INTERACTION OF ANXIETY LEVEL, LECTURE ATMOSPHERE, AND TESTING ATMOSPHERE ON TEST SCORES

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ABSTRACT

Environmental atmospheres of lecture and test for high anxious and low anxious students were factorially manipulated in order to assess the effect on classroom test performance. Results indicated that an unrelaxed lecture atmosphere was more conducive to optimal test performance than a relaxed lecture atmosphere. Other factors and all interactions were found to be insignificant. Theoretical implications were discussed.

The concept of anxiety is so complex that it is difficult to study. For this reason many researchers have studied anxiety in particular stressful situations. Sarason, Davidson, Lighthall, Waite, & Ruebush (1960) chose test anxiety as an ideal area of investigation because of its "near-universal" experience, especially in the United States, which is "a test-giving and test-conscious culture." The individual places great significance on his test performance. Frequently, it affects the course of his life. Therefore, test anxiety is a profitable area of study.

Kurzwell (1968) suggests that mild examination anxiety is a normal experience, due to a student's latent feeling of inadequacy in the attempt to gain full command of the subject matter or skills presented to him. Mandler & Sarason (1952) were of the opinion that mild anxiety can mediate improvement in test scores. Other studies (Spielberger, 1966; Cattell & Sealy, 1965; Carlson & Ryan, 1969) have shown that high test anxiety has interfering effects on test performance. Spielberger's clinical observations suggest that college students feel that anxiety interferes with their thought processes during tests and that they often experience "blocking" in recall of "known" answers. College students in this study also reported that anxiety produces frequent misinterpretation of complex or ambiguous test questions. Spielberger reported that performance on more difficult questions (as compared to less difficult questions) is expected to be lower for high anxious students as compared to low anxious students. Sarason, et. al. (1960) have shown that the

presence of the teacher in the classroom during testing affects anxiety. They suggested that the teacher of anxious students is perceived as the authority figure who is going to pass judgment on one's adequacy. These researchers contend that the classroom itself is anxiety-provoking and should be the experimental setting in test anxiety studies. Classroom tests are generally complex and require the recall of unspecified elements from a larger body of materials learned in the recent but not the immediate past. Spielberger (1966) pointed out that students differ in the amount of study, and thus original learning, in preparation for such tests. However, sudden and previously unannounced tests ("pop" tests) over material presented within the class session control for the study variable to a degree. Kurzwell (1968) postulated that there is a general innate resistance to sudden inspection and suggests that test anxiety is usually high under the circumstances of "pop" tests.

The variable of intelligence is often excluded from anxiety studies, because it is questionable whether intelligence test scores adequately describe the underlying abilities of individuals who manifest high anxiety in the testing situation. This consideration is of particular importance since the relation of type of test to test performance seems to play an important determining role. It is essential that the experimenter examine previous test scores of these high anxious subjects (Ss) (Mandler & Sarason, 1952).

The predominant findings in test anxiety studies are consistent inverse functional relationships between school achievement and anxiety when measured by factor-pure scales (Cattell, Butcher, Connor, Sweney, & Tsujioka, 1961; Cattell & Sealy, 1965). Anxiety is more frequently

a cognitive disorganizer than an aid to learning, as shown by the loadings of the anxiety factor on reduced capacity for immediate memory, poorer simple calculation performance, etc. (Spielberger, 1966). Carlson & Ryan (1969) found significant negative correlations between test anxiety and higher levels of cognitive performance. West, Lee, and Anderson (1969) gave fifty-eight sixth and eighth graders the Test Anxiety Scale for Children and one form of an achievement test. Two forms of the test were used; one included irrelevant information in each item; the other included no irrelevant information. A significant interaction was obtained between selectivity and test anxiety.

Several studies have shown that anxiety does not affect performance. For example, Coren and Schulamn (1971) tested undergraduates under high and low test anxiety conditions on fifteen words selected from the Palermo and Jenkins word association norms. More common associative responses were emitted by the highly stressed group. Fisch (1971) collected data from fifty-two students in an introductory statistics course on habitual test anxiety, actual test anxiety, need achievement, motivation to study, estimate of intellectual capacity, and perceived difficulties following the course. He found no relationship between the amount of test anxiety and performance on the final test.

