THE EFFECTS OF TECHNICAL AND SHORT STORY WRITING COURSES ON A MEASURE OF CREATIVITY

by

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A Thesis Submitted to the Faculty of the

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

In Partial Fulfillment of the Requirements
For the Degree of

MASTER OF ARTS

In the Graduate College

THE UNIVERSITY OF ARIZONA

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STATEMENT BY AUTHOR

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ACKNOWLEDGMENTS

I gratefully acknowledge the contributions of my committee to this paper. The guidance and support provided by these people were invaluable. My particular thanks are extended to my advisor, Dr. Glen Nicholson, for his encouragement and guidance; to Dr. Darrell Sabers for his time and aid in conducting the statistical analysis; and to Dr. Hershel Thornburg for his critical comments.

I would also like to thank The University of Arizona English Department faculty members, Dr. George Sakalosky and Mr. Thomas Lochhaas, for allowing me to administer my research instrument to their classes.

I am particularly indebted to my husband, David, not only for his support and encouragement, but for his interest in my work.

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ABSTRACT

Undergraduate students enrolled in a fiction writing course and a technical writing course were administered the Torrance Tests of Creative Thinking at the beginning and end of a semester in order to measure any change in their creative abilities as a result of participation in these courses. Statistical analysis of the data revealed that both groups of students gained significantly in their scores, although neither group gained more than the other. There was no significant difference found between the scores of the male and female participants.

This evidence indicates that practice in writing has a positive effect on creative thinking as measured by the Torrance Tests of Creative Thinking. This effect could be due to an improvement in verbal skills.

CHAPTER 1

INTRODUCTION AND RATIONALE

Change has taken place at an incredible rate in all areas of technology, as well as in the profession of education. Less than 20 years ago, Paul Davis (1962) predicted that future educationalists would place more importance on creative thinking than on memory as they then did. This attitude has shown itself in current educational trends. With the tremendous rate of change have come a few problems for today's educators. It has become impossible to predict the knowledge needed by future generations. However, the attitudes and abilities that will be needed for solving future problems can be identified as well as developed. How creatively the individual can meet these problems may determine how effectively he solves them.

Background

Creative behavior offers a wide area for study because of its involvement in all human activities; it is not restricted to artistic endeavors or scientific investigations. This study does have several areas of contention. The two major problems are basic ones--defining creativity and measuring it. Although most researchers create their own definitions of creativity, many such definitions have shared components, particularly flexibility, fluency, and originality. These three

ideas are fairly well accepted as important in the creative process and are used by such researchers as Parnes (1963), Torrance (1966), Guilford (1967), and Wallach (1971). Definitions range from the Freudian "regression in the service of the ego" (Hartman, 1958, p. 93) to that provided by Torrance (1966, p. 8) and on which he bases his measure of creative thinking:

> A process of becoming sensitive to problems, deficiencies, gaps in knowledge, missing elements, disharmonies, and so on; identifying the difficulty; searching for solutions, making guesses, or formulating hypotheses about the deficiencies; testing and retesting these hypotheses and possibly modifying and retesting them; and finally communicating the results.

Other related definitions, provided by such researchers as Getzels and Jackson (1962) and Mednick and Mednick (1972), refer to creativeness as a process of rearranging known facts into new relationships for a more effective achievement of results.

Measuring creativity is a problem because of the lack of agreement on criteria. Many researchers consider the establishing of objective criteria as the most crucial problem in studying creativity (Taylor and Holland, 1964; Shapiro, 1968). Basically, the two most widely accepted variables used for criteria measurement are (1) products and (2) person variables (Shapiro, 1968). A third variable that is becoming more generally accepted is performance on tests of creative ability. Patents, journal publications, technical books, and other such products can be counted to obtain a criterion score, but this procedure is questionable (McPherson, 1963). For example, not all products, though having worth, are patentable. Evaluations by supervisors and peers, as

well as self-reports, provide person criteria. The major problems with this approach are (1) bias (Bloom, 1963) and (2) little interscorer reliability (Taylor, Smith, and Ghiselin, 1963). Some studies, however, have found ratings by others to be valid (Flanagan, 1949; Taylor, 1963; Taylor and Holland, 1964), especially when ratings were spontaneous (Buel, 1960). The most notable of the tests of creative ability that have been designed are The Southern California Tests of Fluency, Flexibility, and Elaboration (Guilford, 1959); Torrance Tests of Creative Thinking (Torrance, 1962, 1963, 1965); Ship Destination Test; Logical Reasoning; and Pertinent Questions (Guilford, 1959). These tests have been widely used in studying creativity, and although their validity as measures of creativity is still challenged by researchers, statistical evaluations have indicated their usefulness.

