5.62				1.236
Middle Male	18	6.72				
Middle Female . .	19	5.21				
High Intermediate.	34	4.97				
High Male	22	5.86				
High Female . . .	15	4.87				
Total	176	5.51				1.75

Group	N	Mean	Group[1]			
			M.F.	H.I.	H.M.	H.F.
Low Male	22	5.23	0.024	0.367	0.814	0.400
Low Female	17	5.94	0.809	1.273	0.098	1.131
Low Intermediate.	29	5.62	0.480	0.934	0.306	0.814
Middle Male	18	6.72	1.641	2.276[2]	1.026	1.899
Middle Female . .	19	5.21		0.326	0.815	0.368
High Intermediate.	34	4.97			1.317	0.127
High Male	22	5.86				1.179
High Female . . .	15	4.87				
Total	176	5.51				0.86

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[1] L.M. = Low Male; L.F. = Low Female; L.I. = Low Intermediate; M.M. = Middle Male; M.F. = Middle Female; H.I. = High Intermediate; H.M. = High Male; H.F. = High Female.

[2] 40 degrees of freedom; $\underline{t}$ = 2.021 at 0.05.

TABLE III

COMPARISONS OF A.C.E. AVERAGE SCORES BETWEEN GROUPS OF VARYING ANXIETY LEVELS AFTER COMBINING THE SEX GROUPS FOR EACH LEVEL

Group	N	Mean	Group[1]				
			L.A.	L.I.	M.	H.I.	H.A.
Low Anxiety . .	39	5.54		0.111	0.628	0.921	0.131
Low Intermediate . .	29	5.62			0.442	0.908	0.225
Middle . . .	37	5.95				1.510	0.762
High Intermediate . .	34	4.97					0.806
High Anxiety . .	37	5.46					

[1] L.A. = Low Anxiety; L.I. = Low Intermediate; M = Middle; H.I. = High Intermediate; H.A. = High Anxiety.

Materials for the Anagram Experiment

Two sets of anagrams (Set A and Set B), equated for difficulty in a preliminary study, were used. The anagrams were printed on 1-inch by 3-inch white cards with template number 240 and pen number 3 of the LeRoy lettering set. The anagrams were selected from Sargent's list (17, p. 13). The difficulty level of each anagram, as checked in the preliminary study, remained essentially the same as those designated by Sargent. A practice list for all subjects consisted of the following:

UEJGD (JUDGE) YEVER (EVERY) NAETRU (NATURE)

Sets A and B were counterbalanced for each of the Anxiety groups (see page 16). The two sets are presented below:

Difficulty Level: E (easy); I (intermediate); D (difficult)

<u>Set A</u>:

E	1.	PEEOLP	(PEOPLE)
D	2.	NMGOINR	(MORNING)
E	3.	GUORP	(GROUP)
I	4.	EEPYLS	(SLEEPY)
E	5.	EYMTP	(EMPTY)
D	6.	EVSUORN	(NERVOUS)
I	7.	THWGIE	(WEIGHT)
D	8.	CEPART	(CARPET)
I	9.	NPEHPA	(HAPPEN)

E	10.	EDDILM	(MIDDLE)
D	11.	RSANEO	(REASON)
I	12.	CMYOPAN	(COMPANY)

Set B:

E	1.	EJEWYRL	(JEWELRY)
D	2.	SCLIAO	(SOCIAL)
E	3.	UCTRK	(TRUCK)
I	4.	BAIHT	(HABIT)
E	5.	AIMANL	(ANIMAL)
D	6.	CNEGAH	(CHANGE)
I	7.	AGAGRE	(GARAGE)
D	8.	RECMI	(CRIME)
I	9.	SDURG	(DRUGS)
E	10.	IPUCLB	(PUBLIC)
D	11.	EONSPR	(PERSON)
I	12.	CUMTOS	(CUSTOM)

Instructions and Procedure for the Anagram Task

The subjects were seated and after asking them to take a comfortable position at the table the investigator said:

> I have here a series of common English words which have the letters all scrambled to form what is known as an anagram. Your task will be to tell me, as rapidly as you can, what the word is. You will have three practice words before I begin timing your answers. I'll start the watch as I turn up each card.

All response times and verbalizations were recorded. If, after working for four minutes on an anagram, the subject could not give

the word, the first letter was given as a cue. Each minute thereafter another letter was given until the subject solved the word. Table XXXVII in Appendix A indicates the number of people who needed cues on each word. Table XXXVIII presents the distribution of the number of cues needed for solution in each of the extreme anxiety groups.

Upon completion of the first set of anagrams, the subject was asked to check on a continuum[3] the position he felt he held for three questions:

1. How do you <u>feel</u> you compare with others who have tried to unscramble these words?
2. How hard do you <u>feel</u> you tried (compared with the others) to get the correct word as quickly as possible?
3. How hard do you <u>feel</u> you tried (within your own abilities) to get the correct word as quickly as possible?

In the meantime, the investigator was "scoring" the first set of anagrams and referring to "a data sheet." He took the subject's self-evaluation on the above three questions and after a moment said (Positive Evaluation):

> Mmm. I believe that you recognize this task is relatively unfamiliar. You were undoubtedly aware of the fact that some words were easy and others were difficult. The words were tested on a group of college students last quarter and were

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[3] See Appendix C, page 117.

> deliberately chosen to have this range. Very often, the subjects reported that they felt they were doing poorly because of the time that elapsed while they were trying the hard ones. You may have experienced the same feeling. Actually, your over-all performance is more efficient than at least 80 per cent of the group on whom I tried these words last quarter. In other words, your performance was really very good. Since your feelings may have interfered with your ability to perform at a maximal level, I'd like to get a second sample of your performance.

(Negative Evaluation):

> Mmm. I believe you recognize that you seem to be having an unusual amount of difficulty on this task. According to the information I collected last quarter on a group of college students, you rank in the bottom 10 per cent of the group. However, just to be sure, why don't we take a second sample of your performance before we consider this as representative of your efficiency.

The second set of anagrams was then administered. Upon completion of this set of anagrams, a second questionnaire[4] was filled out by the subjects:

1. How did you feel when you found that you were not getting some words quickly?
2. How did you feel when the examiner began (and continued) to give you cues?
3. Had you known in advance what you would be asked to do in this experiment, would you still have volunteered? Why?
4. Now (after the second group of words), how do you feel you compare with others who have tried to unscramble these words?
5. How hard did you try on the second set when you compare it with the first set?
6. What was your reaction to the examiner's report of your performance on the first set of words?

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[4] See Appendix D, page 118.

At this point the investigator spoke about the research. He said, in effect, that the nature of the research was to see if a relationship existed between the way people feel about their own tenseness, as reflected in the M.M.P.I., and how they behave on a task which requires that they be able to shift their approach a great deal before they can arrive at a solution. The subjects were also told that the evaluation of their anagram solution skill followed a prescribed experimental design and was not based on their actual performance. In addition, a group profile of the M.M.P.I. scores for High and Low Anxious subjects was displayed. The investigator pointed out that all the scores fell within the limits of the normal range and stated that as far as he was concerned he was dealing with subjects who had ''normal limits'' of ''tension'' feelings.

Each subject was asked not to speak with his classmates about the research until after the investigator made his report to the classes at a later date. In addition, each subject was asked if anyone had spoken to him about the experiment. All subjects denied previous knowledge.

Measures Available or Employed for the Anagram Solution Task

1. Median solution time for four anagrams at each of the three difficulty levels.

2. An anagram rigidity score based upon the mean number of cues needed to solve all anagrams in each set.

The solution time scores were treated in a factorial design utilizing analysis of variance and covariance. The variables included were Anxiety Level (High and Low), Anagram List Order (A followed by B, B followed by A), Investigator Evaluation (positive or negative), and Anagram Difficulty Level (Easy, Intermediate, Difficult). Tables XXVIII to XXXVI-B in Appendix A present the summary of the ordering and statistical treatment of these data. Other comparisons were evaluated with a t-test.

The analysis of covariance for the solution time data of Set II took into account the initial differences in anagram solution performance as given in Set I.

CHAPTER IV

RESULTS

Performance on the Anagram Task

The proposed division of the anagrams into three levels of difficulty--easy, intermediate, and difficult--was achieved. Table IV presents the mean solution times at each of these levels for all subjects. The F ratios are enormous, 256.3 for Set I and 199.0 for Set II. This very significant division of levels is equally reflected in the number of cues which were necessary at each difficulty level before solution was accomplished (see Table XXXVII, Appendix A, page 108).

The average time needed by the High and the Low Anxious groups for solution of the anagrams in Set II is presented in Table V. The small differences in performance between the anxiety groups at each of the anagram difficulty levels are not significant. However, as predicted, the High Anxious group performs better than the Low only at the intermediate level of anagram difficulty. Again, the direction and degree of these small differences are equally reflected

TABLE IV

MEAN SOLUTION TIME IN SECONDS AT EACH OF THE THREE DIFFICULTY LEVELS OF ANAGRAMS FOR THE EIGHTY EXPERIMENTAL SUBJECTS

Set	Easy	Intermediate	Difficult
I	4.05	66.51	217.24
II	8.89	60.50	202.85

TABLE V

MEAN SOLUTION TIME IN SECONDS AT EACH OF THE THREE DIFFICULTY LEVELS OF ANAGRAMS (SET II) FOR THE FORTY MEMBERS IN EACH OF THE EXTREME ANXIETY LEVEL GROUPS

Group	N	Easy[1]	Intermediate	Difficult
High Anxious	40	11.00	57.74	204.92
Low Anxious	40	6.77	63.27	200.77
Total	80	8.89	60.50	202.85

[1] Difference between High Anxious and Low Anxious is not significant (*t* = 1.360).

in the number of cues which were necessary at each difficulty level before solution was accomplished.

No treatment variable or interaction term, other than task difficulty, is significant in the initial analysis of variance. The analysis of covariance, however, yielded three significant interaction terms as well as a significant finding for the difficulty variable (see Table VI). These relationships will now be considered one at a time.

Changes in Anagram Performance Produced by the Interaction of Degree of Manifest Anxiety and Evaluation by the Investigator

The anxiety x report interaction, significant at the 0.05 level of confidence, can be understood by reference to Table VII.

Inspection of these data shows that different responses are elicited from the High Anxious and the Low Anxious groups by the investigator's evaluation. If the High Anxious group is given a favorable report it performs more poorly than before the report. If the Low Anxious group is given the same favorable report it performs better than it did before the report. Contrariwise, the negative investigator evaluation is followed by better performance in the High Anxious groups and no change in performance in the Low Anxious group.

TABLE VI

LIST OF THE SIGNIFICANT F-RATIOS OBTAINED FROM THE ANALYSIS OF COVARIANCE OF THE SUBJECTS' ANAGRAM SOLUTION TIME SCORES

Source	d.f.	F	Sig.
Anxiety x Report	1, 71	4.50	0.05
List x Report	1, 71	5.22	0.05
Difficulty x Anxiety x Report	2, 143	3.47	0.05
Difficulty	2, 143	29.23	0.001

TABLE VII

AVERAGE ANAGRAM SOLUTION TIME IN SECONDS FOR THE TWENTY MEMBERS IN EACH GROUP, DIVIDED ACCORDING TO ANXIETY LEVEL AND THE INVESTIGATOR'S REPORT

Anxiety Level	Favorable Report		Negative Report	
	Anagram Set I	Anagram Set II	Anagram Set I	Anagram Set II
High	234.15	286.27	318.25	261.06
Low	308.63	251.70	290.17	289.92

Changes in Anagram Performance Produced by the Interaction of the Order of List Presentation and Evaluation by the Investigator

The list x report interaction is significant at the 5 per cent level of confidence. This interaction can be understood by reference to Table VIII.

These data show that any report produces a different response from subjects starting on list A than it does from subjects starting on list B. Given a favorable report, the list A subjects perform poorer after the report and the list B subjects perform better. Given a negative report, list A subjects improve in performance and list B subjects decline in performance on the subsequent list.

Changes in Anagram Performance by the Interaction of Anxiety Level, Anagram Difficulty Level, and Evaluation by the Investigator

This triple interaction term is also significant at the 0.05 level of confidence. It is made clearer by reference to Table IX, or Table X, which translates Table IX into per cent of performance change.

