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# Effect of massed and disturbed practice on reading comprehension for high and low anxious college students

Robert C. Kanoy

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EFFECT OF MASSED AND DISTRIBUTED  
PRACTICE ON READING COMPREHENSION  
FOR HIGH AND LOW ANXIOUS COLLEGE STUDENTS

BY

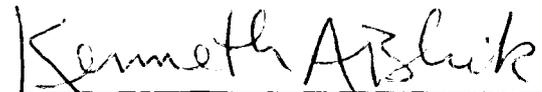
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EFFECT OF MASSED AND DISTRIBUTED  
PRACTICE ON READING COMPREHENSION  
FOR HIGH AND LOW ANXIOUS COLLEGE  
STUDENTS

by

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Bachelor of Arts  
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A Thesis Submitted in Partial Fulfillment of  
the Requirements for the Degree of  
Master of Arts  
in the  
Department of Psychology  
of the  
Graduate School  
University of Richmond  
July, 1976

Thirty-six male and female college students selected from a data bank of 335 students were tested for reading comprehension. Students were of average scholastic aptitude with either an extreme high or extreme low score on the TMAS. The learning task, which served as the test for reading comprehension, was presented to each student under either massed or distributed practice at a controlled rate of speed. The number of correct responses to a multiple choice test served as the dependent variable. One half of the high anxiety students and one half of the low anxiety students were randomly selected for the distributed practice condition. Remaining students received massed practice. Three factors (type of practice, anxiety level, post-test and 24 hour follow-up) were analyzed by ANOVA for thirty-six students completing the study. No evidence was found to support the hypothesis: (1) that students in the distributed practice condition would perform better than students in the massed practice condition, (2) low anxiety students would perform better than the high anxiety students. The data did support the hypothesis that the retention level would not change from the post-test to the 24 hour follow-up test.

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## Chapter I

### Introduction

The present study investigated the relationship of an individual's general anxiety state and academic performance, and attempted to introduce academic performance for average aptitude students.

A literature search revealed that anxiety has had a detrimental effect on a subject's performance in stressful situations. Katchmar, Ross, and Andrews (1958) showed high anxiety to be detrimental to a subject's performance in a stressful situation which was manufactured through falsified knowledge of results. Manifest anxiety did not appear to be related to the performance until the situation became stressful, at which time manifest anxiety appeared to act as a sensitizer to the stress effects.

The literature review also revealed that induced failure relates to the anxiety level of the subject. Lucas (1952) found that induced failure produced a decrement in performance of high anxiety subjects on a verbal learning task. Sarason (1956) induced failure prior to the beginning of a serial learning task. Two types of induced failure were used, related and unrelated. Related failure is informing the subject he has failed on a task virtually identical to the serial learning task on which he will be tested. Induced related failure produced a negative effect on high anxious subjects in task performance.

The low anxious subjects were not affected by the related failure on task performance. Induced unrelated failure refers to informing a subject he has failed on a task completely unrelated to serial learning prior to the presentation of the serial learning task. Unrelated failure also produced a negative effect on high anxious subjects. Low anxious subjects with unrelated failure performed significantly superior to low anxious subjects with related failure. In neutral conditions the learning for high and low anxiety subjects was essentially equal. Thus, anxiety did not affect performance in the neutral condition. The related failure and unrelated failure conditions both produced negative effects on the high anxious subjects. Therefore, high anxious subjects see many situations as threatening and stress producing whether or not the situation is relevant to the learning task.

In addition, failure appears to be related to the amount of anxiety reported by a subject. Feather (1963) found the effects of failure on reported anxiety to be significant. The subject's reported anxiety increased as the amount of failure increased. In summation, previous studies have shown the amount of past failure, and stressful or threatening situations partly explain the negative relationship of anxiety and academic performance found for average aptitude students.