Review of Related Research

Many aspects of creativity have been studied, including how it is affected by formal or informal school organization (Torrance, 1962; Sears, 1963; Hason and Butcher, 1966), time limits in testing (Van Mondfrans et al., 1971; Aliotti, 1973), stress (Belcher and Parisi, 1974), testing atmosphere (Wallach and Kogan, 1965), and teaching techniques (Parnes and Meadow, 1960; Yee, 1964). It is this last aspect that is of interest in this paper.

The 1959 University of Utah Research Conference on the Identification of Creative Scientific Talent reported evidence, provided by at least six research projects, that creative productivity could be developed by deliberate procedures (Taylor, 1959). There have been no

research studies contradicting this view. Guilford (1952, p. 48) expressed this same conviction: "Like most behavior, creative activity probably represents to some extent many learned skills. There may be limitations set on these skills by heredity; but I am convinced that through learning one can extend the skills within those limitations." Maltzman and his associates at the University of California provided support for this opinion with a group of research studies on originality-training. Their hypothesis was that "originality is a learned form of behavior which does not differ in principle from other forms of operant behavior" (Maltzman, Simon, and Lecht, 1959, p. 2).

Various programs and techniques have been designed with the developing of creative thinking in mind. Many have been exclusively nonacademic (Crutchfield and Covington, 1965; Olton, 1966; Shively, Feldhusen, Treffinger, and Asher, 1971), while others involved techniques easily integrated into traditional courses (Sommers, 1961; Anderson, 1963; Ragouzis, 1965). Despite all the recent research in designing such programs and techniques, few researchers have examined the effects of traditional courses on the creativity of students. Because there already might be courses in the college curriculum which improve creativity, others which have no effect, and still others with negative effects, the subject warrants research.

Separate Programs

One view currently held by researchers in the area of creativity is that creative problem-solving should be taught separately from traditional subject matter. The University of Buffalo has offered a course

in creative problem-solving since 1954. Two research studies evaluating this course have revealed that students who had taken the course were significantly superior to the control group, students who had not taken the course, on five of seven creativity measures. Students who had taken the course showed significant gain on a scale devised "to assess factors of leadership ability, dominance, persistence and social initiative" (Meadow and Parnes, 1959, p. 189). Among those maintaining that transfer from one subject is haphazard are Crutchfield and Covington (1965), who developed self-instructional materials for fifth and sixth graders built around mystery stories. Students using these materials have registered measurable gains on the Torrance Tests of Creative Thinking. In 1966, Olton also designed some self-instructional materials whose use resulted in gains. Olton's materials were similar to Crutchfield and Covington's and were designed for the same grade levels. In 1971, Shively and his associates conducted a study using Torrance Tests of Creative Thinking scores to compare the Productive Thinking Program and the Purdue Creative Thinking Program. Participants in both programs showed gains, with the Productive Thinking Program participants having greater gains than the Purdue Creative Thinking Program participants.

Integrated Techniques

A second view of developing creativity involves the use of techniques integrated into traditional courses. These techniques include brainstorming, metaphorical thinking, attribute listing, Delphi programs, concept formation, and many others. Torrance (1960) examined

such creative principles and procedures integrated into language arts courses. Anderson (1963) integrated problem-solving techniques into college level Industrial Arts classes and found gains as a result. Anderson's study replicated one done by Sommers (1961), who used his own Industrial Arts students as subjects and also recorded significant gains. Sommers found that mastery of subject matter increased along with creative ability scores as a result of making creative problem-solving a part of the existing course. Ragouzis (1965) studied the effects of nongrading on creativity, while Even (1964) tested the effects of selected art experience on the creativity of high school art students; both found gains as a result of their treatments.

Institutes and workshops featuring the integration of creative problem-solving techniques with the teaching of academic subjects have been conducted, including one at the University of Buffalo for teachers of American History. Also, San Jose State College conducts an annual five-day Creative Education Institute offered for graduate credit. Such programs illustrate the growing interest of educators in integrated techniques.