Drive Theory: The basic theory behind all of these studies is the Drive Theory, developed from the assumption of Hull (1934) that the excitatory potential, E, which determines the strength of a given response, R, is a multiplicative function of total effective drive state, D, and habit strength, H. Thus:

$$R = f(E) = f(D \times H)$$

Total effective drive results from the summation of all individual need states existent at a given time, irrespective of their source. The number and strength of specific habits elicited in any situation is determined by previous experience in the same or similar situation. All habit tendencies evoked in the subject interact multiplicatively with the total effective drive then operating (Spielberger, 1966). Predictions from Hullian theory regarding the effects of variations in D on performance have been succinctly stated by Taylor (1956):

> The implication of varying drive level in any situation in which a single habit is evoked is clear: the higher the drive, the greater the value of E and hence of response strength. Thus in simple noncompetitional experimental arrangements involving only a single habit tendency the performance level of high-drive Ss should be greater than that for low-drive groups. Higher drive levels should not, however, always lead to superior performance (i. e., greater probability of the appearance of the correct response). In situations in which a number of competing response tendencies are evoked, only one of which is correct, the relative performance of high and low drive groups will depend upon the number and comparative strengths of the various response tendencies.

Response interference hypothesis: Spence (1960) conceived of anxiety as an acquired drive which has the capacity to generally energize the organism. This conception is consonant with activation theory, within limits. That is, Spence views anxiety as a force that motivates the individual to perform. However his theory does not extend to a level of drive that disrupts performance. This omission may reflect the scarcity of laboratory data illustrating the interfering effects of high anxiety levels.

According to Spence's theory, in learning situations in which only one response is possible or in which the task is simple, anxiety

will energize the correct response to a greater extent than it will the incorrect ones, and will thus increase the speed of learning. Anxiety will energize or strengthen each of the habits in the hierarchy in proportion to the initial strength of the habit. Yet, as Levitt (1967) points out, most human learning is complex. He states that a complex situation is one in which there are a number of competing response tendencies, all of which are equally weak in habit strength. Therefore, the effect of anxiety as an energizer is to increase the habit strength of the many incorrect response tendencies to the disadvantage of the lone correct response. And learning will thus proceed more slowly.

The "response interference hypothesis," presented by Spence (1956), states that task-irrelevant responses which in some situations may interfere with efficient performance are more easily elicited in high than in low anxiety Ss. This hypothesis leads to the prediction that the performance of high anxiety Ss will be inferior to that of low anxiety Ss.

Response repertory hypothesis: Another view, advanced by Mandler and Sarason (1952), interprets anxiety as a learned drive with the characteristics of a strong stimulus. Anxiety is situationally evoked. The individual has learned or developed characteristic responses to anxiety which he brings with him to the current situation involving intellectual achievement (e. g. test situation). Two types or responses tend to be evoked: 1) responses which are not task-relevant (task-irrelevant) and that tend to disrupt performance; self-centered feelings of inadequacy, fear of failure, desire to leave the situation, etc., and 2) task-relevant responses which

facilitate performance by reducing the anxiety and lead to successful completion of the task.

This view leads to the hypotheses that: 1) individuals with strong anxiety drive (high anxious subjects) will perform more poorly than those with low anxiety drive when the task irrelevant responses interfere with adequate performance; 2) when the stimulus situation contains elements which specifically arouse test or achievement anxiety, this increase in anxiety will lead to poorer performance in individuals who have task-irrelevant anxiety responses in their response repertory. For individuals without such irrelevant response tendencies, these stimulus elements will raise their general drive level and result in improved performance. Such elements would be any suggestion that the individual is being judged, a statement of expected performance, etc. (Sarason, Mandler, Craighill, 1952).

The effects of "instruction set" on outcomes of test anxiety research has varied. Findings important to the present study suggest that ego-oriented instructions are more anxiety-provoking and that task-oriented instructions are relaxing and do not place much emphasis on competitiveness (Kellogg, 1971).

Much of the research on test anxiety has been conducted with the hope of finding solutions to the debilitating effects of anxiety on students who experience high test anxiety. Sarason, et. al. (1960) stated that the conditions under which test anxious children would not experience those reactions which ordinarily impair their performance are: 1) when problem-solving tasks are presented to them in such a way as to minimize the test-like atmosphere of the situation (e. g., game-like), and 2) when the nature of the instructions allow test

anxious children to have a relationship with the examiner which permits expression and partial support of their dependency needs (e. g., not standardized tests).

Sarason, Pederson, and Nyman (1968) found a correlation for college students between grade point averages and test anxiety scores to be significantly lower than a correlation between entrance examination and test anxiety scores. This suggests that in situations such as the classroom, highly anxious students may, through familiarity with the teacher, room, requirements, etc. overcome some of their concerns about being evaluated. Kurzwell (1968) has suggested reducing the competitive spirit in our school systems, establishing maximum flexibility of curricula, instructing teachers on the beneficial educational influence they can have through conducting a relaxed class and through relating on a personal, unauthoritarian basis with the students. Spielberger (1966) recommended group counseling for highly anxious students in which they can discuss ways to reduce their fears and interfering feelings in testing situations.