Mandler and Sarason (1952) pointed out that for high anxious subjects the optimal condition for performance was achieved if no reference was made to the test situation and that low anxious subjects performed best in the test situation after receiving a report of failure on a previous task. In a classroom study, Runkel (1959) found performance in schoolwork was sometimes improved under low anxiety, but high levels

of anxiety were uniformly found to bring about a decrement in performance. Other studies investigated the relationship between anxiety (Taylor Manifest Anxiety Scale) and academic performance (college grade point averages). Matarazzo (1954) and Klugh and Bendig (1956) found no significant correlations between TMAS scores and GPA. In addition, Sarason (1956) reported that an analysis of variance failed to reveal any differences in GPA as a result of comparing subjects of different levels of TMAS scores. In no studies had anxiety been considered a factor in relation to grades for students with differing intellectual abilities.

The work of Spielberger and Katzenmeyer (1959) examined the relationship between academic performance, level of anxiety, and scholastic aptitude in college students. Spielberger and Katzenmeyer decided that the moderately high correlation between various measures of intelligence and college grades seemed to indicate that poor academic performance was primarily determined by limited ability while good grades were largely determined by superior intellectual endowment. Therefore, personality or motivational variables might be most likely to influence the academic performance of students of average ability. The purpose of Spielberger and Katzenmeyer's 1959 study was to examine further the relationship between TMAS scores and GPAs and determine if this relationship varied as a function of the intellectual level of the student. The TMAS was given to all students in introductory psychology classes at Duke University at the beginning of each of six consecutive semesters. GPAs (based on a 4 point scale, A=4, B=3, etc.) of the students were taken for the semester in which they had taken the TMAS. Students

receiving a score of seven or greater on the Lie scale of the MMPI were eliminated from the study. Pearson Product Moment correlations were determined between TMAS-GPA,  $r = -.14$ ; TMAS-ACE (ACE Psychological Examination, a measure of scholastic aptitude),  $r = -.11$ ; ACE-GPA,  $r = +.29$ ; all of which were significant at  $p < .01$ . Students were divided into five levels of scholastic aptitude on the basis of ACE scores with each level containing approximately 20% of the total sample. The mean GPA of each level was determined. Tests for linear and curvilinear regression indicated that GPAs were unrelated to TMAS scores for the low and high aptitude groups. However, a test for linear regression for the middle groups yielded a significant  $F = 13.06$  ( $df = 1,390$ ,  $p < .001$ ). The study concluded that grades varied inversely with one's anxiety level for the average aptitude students.

Spielberger and Katzenmeyer suggested that previous studies may have failed to find a significant relationship between TMAS scores and grades for the following reasons: 1. failure to take intelligence into account, 2. heterogeneity with respect to intelligence, and 3. the inclusion of both male and female subjects. Spielberger and Katzenmeyer took all three points into account for their study and used only male college students divided into five levels of scholastic aptitude.

Kanoy and Walker (1976) in confirming the work of Spielberger and Katzenmeyer selected college students and included scholastic aptitude as a factor in examining the relationship of anxiety and academic performance. The negative relationship was greatest for average aptitude students. As one moved toward either end of the aptitude continuum, the negative relationship of anxiety and academic performance decreased.

The study also found that high anxiety subjects showed a greater negative relationship than low anxiety subjects across all aptitude levels. The Kanoy and Walker study included both male and female students, but examined the anxiety-academic performance relationship separately for both sexes. For the low anxiety subjects, neither sex showed a differential relationship across aptitude levels. However, for high anxiety subjects, females showed the greatest degree of negative relationship toward low aptitude ability, and for males the largest negative relationship was toward high aptitude ability. If the academic college environment, filled with tests, reports, and term papers is viewed as a stress producing situation, then the results of these two studies are in keeping with the literature - high anxiety subjects being most affected in the stressful situations.

If the high anxious, average aptitude student wishes to improve his academic performance, he will need to eliminate or compensate for the debilitating effects of the high anxiety level. One possible solution is reducing the effects of the anxiety through therapy sessions. Spielberger, Weitz, and Denny (1962) found that group counseling sessions for high anxious, male, college freshmen improved their grades from mid-term to the end of the semester more than control subjects matched on academic aptitude indicators. A later study by Spielberger and Weitz (1964) worked on an approach to prevent under-achievement of anxious college freshmen through group counseling techniques. Anxious college freshmen were invited early in their first semester to participate in a special academic orientation program. Those in the experimental group, which received group counseling each week of the first semester,

made higher grades than the control subjects.