These data reveal that the effects of anxiety level and examiner report taken together are different at each of the levels of anagram difficulty. Regardless of the nature of the report--positive

TABLE VIII

AVERAGE ANAGRAM SOLUTION TIME FOR THE TWENTY MEMBERS IN EACH GROUP, DIVIDED ACCORDING TO INITIAL LIST OF ANAGRAMS PRESENTED AND THE INVESTIGATOR'S REPORT

List	Favorable Report		Negative Report	
	Anagram Set I	Anagram Set II	Anagram Set I	Anagram Set II
A	258.38 (A)	283.07 (B)	315.94 (A)	242.30 (B)
B	284.40 (B)	254.89 (A)	292.47 (B)	308.68 (A)

TABLE IX

AVERAGE SOLUTION TIME IN SECONDS FOR THE TWENTY MEMBERS IN EACH GROUP, DIVIDED ACCORDING TO ANXIETY LEVEL AND INVESTIGATOR'S REPORT FOR EACH OF THE THREE DIFFICULTY LEVELS OF ANAGRAMS

Group	Investigator's Report	Easy		Intermediate		Difficult	
		Anagram Set I	Anagram Set II	Anagram Set I	Anagram Set II	Anagram Set I	Anagram Set II
High Anxiety . .	Positive	5.32	10.30	44.26	46.39	184.58	229.58
	Negative	4.02	11.71	76.91	69.08	237.33	180.27
Low Anxiety . .	Positive	3.65	8.16	77.94	56.85	227.55	186.69
	Negative	3.20	5.39	66.95	69.69	220.02	214.85

TABLE X

PER CENT CHANGE IN PERFORMANCE FOR EACH ANAGRAM DIFFICULTY LEVEL BY THE ANXIETY GROUPS, DIVIDED ACCORDING TO A POSITIVE OR A NEGATIVE INVESTIGATOR EVALUATION

Group	Negative Evaluation			Positive Evaluation		
	Easy Anagrams	Intermediate Anagrams	Difficult Anagrams	Easy Anagrams	Intermediate Anagrams	Difficult Anagrams
High Anxious . .	-191.3	+ 10.2	+ 24.0	- 93.6	- 4.8	- 24.4
Low Anxious . .	- 68.4	- 4.1	+ 2.3	-123.6	+ 27.1	+ 18.0

or negative--both High and Low Anxious subjects perform more poorly on the second set of easy anagrams. High Anxious subjects perform more poorly at the intermediate difficulty level after a positive report. Low Anxious subjects improve with the same report. The opposite occurs with a negative report--the High Anxious improve, the Low Anxious do slightly worse. Similarly, the High Anxious do poorer at the most difficult anagram level after a positive report while the Low Anxious improve. With the negative report the High Anxious improve, the Low Anxious show minimal or no change.

Changes in Anagram Performance From Set I to Set II at Each Difficulty Level

The F-test for the difference between the time required for solution of anagram set I and the time required for anagram set II, when considering each difficulty level, is highly significant ($F = 29.23$). Table IV presents the average solution time scores. The only significant shift ($t = 2.898$) in performance is for the easy anagrams (4.05 seconds to 8.89 seconds). This shift is not related to levels of manifest anxiety. Both High ($t = 2.124$) and Low ($t = 2.428$) Anxious subjects perform significantly poorer on these easy items. However, they do not differ significantly from each other at any level of anagram difficulty in either set I or set II.

One obvious conclusion to be drawn from all these relationships is that any subsequent analysis of the effect of manifest anxiety on performance must be extremely complex.

Relationship Between Degree of Manifest Anxiety and Grade-Point Average

The five levels of manifest anxiety (see Table I, p. 14) are related to intellectual achievement as represented by grade-point average. These groups are also divided as to sex. Table XI presents the mean grade-point averages and all possible comparisons. All significant differences are presented below:

Comparison	d.f.	t	Sig.
1. Low Male vs. Low Female	36	2.937	0.01
2. Low Male vs. Low Intermediate	51	2.778	0.01
3. Low Male vs. Middle Male	37	2.500	0.02
4. Low Male vs. Middle Female	32	2.545	0.02
5. High Female vs. Low Female	28	2.378	0.05
6. High Female vs. Low Intermediate	43	2.298	0.05
7. High Female vs. Middle Male	29	2.041	>0.05*
8. High Female vs. Middle Female	29	2.075	0.05
9. High Intermediate vs. Low Female	48	2.033	0.05
10. High Intermediate vs. Low Intermediate .	63	2.035	0.05
11. High Intermediate vs. Middle Female . .	49	2.013	0.05

* $t = 2.045$ at 0.05.

TABLE XI

COMPARISONS OF MEAN GRADE-POINT AVERAGE BETWEEN GROUPS WITH VARYING LEVELS OF ANXIETY

Group	N	Mean	Group[1]			
			L.M.	L.F.	L.I.	M.M.
Low Male	22	2.12		2.937	2.778	2.500
Low Female	16	2.49			0.144	0.061
Low Intermediate.	31	2.47				0.194
Middle Male	17	2.50				
Middle Female . .	17	2.54				
High Intermediate.	34	2.24				
High Male	22	2.39				
High Female . . .	14	2.10				

Group	N	Mean	Group[1]			
			M.F.	H.I.	H.M.	H.F.
Low Male	22	2.12	2.545	1.062	1.901	0.130
Low Female	16	2.49	0.275	2.033	0.641	2.378
Low Intermediate.	31	2.47	0.427	2.035	0.563	2.298
Middle Male	17	2.50	0.196	1.857	0.625	2.041
Middle Female . .	17	2.54		2.013	0.802	2.075
High Intermediate.	34	2.24			1.163	0.972
High Male	22	2.39				1.593
High Female . . .	14	2.10				

Note: See list of significant t-ratios on p. 35.

[1] L.M. = Low Male; L.F. = Low Female; L.I. = Low Intermediate; M.M. = Middle Male; M.F. = Middle Female; H.I. = High Intermediate; H.M. = High Male; H.F. = High Female.

These data clearly show that level of anxiety is a relevant variable in determining intellectual achievement in a college situation. The relationship is essentially the same as given in Figure 2 (see p. 43). The special features represented in Figure 2 will be described in the next section.

The "Defensive-Low" Category and Grade-Point Average

As stated in the theory chapter, it was anticipated that some Low Anxious subjects would be defending against anxiety or its expression and would really be High Anxious. To test this hypothesis of a "Defensive-Low" adjustment it was necessary to derive an objective measure of defense. The Welsh formula[5] for determining anxiety level was examined, and two ways by which its value could be reduced were considered: (1) by an exaggeration of the Hs and/or Hy scale score, and (2) by a much reduced D and/or Pt scale score. Exaggeration was assumed to reflect disturbance, for example, in the popular sense of "protesting too much." Thus, the "Defensive-Low"

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[5] A.I. = (Hs + D + Hy)/3 + (D + Pt) - (Hs + Hy). Hs = Hypochondriasis, D = Depression, Hy = Hysteria, Pt = Psychasthenia, A.I. = Anxiety Index.

individual is defined as one who achieves a Low Anxiety index on the M.M.P.I. with either an exaggerated Hy scale <u>or</u> a much reduced D scale.[6] These two scales were selected because they represent two distinct kinds of mechanisms used to handle neurotic anxiety--symptom development (high Hy) and reaction formation (low D). Both mechanisms constitute psychological denial of ''neuroticlike'' anxiety.

Of those selected for the ''Defensive-Low'' category, two-thirds are male, and they represent 64 per cent of the so-called Low Anxious males. The women in this category represent 44 per cent of the so-called Low Anxious females. Altogether, the twenty-one members thus selected represent 10 per cent of our population sample.

The data for the analysis in which the ''Defensive-Low'' category is included are presented in Figure 2. The mean grade-point averages and the t-ratios for all possible comparisons are presented in Table XII. All significant t-ratios are presented on the following page.

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[6] Since the population tested consists of ''normal'' college students, extreme peaked scores associated with clinical populations were not anticipated. Therefore, rather than using the recommended 20-unit deviation (9, p. 17), exaggeration of Hy or deflation of D was arbitrarily assigned to a variation of 14 or more t-score units from the mean.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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[illegible]

Comparison	d.f.	t	Sig.
1. Low Female (-''D.L.'') vs. Low Male (-''D.L.'')	15	3.801	0.01
2. Low Female (-''D.L.'') vs. High Intermediate	41	2.774	0.01
3. Low Female (-''D.L.'') vs. High Anxious	43	2.042	0.05
4. Low Female (-''D.L.'') vs. ''Defensive-Low''	28	3.382	0.01
5. Low Male (-''D.L.'') vs. Low Intermediate	37	2.459	0.02
6. Low Male (-''D.L.'') vs. Middle	40	2.283	0.05
7. Low Intermediate vs. High Intermediate	63	2.000	0.05
8. Low Intermediate vs. ''Defensive-Low''	50	2.131	0.05
9. Middle vs. High Intermediate	66	2.205	0.05
10. Middle vs. High	68	1.739	0.10
11. Middle vs. ''Defensive-Low''	53	2.183	0.05

TABLE XII

COMPARISONS OF MEAN GRADE-POINT AVERAGE BETWEEN GROUPS WITH VARYING LEVELS OF ANXIETY AFTER STATISTICALLY EQUATED SEX GROUPS WERE COMBINED AND THE "DEFENSIVE-LOW" CATEGORY WAS SUBTRACTED FROM THE LOW ANXIOUS GROUP

Group	N	Mean	Group[1]		
			L.F.	L.M.	L.I.
Low Female (-D.L.)	9	2.67		3.801	1.130
Low Male (-D.L.)	8	2.02			2.459
Low Intermediate	31	2.47			
Middle	34	2.52			
High Intermediate	34	2.24			
High	36	2.28			
"Defensive-Low"	21	2.21			

Group	N	Mean	Group[1]			
			M.	H.I.	H.	D.L.
L.F.[1] (-D.L.)	9	2.67	0.714	2.774	2.042	3.382
L.M.[1] (-D.L.)	8	2.02	2.283	1.384	1.307	1.429
Low Intermediate	31	2.47	0.365	2.000	1.496	2.131
Middle	34	2.52		2.205	1.739	2.183
High Intermediate	34	2.24			0.342	0.278
High	36	2.28				0.538
"Defensive-Low"	21	2.21				

Note: See list of significant t-ratios on p. 39.

[1] L.F. = Low Female; L.M. = Low Male; L.I. = Low Intermediate; M. = Middle; H.I. = High Intermediate; H. = High; D.L. = Defensive-Low.

For both male and female subjects the mean grade-point average of the "Defensive-Low" category does not differ significantly from that of the High Anxious. This, coupled with a similar analysis of the anagram data in the next section (see pp. 42-45), and the fact that the remaining Low Anxious females differ significantly from both the High Anxious and the "Defensive-Low" subjects in mean grade-point average, support the hypothesis that the "Defensive-Low" group is really High Anxious.

Comparisons 6 to 11 (see p. 39) are the most pertinent for Hypothesis 3. The subjects of the Middle group, excluding the Low Anxious females, are the best achievers. When a one-tail test is employed, as is appropriate, the difference between the Middle and High Anxious groups is also significant below the 0.05 level.

When the "Defensive-Lows" are removed from the Low Anxious group there remain nine Low Anxious females whose achievement in terms of college grade-point average is significantly higher than for the remaining eight males. In fact, their achievement is superior to all other groups, though not significantly so for all groups. It would appear, though the sample (N = 9) is small, that these young women are a highly motivated group despite the relative absence of anxiety. A tentative conclusion to be drawn from these results is

that true low anxiety has a differential sex-effect with respect to intellectual achievement.

For the most part, however, the data are consistent with the present prediction of a bow-type curve (see Figure 2).

"Defensive-Low" Category and the Anagram Rigidity Score

In analyzing the anagram solution data, constriction of performance is measured by the Anagram Rigidity (A.R.) score. For each list, this score is the average number of cues the subject needs in order to solve the anagrams. Let us inquire as to the consistency of the "Defensive-Low" group's A.R. score with this group's mean grade-point average performance. Table XIII presents these data.