Smith, Ascough, Ettinger, and Nelson (1970) have contributed evidence that supports the hypothesis that exposure to humor may reduce anxiety and thereby affect task performance. A course examination was administered under standard classroom conditions in which approximately half of the students received a form of the examination containing one third humorous test items, while the remainder of the students received a nonhumorous form of the examination. A significant interaction was found between anxiety and humor, indicating that the effects of humor on performance differed as a function of level of anxiety. Humor and anxiety are incompatible, and humor

proved to be beneficial in testing situations. The humor served to inhibit anxiety so that the anxiety did not affect task-oriented behavior deteriously. Smith, et. al. noted that the optimal drive level concept would predict that humor-mediated anxiety reduction would facilitate performance only if the anxiety were above the optimal level required for performance of the task in question.

The present study factorially manipulated the environmental atmospheres of lecture and test for high anxious and low anxious subjects in order to determine the condition most conducive to classroom test performance. The manipulation of lecture atmosphere, in addition to the manipulation of test atmosphere, is the contribution of this study to the research on test anxiety. With the classroom as the experimental setting, the participating instructor delivered the same lecture and test to all subjects. Instructions given before and after the lecture and test differed among the groups under the relaxed and unrelaxed conditions. The instructions to the groups under relaxed conditions were task-oriented; they were intended to be relaxing and to place no emphasis on competitiveness. Previous data (Kellogg, 1971) has shown this approach to aid in the reduction of anxiety. The instructions to the groups under unrelaxed conditions were not designed to be ego-oriented, but were given in the anxiety-aroused atmosphere of an unannounced test.

Present hypotheses: The hypotheses of the present study were consistent with the theory advanced by Mandler and Sarason (1952). That is, high anxious Ss will perform more poorly than low anxious Ss when anxiety is situationally evoked in an evaluation situation. It was predicted in this study that a significant triple interaction

would be found in lecture, test, and anxiety levels such that: 1) high anxious Ss would perform best under relaxed lecture and test atmospheres, and 2) low anxious Ss would perform best under unrelaxed lecture and test atmospheres. A significant interaction was also expected between the relaxed type of test atmosphere and anxiety level, such that high anxious Ss would score higher on the test than would the low anxious Ss. A possibly significant interaction was expected between the type of lecture atmosphere and level of anxiety, such that high anxious Ss who received the lecture in a relaxed atmosphere would score higher than the low anxious Ss who received the same type of lecture. No interaction was predicted between the type of lecture and the type of test atmospheres. Also, no simple main effects of lecture, test, or anxiety levels were hypothesized. This final hypothesis is based on the rationale that high anxious (HA) students would possibly attend to the instructor more in a relaxed atmosphere; whereas, low anxious (LA) students tend to falter in attention to the instructor presenting the lecture. Likewise, it was assumed that HA students would score higher on classroom tests given in a relaxed atmosphere. On the other hand, LA students were expected to score lower on the test administered in a relaxed atmosphere. It is assumed that a relaxed atmosphere will reduce debilitating responses in HA students; thereby, enabling them to perform more effectively in the classroom and particularly on classroom tests. It is assumed that LA students will decrease their relevant responses initially. After conditioning to the new atmosphere, it is expected that LA students will again reach their optimal level of performance under relaxed environmental conditions

in the classroom.

Method

Subjects: Out of 120 naive students enrolled in two sections of Introductory Psychology taught by the same instructor at Appalachian State University, 72 were selected to serve as subjects on the basis of anxiety and previous test scores.

Materials: Sarason's (1958) Test Anxiety Scale (TAS) and pretest scores from class examinations were used in the study. The TAS is presented in Appendix A. A lecture outline on the topic for which a test was constructed was composed by the instructor and served as a guideline for the single 45 minute lecture presented in both classes. The scores on a fifteen-item multiple-choice test, which was administered immediately following the lecture, served as the dependent variable. The test is presented in Appendix B.

Procedure: The design of this experiment can best be conceptualized as a 2 x 2 x 2 (test anxiety by lecture atmosphere by testing atmosphere) factorial design.

The TAS was administered to both classes by the experimenter approximately three weeks before the start of the experiment. Students scoring in the highest and lowest thirty-five percent on the TAS (cut-off score of 10 for HA and of 6 for LA) in each class formed the HA and LA groups, respectively. Within these groups, subjects were equated for scores on earlier course examinations. The two classes (with HA and LA Ss in each) comprised the relaxed and unrelaxed lecture atmospheres. The HA and LA Ss in each class were

further subdivided to form the relaxed and unrelaxed test atmosphere conditions. Students who were not selected to participate in the research and whose data was subsequently disregarded were equally distributed among the groups. Table I represents the formation of the experimental groups and the number (N) of subjects per cell. Although nine Ss were assigned to each cell, subject attrition was high due to attendance problems.