Purpose of Study

The purpose of this study was to determine whether either of two courses, technical writing and short story writing, had an effect on the development of creativity. Fiction writing has traditionally been termed a "creative" skill. In theory, the fiction writing course trains students to notice significant details in the world around them, to listen carefully to the nuances of spoken language, and to integrate

those details and nuances into a sequence reflecting causal patterns. On the other hand, technical writing courses presumably teach the student to deal precisely and carefully with a specific topic in order to describe a given process in all its details. It is often assumed that the latter course has little effect on creativity. Though each writing course deals with verbal behavior, especially the selection and ordering of details in order to describe an event or process as it unfolds sequentially, one is usually regarded as creative and the other as mechanical. This study attempted to examine differences in effects that might be attributed to participation in one of the courses as opposed to participation in the other.

Because the study, in fact the very definition of creativity, is highly problematic and emotionally charged, all solid information concerning it is of great value. Any information showing that traditional courses do affect creativity would be significant in itself; moreover, any difference measured between the effects of two such courses could offer teachers information concerning ways of increasing measurably students' creative performance. In like manner, similarities observed between performance of both groups would suggest that teachers could learn specific techniques for increasing the incidence and quality of creative performance by isolating similar elements in the two classes.

Statement of Hypotheses

The following hypotheses were formulated:

1. There are no significant differences between the pretest and the posttest scores on the Torrance Tests of Creative Thinking for students enrolled in a technical writing course.
2. There are no significant differences between the pretest and the posttest scores on the Torrance Tests of Creative Thinking for students enrolled in a fiction writing course.
3. There are no significant differences between gains in scores on the Torrance Tests of Creative Thinking by students enrolled in a technical writing course and those enrolled in a fiction writing course.
4. There are no significant differences between the means of the Torrance Tests of Creative Thinking scores for male and female subjects.

CHAPTER 2

METHODS

Subjects

Thirty-eight students in a short story writing course took the pretest, while only 15 took the posttest. Ten dropped the course; seven were absent the day of the posttest; five chose not to take the test; and one, who was absent, took the test under very different circumstances from the rest of the subjects (in an office, telephone ringing, and people milling around) so her scores were not used. Forty-seven students in a technical writing course participated in the pretest, while 35 participated in the posttest. Five dropped the course; four were absent; and three chose not to take the posttest.

Both courses were offered at the 100 level (for sophomores and juniors) by the English Department of The University of Arizona. The number of subjects was restricted by course enrollment. Instructors were not given any special training in methods for developing creative thinking but taught the courses as they had done in the past.

Variables

There are two independent variables considered in this study. The most important of the two, for the purposes of this study, is the effect of participation in a technical writing course as opposed to

participation in a fiction writing course. The second is the sex of the participants as it relates to scores on the Torrance Tests of Creative Thinking. The dependent variable for this study is performance on Verbal Tests, Forms A and B of the Torrance Tests of Creative Thinking.

Instrument

The dependent variable was measured by means of the Torrance Tests of Creative Thinking (TTCT), Verbal Tests, Forms A and B. The TTCT consists of seven parallel tasks: (1) Asking, (2) Guessing Causes, (3) Guessing Consequences, (4) Product Improvement, (5) Unusual Uses of Cardboard Boxes (Tin Cans in Form B), (6) Unusual Questions, and (7) Just Suppose. E. Paul Torrance (1966) has designed these test activities as models of the creative process. Different kinds of thinking are called forth by each activity, allowing each activity to contribute something unique to the test battery. He selected these tasks by factor analysis of a variety of tasks to obtain relatively uncorrelated tasks with the widest possible coverage of thinking abilities involved in the creative process.

The Asking and Guessing activities [(1) Asking, (2) Guessing Causes, and (3) Guessing Consequences] were included "to give subjects an opportunity to express their curiosity and give a picture of their ability to develop hypotheses and think in terms of possibles" (Torrance, 1966, p. 11). Curiosity has long been recognized as important in scientific creativity and as being exhibited in the number and kind of questions asked. Causal conditions and their results have been

considered separately in Western scientific thought. Developmental psychologists, particularly Piaget (1954), have also divided them but have been more concerned with causal thinking than effect thinking. Torrance's (1966) research has indicated that effect or consequences thinking develops earlier than does causal thinking.