The Low Anxious groups improve (the Low Males significantly so) on the second list following prolonged situational frustration. On the other hand, both the High Anxious group and the "Defensive-Low" group perform more poorly. This result is consistent with the idea that anxiety begets even more anxiety (inappropriate responses) and consequently produces even greater performance inefficiency. On list II, the difference between the Low Anxious male group's A.R. score and the High Anxious group's score is significant at the 0.10

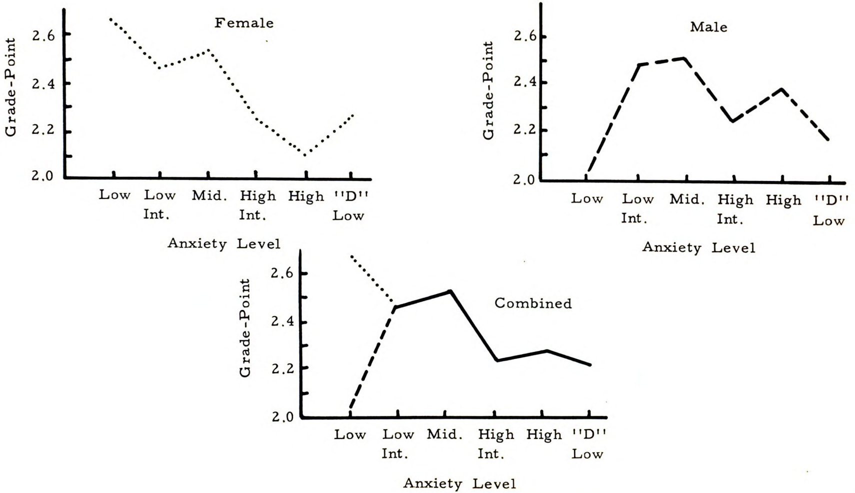

Figure 2. Grade-point achievement for varying anxiety levels with the "Defensive-Low" group removed from the Low Anxious level.

TABLE XIII

MEAN ANAGRAM RIGIDITY SCORES FOR THE SUBJECTS IN THE LOW ANXIOUS, HIGH ANXIOUS, AND "DEFENSIVE-LOW" GROUPS

Group	N	List I Mean	List II Mean
Low Male Minus "D.L."	8	0.5728	0.3124
Low Female Minus "D.L."	9	0.4444	0.4259
High Anxious	36	0.4699	0.4915
"Defensive-Low" ("D.L.")	21	0.4762	0.5079

level using a two-tail test. The difference between the Low males' score and the "Defensive-Low" group's score fell just short of this level (t = 1.678, where a t of 1.703 is required). Thus, the performance of "Defensive-Low" subjects is clearly more similar to the High Anxious performance results than to the truly Low Anxious results.

Relationship Between Mechanisms for Handling Anxiety and Intellectual Performance

Two separate measures of mechanisms for handling anxiety were employed: (1) the Welsh Internalization ratio,[7] and (2) a "peak-score" pattern analysis of the M.M.P.I. profile. The second method was suggested when empirically determined differences in performance, between the high Hy and the low D subjects in the "Defensive-Low" group, were noted (see Discussion, pp. 75-76).

The hypothesis tested with regard to the Welsh Internalization ratio is that in anxious groups, the higher the ratio the higher will be the grade-point average and the smaller will be the A.R. score. Table XIV presents the data for this analysis.

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[7] I.R. = (Hs + D + Pt)/(Hy + Pd + Ma). Hs = Hypochondriasis, D = Depression, Pt = Psychasthenia, Hy = Hysteria, Pd = Psychopathic Deviate, Ma = Manic.

TABLE XIV

AVERAGE ANAGRAM RIGIDITY SCORE AND AVERAGE GRADE-POINT ACHIEVEMENT RELATED TO ANXIETY LEVEL AND DISTRIBUTED ACCORDING TO THE INTERNALIZATION RATIO

Group	Internalization Ratio Range	N	Anagram Rigidity, Score I	Anagram Rigidity, Score II	Grade-Point N[1]	Grade-Point Avg.
High	>1.10	16	0.4219	0.4376	13	2.37
	0.80-1.09	24	0.4999	0.5219	23	2.22
Defensive-Low	>1.10	1	0.4175	0.5000	1	1.95
	0.80-1.09	15	0.5000	0.5056	15	2.28
	0.60-0.79	5	0.4167	0.5162	5	2.03
Combined High and Defensive-Low	>1.10	17	0.4216	0.4412	14	2.34
	0.80-1.09	39	0.4999	0.5157	38	2.24
	0.60-0.79	5	0.4167	0.5162	5	2.03
Low	>1.10	1	0.4175	0.5000	1	1.95
	0.80-1.09	27	0.4598	0.4290	25	2.26
	0.60-0.79	12	0.5278	0.4998	12	2.35
Total	>1.10	17	0.4216	0.4412	14	2.34
	0.80-1.09	51	0.4787	0.4727	48	2.24
	0.60-0.79	12	0.5278	0.4998	12	2.35

[1] The discrepancy between Grade-Point N and Anagram N came about when grade-point averages were not available for all the subjects.

Careful examination of this table reveals a pronounced trend, though none of the differences between means are significant. That is, Anxious subjects with higher Internalization ratio scores perform better. Note that the sixteen High Anxious subjects who internalize >1.10 obtain the highest grade-point average and a better-than-average[8] anagram rigidity score. Furthermore, within the combined High and "Defensive-Low" group, the A.R. scores and grade-point averages are aligned according to the hypothesis with the single exception of the "Defensive-Low" subjects in the 0.60 to 0.79 range. In view of the small number (N = 5) in this group, the alignment is considered as relatively convincing support for the hypothesis. It should be re-emphasized that the inverse relationship between internalization and rigidity applies only to Anxious subjects. When the data for <u>all</u> subjects are examined, no significant (r = 0.075) relationship exists. It follows, not only from these findings, but also from Carp's study (2), that an optimal internalization ratio is conditioned by level of anxiety (see Table XXXIX, Appendix A, p. 110).

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[8] The average anagram rigidity score for all subjects was 0.4739 on set I and 0.4701 on set II.

[illegible]

[illegible]

The second measure ("peak-score" patterns) for handling anxiety was applied to the hypothesis that subdivision of the High Anxious group will relate to differences in intellectual performance. Five such divisions were made out of the thirty-six subjects whose grade-point averages were obtainable. One group was High Anxious without any peak score (above 64) on the M.M.P.I. Another group had only one peak--either on the D scale or on the Pt scale. A third group had peaks on both D and Pt. The fourth group also had the same D and Pt peaks indicating anxiety, but had, in addition, peaks on Hs and/or Hy indicating a stabilized defense system. The fifth group was composed of three persons who did not fit any of the previous four categories. Table XV presents the data on intellectual performance among these groups.

The data in the table are very suggestive. Note that both in grade-point average and in anagram rigidity score the "Neurotic" group with only the double peak on D and Pt performs poorer than the group with not only the double peak on D and Pt but with defense peaks on Hs and/or Hy as well. Note, too, that the group without any peak scores performs most poorly. Apparently, since this group's High Anxious classification was obtained without heavy loading from any single scale, its anxiety might be termed as more general or

TABLE XV

AVERAGE ANAGRAM RIGIDITY SCORE AND AVERAGE GRADE-POINT ACHIEVEMENT RELATED TO VARYING WAYS FOR HANDLING HIGH MANIFEST ANXIETY, DISTRIBUTED ACCORDING TO SUBJECTS' VARYING PEAK-SCORE PATTERNS ON THE M.M.P.I.

Group	N	Anagram Rigidity, Score		Grade-Point
		I	II	
1. "Free Floating Anxiety" High Anxious without any peak score	9	0.5924	0.5556	2.01
2. One peak on either D or Pt . . .	11	0.4242	0.3409	2.37
3. "Neurotic" D and Pt peaks only	7	0.5001	0.5951	2.19
4. D and Pt peaks plus defense peaks on Hs and/or Hy . . .	6	0.3472	0.4629	2.39
5. Miscellaneous peaks	3	0.4444	0.6667	2.68
Total	36	0.4699	0.4915	2.28

"free-floating" than the other subjects'. Consequently, this group's greater constriction in performance is clearly meaningful in terms of anxiety theory.

Several statistically significant differences in performance among these groups are present. Performance on anagram set I in the fourth group is significantly better than the performance of the "free-floating anxiety" group at the 0.05 level of confidence (*t* = 2.60). The fourth group also performed better on set II, but not significantly so. Its grade-point average achievement was better at the 0.01 level (*t* = 3.132). The differences between group 4 and the "Neurotic" group all indicate superior performance by the group with the stabilized defense system (*not* statistically significant).

Group 2, also, performed on anagram list II significantly better than did the "free-floating anxiety" group at the 0.05 level (*t* = 2.153). Similarly for grade-point average, Group 2 excelled at the 0.02 level (*t* = 2.852). Group 2 is superior to the "Neurotic" group at the 0.10 level on anagram set II and near the 0.10 level for grade-point average (*t* = 1.67 where *t* = 1.753 is necessary).

These differences in performance which relate to (1) different peak-score patterns on the M.M.P.I. and (2) to differences in the Internalization ratio within a so-called homogeneous High Anxious

group serve to re-emphasize the hypothesis of subproblem B. It is not simply the presence or degree of anxiety which determines intellectual performance. Rather, it is the nature of the defense mechanisms used for handling the anxiety which plays the primary role. The relationship between anxiety and performance appears to be modified by the complexities of personality dynamics.

Summary Comment on Subproblem B

It should be emphasized that these findings were obtained from an ordinary college student population. Therefore, the "neurotic" traits described were not sufficiently strong, at the time of this experiment, to require that these students withdraw from school. Although some subjects overtly expressed both the need for and experience with psychiatric aid, generally speaking, the population for this study was "normal."

Thus we have seen that within "normal anxiety" limits, varying degrees of anxiety <u>and</u> varying methods employed by persons for dealing with their anxiety relate to differences in intellectual performance. This fact lends fairly convincing support not only to the theoretical formulation of this study but also to the clinician's concept of "functional" constriction.

Relationship Between Degree of Manifest Anxiety and the Subjects' Motivation and Attitudes Toward the Anagram Task

The data in Table XVI show that all groups felt that they tried significantly harder (0.001 level) than their moderate <u>effort</u> level to solve the anagrams. Table XVII presents the analysis of the differences in the intensity of this feeling between High and Low Anxious groups. The greater intensity of this feeling reported by the High Anxious group is not significantly different ($\underline{t}$ = 1.55) from the Low Anxious report. Therefore, one can conclude that felt effort or motivation was stronger than ordinary[9] and that it was of relatively equal intensity in both the High and the Low Anxious groups.

Tables XVIII and XIX present the same analyses with regard to the subjects' evaluation of their relative efficiency in anagram <u>performance</u>. Table XVIII indicates that both the High and Low Anxious groups felt they performed significantly poorer (0.001 level) than the average. Table XIX indicates that the greater intensity of this feeling, reported by the High Anxious group, is also not significant

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[9] Additional support that motivation was intense can be inferred from the fact that the subjects solved all but five of the 1,920 anagrams (80 subjects solving 24 anagrams) before the investigator cued the entire word.

TABLE XVI

DEVIATION OF "FELT" DEGREE OF EFFORT EXPENDED FROM A MODERATE LEVEL WITH A HYPOTHETICAL MEAN OF ZERO

Group	N	Mean Dev.	S.E. Mean	t	Sig.
Total High	40	5.89	0.4016	14.67	0.001
High Male	24	6.26	0.4685	13.36	0.001
High Female	16	5.32	0.7129	7.46	0.001
Total Low	40	4.85	0.5351	9.06	0.001
Low Male	22	4.15	0.8082	5.14	0.001
Low Female	18	5.69	0.6304	9.03	0.001
Total	80	5.36	0.3375	15.88	0.001

TABLE XVII

SIGNIFICANCE OF DIFFERENCES (t-RATIOS) BETWEEN HIGH AND LOW ANXIOUS SUBJECTS' REPORTED STRENGTH OF INDIVIDUAL EFFORT TOWARD ANAGRAM SOLUTION

Group	N	Mean Dev.	High Male	High Female	Low Male
High Male	24	6.26		1.199	2.363[a]
High Female	16	5.32			1.063
Low Male	22	4.15			
Low Female	18	5.69			
Total High	40	5.89			
Total Low	40	4.85			
Total	80	5.36			

Group	N	Mean Dev.	Low Female	Total High	Total Low
High Male	24	6.26	0.758		
High Female	16	5.32	0.408		
Low Male	22	4.15	1.492		
Low Female	18	5.69			
Total High	40	5.89			1.55
Total Low	40	4.85			
Total	80	5.36			

[a] 40 degrees of freedom.
t = 2.02 at 0.05.
t = 2.42 at 0.02.