Insert Table I about here

Instructions: One section of the course was given a lecture in a relaxed atmosphere (RL) and the other section was given a lecture in an unrelaxed atmosphere (UL), defined by the teacher-instructions at the beginning of the lecture (see below). Following the lecture, the two previously formed experimental groups in each section were separated into different classrooms in order to receive either a test in a relaxed atmosphere (RT) or a test in an unrelaxed atmosphere (UT), defined by the teacher-instructions at the beginning of the testing period. The following two sets of specific instructions were written by the experimenter and read to the classes by the instructor:

> Section 1: Relaxed Lecture:
> Beginning of class: 'I want you to just listen to my lecture today. Put down your pens; don't take notes. Just relax and try to learn something.'
>
> End of lecture: 'I want the following students to go next door (specify which room) and wait. I'll be there in a few minutes to talk to you: (Names of students were listed for instructor to call out).'

To first group (RLRT): 'I'm going to test you on the material I covered today, but I will never see the tests again (while passing out tests). They will only be used by a graduate student for research purposes. It is very important for the research results that you do your best on the test, but do not cheat. Talking will not be allowed. Remember, your score on this test will in no way affect your grade in this class. Remain seated when you have finished, and I will be back to collect the tests in a few minutes.'

(Go to second group in other classroom.)
To second group (RLUT): 'Space yourselves in the seats, please (while passing out tests). I'm going to test you on the material I covered today. Remain seated when you have finished and I will be back to collect the tests in a few minutes. Bonnie will proctor while I am gone. Talking will not be allowed.'

(Return to first group and collect the tests.)
To first group (RLRT): 'If you are interested in the experiment and wish to know the results, you may find them in the library within a few months in the thesis written by Janice Lee Carter. It is very important that you do not discuss this experiment with anyone else, because similar experiments are going to be conducted in other classes, and naivete is necessary for valid results. Class dismissed.'

(Return to second group and collect the tests.)
To second group (RLUT): 'I gave you this test only to help a graduate student collect data for a research experiment. I will not see your scores, nor will your scores on this test in any way affect your grade in this class. The rest of the class was told this before they took the test in order to gain comparative data. If you are interested in the experiment and wish to know the results, you may find them in the library within a few months in the thesis written by Janice Lee Carter. It is very important that you do not discuss this experiment with anyone else, because similar experiments are going to be conducted in other classes, and naivete is necessary for valid results. Class dismissed.'

Section 2: Unrelaxed Lecture:
(Begin lecture as usual.)

End of lecture: 'I want the following students to come with me next door: (Names of students were listed for instructor to call out). The rest of you

wait here, and I'll be back in a few minutes.'[1]

To first group (ULUT): 'Space yourselves in the seats, please (while passing out tests). I'm going to test you on the material I covered today. Remain seated when you have finished and I will be back to collect the tests in a few minutes. Bonnie will proctor while I am gone. Talking will not be allowed.'

(Return to remaining group in original classroom.)
To second group (ULRT): 'I'm going to test you on the material I covered today, but I will never see the tests again (while passing out tests). They will only be used by a graduate student for research purposes. It is very important for the research results that you do your best on the test, but do not cheat. Talking will not be allowed. Remember, your score on this test will in no way affect your grade in this class. Remain seated when you have finished, and I will be back to collect the tests in a few minutes.'

(Return to first group and collect the tests.)
To first group (ULUT): 'I gave you this test only to help a graduate student collect data for a research experiment. I will not see your scores, nor will your scores on this test in any way affect your grade in this class. The rest of the class was told this before they took the test in order to gain comparative data. If you are interested in the experiment and wish to know the results, you may find them in the library within a few months in the thesis written by Janice Lee Carter. It is very important that you do not discuss this experiment with anyone else, because similar experiments are going to be conducted in other classes, and naivete is necessary for valid results. Class dismissed.'

(Return to second group and collect the tests.)
To second group (ULRT): If you are interested in the experiment and wish to know the results, you may find them in the library within a few months in the thesis written by Janice Lee Carter. It is very important that you do not discuss this experiment with anyone else, because similar experiments are going to be conducted in other classes, and naivete is necessary for valid results. Class dismissed.'

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[1]This difference in instructions was made in order to counteract for the effects of waiting.

The fifteen-item multiple-choice test used in this experiment was constructed by the instructor who attempted to make the items as difficult as those on previous class examinations. The tests were graded by the experimenter to obtain post-test scores for the subjects. Differences in scores on pre-tests (previous classroom examinations) and post-test were obtained for each subject in order to determine the effects of relaxed and unrelaxed lecture and test atmospheres.