The group counseling technique appears effective, but not practical. Many schools would not have the qualified personnel, the time, or the money to institute a group counseling program. An alternative approach would be an academic skills program which would use group study sessions and could be taught by either professors or students. Therefore, the present study investigated the suggestion that massed and distributed practice study sessions will have differential effects on the performance of a high anxious, average aptitude student on a learning task.

Previous studies examined the effects of massed and distributed practice on the learning and retention of verbal tasks and concept formations, Oseas and Underwood (1952) studied the learning of simple concepts for geometrical forms of different sizes and shapes. Inter-trial rest periods of 6, 15, 30, and 60 seconds were used in the learning session. Retention was measured 24 hours after learning and the intervals of 15, 30, and 60 seconds produced small, but consistent differences favoring faster learning. In another study, Underwood and Richardson (1957) found that subjects who learned paired consonant syllables, under conditions of massed and distributed practice, resulted in a facilitation of learning with the distributed practice.

In a 1961 paper Underwood reviewed his studies of the previous ten years which had been directed at the differences between massed and distributed practice. Underwood's studies included serial learning, verbal-discrimination learning, inter-list interference and retention of serial nonsense lists and retention of paired consonant syllables.

Underwood had defined distributed practice as learning periods with inter-trial rest intervals greater than 15 seconds, and massed practice as rest intervals between 2 and 8 seconds in length. He concluded that distributed practice enhances learning when a minimal level of interference occurs during the response acquisition. In addition, Underwood suggested that the amount of interference and length of the interval were the critical variables in the facilitation of learning. As the former increases the latter must be shortened for facilitation to occur.

The first study which compared massed and distributed practice effects for a college course was done by Waechter (1967). Waechter compared the effects of massed and distributed practice for the acquisition and retention of science facts by junior level college students enrolled in an Elements of Earth Science course. Waechter also looked at the effects of massed and distributed practice upon acquisition and retention by the same students when classified into groups above and below the mean of CEEB scores. Thirdly, the study looked for a possible difference between the ability of students to understand science statements after learning under the two conditions. 146 students majoring in elementary education were the subjects of the experiment. Half of the students received massed practice and the remaining half had distributed practice. All students received 38 hours of lecture and 14 two hour labs. Students in the massed practice condition completed the course requirements in nine weeks, and students under distributed practice completed the same requirements in 18 weeks. The students' gain between a pre- and post-test was used to compare achievement

resulting from the two methods. In comparing achievement there was no statistical evidence to indicate that massed learning was superior to distributed practice learning. Three post-tests were given to determine the significant differences in retention: 1st test - at end of course, 2nd test - 12 weeks later, 3rd test - 18 weeks after the end of the course. Gain scores between each of the post-tests were compared, as well as the mean differences on mean gains. There was no statistical evidence that one method was superior to the other in student retention of science facts. Thirdly, Waechter showed that there was not a statistically significant difference for massed practice or distributed practice students in the retention of science facts when classified according to ability. Finally, a rating scale, which measured the student's difficulty in understanding science statements, was given before and after the course. Comparing the mean differences of mean gains on the pre and post scores for the rating scale showed that distributed practice students were favored in understanding science statements ( $p < .01$ ).

The Waechter study is based on the assumption that learning is due mainly to how the material is presented to the student. However, learning could also be due to how the student studies and rehearses the material to be learned. Waechter presented the material under massed and distributed conditions, but he did not control the study sessions of each student. Waechter should have given massed and distributed practice sessions for studying the material, just as Underwood had done in his learning studies. If Waechter had controlled the study sessions, he might have found a significant difference between the

achievement scores for massed and distributed conditions. The present study incorporated this suggestion and in addition, investigated the possibility that massed and distributed practice has a differential effect in learning an academically related task for average aptitude college students of both low and high anxiety levels. The task was to correctly answer questions on a reading comprehension test. Two variables were anxiety and practice condition. An interaction was expected between anxiety and type of practice. Examination of the simple effects should have shown distributed practice to be superior for high anxiety subjects as well as for low anxiety subjects. Also, both the distributed practice and massed practice conditions should have produced higher scores for the low anxiety subjects compared to the high anxiety subjects. Low anxiety subjects, who received distributed practice, should have scored higher than high anxiety subjects, who received massed practice.