TABLE XVIII

SIGNIFICANCE OF SUBJECTS' MEAN DEVIATION FROM A HYPOTHETICAL POINT (MEAN OF ZERO) REPRESENTING A FEELING OF AVERAGE PERFORMANCE EFFICIENCY IN SOLVING THE ANAGRAMS

Group	N	Mean Dev.	S.E. Mean	t	Sig.
Total High	40	-2.28	0.4420	5.158	0.001
High Male	24	-1.92	0.5192	3.698	0.01
High Female	16	-2.81	0.7875	3.568	0.01
Total Low	40	-1.51	0.3859	3.913	0.001
Low Male	22	-1.14	0.4822	2.364	0.05
Low Female	18	-1.97	0.6233	3.161	0.01
Total	80	-1.89	0.2948	6.411	0.001

TABLE XIX

SIGNIFICANCE OF DIFFERENCES (t-RATIOS) BETWEEN HIGH AND LOW ANXIOUS SUBJECTS' REPORTED PERFORMANCE EFFICIENCY ON THE ANAGRAMS

Group	N	Mean Dev.	High Male	High Female	Low Male
High Male	24	-1.92		1.011	1.121
High Female	16	-2.81			1.960[a]
Low Male	22	-1.14			
Low Female	18	-1.97			
Total High	40	-2.28			
Total Low	40	-1.51			
Total	80	-1.89			

Group	N	Mean Dev.	Low Female	Total High	Total Low
High Male	24	-1.92	0.064		
High Female	16	-2.81	0.870		
Low Male	22	-1.14	1.098		
Low Female	18	-1.97			
Total High	40	-2.28			1.314
Total Low	40	-1.51			
Total	80	-1.89			

[a] 40 degrees of freedom.

t = 2.021 at 0.05.

t = 1.684 at 0.10.

statistically (t = 1.314) even with a one-tail test. Therefore, one can conclude that feelings of failure were strong and of relatively equal intensity in both the High and the Low Anxious groups. By inference one can consider that the "frustration" inherent in the anagram task is fairly equal in both groups.

Analysis of Table XX and XXI reveals a significant difference between High and Low Anxious groups' feelings about how hard other people worked on the anagrams. We saw earlier (p. 52) that all groups felt they worked harder than ordinary and that High and Low anxious groups did not differ significantly from each other in their intensity of this feeling. Now, when asked to compare their effort with that of "others," the High Anxious feel they work significantly harder (0.001 level) than the average. In addition, they feel this with significantly stronger intensity (0.02 level) than the Low Anxious who, although nearer the hypothetical average, also feel they worked harder than "others" (0.02 level).

Relationship Between Degree of Manifest Anxiety and the Subject's Shift in Attitude Concerning His Relative Performance

Though initially unanticipated, clearer understanding of the operation of anxiety in performance is to be found in a careful

TABLE XX

SIGNIFICANCE OF SUBJECTS' MEAN DEVIATION FROM A HYPOTHETICAL POINT (MEAN OF ZERO) REPRESENTING A FEELING THAT ALL GROUPS TRIED EQUALLY HARD TO SOLVE THE ANAGRAMS

Group	N	Mean Dev.	S.E. Mean	t	Sig.
Total High	40	1.91	0.3699	5.170	0.001
High Male	24	1.99	0.4608	4.319	0.001
High Female	16	1.79	0.6300	2.841	0.02
Total Low	40	0.75	0.2786	2.674	0.02
Low Male	22	0.97	0.3600	2.694	0.02
Low Female	18	0.47	0.4366	1.077	n.s.
Total	80	1.33	0.2396	5.551	0.001

[illegible]

[illegible] Report [illegible]

[illegible]

[illegible]

TABLE XXI

SIGNIFICANCE OF DIFFERENCES (t-RATIOS) BETWEEN HIGH AND LOW ANXIOUS SUBJECTS' REPORTED STRENGTH OF COMPARATIVE EFFORT TOWARD ANAGRAM SOLUTION

Group	N	Mean Dev.	High Male	High Female	Low Male
High Male	24	1.99		0.268	1.759[b]
High Female	16	1.79			1.233
Low Male	22	0.97			
Low Female	18	0.47			
Total High	40	1.9125			
Total Low	40	0.745			
Total	80	1.33			

Group	N	Mean Dev.	Low Female	Total High	Total Low
High Male	24	1.99	1.959[b]		
High Female	16	1.79	1.803[c]		
Low Male	22	0.97	0.912		
Low Female	18	0.47			
Total High	40	1.9125			2.522[a]
Total Low	40	0.745			
Total	80	1.33			

[a] 60 degrees of freedom; t = 2.390 at 0.02.

[b] 40 degrees of freedom; t = 1.684 at 0.10.

[c] 30 degrees of freedom; t = 1.697 at 0.10.

analysis of the differences between Anxious groups' shift in attitude concerning their relative performance in the group. We see in the analysis of covariance (Table XXXVI-A and XXXVI-B, Appendix A, pp. 104-107) that no significant differences in anagram solution ability relate to either anxiety level or to investigator evaluation. However, a significant effect upon performance is produced by the interaction of these variables. Since both High and Low Anxious groups perform differently after positive than after negative evaluation and also differ from each other after any single evaluation, there must, by inference, be a difference in the subjects' emotional reaction to the investigator's report. It is further felt that these differences in attitude should be reflected in the subjects' changed feelings about their comparative performance.

Before this analysis is made, let us evaluate the subjects' reaction to the investigator evaluation. Given a favorable report, 75 per cent of these High Anxious subjects report better performance than they reported initially. Actually, only 30 per cent improved. Similarly, for the negative report, 85 per cent felt they did worse while only 35 per cent actually did worse. Within the Low Anxious group, 75 per cent reported a better level of performance when only 55 per cent actually did better, 85 per cent felt they

did worse while 55 per cent actually did worse. These results clearly indicate that the subjects understood and attended to the investigator's report.

Tables XXII to XXIV[10] present the data relevant to the relationship between the subjects' self-evaluation and the nature of the investigator's experimental report. Table XXII, like Table XVIII, indicates that all subjects felt they performed poorer than average at the 0.001 level of confidence before the experimental report. Table XXIII, like Table XIX, indicates that there was no significant difference between the groups in the intensity of this feeling.

As indicated in Table XXII, a positive experimental report led to feelings of approximately average performance, while a negative report led to feelings of even poorer performance. Table XXIV gives evidence that the intensity of these feelings do not differ between the groups who were given a common evaluation. However, when the groups were given a contrasting evaluation--positive versus negative--these feelings are significantly different at less than the 0.001 level of confidence.

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[10] The categories prior to the experimental report differ from those in Table XVIII-XIX. Here anxiety level and investigator evaluation are the categories. Before, anxiety level and sex were the divisions.

[illegible] cases that the [illegible]

TABLE XXII

SIGNIFICANCE OF SUBJECTS' MEAN DEVIATION FROM A FEELING OF AVERAGE PERFORMANCE IN SOLVING THE ANAGRAMS BOTH BEFORE AND AFTER THE INVESTIGATOR'S EXPERIMENTAL EVALUATION

Group	N	Mean Dev.	S.E. Mean	t	Sig.
		Prior to Evaluation			
High Plus	20	-2.26	0.6584	3.433	0.01
High Minus	20	-2.29	0.6079	3.767	0.01
Low Plus	20	-1.68	0.5483	3.064	0.01
Low Minus	20	-1.35	0.5575	2.422	0.05
Total Plus	40	-1.97	0.4259	4.625	0.001
Total Minus	40	-1.82	0.4131	4.406	0.001
		Following Evaluation			
High Plus	20	0.655	0.6148	1.065	n.s.
High Minus	20	-4.39	0.5689	7.717	0.001
Low Plus	20	0.165	0.6446	0.256	n.s.
Low Minus	20	-4.591	0.4726	9.714	0.001
Total Plus	40	0.41	0.4416	0.928	n.s.
Total Minus	40	-4.49	0.3654	12.288	0.001

TABLE XXIII

SIGNIFICANCE OF DIFFERENCES (t-RATIOS) BETWEEN SUBJECTS' REPORTED PERFORMANCE EFFICIENCY ON THE ANAGRAMS WHEN RELATED TO THEIR PRE-EVALUATION (FROM THE INVESTIGATOR) CATEGORY

Group	N	Mean Dev.	High Pre-Plus	High Pre-Minus	Low Pre-Plus	Low Pre-Minus	Total Pre-Plus	Total Pre-Minus
High Pre-Plus	20	-2.26		0.034	0.701	1.083		
High Pre-Minus	20	-2.29			0.772	1.171		
Low Pre-Plus	20	-1.68				0.428		
Low Pre-Minus	20	-1.35						
Total Pre-Plus	40	-1.97						0.253
Total Pre-Minus	40	-1.82						

TABLE XXIV

SIGNIFICANCE OF DIFFERENCES (t-RATIOS) BETWEEN SUBJECTS' REPORTED PERFORMANCE EFFICIENCY ON THE ANAGRAMS AFTER THEIR EVALUATION BY THE INVESTIGATOR

Group	N	Mean Dev.	High Plus	High Minus	Low Plus
High Plus	20	0.655		6.183^{a}	0.566
High Minus	20	-4.39			5.442^{a}
Low Plus	20	0.165			
Low Minus	20	-4.59			
Total Plus	40	0.41			
Total Minus	40	-4.49			

Group	N	Mean Dev.	Low Minus	Total Plus	Total Minus
High Plus	20	0.655	6.947^{a}		
High Minus	20	-4.39	0.278		
Low Plus	20	0.165	6.112^{a}		
Low Minus	20	-4.59			
Total Plus	40	0.41			8.551^{b}
Total Minus	40	-4.49			

[a] 40 degrees of freedom; t = 3.551 at 0.001.

[b] 60 degrees of freedom; t = 3.460 at 0.001.

What is the extent of the shift in reported mean performance level after the investigator's evaluation? Table XXV presents the pre- and post-evaluation scores[11] on felt performance and the t-ratios for all the comparisons. All but one is significant at better than the 0.05 level of confidence. We may also inquire as to which group showed the greatest absolute change in felt performance following the investigator's evaluation; i.e., independent of direction. Table XXVI presents the <u>absolute</u> shifts and the t-ratios for all the comparisons. The greatest absolute changes in reported feeling about performance take place in the High Anxious group which received a positive evaluation and in the Low Anxious group which received a negative evaluation. The High Anxious group's shift after this positive evaluation is significantly greater (0.05 level) than the Low Anxious group's shift after the same evaluation. The Low Anxious group's greater shift after the negative evaluation falls short of significance at the 0.10 level when compared with the High Anxious group's shift after the same evaluation (t = 1.669 where t = 1.684 is needed). The interpretation of these significant findings, with regard to subjects' shift in self-evaluation, will be discussed in the next chapter.

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[11] These scores represent the <u>algebraic</u> mean shift in self-evaluation.

TABLE XXV

THE SIGNIFICANCE OF THE DIFFERENCE BETWEEN THE SUBJECTS' REPORTED PERFORMANCE EFFICIENCY ON THE ANAGRAMS PRIOR TO THE INVESTIGATOR'S EVALUATION AND THEIR REPORT AFTER THE EVALUATION

Group	N	Mean Dev.	High Plus 0.655[a]	High Minus -4.39[a]	Low Plus 0.165[a]
High Pre-Plus	20	-2.26	3.324	2.512	2.703
High Pre-Minus	20	-2.29	3.498	2.589	2.848
Low Pre-Plus	20	-1.68	2.909	3.531	2.236
Low Pre-Minus	20	-1.35	2.485	3.923	1.828
Total Pre-Plus	40	-1.97			
Total Pre-Minus	40	-1.82			

Group	N	Mean Dev.	Low Minus -4.59[a]	Total Plus 0.41[a]	Total Minus -4.49[a]
High Pre-Plus	20	-2.26	2.949		
High Pre-Minus	20	-2.29	3.067		
Low Pre-Plus	20	-1.68	4.141		
Low Pre-Minus	20	-1.35	4.551		
Total Pre-Plus	40	-1.97		3.876	
Total Pre-Minus	40	-1.82			4.846

40 degrees of freedom; t = 1.684 at 0.10; t = 2.021 at 0.05; t = 2.423 at 0.02; t = 2.704 at 0.01; t = 3.551 at 0.001.

[a] Subjects' report of performance after investigator's evaluation.

TABLE XXVI

GROUP DIFFERENCES BETWEEN SUBJECTS' AVERAGE ABSOLUTE SHIFT IN REPORTED PERFORMANCE FROM PRE- TO POST-INVESTIGATOR EVALUATION

Group	N	Mean Shift[1]	High Plus	High Minus	Low Plus
High Plus	20	3.915		1.377	2.409[a]
High Minus	20	2.800			0.979
Low Plus	20	2.150			
Low Minus	20	3.255			
Total High	40	3.358			
Total Low	40	2.703			
High + and Low -	40	3.585			
High - and Low + ...	40	2.475			

Group	N	Mean Shift[1]	Low Minus	Total Low	High - and Low +
High Plus	20	3.915	0.815		
High Minus	20	2.800	0.609		
Low Plus	20	2.150	1.669		
Low Minus	20	3.255			
Total High	40	3.358		1.018	
Total Low	40	2.703			
High + and Low -	40	3.585			2.056[b]
High - and Low + ...	40	2.475			

[1] Absolute shift (disregarding direction).