Results

The hypothesized outcome of the study was not supported by the data. An analysis of variance per a 2 x 2 x 2 (test anxiety by lecture atmosphere by test atmosphere) unbalance design (due to S attrition) was conducted on the data to assess significance of the three factors involved and their interactions.

Although a main effect of lecture atmosphere was found ($F = 5.83$, $df = 1/44$, $p < .05$), no other main effect or interaction was obtained. A table describing the statistical analysis is presented in Appendix C.

Figure 1 shows the discrepancy in mean scores on the pre-tests and post-test according to the lecture and test atmospheres. The figure shows that the mean difference scores for both HA and LA Ss were significant when the lecture was presented in an unrelaxed lecture atmosphere, regardless of the atmosphere in which the test was presented. It can be seen that the groups did not differ as a function of test atmosphere. Figure 2 shows that the variable of anxiety level does not appear to interact with the other

experimental variables.

Insert Figures 1 and 2 about here

Discussion

The results of this study did not support the hypotheses that: 1) HA Ss would perform best under relaxed lecture and test atmospheres, and 2) LA Ss would perform best under unrelaxed lecture and test atmospheres. The fact that an unexpected significance of lecture atmosphere was found may have been due to students attending to other stimuli rather than the lecture when instructed to relax and enjoy the lecture. Students may resort to writing letters or reading books or just daydreaming instead of listening to the lecture and taking notes.

The fact that no other significant interactions were obtained may be interpreted in several ways. Perhaps no difference actually existed. Or, perhaps, the basic statistical technique used did not provide power. Yet, because of subject attrition, resulting in an unbalanced design, the statistical procedure used was the most feasible. Another interpretation would be that the basic model and data gathering procedure were not the most adequate. Perhaps the instructor owned certain characteristics which did not allow Ss to respond freely to the variations in conditions. Another instructor and his two classes were used in the experiment in order to have comparison data, and a student-teacher evaluation questionnaire was employed. However, because of severe S attrition in this second instructor's classes,

the data obtained was invalid and had to be discarded. Another possibility causing the insignificance could have been that the Ss did not truthfully respond to statements on the TAS. Furthermore, the evaluation technique may not have been accurate in that the pre-tests were not constructed in the same way as the post-test was constructed. The data which shows that the average post-test scores were higher than the pre-test scores requires one to question the assumption that the instructor actually did make the post-test as difficult as his pre-tests. On the other hand, the assumption could be correct, and the factor contributing to the rise in scores could be adaptation to the instructor's test construction and grading style. Another explanation for the lack of significant interactions in this experiment could be that the unbalance of the design was critical. The lack of statistical balance was due to the lack of control over the experimental units of students who had freedom to attend or not attend classroom lectures. A suggestion which would probably reduce subject attrition and the resulting unbalance is to choose an instructor who requires attendance at all class meetings with severe reprimands for "class cutting," except in emergencies or serious illness. Another suggestion to improve this research is to reduce the number of factors, in addition to reducing S attrition, in order to cleanly determine the effect of a single factor or a single interaction. In the present study it was impossible to cleanly compare factor A levels, because equal numbers in each level were not subjected to the same proportions of other combinations of conditions. This experiment could be broken down into several individual ones; for example, an experiment on the responses to relaxed versus

unrelaxed testing atmospheres of HA and LA Ss.

The fact that lecture atmosphere was deemed statistically important in this experiment, regardless of other factors, may say something to teachers in education. That is, that students are more likely to perform better on tests covering lecture material if the material (lecture) is presented in an unrelaxed atmosphere. Assuming that performance on tests represents learning or knowledge gained, this experiment may tell teachers that their students will learn more if their lecture atmosphere is unrelaxed. However, this finding may be contradicted in a study where Ss are first conditioned to relaxed lecture and test atmospheres. After conditioning, results may show that Ss, especially HA Ss, can perform better on classroom tests in relaxed atmospheres. Such an experiment would be a profitable area of future study.