## Chapter II

### Method

Subjects. Subjects consisted of 36 college students selected from the psychology classes at the University of Richmond. Students included male and female students from all four class levels with differing liberal arts majors. Selection of Ss was determined by TMAS and CEEB scores.

Apparatus. Apparatus and materials included a questionnaire composed of the Taylor Manifest Anxiety Scale (TMAS) and the L scale from the MMPI. A tape recorder was used to present all instructions to Ss. Craig Readers with speed control presented the learning task material. The learning task consisted of two short passages, of approximately 500 words in length, followed with eight multiple choice questions. The passages and questions were taken from Part B of the Reading Comprehension test of the Iowa Silent Reading Tests, Level 3, Form E. The passages and questions represented a part of the tests used for evaluating the reading comprehension of advanced high school and college level students.

Procedure. Students in all psychology classes were first administered the questionnaire with the TMAS and the L scale. Each questionnaire was given two scores: the TMAS score and the L scale score. An L scale score of 7 (2 standard deviations above mean) or greater indicates

a tendency to put oneself in a favorable light (Lanyon, 1968 and Marks, Seeman, and Haller, 1974). Therefore, any S scoring 7 or greater on the L scale was eliminated from the study.

From the remaining Ss, those with average scholastic aptitude were used for the study. Average scholastic aptitude was defined as a CEEB total score between the range 1017 and 1132. These two scores form the extreme limits of the middle 33% range of aptitude scores at the University of Richmond (Kanoy and Walker, 1976). Within this average aptitude level, Ss were selected for a high anxiety (HA) group with raw TMAS scores of 22 or greater (Kanoy and Walker, 1976) and a low anxiety (LA) group with raw TMAS scores of 9 or less (Kanoy and Walker, 1976). 70 students met the criterion for both aptitude and anxiety. 40 students were selected at random and asked to participate in a learning experiment. 36 students agreed to participate. The anxiety groups were then divided into two additional groups. Half of the Ss received massed practice (MP) on the learning task and the second half received distributed practice (DP).

The learning task passages from the Iowa Silent Reading Tests were presented on the Craig Control Readers at a rate of 200 words per minute, which is the mean rate of reading speed for students at the University of Richmond when reading for comprehension (Preston, 1975). The passages were presented to each S for four readings. The instructions from the Iowa Silent Reading Test manual allow each person tested on Part B of the Reading Comprehension Test to study the material for 7 minutes. Four readings allowed Ss to view the material for approximately 7 minutes and 20 seconds (each presentation lasted approximately 1 minute

and 50 seconds). The massed practice groups had a 5 second pause between presentations. Studies of verbal learning, such as Underwood (1961, a review) and Oseas et. al. found 2 - 8 second intervals served as massed practice and intervals greater than 15 seconds served as a distributed practice condition. Distributed practice groups for the present study had 2 minute intervals between presentations. Following the final presentation, there was a 30 second pause and then Ss were given eight multiple choice questions to answer in response to the passages. Ss in the massed practice condition received the following taped instructions:

"Read the following passages as they appear on the control reader set before you. The passages will be presented at a constant speed. The passages will be presented 4 times with a 5 second pause between presentations. After the final presentation there will be a 30 second pause and then you will receive questions to answer pertaining to the passages. Please make your best effort in learning the passages and choosing the best response to each question."

Ss in the distributed practice condition received these instructions:

"Read the following passages as they appear on the control reader set before you. The passages will be presented at a constant speed. The passages will be presented 4 times with a 2 minute pause between presentations. During the pause, just rest your head on the desk in front of you. After the final presentation there will be a 30 second pause and then you will receive questions to answer pertaining to the passages. Please make your best effort in learning the passages and choosing the best response to each question."

After each S completed the multiple choice questions, the answers were collected and later scored by E. Each S was then asked to return 24 hours later for a follow-up session. For the follow-up test, Ss answered the same eight multiple choice items found on the post-test.

Answers were collected and again scored by E. The number of correct responses on the multiple choice test served as the dependent variable for analysis.