[a] 40 degrees of freedom; t = 2.021 at 0.05; t = 1.684 at 0.10.

[b] 70 degrees of freedom; t = 1.994 at 0.05.

CHAPTER V

DISCUSSION

Like the results chapter, the discussion will follow the same organization as the hypotheses. Where pertinent, supplementary data will be discussed.

Performance on the Anagram Task

As noted in the results (p. 26), the differences in performance between the High and Low Anxious groups are not significant. One explanation for this unexpected result is that the challenge of the anagram task minimized any difference in initial anxiety level. The strength of this challenge (motivation) is clearly indicated by the subjects' answers to the questions appraising their motivation. As a consequence, the initial level of stimulation for all the subjects may have been near point B (see Figure 1, p. 4) where the difference in expected performance between the High and Low Anxious is very small.

It was also reported (pp. 28-29) that the investigator's report had a significantly different effect upon the performance of the High

and Low Anxious groups. The entire analysis of the subjects' report on their feelings about the anagram task (pp. 52-67) clarifies this result. Recall that the High Anxious initially felt that they worked significantly harder than the others and tended to feel less achievement. Imagine their surprise when the examiner told them they performed very well! Two things might have resulted. First the surprise itself, nonappropriate for anagram solution, may have been sufficiently large and lasting to interfere with efficiency on performance. Second, increased motivation and a desire to maintain "good" performance may have been stimulated. This increase may have pushed the subjects' drive level beyond an optimum point and performance became poorer. Since efficient performance on anagrams apparently depends upon the ability to rapidly select and test alternate approaches (flexibility), the poorer performance is attributed to an increase in these subjects' rigidity.

Similar reasoning may be applied to the performance by the Low Anxious group. Despite its report that it too worked hard and felt failure on the anagram task, the fact that it responded in a Low Anxious manner on the M.M.P.I. probably means that this group generally felt adequate and comfortable. The investigator's "approval" was undoubtedly less surprising to this group than it was to the High

Anxious. Apparently the realignment of examiner appraisal and the general attitudes these subjects held dissipated any ''failure-aroused'' tensions. The relaxed attitude, conducive to flexibility, made for improvement in anagram solution time. We know too, by implication, that Low Anxious subjects feel less than do High Anxious subjects that the events in the environment are directed personally. Consequently, the investigator's report of failure was considered more objective than ''threatening.'' It may have produced mild surprise and transient interfering responses which prevented improved performance. But, generally speaking, the absence of ''personal threat'' enabled the subjects to go on to the second anagram set without change in drive level and without a meaningful reduction in performance.

Two unanticipated but nevertheless relevant findings require discussion. The interaction of the order of anagram list presentation and the evaluation by the investigator is significant at the 0.05 level of confidence (see pp. 30-31). The author cannot offer any meaningful interpretation for this result. What happened is that, given either a positive or a negative evaluation, the subjects who started on list A are affected differently than the subjects who started on list B. These differences cannot reasonably be attributed to differences in list difficulty. In the first place, there were no list

differences revealed by the analysis of variance. Secondly, any given list was followed not only by poorer performance under one set of evaluation conditions but also by better performance under the other evaluation. It is felt, nevertheless, that the other results are not complicated by this particular finding, since an equal number of subjects from both anxiety level groups were assigned to each list order and to each evaluation category.

Another, but this time meaningful, interaction was found. There is a significant triple interaction between anxiety level, anagram difficulty level, and investigator evaluation (see pp. 30, 32). This finding clearly demonstrates the complexity of our problem. There is no significant change in performance when the interaction of anxiety level and anagram difficulty level is examined. But the interaction becomes significant relative to the nature of the investigator's evaluation. Apparently, the High Anxious group's greater sensitivity to social interaction makes for more changes in their subsequent performance (see Table X, p. 33). In addition, it would appear that for both High and Low Anxious subjects, a report which agrees with their self-concept (whether optimistic or pessimistic) contributes more toward improvement of performance on other than easy anagrams than a report which contradicts that self-concept. This means

that a negative report to High Anxious subjects who feel that it is accurate can improve their subsequent performance on tasks of moderate difficulty. On the other hand, a report stated in positive or complimentary terms to High Anxious subjects who feel that it is inaccurate leads to slightly poorer performance. The Low Anxious subjects improve in their performance on the moderately difficult tasks after they are complimented.

Relationship Between Degree of Manifest Anxiety and Grade-Point Average

Additional emphasis will now be given the finding concerning women subjects and the relationship between degree of manifest anxiety and grade-point average. Tables XI and XII indicate that High Anxious women are the poorest achievers (Mean = 2.10) and Low Anxious women, with "Defensive Lows" removed, the best (Mean = 2.67). It is possible that the Low Anxious women, performing under heightened motivation (strong affiliation need or achievement motive)[12] are near the point of optimal facilitation while the additional motivation inherent in an anxiety state has pushed the High Anxious subjects

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[12] A reported characteristic of undergraduate college women (24).

beyond this point and performance suffers. The "Defensive-Low" women also are subject to the added stimulation of a basic anxiety state and perform significantly poorer (Mean = 2.26) than the truly Low Anxious women (see Figure 2, p. 43).

Relationship Between Mechanisms for Handling Anxiety and Intellectual Performance

Another personality variable beside "Defensive-Low" which apparently influences the effect of anxiety on intellectual performance is the degree of the subjects' awareness of anxiety. Carp (2) has used the Welsh Internalization ratio as a measure of this awareness and found more favorable treatment results on anxious patients who indicate greater awareness. Accordingly, the same ratio was used in the present study as a measure of awareness or as one characteristic approach toward managing basic feelings of anxiety. Anxious subjects in whom awareness was higher (higher internalization ratios) were also those in whom performance was better. Presumably, the anxious subjects with low internalization ratios are people who use up energy to "act out." Thus they "unconsciously" avoid recognition of anxiety pressures within themselves. As a result of these inappropriate ("acting out") responses their intellectual efficiency suffers.

Still another measure from the M.M.P.I. was used to evaluate the defense mechanisms for handling anxiety. We noted (pp. 37-38) how a "Defensive-Low" group was selected on the basis of an Hy scale "peaked" above the expected average of 50 and a D scale "deflated" below this average. As suggested, the extreme scores on these two scales represent different mechanisms for handling anxiety. For example, an extremely high Hy score represents the characteristic answers (on the M.M.P.I.) of neurotics with conversion hysteria symptoms. These persons "unconsciously" develop somatic symptoms in order to deny release and personal awareness of anxiety-producing sources. Feelings of manifest anxiety are not only curbed but the person also no longer needs to use psychic energy to combat the source of anxiety. The somatic symptom precludes such a need. Relatively speaking, this kind of neurotic has greater freedom to perform on tasks isolated from his source of anxiety. On the other hand, the extremely low D score can be understood as a "reaction formation" defense.[13] This "unconscious" defense demands a more active expenditure of energy for its maintenance and

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[13] Note the extremely low Anxiety Index and internalization ratio for this group in Table XXVII.

leaves little energy for use on other tasks. If these formulations from the theory of personality dynamics are true, the low D group should perform more poorly than the High Hy group. Table XXVII indicates that this is so. In accord with the theory, the high Hy group withstands the situational frustration of the anagram task on set I and improves its performance on set II. The low D group becomes progressively poorer as the frustration presumably mounts over the two sets of anagrams. The differences between the groups' performances were tested for significance and the difference between the means of the anagram rigidity scores for the second set approaches the 0.05 level ($\underline{t} = 2.049$ where $\underline{t} = 2.093$ is required).

This empirical finding within the "Defensive-Low" group was further, and independently, verified by a "peak-score" analysis of the apparently homogeneous High Anxious group. The hypothesis is that subjects who obtain different "peak-score" patterns on the M.M.P.I. will reveal significant differences in intellectual performance. The results of this analysis (pp. 48-50) indicate clearly that it is not level of anxiety alone, but also the accompanying methods of dealing with anxiety which influence intellectual performance.

TABLE XXVII

ANAGRAM RIGIDITY SCORE RELATED TO INTERNALIZATION RATIO AND ANXIETY INDEX WITHIN THE "DEFENSIVE-LOW" GROUP

Group	N	Anagram Rigidity		Internalization Ratio	Anxiety Index
		Score I	Score II		
Hy above 64	12	0.4237	0.4027	0.9541	31.33
D below 36	9	0.5463	0.6480	0.7551	26.11

Relationship Between Degree of Manifest Anxiety and the Subject's Attitudes and Motivation Toward the Anagram Task

The analysis of this relationship was made (pp. 52-59) in an attempt to provide objective evidence that both High and Low Anxious subjects were comparably motivated by the anagram task. The results are sufficiently clear to eliminate the need for additional discussion in this regard.

As expected, the contrast of evaluating effort on the anagrams using the self as a criterion with evaluating effort using others as a criterion produced a significant difference between the groups. The High Anxious subjects felt they worked harder than the average person significantly more than the Low Anxious subjects reported. This was true despite the fact that no significant difference between the groups was found when they were compared for degree of effort using their own capacities as a criterion.

Coupling this significant difference in feelings of comparative effort with trends appearing in the analyses of the other questions provides behavioral validity for the Anxiety Index. In the other questions the High Anxious consistently tended to be more extreme than the Low Anxious. They felt they worked farther beyond their own moderate effort level than did the Low Anxious and felt too that they

performed even poorer than the feeling of poor performance reported by the Low Anxious. The direction of all of these differences are consistent with the behavior one expects from an anxious person.

Relationship Between Degree of Manifest Anxiety and the Subject's Shift in Attitude Concerning His Relative Performance

The subjects clearly were responding to the investigator's evaluation (pp. 60-67). Close analysis of the data suggests some interesting directional trends. The author again offers two formulations relating to personality theory[14] to explain these trends.

First, it appears that the subjects felt the least need to shift their self-evaluation when the investigator's report was congruent with their self-concept. For example, the High Anxious subjects shifted less with a negative report than with a positive one. Likewise, the Low Anxious subjects shifted less with a positive report than with a negative one.

Second, since a Low Anxious person is supposedly less subject than a High Anxious one to hurt feelings and personal sensitivity

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[14] These formulations are even more meaningful when we consider that they also provide a clearer understanding of the changes in efficiency of anagram solution following the investigator's evaluation (see pp. 68-70).

[illegible]

[illegible]

[illegible]

[illegible]

the more marked shift by the Low Anxious subjects after a negative report is clear. The report was apparently considered to be "objective," not personal, and the subject checked his performance toward the lower end of the continuum without feelings of threat. Not so with the High Anxious person. Although he spontaneously reported poorer performance before outside evaluation, the report was apparently viewed as a personal threat and the need to defend against inadequacy feelings arose. This need is reflected in the "refusal to admit" to a performance as extremely poor as that suggested by the investigator even though the subject did check a poorer performance than he did initially. This "defensiveness" was further revealed by the fact that now the High Anxious person did not feel that he performed as poorly (not statistically significant) as the Low Anxious person indicated.

CHAPTER VI

RECOMMENDATIONS FOR FURTHER STUDY

The present findings provide the basis for at least two recommendations for further study.

A much larger number of subjects should be used to compare Low Anxious women (''Defensive-Lows'' removed) with the same category of males. It is possible that the reported academic superiority of undergraduate women over men can be attributed to this single sex-group difference. Next, it would seem appropriate to attempt to determine the source of the extra motivation in the truly Low Anxious females. Is it ''masculine protest''? Is it a higher achievement need?

A final suggestion is related to the observation that mechanisms of defense against anxiety relate to performance. A meaningful extension of this finding would consist of a series of studies based upon theoretical descriptions of personality dynamics. In such projected investigations the relative effectiveness of various kinds of mechanisms for handling anxiety would be predicted from the theoretical statements relating to them. Studies like these would be especially provocative since they would also serve as tests of the theory.

CHAPTER VII

SUMMARY AND CONCLUSIONS

The major problem of this study was to examine the effects of varying levels of manifest anxiety upon intellectual performance. Particular emphasis was placed on the subjects' methods of dealing with anxiety.