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TABLE I

Formation of Experimental Groups

		HA	LA
RL	RT	N = 3	N = 5
	UT	N = 7	N = 5
UL	RT	N = 9	N = 9
	UT	N = 6	N = 8

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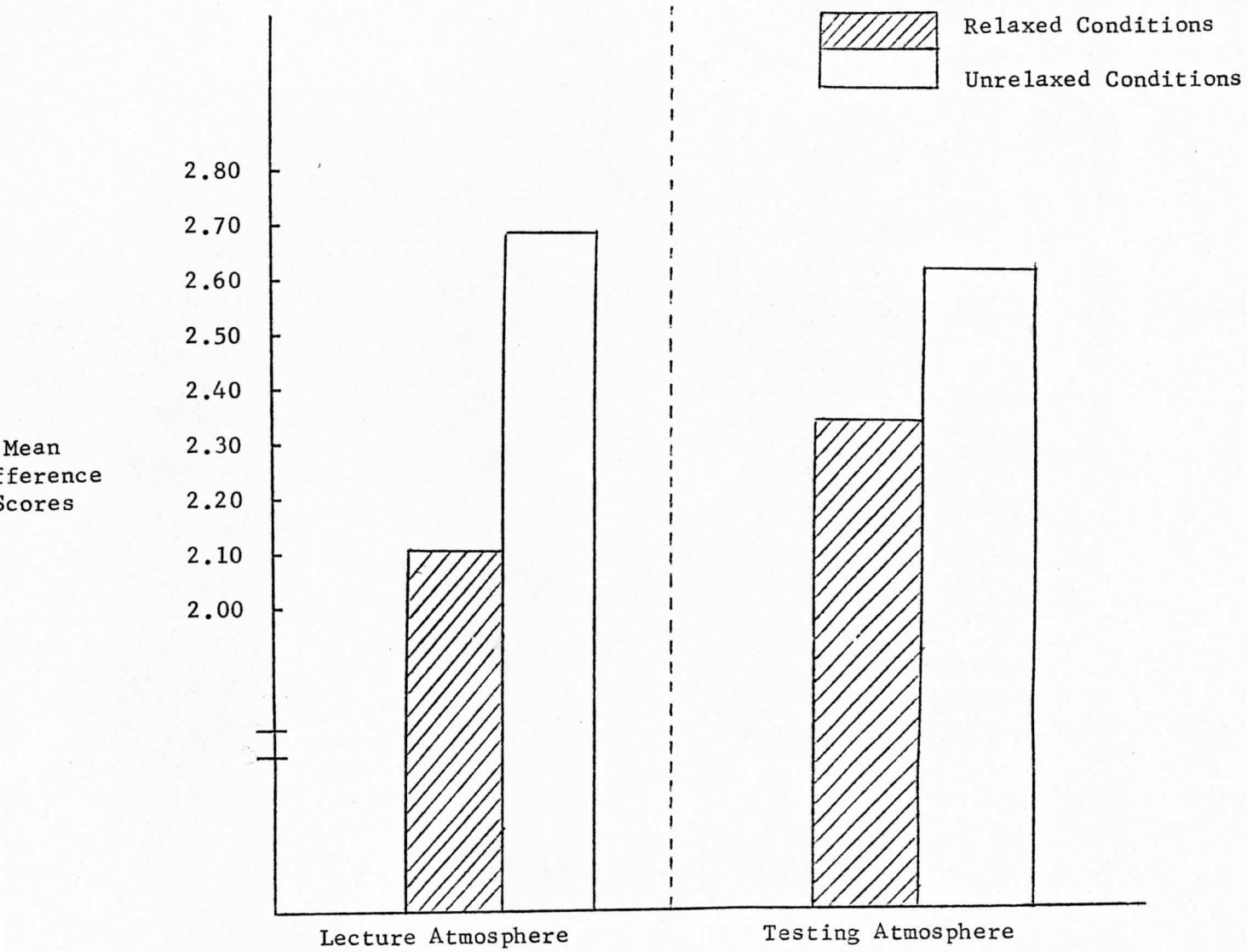
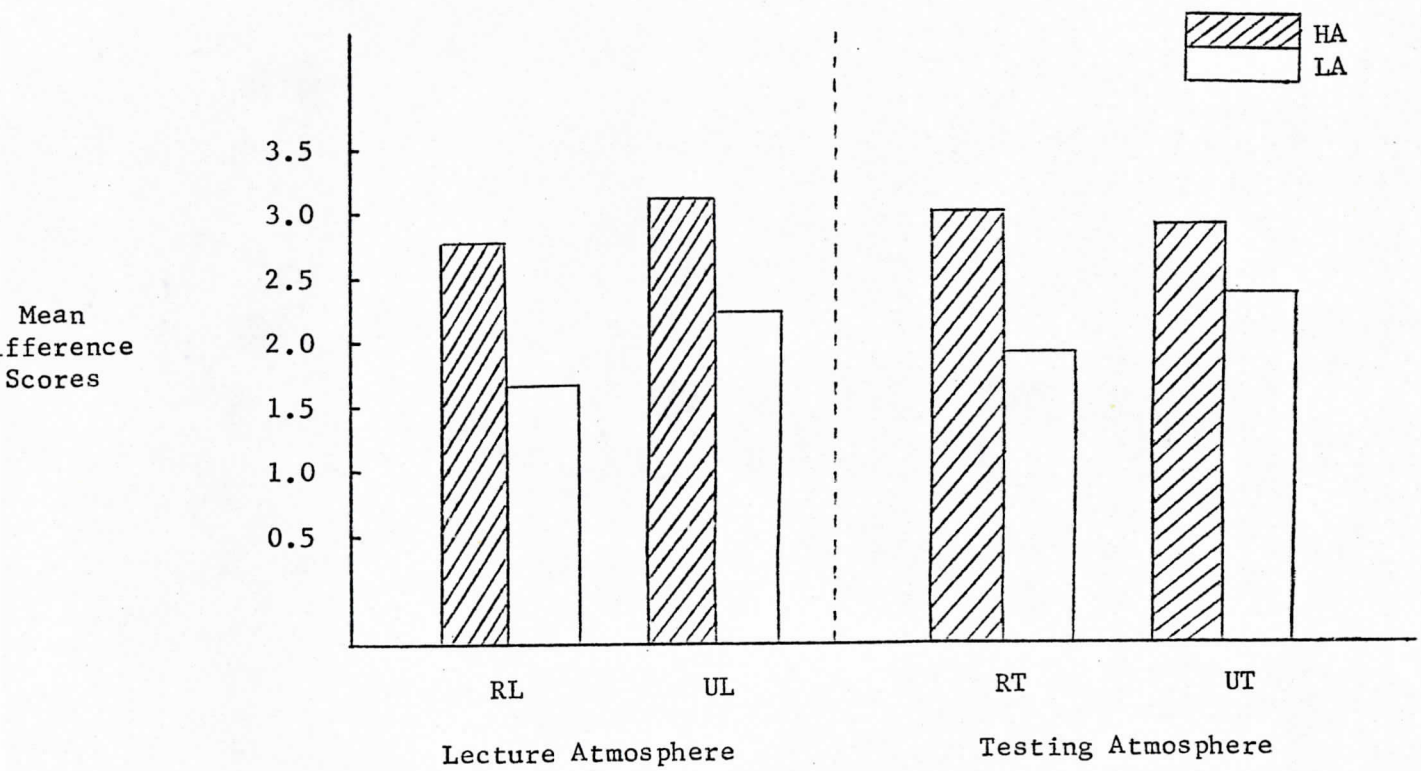