Of all the test activities included in the test battery, the Product Improvement activity has the most face validity. People are willing to accept the redesigning of a toy so that it will be more fun to play with as an indication of creative ability. Subjects also find the task interesting. Torrance (1966, p. 12) has said that the subjects "'regress in the service of the ego' and play with ideas that they would not dare express in a more serious task."

The Unusual Uses activity is a modification of Guilford's Brick Uses Test. Believing that children would be more creative with items more available to them in their daily environment, Torrance substituted tin cans and cardboard boxes for bricks. The potential of tin cans as a stimulus to invention has been supported by USAF survival training and the experiences of POWs during WWII. Also, because it is easy to simply define a tin can or a cardboard box as a container, it is difficult to produce other types of uses. This task then is also a measure of the ability to escape rigidity of thought (Torrance, 1966).

The Unusual Questions activity is an adaption of Burkhart and Bernheim's (1963) technique for measuring divergent thinking ability. Burkhart and Bernheim feel that "productive spontaneity" does not serve sufficiently as a prediction of creative achievement, but that divergent

thinking is the critical factor in creativity (Torrance, 1966). Torrance allows five minutes for the task, but his own experimentation has indicated greater validity with more time.

The Just Suppose activity, in which a subject is given a fantastic hypothetic situation to consider, was adapted by Torrance from consequences-type tests in Guilford's (1959) test battery and is a variation of the Guessing Consequences activity discussed earlier. This task was designed to measure the kind of thought involving play and fantasy. It is an indication of the subject's "ability to consider, evaluate, and play with unusual ideas and to think through their possible consequences" (Torrance, 1966, p. 13). Earlier, Reid (1960) had designed a test called "Supposings" to which subjects responded with great enthusiasm. Thurstone is also said to have selected his graduate students by their attitudes toward and responses to a "just suppose" type situation (Torrance, 1966).

The Verbal Tests require 45 minutes for administration, in addition to the time necessary for providing an orientation, handing out booklets, and giving instructions. Each task is timed separately.

The number of relevant responses generated by the subject is the fluency score for each activity, while the number of different approaches used in generating these ideas is the flexibility score. Statistical infrequency and appropriateness of the ideas generated form the basis for the originality score. Elaboration scores are also available but were not used in this study because of a lack of statistical support of their usefulness. Also, no score for flexibility is obtained for the Unusual Questions activity.

Scores for each score-interpretation category--fluency, flexibility, and originality--were computed and analyzed. A composite score was found by summing the T-scores for each category.

Studies of the reliability of the TTCT show test-retest reliability coefficients ranging from .34 to .97, most often appearing in the .70s. Alternate forms reliability coefficients have ranged from .60 to .89, also averaging in the .70s. Also, high levels of inter- and intrascorer reliabilities range from .86 to .99, averaging .95.

The TTCT has been criticized (Thorndike, 1963, 1972; Vernon, 1964; Wallach and Kogan, 1965) for the low intercorrelations among the tasks, but Torrance justifies these tasks because they call into play different abilities which he considers to be a part of creativity.

Construct validity studies have been done with acceptable results. Some studies show very low correlations (.04 to .21) with scores on the TTCT and measures of intelligence, indicating that this test measures something other than intelligence. Concurrent validity has been found with peer nominations (statistically significant, but .24), teacher nominations, sales productivity, and educational achievement. Predictive validity with creative performance as the criterion has also been studied and found significant (.51 to .63).

Procedures

The Verbal Tests, Form A of the TTCT were administered on the first day of class to each group. Verbal Tests, Form B of the TTCT were administered to each group during the last week of class. Instructions for group testing provided in the TTCT manual were followed. In

the initial briefing, subjects were told that the purpose of the study was to measure any change in their creative ability as measured by the TTCT. A brief description of the test was given. They were informed that a second form of the test would be given at the end of the semester. Subjects were guaranteed privacy of responses and assured that neither their participation or performance would have any effect on their grades in the course.

Data Analysis

The hypotheses presented in an earlier section of this paper were tested statistically by use of a two-factor mixed design--Repeated Measures on one factor (Bruning and Kintz, 1968). This design permits comparison of differences in the overall performance of the subjects in the experimental groups as well as evaluation of changes in performance shown by the subjects. Equal N is not necessary. Category scores and composite scores were analyzed.