Eighty subjects, forty High Anxious and forty Low Anxious, were asked to solve two sets of twelve anagrams (subdivided into three difficulty levels with four anagrams at each level). Immediately following completion of a set, each subject evaluated his work and compared it with his subjective assessment of the other subjects' work. After the first set, the investigator systematically gave either a positive or a negative evaluation of the subject's performance.

The differences in performance between High and Low Anxious groups, at each of the difficulty levels, were not statistically significant. However, the direction of each difference was in accord with the theoretical formulation as to interplay between task-relevant and task-irrelevant responses at different intensities of anxiety. As expected, neither the High nor the Low Anxious group was consistently

superior at all anagram difficulty levels. The Low group was superior at the easiest and at the most difficult level, and the High group was superior at the intermediate difficulty level.

The interaction between investigator's evaluation and anxiety level was significant. Negative evaluation (frustration) tended to improve performance of the High Anxious when the task was more difficult, while examiner "approval" tended to elicit poorer performance. Comparable examiner evaluations of Low Anxious groups yielded a contrasting picture (beyond the easy anagram level). Negative evaluation was followed by minimal or no change, while "approval" tended to improve performance. Both negative and positive evaluations were followed by significantly poorer performance in both groups on the easy anagrams.

A bow-type function was obtained, for the most part, between degree of manifest anxiety and grade-point average (N = 173). Only female members of the lowest anxiety group deviated from this pattern, since they achieved the highest grade-point average of any subgroup. Aside from this single discrepancy, an intermediate level of anxiety resulted in the best academic performance.

It was found that variations in the anxiety index proved insufficient to account for performance differences on both grade-point

average and anagram rigidity. The habit pattern, characteristic of each subject's method of handling anxiety, appeared to be important in determining his generalized intellectual efficiency. The characteristic ways of handling anxiety were inferred from the M.M.P.I.--combinations of peak-scores or the Welsh Internalization ratio. High internalization (for Anxious subjects only) was associated with greater intellectual efficiency.

The data obtained from each subject's evaluation of his performance tended to validate the notion of generalized manifest anxiety. The fact that the High Anxious tended to underestimate their achievement level and overestimated, significantly more than the Low Anxious, the amount of effort they had to expend as compared with others was considered validating evidence.

The present findings indicate that the relationship between manifest anxiety and intellectual performance is complex. Ways of handling anxiety, examiner evaluation, and task difficulty all influence this relationship.

In closing, it is possible to summarize the results by saying that all hypotheses given in Chapter II were substantially upheld except for Hypothesis 1 of Subproblem A. In the latter case, the <u>direction</u> of the results was in keeping with this hypothesis.

BIBLIOGRAPHY

1. Bitterman, M. E., and W. H. Holtzman. Conditioning and extinction of the galvanic skin response as a function of anxiety. *J. abnorm. soc. Psychol.*, 1952, 47, 615-623.

2. Carp, A. M.M.P.I. performance and insulin shock therapy. *J. abnorm. soc. Psychol.*, 1950, 45, 721-726.

3. Child, I. L., and I. K. Waterhouse. Frustration and the quality of performance: II. A theoretical statement. *Psychol. Rev.*, 1953, 60, 127-139.

4. Cochran, W. G., and Gertrude M. Cox. *Experimental designs*. New York: John Wiley and Sons, Inc., 1950.

5. Courts, F. A. Relations between experimentally induced muscular tension and memorization. *J. exp. Psychol.*, 1939, 25, 235-256.

6. Deese, J. E., R. S. Lazarus, and J. Keenan. Anxiety, anxiety reduction, and stress in learning. *J. exp. Psychol.*, 1953, 46, 55-60.

7. Farber, I. E., and K. W. Spence. Complex learning and anxiety. *J. exp. Psychol.*, 1953, 45, 120-125.

8. Haggard, E. A. Some conditions determining adjustment during and readjustment following experimentally induced stress. In S. S. Tompkins (Ed.), *Contemporary psychopathology*. Cambridge: Harvard Univ. Press, 1943.

9. Hathaway, S. R., and J. C. McKinley. *Manual Minnesota Multiphasic Personality Inventory (Rev.)*. New York: The Psychological Corporation, 1951.

10. Hilgard, E. R., L. V. Jones, and S. J. Kaplan. Conditioned discrimination as related to anxiety. *J. exp. Psychol.*, 1951, 42, 94-99.

11. Lindquist, E. F. *Design and analysis of experiments in psychology and education*. New York: Houghton Mifflin Company, 1953.

12. Malmo, R. B. Experimental studies of mental patients under stress. In Reymert, M. L. (Ed.), *Feeling and Emotion*. New York: McGraw-Hill, 1950.

13. May, R. *The meaning of anxiety*. New York: The Ronald Press Co., 1950.

14. Montague, E. K. The role of anxiety in serial rote learning. *J. exp. Psychol.*, 1953, 45, 91-96.

15. Sarason, S. B., and G. Mandler. Some correlates of test anxiety. *J. abnorm. soc. Psychol.*, 1952, 47, 810-817.

16. Sarason, S. B., G. Mandler, and P. G. Craighill. The effect of differential instructions on anxiety and learning. *J. abnorm. soc. Psychol.*, 1952, 47 (No. 2, Morton Prince Memorial Supplement), 561-565.

17. Sargent, S. S. Thinking processes at various levels of difficulty. *Arch. Psychol.*, 1940, No. 249.

18. Snedecor, G. W. *Statistical methods* (4th ed.). Ames, Iowa: The Collegiate Press, 1946.

19. Spence, K. W., and I. E. Farber. Conditioning and extinction as a function of anxiety. *J. exp. Psychol.*, 1953, 45, 116-119.

20. Taylor, Janet A. A personality scale of manifest anxiety. *J. abnorm. soc. Psychol.*, 1953, 48, 285-290.

21. Taylor, Janet A. The relationship of anxiety to the conditioned eyelid response. *J. exp. Psychol.*, 1951, 41, 81-92.

22. Taylor, Janet A. The relationship of anxiety to the conditioned eyelid response. Unpublished Ph.D. dissertation. State Univ. of Iowa, 1949.

23. Taylor, Janet A., and K. W. Spence. The relationship of anxiety level to performance in serial learning. J. exp. Psychol., 1952, 44, 61-64.

24. Veroff, J., S. Wilcox, and J. W. Atkinson. The achievement motive in high school and college age women. J. abnorm. soc. Psychol., 48, 1953, 108-119.

25. Welch, L., and J. Kubis. The effect of anxiety on the conditioning rate and stability of the PGR. J. Psychol., 1947, 23, 83-91.

26. Welsh, G. S. An anxiety index and an internalization ratio for the M.M.P.I. J. consult. Psychol., 1952, 16, 65-72.

27. Wesley, Elizabeth L. Perseverative behavior in a concept-formation task as a function of manifest anxiety and rigidity. J. abnorm. soc. Psychol., 1953, 48, 129-134.

APPENDIXES

APPENDIX A

Tables

TABLE XXVIII

SUMMARY DATA OF SOLUTION TIME SCORES ON ANAGRAMS PRIOR TO THE INVESTIGATOR'S REPORT: SET I

Group	Easy	Intermediate
High A, Pre-Plus, N = 10		
ΣX	62.00	494.00
Mx	6.20	49.40
$(\Sigma X)^2$	3,844.00	244,036.00
ΣX^2	1,056.46	53,239.00
High A, Pre-Minus, N = 10		
ΣX	43.90	570.80
Mx	4.39	57.08
$(\Sigma X)^2$	1,927.21	325,812.64
ΣX^2	415.99	53,383.84
High B, Pre-Plus, N = 10		
ΣX	44.40	391.10
Mx	4.40	39.11
$(\Sigma X)^2$	1,971.36	152,959.21
ΣX^2	412.88	20,907.91
High B, Pre-Minus, N = 10		
ΣX	36.40	967.30
Mx	3.64	96.73
$(\Sigma X)^2$	1,324.96	935,669.29
ΣX^2	238.00	151,383.25

TABLE XXVIII (Continued)

Difficult	Total	$(\text{Total } \Sigma X)^2$	$\sum_{1}^{10}(E+I+D)^2$
1,629.50	2,185.50		
162.95	218.55		
2,655,270.25		4,776,410.25	
378,710.75	433,006.21		669,572.61
2,234.50	2,849.20		
223.45	284.92		
4,992,990.25		8,117,940.64	
590,584.25	644,384.08		969,342.54
2,062.00	2,497.50		
206.20	249.75		
4,251,844.00		6,237,506.25	
550,159.00	571,479.79		781,973.73
2,512.00	3,515.70		
251.20	351.57		
6,310,144.00		12,360,146.49	
651,652.00	803,273.25		1,328,302.97

TABLE XXVIII (Continued)

Group	Easy	Intermediate
Low A, Pre-Plus, N = 10		
ΣX	47.20	809.90
Mx	4.72	80.99
$(\Sigma X)^2$	2,227.84	655,938.01
ΣX^2	519.88	92,784.85
Low A, Pre-Minus, N = 10		
ΣX	34.80	832.90
Mx	3.48	83.29
$(\Sigma X)^2$	1,211.04	693,722.41
ΣX^2	218.28	107,929.81
Low B, Pre-Plus, N = 10		
ΣX	25.80	748.75
Mx	2.58	74.88
$(\Sigma X)^2$	665.64	560,626.56
ΣX^2	167.66	128.268.23
Low B, Pre-Minus, N = 10		
ΣX	29.10	506.10
Mx	2.91	50.61
$(\Sigma X)^2$	846.81	256,137.21
ΣX^2	122.23	50,046.01
Total		
$\Sigma\Sigma X$	323.60	5,320.85
$\Sigma\Sigma X^2$	3,151.38	657,942.90
$(\Sigma\Sigma X)^2$	104,716.96	28,311,444.72

TABLE XXVIII (Continued)

Difficult	Total	(Total $\Sigma X)^2$	$\sum_{1}^{10}(E+I+D)^2$
2,125.00	2,982.10		
212.50	298.21		
4,515,625.00		8,892,920.41	
507,625.00	600,929.73		997,970.91
2,601.90	3,469.60		
260.19	346.96		
6,769,883.61		12,038,124.16	
721,239.31	829,387.40		1,324,181.58
2,416.00	3,190.55		
241.60	319.06		
5,837,056.00		10,179,609.30	
660,570.50	789,006.39		1,227,301.24
1,798.50	2,333.70		
179.85	233.37		
3,234,602.25		5,446,155.69	
500,940.25	551,108.49		832,201.05
17,379.40	23,023.85		
4,561,481.06	5,222,575.34		
302,043,544.36	330,459,706.04	530,097,668.82	

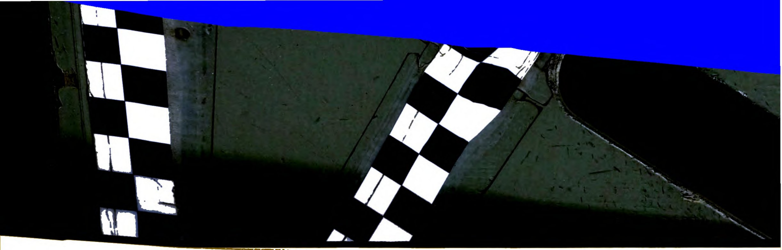

TABLE XXIX

SUMMARY DATA OF SOLUTION TIME SCORES ON ANAGRAMS AFTER THE INVESTIGATOR'S REPORT: SET II

Group	Easy	Intermediate
High B, Post-Plus, N = 10		
ΣY	76.90	434.90
My	7.69	43.49
$(\Sigma Y)^2$	5,913.61	189,138.01
ΣY^2	3,192.81	36,132.03
High B, Post-Minus, N = 10		
ΣY	28.60	522.20
My	2.86	52.22
$(\Sigma Y)^2$	817.96	272,692.84
ΣY^2	139.20	42,461.14
High A, Post-Plus, N = 10		
ΣY	129.10	492.90
My	12.91	49.29
$(\Sigma Y)^2$	16,666.81	242,950.41
ΣY^2	3,325.89	35,413.11
High A, Post-Minus, N = 10		
ΣY	205.50	859.40
My	20.55	85.94
$(\Sigma Y)^2$	42,230.25	738,568.36
ΣY^2	11,143.85	119,862.56

TABLE XXIX (Continued)