Relaxed Conditions
Unrelaxed Conditions
2.80
2.70
2.60
2.50
2.40
2.30
2.20
2.10
2.00
Mean
fference
Scores
Lecture Atmosphere
Testing Atmosphere


HA
LA
3.5
3.0
2.5
2.0
1.5
1.0
0.5
Mean
fference
Scores
RL
UL
RT
UT
Lecture Atmosphere
Testing Atmosphere

Appendix A

Test Anxiety Scale

QUESTIONNAIRE ON ATTITUDES TOWARD TESTING SITUATIONS

NAME: (please print) _____ SECTION NO. _____

Very little is known about people's feelings toward the taking of various kinds of tests. We assume that people differ in the degree to which they are affected by the fact that they are going to take a test. We are interested in how widely people differ in their opinions of and reactions to various kinds of testing situations.

The value of this questionnaire will in large part depend on how frank you are in stating your opinions, feelings, and attitudes. Needless to say, you answers will be kept strictly confidential; they will under no circumstances be made known to any instructor or official of the university. We request your name only that you may be selected to participate in future research.

If you have not taken an intelligence test (we assume every one of you has taken a course examination) answer the relevant questions in terms of how you think you would react to one. We want to know what you think your attitudes and feelings toward taking such a test would be and not what you think they ought to be.

To the left of each question is a "T" (standing for true, this is how I feel or this describes me) and an "F" (standing for false, this is not how I feel, it does not describe me or my behavior in that situation). PLEASE CIRCLE the T or F next to each question to indicate how you feel.

If you have any questions, please ask them now.

Work fairly quickly as your first impressions are usually most adequate.

T F 1. While taking an important examination, I perspire a great deal.

T F 2. I get to feel very panicky when I have to take a surprise exam.

T F 3. During tests, I find myself thinking of the consequences of failing.

T F 4. After important tests I am frequently so tense that my stomach gets upset.

T F 5. While taking an important exam I find myself thinking of how much brighter the other students are than I am.

T F 6. I freeze up on things like intelligence tests and final exams.

T F 7. If I were to take an intelligence test I would worry a great deal before taking it.

T F 8. During course exams, I find myself thinking of things unrelated to the actual course material.

T F 9. During a course exam, I frequently get so nervous that I forget the facts I really know.

T F 10. If I knew I was going to take an intelligence test, I would feel confident and relaxed beforehand.