### Chapter III

#### Results

The number of correct responses to the multiple choice questions served as the dependent variable. Table 1 gives the mean number of correct responses and the variances on the multiple choice questions for each of the four groups. The first column shows the post-test

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 Insert Table 1 here

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 results and the second column gives results from the 24 hour post-test.

A three factor (2 x 2 x 2) ANOVA (Winer, 1971) was performed on the data. The factors were practice (massed vs. distributed), anxiety (high vs. low), and the two tests (post-test and 24 hour post-test). Hartley's  $F_{max}$  test assured homogeneity of variance between the groups ( $F_{max} = 2.89, p > .05$ ). Table 2 gives the summary table of results for the three factor ANOVA.

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 Insert Table 2 here

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 No evidence was found to support the hypothesis of a two factor interaction between anxiety and practice conditions [ $F(1,32) = .165, p > .05$ ]. In addition, there was no evidence to support the hypotheses that DP Ss should perform superior to MP Ss within each anxiety level, DP LA > MP LA and DP HA > MP HA [ $F(1,32) = 1.485, p > .05$ ] and that LA Ss

are expected to perform better than HA Ss, DP LA > DP HA and MP LA > MP HA [ $F(1,32) = .165, p > .05$ ]. No evidence was found to support the prediction that DP LA > MP HA. Finally, the data did support the hypothesis that there would be no significant changes between the post-test results and the 24 hour post-test [ $F(1,32) = 2.997, p > .05$ ].

Table 1

Mean Number of Correct Responses (and Variances) on Reading Comprehension Tests under Massed and Distributed Practice Conditions by College Students with Different Anxiety Levels.

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	<u>Post-test</u>		<u>24 hour Post-test</u>	
	<u>Mean</u>	<u>Variance</u>	<u>Mean</u>	<u>Variance</u>
High Anxiety:				
Massed Practice	5.89	1.61	5.44	1.78
Distributed Practice	6.11	2.36	6.00	2.75
Low Anxiety:				
Massed Practice	5.44	3.03	5.11	3.61
Distributed Practice	6.11	1.61	6.00	1.25

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Table 2

Summary Table for 2 x 2 x 2 ANOVA. (A - type of practice, B = anxiety level, C = post-test and 24 hour post-test.)

<u>Source of variation</u>	<u>df</u>	<u>SS</u>	<u>MS</u>	<u>F</u>
A x B x C	1	.011	.011	.029
A x C	1	.348	.348	.928
B x C	1	.016	.016	.043
C	1	1.124	1.124	2.997
C x Subjects within group (error term)	32	12.014	.375	
A x B	1	.682	.682	.165
A	1	6.125	6.125	1.485
B	1	.680	.680	.165
Subjects within group (error term)	32	131.990	4.125	

$$F_{.95} (1,32) = 4.17$$

## Chapter IV

### Discussion

The studies by Underwood (1961), Madsen (1963), and Bregman (1964), all indicated that DP was commonly accepted as superior to MP in the facilitation of verbal learning. Therefore, the present study expected to show that DP produced a superior performance on the number of correct responses for a test of reading comprehension than MP, within each anxiety level (DP LA > MP LA; DP HA > MP HA). The results did not support this prediction. Returning to Underwood's review (1961) of his learning studies for the previous ten years, he stated that DP enhanced learning when a minimal level of interference occurred during the response acquisition. He further suggested the amount of interference and the length of the rest interval were the critical variables, and as the amount of interference increased, the length of the interval should be shortened for facilitation to occur. This optimal level of interference, suggested by Underwood, may not have been reached in the present study for several reasons. First, there may have been physical distractions to S during the experiment due to the location of the experimental laboratory and placement of the Craig Reader in front of an open window. This allowed for the possibility that people walking by the open window might be seen or heard by S sitting in front of the Craig Reader. A second possible distraction

was E. The need for E to change slides during the experiment may have presented a distraction to S. If the above reasons prevented the optimal level of interference to be reached, then the facilitating effect of DP would not be seen and therefore explain why the DP groups did not out perform the MP groups of each anxiety level.