CHAPTER 3

FINDINGS

Results

Both groups gained significantly in their posttest scores over their pretest scores in all three categories, as well as on the composite scores. The mean for the fluency category, the indication of the subject's ability to generate unusual ideas, rose from 88 (S.D. = 24.06) to 94.06 (S.D. = 21.84) in the short story writing class and from 91.48 (S.D. = 27.57) to 103.77 (S.D. = 36.23) in the technical writing class. The mean for the flexibility category, the indications of the subject's ability to use a variety of approaches, rose from 36.2 (S.D. = 8.88) to 39.7 (S.D. = 7.88) in the short story writing class and from 39.31 (S.D. = 8.78) to 43.37 (S.D. = 10.49) in the technical writing class. The mean for the originality category, the indication of the subject's ability to generate statistically infrequent responses, rose from 87.4 (S.D. = 30.46) to 98.93 (S.D. = 26.67) in the short story writing class and from 87.51 (S.D. = 35.7) to 106.37 (S.D. = 44.85) in the technical writing class. The short story writing class had a pretest composite mean of 157.4 (S.D. = 29.95) and a posttest composite mean of 167.33 (S.D. = 25.15). The technical writing class had a pretest composite mean of 161.6 (S.D. = 34.32) and a posttest composite mean of 175.14 (S.D. = 38.87) (see Appendix A).

Analysis of the data revealed F-scores for fluency of 13.14 (see Table 1); for flexibility of 15.74 (see Table 2); for originality of 22.46 (see Table 3); and for the composite of 17.36 (see Table 4).

Table 1. ANOVA table for fluency scores--short story writing class versus technical writing class

Source	df	SS	MS	F
Total	99	89100.8		
Between Subjects	49	76268.3		
Conditions	1	913.4	913.4	.58184
$Error_b$	48	75354.8	1569.9	
Within Subjects	50	12832.6		
Trials	1	2714.4	2714.4	13.1407*
Trials X Conditions	1	203.0	203.0	.98293
$Error_w$	48	9915.1	206.6	

*p = .001

Table 2. ANOVA table for flexibility scores--short story writing class versus technical writing class

Source	df	SS	MS	F
Total	99	8959.1		
Between Subjects	49	7417.6		
Conditions	1	239.4	239.4	1.6006
$Error_b$	48	7178.3	149.5	
Within Subjects	50	1541.5		
Trials	1	380.3	380.3	15.7372*
Trials X Conditions	1	1.5	1.5	.0600
$Error_w$	48	1159.8	24.2	

$p = .001$

Table 3. ANOVA table for originality scores--short story writing class versus technical writing class

Source	df	SS	MS	F
Total	99	142223.4		
Between Subjects	49	120170.9		
Conditions	1	299.4	299.4	.1199
$Error_b$	48	119871.5	2497.3	
Within Subjects	50	22052.5		
Trials	1	6938.9	6938.9	22.4559*
Trials X Conditions	1	281.6	281.6	.9113
$Error_w$	48	14832.0	309.0	

$p = .001$

Table 4. ANOVA table for composite scores--short story writing class versus technical writing class

Source	df	SS	MS	F
Total	99	117542.5		
Between Subjects	49	102929.0		
Conditions	1	757.2	757.2	.3558
$Error_b$	48	102171.8	2128.6	
Within Subjects	50	14613.5		
Trials	1	3881.3	3881.3	17.4704*
Trials X Conditions	1	68.3	68.3	.3076
$Error_w$	48	10663.9	222.2	

*p = .001

The degrees of freedom were 1/48, and the level of significance was .001. There were no significant differences between the two groups' scores. Nor were there differences that could be attributed to sex of subject (see Appendix B).