T F 11. I usually get depressed after taking a test.

T F 12. I have an uneasy, upset feeling before taking a final exam.

T F 13. When taking a test, my emotional feelings do not interfere with my performance.

T F 14. Getting a good grade on one test doesn't seem to increase my confidence on the second.

T F 15. After taking a test I always feel I could have done better than I actually did.

T F 16. I sometimes feel my heart beating very fast during important tests.

Appendix B

Post-test

Quiz: Psychology 301

I. Multiple choice: Read each of the following questions carefully and select the most appropriate choice.

1. There are basically only two types of theories of intelligence, one being multi-factor theory and the other being:
   1. latent trait theory
   2. global theory
   3. tri-factor theory
   4. cognitive theory
   5. all of the above

2. For all practical purposes, intelligence may be defined as:
   1. the sum total of genetic endowment
   2. being synonomous with 'native intelligence'
   3. whatever an I.Q. test measures
   4. the aggregate of truth acquired early in life which predisposes a person to act in a particular fashion
   5. two of the above (which two?)

3. Intelligence tests typically measure two aspects of abilities: verbal and nonverbal. In the historical development of intelligence tests, nonverbal or performance measures were developed:
   1. before verval scales
   2. after verbal scales
   3. at the same time as verbal scales
   4. first by Binet, and then later by Thurstone

4. The intelligence test developed by Binet yields a total estimate of intelligence expressed as an I.Q. This intelligence quotient was calculated by which of the following formulae?
   1. I.Q. = C.A./M.A. x 100
   2. I.Q. = C.A./M.A. x 2
   3. I.Q. = M.A./C.A. x 2
   4. I.Q. = M.A./C.A. x 100

5. The person responsible for the revision of the Binet scales in this country was:
   1. Paul Stanford
   2. Louise Terman
   3. John Watson
   4. J. McKeen Cattell

6. The items in most intelligence tests are deliberately ranked in complexity to account for:
   1. the positive growth function of mental abilities throughout childhood
   2. the positive growth function of mental abilities during adolescence
   3. assumed racial-ethnic difference in human abilities
   4. so that it is impossible to get all the answers right

7. Individual intelligence tests are heavily loaded (or have a large number of questions) with items which measure:
   1. abstract verbal reasoning
   2. concrete nonverbal reasoning
   3. complex psycho-motor skills
   4. abstract nonverbal reasoning
   5. common sense

8. As a person matures through childhood and then on into adolescene, it is assumed that his relative intellectual ability:
   1. remains constant
   2. decreases significantly
   3. increases significantly
   4. is constantly in a state of flux

9. Which of the following is not an individual intelligence test?
   1. WAIS
   2. WISC
   3. MAS
   4. Stanford-Binet

10. The best available data suggest that intellectual growth ends around:
   1. age 18
   2. age 25
   3. age 32
   4. age 14
   5. age 35

11. Once the measured intelligence of a person reaches its peak, it will usually:
   1. remain constant throughout life
   2. remain constant for a while, but begin to decline after age 30
   3. remain constant for a while, but begin to increase after age 30
   4. drop sharply and then level out sometime around age 40
   5. accelerate rapidly for women, but remain constant for men

12. Which of the following is not true for scores on intelligence tests:
   1. girls are superior to boys in verbal skills
   2. an I.Q. score remains fixed
   3. an I.Q. score will always vary in accordance with measurement error
   4. most children never take an individual intelligence test

13. An average I.Q. has always been 100. This value has been determined:
   1. arbitrarially
   2. by precise measurement procedures
   3. by precise mathematical procedures
   4. by precise computer simulation technique
   5. none of the above

14. The fact that any given I.Q. score will vary within certain limits a set percentage of the time is based on the:
   1. standard deviation
   2. standard error of the mean
   3. standard error of estimate
   4. total error variance divided by the error variance of each test item

15. Less than 2% of the general population have I.Q.'s over:
   1. 120
   2. 125
   3. 130
   4. 115
   5. 118

Appendix C

Analysis of Variance

Analysis of Variance

Source	df	SS	MS	F
Anxiety level (A)	1	SSA 3.27	SSA 3.27	.53
Lecture atmosphere (B)	1	SSB 35.9	SSB 35.9	5.83*
Test atmosphere (C)	1	SSC .11	SSC .11	.02
A x B	1	SSAB .84	SSAB .84	.14
A x C	1	SSAC 4.88	SSAC 4.88	.79
B x C	1	SSBC 1.88	SSBC 1.88	.31
A x B x C	1	SSABC 4.84	SSABC 4.84	.79
Error	44	SSE 271.05	$\frac{SSE}{N-8}$ = MSE 6.16	
Total	51	SST 322.77		

* $p < .05$