The second hypothesis was based on the study of Spielberger and Katzenmeyer (1950), which indicated that a significant difference in performance should be expected between the anxiety groups. LA Ss were expected to perform better than HA Ss, within the same practice condition (DP LA > DP HA; MP LA > MP HA). This hypothesis was supported by the studies of Katchmar et al. (1958), Lucas (1952), Sarason (1956) and Sarason (1956) where LA Ss out perform HA Ss in stress producing situations (stress induced by falsified knowledge of results, induced failure, or knowledge of being in a testing situation). The data gave no support for the prediction that the LA Ss would perform superior to HA Ss within each practice condition. The stressful situation may be the key to explaining the failure of this hypothesis. Recalling from the Katchmar et al. (1958) study, the conclusion stated that manifest anxiety did not appear to be related to subject's performance until the situation became stressful, at which time the anxiety appeared to act as a sensitizer to the stress effects. Also, Sarason (1956) found that in neutral conditions, the learning for high and low anxiety subjects was essentially equal. Therefore, perhaps the flaw was in assuming the learning task for the present study created a stressful situation. There was no pressure to take part in the study - all Ss were asked on a voluntary basis. Also, the results held no special

significance to Ss. Therefore, perhaps the learning task was a neutral condition and did not create any stress. In addition, the experiment was conducted during final exam week. If S had recently completed or was preparing for a final exam, the learning task presented might appear comparably easy to S and fail to produce a threatening situation. Without the stress of a threatening situation, the anxiety had no affect on S's performance and thus, the low and high anxiety Ss within each practice condition performed essentially equal on the learning task.

The two preceding hypotheses had led naturally to the prediction: DP LA > MP HA. LA Ss with the benefit of DP should have performed significantly superior to HA Ss with MP. HA Ss must deal with interference produced by the high anxiety level and in addition, learn under the less beneficial practice condition for stressful situations. No evidence to support the prediction was found. In considering the explanations for the failure to support the first two hypotheses, it would be logical that the third hypothesis would lack statistical support, too. If the optimal level of interference had not been obtained, then the DP condition would not produce higher scores than the MP condition and there would be no benefit in being placed in the DP group. And, if the learning task failed to produce a stressful situation, both high and low anxiety Ss would be expected to perform essentially equal. Thus, there should be no difference in the performance of the DP LA Ss and the MP HA Ss.

One additional explanation for the failure to obtain significant differences between massed practice and distributed practice groups needs mentioning. The Iowa Silent Reading Test, which served as the

source for the learning task, was designed for advanced high school and college level students. Most of Ss for this experiment were college sophomores, juniors, and seniors. If the learning task presented was below the reading and comprehension level of these upper level college students, then the task was too easy. Without a reading comprehension task that is an adequate representation of S's ability, the effects of MP and DP for S's of different anxiety levels might be masked and thus, there would be no difference in the performance of the MP and DP groups on the learning task.

The final hypothesis stated that the level of retention was expected to remain the same in the 24 hour post-test as compared to the post-test retention level. Oseas et al. (1952) found that retention of concepts was the same 24 hours after the learning task was presented. The data gave statistical support for no change in the retention level immediately after the learning task presentation and on the 24 hour post-test.

In summation, there are three possible reasons for the failure to reach significance on the first three hypotheses: failure to obtain the optimal level of interference, the lack of stress in the testing situation, and the task complexity. To correct for the failure to reach an optimal level of interference, the learning task should be presented to S in an experimental lab closed to outside stimulation and to distractions within the laboratory room. Also, E could be removed from the setting with a time delay device on the Craig Reader. Next, it is necessary to assure that the learning task is a stress producing situation for S. Perhaps, this can be accomplished by

emphasizing to S the importance of his performance on the learning task and suggest that the test serves as an indication of his ability to perform in courses relying on reading comprehension. Also, the experiment should be conducted prior to the final exam week. Finally, the third problem to be dealt with is task complexity. The present study is believed to have used a learning task too simple for the college student. An alternative is to use material from an actual college course. Passages from a general psychology or general biology course would serve as a more accurate representation of college level reading material. If the above changes were to be incorporated into the design of the present study, then perhaps the first three hypotheses discussed above would be supported. A replication of this study might also reveal DP HA > MP LA, from which the conclusion could be drawn that DP is an effective solution to decreasing the negative relationship between high anxiety and performance on a learning task for average aptitude students.

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