Difficult	Total	(Total $\Sigma Y)^2$	$\sum_{1}^{10}(E+I+D)^2$
2,275.00	2,786.80		
227.50	278.68		
5,175,625.00		7,766,254.24	
560,346.50	599,671.34		800,636.36
1,558.40	2,109.20		
155.84	210.92		
2,428,610.56		4,448,724.64	
385,593.78	428,194.12		604,439.36
2,316.50	2,938.50		
231.65	293.85		
5,366,172.25		8,634,782.25	
572,344.75	611,083.75		904,336.83
2,047.00	3,111.90		
204.70	311.19		
4,190,209.00		9,683,921.61	
521,384.00	652,390.41		1,223,671.77

TABLE XXIX (Continued)

Group	Easy	Intermediate
Low B, Post-Plus, N = 10		
ΣY	56.10	599.00
My	5.61	59.90
$(\Sigma Y)^2$	3,147.21	358,801.00
ΣY^2	682.21	71,735.50
Low B, Post-Minus, N = 10		
ΣY	36.10	604.20
My	3.61	60.42
$(\Sigma Y)^2$	1,303.21	365,057.64
ΣY^2	256.93	71,837.44
Low A, Post-Plus, N = 10		
ΣY	107.10	538.00
My	10.71	53.80
$(\Sigma Y)^2$	11,470.41	289,444.00
ΣY^2	2,161.95	58,130.00
Low A, Post-Minus, N = 10		
ΣY	71.60	789.50
My	7.16	78.95
$(\Sigma Y)^2$	5,126.56	623,310.25
ΣY^2	1,210.82	170,686.75
Total		
$\Sigma\Sigma Y$	711.00	4,840.10
$\Sigma\Sigma Y^2$	22,113.66	606,258.53
$(\Sigma\Sigma Y)^2$	505,521.00	23,426,568.01

TABLE XXIX (Continued)

Difficult	Total	$(\text{Total } \Sigma Y)^2$	$\sum_{1}^{10}(E+I+D)^2$
2,219.50	2,874.60		
221.95	287.46		
4,926,180.25		8,263,325.16	
587,940.25	660,357.96		986,758.26
2,096.50	2,736.80		
209.65	273.68		
4,395,312.25		7,490,074.24	
497,844.75	569,939.12		834,570.76
1,514.20	2,159.30		
151.42	215.93		
2,292,801.64		4,662,576.49	
321,924.34	382,216.29		640,453.73
2,200.50	3,061.60		
220.05	306.16		
4,842,200.25		9,373,394.56	
588,186.25	760,083.82		1,241,666.42
16,227.60	21,778.70		
4,035,564.62	4,663,936.81		
263,335,001.76	287,267,090.77	474,311,773.69	

TABLE XXX

SUMMARY DATA FOR THE PRODUCT OF SET I AND SET II SOLUTION TIME SCORES

Group	Item	Easy	Intermediate	Difficult
High A + B	ΣXY	349.26	21,409.65	405,305.50
High A - B	ΣXY	155.07	27,990.05	405,182.35
High B + A	ΣXY	377.71	23,314.55	461,499.25
High B - A	ΣXY	1,413.42	8,052.70	522,294.00
Low A + B	ΣXY	332.26	53,599.75	473,213.50
Low A - B	ΣXY	136.94	29,617.58	541,311.60
Low B + A	ΣXY	400.30	72,658.10	408,468.80
Low B - A	ΣXY	176.30	86,831.15	469,020.50
Total		3,341.26	433,473.53	3,686,295.50
	ΣΣXΣΣY	230,079.60	25,753,446.08	283,025,951.44

[a] Σ Subjects' XY.

[b] Σ Groups' XY.

TABLE XXX (Continued)

Total	$[\sum_{1}^{10}(E+I+D)_X][\sum_{1}^{10}(E+I+D)_Y]$	(Total ΣX)(Total ΣY)
427,064.41	654,874.22	6,090,551.40
433,327.47	702,984.61	6,009,532.64
485,191.51	724,433.31	7,338,903.75
641,760.12	1,176,540.92	10,940,506.83
527,145.51	887,675.58	8,572,344.66
571,066.12	926,762.85	9,495,601.28
481,527.20	824,714.18	6,889,354.62
556,027.95	958,067.13	7,144,855.92
4,123,110.29	6,856,052.80[a]	62,481,651.10[b]
309,009,477.12		

TABLE XXXI

TEST FOR HOMOGENEITY OF VARIANCE, GROUPINGS PRIOR TO REPORT

Groups	ΣX^2	d.f.	σ^2	$\log \sigma^2$
1. High A (+)	273,792.535	29	9,441.1219	3.9750
2. High A (-)	373,786.059	29	12,889.1744	4.1102
3. High B (+)	363,562.915	29	12,536.6522	4.0982
4. High B (-)	391,268.367	29	13,492.0127	4.1301
5. Low A (+)	304,499.050	29	10,499.9672	4.0212
6. Low A (-)	428,116.595	29	14,762.6412	4.1692
7. Low B (+)	449,686.082	29	15,506.4166	4.1905
8. Low B (-)	369,569.967	29	12,743.7920	4.1053
Total	2,954,281.57	232		32.7997

a. $\bar{\sigma}^2 = 12{,}733.97$

b. $n \log \bar{\sigma}^2 = 32.83966$

c. $\Sigma \log \sigma^2 = 32.79970$

d. Difference = 0.03996

e. (Difference)(K - 1) = 0.35964

f. (2.3026)(e)

$\chi 2 = 0.828107$

TABLE XXXII

TEST FOR HOMOGENEITY OF VARIANCE, POST-REPORT RESULTS

Groups	ΣY^2	d.f.	σ^2	$\log \sigma^2$
1. High (A+) B	340,796.199	29	11,751.5931	4.0701
2. High (A-) B	279,903.299	29	9,651.8379	3.9846
3. High (B+) A	323,257.675	29	11,146.8164	4.0471
4. High (B-) A	329,593.023	29	11,365.2767	4.0556
5. Low (A+) B	384,913.788	29	13,272.8892	4.1230
6. Low (A-) B	320,269.979	29	11,043.7924	4.0431
7. Low (B+) A	226,797.074	29	7,820.5887	3.8932
8. Low (B-) A	447,637.335	29	15,435.7702	4.1885
Total	2,653,168.37	232		32.4052

a. $\bar{\sigma}^2 = 11,436.07056$

b. $n \log \bar{\sigma}^2 = 32.4662$

c. $\Sigma \log \sigma^2 = 32.4052$

d. Difference = 0.0610

e. (Difference)(K - 1) = 0.5490

f. (2.3026)(e)

$\chi^2 = 1.26$

TABLE XXXIII

TEST FOR HOMOGENEITY OF COVARIANCE

Groups	$\Sigma\Sigma XY - (\Sigma X\Sigma Y)/N$	d.f.	σ^2	$\log \sigma^2$
1. High A + B	224,046.0300	29	7,725.7252	3.8879
2. High A - B	233,009.7153	29	8,034.8178	3.9050
3. High B + A	240,561.3850	29	8,295.2202	3.9188
4. High B - A	277,076.5590	29	9,554.3641	3.9802
5. Low A + B	241,400.6880	29	8,324.1617	3.9203
6. Low A - B	254,546.0773	29	8,777.4509	3.9434
7. Low B + A	251,882.0462	29	8,685.5878	3.9388
8. Low B - A	317,866.0860	29	10,960.8995	4.0398
Total	2,040,388.5868	232		31.5342

a. $\bar{\sigma}^2 = 8,794.77839$

b. $n \log \bar{\sigma}^2 = 31.55376$

c. $\Sigma \log \sigma^2 = 31.53420$

d. Difference = 0.01956

e. (Difference)(K - 1) = 0.17604

f. (2.3026)(e)

$\chi^2 = 0.405$

TABLE XXXIV

ANALYSIS OF PRE-CONDITION RESPONSE TIME TO ANAGRAMS

Source	d.f.	Sum Squares	Mean Square	F
Total	239	3,013,835.0557		
A. Between Subjects	79	501,541.9240		
1. Between Groups	7	59,553.4863	8,507.64	1.39
a. Lists	1	10.8587	10.86	0.00
b. Anxiety	1	3,588.6533	3,588.65	0.58
c. Pre-Report	1	7,178.2812	7,178.28	1.17
d. (a) x (b)	1	15,136.0226	15,136.02	2.47
e. (a) x (c)	1	4,082.5127	4,082.51	0.67
f. (b) x (c)	1	17,531.7774	17,531.78	2.86
g. (a) x (b) x (c)	1	12,025.3804	12,025.38	1.96
2. Between Subjects in Same Group	72	441,988.4377	6,138.73	
B. Within Subjects	160	2,512,293.1317		
1. Difficulty	2	1,922,006.0387	961,003.02	256.29**
2. (B1) x (A1)	14	50,333.7435	3,595.27	0.96
a. (B1) x (A1a)	2	622.5479	311.27	0.08
b. (B1) x (A1b)	2	2,423.7768	1,211.89	0.32
c. (B1) x (A1c)	2	5,636.2016	2,818.10	0.75
d. (B1)(A1a)(A1b)	2	9,348.6793	4,674.34	1.25
e. (B1)(A1a)(A1c)	2	16,121.3005	8,060.65	2.15
f. (B1)(A1b)(A1c)	2	9,859.0523	4,929.53	1.31
g. (B1)(A1a)(A1b)(A1c)	2	6,322.1851	3,161.09	0.84
3. Pooled Subjects x Groups	144	539,953.3495	3,749.68	

** 2, 125 degrees of freedom; F = 4.78 at 0.01.

TABLE XXXV

ANALYSIS OF POST-CONDITION RESPONSE TIME TO ANAGRAMS

Source	d.f.	Sum Squares	Mean Square	F
Total	239	2,687,637.75		
A. Between Subjects	79	435,878.77		
1. Between Groups	7	34,469.38	4,924.20	0.88
a. Lists	1	2,431.43	2,431.43	0.44
b. Anxiety	1	54.24	54.24	0.01
c. Report	1	282.31	282.31	0.05
d. (a) x (b)	1	9,944.65	9,944.65	1.78
e. (a) x (c)	1	14,901.08	14,901.08	2.67
f. (b) x (c)	1	6,706.67	6,706.67	1.20
g. (a) x (b) x (c)	1	149.00	149.00	0.03
2. Between Subjects in Same Group	72	401,409.39	5,575.13	
B. Within Subjects	160	2,251,758.98	14,073.49	
1. Difficulty	2	1,614,539.57	807,269.79	199.00**
2. (B1) x (A1)	14	53,066.96	3,790.50	0.93
a. (B1) x (A1a)	2	2,250.49	1,125.25	2.77
b. (B1) x (A1b)	2	1,261.06	630.53	0.16
c. (B1) x (A1c)	2	8,271.70	4,135.85	1.02
d. (B1)(A1a)(A1b)	2	7,227.69	3,613.85	0.89
e. (B1)(A1a)(A1c)	2	8,431.62	4,215.81	1.04
f. (B1)(A1b)(A1c)	2	23,874.31	11,937.15	2.94
g. (B1)(A1a)(A1b)(A1c) . . .	2	1,750.10	875.05	0.22
3. Pooled Subjects x Groups	144	584,152.45	4,056.61	

** 2, 125 degrees of freedom; F = 4.78 at 0.01.

TABLE XXXVI-A

SOURCE DATA FOR ANALYSIS OF COVARIANCE BETWEEN SUBJECTS

Source	d.f.	x^2 Sum Squares	xy Sum Squares
Total	239	3,013,835.06	2,033,820.62
A. Between Subjects . . .	79	501,541.92	196,061.26
1. Between Groups	7	59,553.49	- 6,567.97
a. Lists	1	10.86	162.49
b. Anxiety	1	3,588.65	- 441.21
c. Report	1	7,178.28	1,423.57
d. Lists x Anxiety	1	15,136.02	12,268.76
e. Lists x Report	1	4,082.51	- 7,799.60
f. Anxiety x Report . . .	1	17,531.78	- 10,843.42
g. Lists x Anx. x Rept. .	1	12,025.38	- 1,338.56
2. Between Subjects in Same Group - Error .	72	441,988.44	202,629.23
		$C = 0.4584$	$C^2 = 0.2101$

* 1, 60 degrees of freedom; F = 4.00 at 0.05.