Discussion

Significant gains for both the creative writing group and the technical writing group were found, but there were no significant differences between the two groups. The statistical evidence provided in this study has indicated that practice in writing and improvement of verbal skills, whether sponsored by a creative or a technical writing

course, have a positive effect on creative thinking as measured by the TCCT. By inference this could mean that, at the undergraduate level, (1) the TCCT is measuring something other than creative thinking, or (2) that verbal behavior plays a significant role in creative behavior. A correlation of a college-level verbal skills test and TCCT scores might reveal that the TTCT is closely related to verbal skills at the college undergraduate level. This would mean that the TTCT lacked effectiveness at this level of education. The second interpretation would lead to the conclusion that both courses, as writing courses providing instruction in organizing thoughts and presenting these thoughts in patterned relationships, cause an increase in the development of an individual's creativity. One can infer that creative behavior is, in part, dependent on the ability to organize experiences and to recognize relationships among its constituents. This interpretation corresponds with the definition of creative thinking on which the TTCT is based (as stated on page 2). Torrance has designed the TTCT as a method embodying this concept.

If the TTCT is found to be significantly correlated with verbal skills, then the validity of its use at the undergraduate level would be questionable. However, if the organizing and conceptualizing skills taught in undergraduate writing courses are found to be responsible for the improvement in scores, educators could make use of the fact in designing programs and classroom techniques, as well as curricula, so that students might benefit from learning these skills.

Certainly, this study suggests the need for research to validate or discredit one or both of the interpretations given. More research is justified because it would provide more information on creativity which then could be incorporated into the body of information acquired by the student through educational processes, but may particularly be justified as more research in this area could further delineate the relationship of language manipulation and skills to creativity. More research would also suggest a greater variety of ways in which educators could foster in students the ability to create.

APPENDIX A

DATA BY COURSE PARTICIPATION

Table A.1. Means and standard deviations by course

		Short Story Writing		Technical Writing	
		Pretest	Posttest	Pretest	Posttest
Fluency	Mean	88.0	94.1	91.5	103.8
	S.D.	24.1	21.8	27.6	36.2
Flexibility	Mean	36.2	39.7	39.3	43.4
	S.D.	8.9	7.9	8.8	10.5
Originality	Mean	87.4	98.9	87.5	106.4
	S.D.	30.5	26.7	35.7	44.9
Composite	Mean	157.4	167.3	161.6	175.1
	S.D.	29.9	25.2	34.3	38.9

APPENDIX B

DATA BY SEX OF PARTICIPANTS

Table B.1. Means and standard deviations by sex--short story writing students

		Male		Female	
		Pretest	Posttest	Pretest	Posttest
Fluency	Mean	84.7	88.1	94.6	106.0
	S.D.	27.9	24.0	13.6	10.3
Flexibility	Mean	35.7	36.6	37.2	46.0
	S.D.	10.0	6.8	6.9	6.3
Originality	Mean	79.9	90.1	102.4	116.6
	S.D.	33.2	26.3	18.7	18.8
Composite	Mean	151.8	158.0	168.6	186.0
	S.D.	34.2	24.5	16.4	14.6

Table B.2. Means and standard deviations by sex--technical writing students

		Male		Female	
		Pretest	Posttest	Pretest	Posttest
Fluency	Mean	93.6	103.9	88.7	103.5
	S.D.	30.4	40.0	24.1	31.4
Flexibility	Mean	41.1	44.6	37.0	41.8
	S.D.	9.5	11.7	7.4	8.8
Originality	Mean	91.6	108.6	82.1	103.4
	S.D.	37.7	50.9	33.4	36.9
Composite	Mean	166.3	176.9	155.4	172.8
	S.D.	36.9	42.9	30.6	34.1

Table B.3. ANOVA table for composite scores--short story writing class (male versus female)

Source	df	SS	MS	F
Total	29	22156.9		
Between Subjects	14	19780.5		
Conditions	1	3345.1	3345.1	2.6459
$Error_b$	13	16435.4	1264.3	
Within Subjects	15	2376.5		
Trials	1	740.0	740.0	6.7398*
Trials X Conditions	1	209.1	209.1	1.9040
$Error_w$	13	1427.4	109.8	

*p = .025

Table B.4. ANOVA table for composite scores--technical writing class (male versus female)

Source	df			
Total	69	94628.3		
Between Subjects	34	82391.3		
Conditions	1	957.8	957.8	.388
$Error_b$	33	81433.5	2467.7	
Within Subjects	35	12237.0		
Trials	1	3209.6	3209.6	11.99*
Trials X Conditions	1	195.3	195.3	.7296
$Error_w$	33	8832.1	267.6	

*$p = .005$

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