TABLE XXXVI-A (Continued)

y^2 Sum Squares	Residuals $(y - cx)^2$			F
	d.f.	Sum Squares	Mean Square	
2,687,637.75				
435,878.77				
34,469.38	7	53,003.08	7,571.87	1.74
2,431.43	1		2,284.74	0.53
54.24	1		1,212.72	0.28
282.31	1		485.34	0.11
9,944.65	1		1,876.73	0.43
14,901.08	1		22,909.49	5.27*
6,706.67	1		20,331.34	4.68*
149.00	1		3,902.72	0.90
401,409.39	71	308,500.68	4,345.08	

$2C = 0.9168$

TABLE XXXVI-B

SOURCE DATA FOR ANALYSIS OF COVARIANCE WITHIN SUBJECTS

Source	d.f.	x^2 Sum Squares	xy Sum Squares
B. Within Subjects	160	2,512,293.13	1,837,759.36
1. Difficulty	2	1,922,006.04	1,760,828.79
2. Difficulty x Group . . .	14	50,333.74	- 18,450.19
a. Difficulty x List	2	622.55	- 1,156.96
b. Difficulty x Anxiety . .	2	2,423.78	813.17
c. Difficulty x Report . .	2	5,636.20	- 2,395.43
d. (D) x (L) x (A)	2	9,348.68	7,330.49
e. (D) x (L) x (R)	2	16,121.30	- 10,251.57
f. (D) x (A) x (R)	2	9,859.05	- 10,180.13
g. (D) x (L) x (A) x (R) . .	2	6,322.19	- 2,609.76
3. Pooled Subjects by Groups--Error	144	539,953.35	95,380.76
		C = 0.1766	C^2 = 0.0312

* 2, 125 degrees of freedom; F = 3.07 at 0.05.

** F = 4.78 at 0.01.

TABLE XXXVI-B (Continued)

y^2 Sum Squares	Residuals $(y - cx)^2$			F
	d.f.	Sum Squares	Mean Square	
2,251,758.98				
1,614,539.57	2	231,887.53	115,943.77	29.23**
53,066.96	14	61,153.98	4,368.14	1.10
2,250.49	2	2,678.55	1,339.28	0.34
1,261.06	2	1,049.47	524.74	0.01
8,271.70	2	9,293.61	4,646.81	1.17
7,227.69	2	4,930.24	2,465.12	0.62
8,431.62	2	12,555.46	6,277.73	1.58
23,874.31	2	27,777.53	13,888.77	3.50*
1,750.10	2	2,869.12	1,434.56	0.36
584,152.45	143	567,310.51	3,967.21	

$2C = 0.3532$

TABLE XXXVII

NUMBER OF SUBJECTS NEEDING CUES FOR EACH OF THE ANAGRAMS

Group and Condition	Difficulty Division and Word Presentation Order												Total[1]
	Easy				Intermediate				Difficult				
	1	3	5	10	4	7	9	12	2	6	8	11	
High Anxious Pre-Report . . .		1	1	2	4	6	7	9	14	22	23	22	111
High Anxious Post-Report . . .	__	4	__	1	3	11	5	6	18	24	19	22	113
High Anxious Totals . . .		5	1	3	7	17	12	15	32	46	42	44	224
Difficulty Level Totals . . .	9				51				164				
Low Anxious Pre-Report . . .		2	1	1	5	7	4	9	17	29	17	18	110
Low Anxious Post-Report . . .	__	2	1	2	3	9	5	14	20	23	22	13	114
Low Anxious Totals . . .		4	2	3	8	16	9	23	37	52	39	31	224
Difficulty Level Totals . . .	9				56				159				

[1] Total Anagram presentations = 80 Subjects x 24 Words = 1920.

TABLE XXXVIII

NUMBER OF CUES NECESSARY BEFORE SOLUTION OF CUED WORDS WAS ATTAINED: THE NUMBER OF SUBJECTS IN EACH CUE FREQUENCY CATEGORY

Group and Condition	Number of Cues 1	2	3	4	5	6	Total
High Anxious Pre	39	43	21	7		1	111
High Anxious Post	46	35	19	8	2	3	113
High Anxious Total	85	78	40	15	2	4	224
Cues x Total	85	156	120	60	10	24	455
Low Anxious Pre	39	36	25	6	4		110
Low Anxious Post	57	27	17	10	3		114
Low Anxious Total	96	63	42	16	7		224
Cues x Total	96	126	126	64	35		447
Total Pre	78	79	46	13	4	1	221
Cues x Total	78	158	138	52	20	6	452
Total Post	103	62	36	18	5	3	227
Cues x Total	103	124	108	72	25	18	450
Grand Total	181	141	82	31	9	4	448
Cues x Total	181	282	246	124	45	24	902[a]

[a] Average number of cues per subject for both lists = 11.28.

TABLE XXXIX

FREQUENCY OF INTERNALIZATION RATIO SCORES AT VARYING LEVELS FOR THE HIGH, MIDDLE, AND LOW ANXIETY GROUPS

Internalization Ratio	Low Anxiety	Middle Anxiety	High Anxiety	Total
>1.10	1	2	16	19
0.90-1.09	13	23	20	56
0.80-0.89	14	13	4	31
0.60-0.79	12	1		13
Total	40	39	40	119

TABLE XL

SCALES EXTRACTED FROM THE M.M.P.I. CURRENT IN RESEARCH LITERATURE

Scale	Book No.	Card	Score
Ta	7	A55L	F
Ta, We	13/290	I34R	T
Ta, We	14	B19R	T
Ta	18	B18L	F
Ta, We	23/288	A15R	T
Ta, We	31	B35R	T
Ta, We, Wi	43	B28R	T
Ta	67	F36R	T
Ta	86	I39R	T
Ta, Wi	107	G12L	F
Ta	125	B15R	T
Ta	142	I37R	T
Ta	158	F51R	T
Ta	163	A 5L	F
Ta, We, Wi	186	A45R	T
Ta, Wi	190	A10L	F
Ta, We, Wi	191	B 4R	T
Ta, We	217	F46R	T
Ta	230	B10L	F
Ta, We, Wi	238	G21R	T
Ta	241	B36R	T
Ta, Wi	242	A 8L	F
Ta, Wi	263	B 3R	T
Ta	264	I40L	F

TABLE XL (Continued)

Scale	Book No.	Card	Score
Ta	287	H31L	F
Ta, We	301	I35R	T
Ta, We	321	F 4R	T
Ta	322	C18R	T
Ta, We	32/328	I27R	T
Ta, We	335	A26R	T
Ta, We	337	G 1R	T
Ta	340	G22R	T
Ta	352	H32R	T
Ta	361	I32R	T
Ta	317/362	F10R	T
Ta	*371-371	F 6L	F
Ta	*397-397	I31R	T
Ta	*382-407	F37L	F
Ta	*391-418	I36R	T
Ta	*378-424	B13R	T
Ta, We	*369-431	I54R	T
Ta, We	*385-439	G13R	T
Ta	*380-442	B29L	F
Ta, We	*387-499	H29R	T
Ta, We	*389-506	I33R	T
Ta	*373-523	A52L	F
Ta	*367-528	A51L	F
Ta	*376-530	A53R	T
Ta	*399-549	I41R	T
Ta, We	*394-555	J 4R	T
Tay, We	10	B11R	T

TABLE XL (Continued)

Scale	Book No.	Card	Score
Tay, Wi	29	B16R	T
Tay, Wi	44	A11R	T
Tay, We, Wi	72	B17R	T
Tay, Wi	114	A12R	T
Tay, Wi	189	A40R	T
Tay, We	360	H30R	T
Tay	*388-388	H46R	T
Tay	*384-405	A39L	F
Tay	*375-462	B22L	F
Tay	*379-474	B23L	F
Tay, We	*381-494	H50R	T
Tay	*392-535	B 5R	T
Tay, We	*370-543	G 2R	T
Tay, We	*386-559	J 6R	T
Winne	2	B12L	F
Winne	3	B27L	F
Winne, We	5	B31R	T
Winne	9	C17L	F
Winne	41	F44R	T
Winne	46	A24L	F
Winne	47	B 1R	T
Winne	51	A 2L	F
Winne	68	A50L	F
Winne	76	F49R	T
Winne	103	A44L	F
Winne	108	A13R	T
Winne	159	B 2R	T

TABLE XL (Continued)

Scale	Book No.	Card	Score
Winne	175	A16L	F
Winne	178	A27L	F
Winne (Stand. T)	**208	C48R	F**
Winne	236	F45R	T
Welsh	179	C51R	T
Welsh	351	H28R	T
Welsh	365	H49R	T
Welsh	395	I10R	T
Welsh	480	J36R	T

Expanatory notes:

Ta: Taylor 50-item Anxiety scale.

We: Welsh 31-item Anxiety scale.

Wi: Winne 30-item scale of Neuroticism.

Tay: Taylor 65-item Anxiety scale (original 50 items are marked Ta and additional 15 are marked Tay).

13/290: Paired numbers separated by a diagonal are duplicate M.M.P.I. items.

*382-407: Asterisk and paired numbers indicate the number on the Graff supplementary sheet first, followed by the item number in the M.M.P.I. booklet.

**: This item, scored F by Winne, is a contradiction of the initial M.M.P.I. standardization scoring of T.

Ta, We, Wi: Any combination of scale name abbreviations indicates the scale items which overlap on the various scales.

The original Taylor scale items were selected by 80 per cent agreement of five clinical psychologist judges.

The Welsh scale items were selected by at least 80 per cent agreement of ten clinical psychologist judges.

The Winne scale was constructed from results of a criterion-neurotic and a normal control study. The 30 items with the highest χ^2 differentiation were included in this scale.

Welsh reports a tetrachoric r of 0.91 between the 31-item scale and the Anxiety Index (the one used in this study) scores obtained by 50 subjects at the Oakland Mental Hygiene Center.

APPENDIX B

SUPPLEMENT USED TO ADD THE M.M.P.I. ITEMS WHICH ARE NOT IN THE SHORT FORM OF THE M.M.P.I., BUT WHICH ARE INCLUDED IN THE 65-ITEM TAYLOR SCALE OF MANIFEST ANXIETY

367. I blush no more often than others.

368. I cannot understand what I read as well as I used to.

369. I worry quite a bit over possible misfortunes.

370. Several times a week I feel as if something dreadful is about to happen.

371. I am not unusually self-conscious.

372. I very much like horseback riding.

373. I practically never blush.

374. At periods my mind seems to work more slowly than usual.

375. I have had no difficulty starting or holding my urine.

376. I am often afraid that I am going to blush.

377. I find it hard to set aside a task that I have undertaken, even for a short time.

378. I feel hungry almost all the time.

379. I have to urinate no more often than others.

380. I have had periods in which I lost sleep over worry.

381. I am afraid of finding myself in a closet or small closed space.

382. I am usually calm and not easily upset.

383. People often disappoint me.

384. I have no trouble swallowing.

385. It makes me nervous to have to wait.

386. I have often been frightened in the middle of the night.

387. I must admit that I have at times been worried beyond reason over something that really did not matter.

388. I am afraid to be alone in the dark.

389. I am a high strung person.

390. I have often met people who were supposed to be experts who were no better than I.

391. At times I think I am no good at all.

392. My mouth feels dry almost all the time.

393. The one to whom I was most attached and whom I most admired as a child was a woman (mother, sister, aunt, or other woman).

394. I sometimes feel that I am about to go to pieces.

395. I like to let people know where I stand on things.

396. Sometimes I am sure that other people can tell what I am thinking.

397. I have sometimes felt that difficulties were piling up so high that I could not overcome them.

398. I often think, "I wish I were a child again."

399. I shrink from facing a crisis or difficulty.

APPENDIX C

QUESTIONNAIRE FOLLOWING FIRST LIST OF ANAGRAMS

1. How do you *feel* you compare with others who have tried to unscramble these words? Please make a check mark where you feel you stand.

Poorest	Same	Best

2. How hard do you *feel* you tried (compared with the others) to get the correct word as quickly as possible?

Tried less than all the rest	Same	Tried harder than all the rest

3. How hard do you *feel* you tried (within your own abilities) to get the correct word as quickly as possible?

Made no extra effort	Tried to a moderate degree	Tried as hard as I was able

APPENDIX D

QUESTIONNAIRE FOLLOWING SECOND LIST OF ANAGRAMS

1. How did you feel when you found that you were not getting some words quickly?

2. How did you feel when the examiner began (and continued) to give you cues?

3. Had you known in advance what you would be asked to do in this experiment, would you still have volunteered? Why?

4. Now (after the second group of words), how do you feel you compare with others who have tried to unscramble these words? Please place a check mark where you feel you stand.

Poorest ______________________ Same ______________________ Best

5. How hard did you try on the second set when you compare it with the first set? Please check one.

Less hard_____ The same_____ Harder_____

6. What was your reaction to the examiner's report of your performance on the first set of words?