THE EFFECTS OF COMPETITION AND NONCOMPETITION ON PRODUCTIVITY

by

Tyler Nye Hutchison

Approved by

J. D. Delk
Chairman, Thesis Committee

Joan W. Wells
Professor of Psychology

R. G. Schmieder
Professor of Psychology

Ivan G. Branch
Chairman, Department of Psychology

Richard W. Rupp
Dean of the Graduate School

THE EFFECTS OF COMPETITION AND NONCOMPETITION ON PRODUCTIVITY

A THESIS

PRESENTED TO

THE FACULTY OF THE GRADUATE SCHOOL

APPALACHIAN STATE UNIVERSITY

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF ARTS

by

Tyler Nye Hutchison

March, 1978

Table of Contents

List of Tables

Acknowledgements

I would like to thank Dr. Hank Schneider and Dr. Joan Walls for their assistance as members of my thesis committee and extend my sincere appreciation to Dr. J. Dan Duke for his guidance, advice and support from the development through the completion of this paper.

I wish to express my gratitude to my parents, Robert S. Hutchison, Jr. and Mary Montague Hutchison for their diligent work and continuous support throughout this project and, furthermore, throughout my life.

Abstract

The present study attempted to establish a relationship among competitive and noncompetitive motives, motor and cognitive tasks, and individual and group contingencies as pertaining to their effect upon productivity. One hundred and twenty-eight male high school freshmen participated in an experiment involving the solving of anagrams and the construction of tinker toy parts into models. Results were analyzed using a 2 x 2 x 2 between group analysis of variance. None of the three null hypotheses tested nor the four interaction effects were found to be statistically significant. Past experiments concerned with competitive and noncompetitive motives as to their effects upon productivity were discussed in an effort to explain the results of this experiment.

The Effects of Competition and Noncompetition on Productivity

In recent years there has been a great deal of interest in how competition and noncompetition affect productivity, with the studies in this area producing conflicting results. Some studies support competition as a superior motive to generate production, other studies support noncompetition as superior, while still other studies support neither motive as superior.

Experiments used in past studies have employed a variety of tasks to measure the effects of competition and noncompetition on productivity. These various types of tasks might be divided into two broad categories of cognitive and motor tasks. There exists a question as to which motive, competition or noncompetition, is superior for which task, cognitive or motor. The type of task involved in experiments appears to be one factor related to the contrast in findings of motives for production.

As there is a paucity of literature comparing the effects of noncompetition to competition on productivity, studies using a cooperative motive were included in the review of literature. Cooperation is not to be equated with noncompetition, but it is felt that cooperation and noncompetition possess enough similarity that the studies comparing cooperation to competition are relevant to the present study. In fact cooperation could be said to be a form of noncompetition.

Noncompetition and cooperation are similar in that both motives create a situation in which participants are not in opposition as they work toward goal attainment. For the purposes of this thesis, noncompetition will be defined as a situation in which goal attainment by one participant or group has no effect upon the goal attainment of others. Deutsch (1973) provides the definition of the terms cooperation and competition. Deutsch stated:

> In a cooperative situation when a participant behaves in such a way as to increase his chances of goal attainment, he increases the chances that the others, with whom he is promotively linked, will also attain their goals. In contrast, in a competitive situation when a participant behaves in such a way as to increase his own chances of goal attainment he decreases the chances of the others. (p.22)

Deutsch (1973) performed a study using discussion groups whose task was to solve intellectual puzzles in which two groups were used, a competitive group and a cooperative group. Deutsch found that the discussion group in the cooperation condition produced more puzzle solutions than the competitive group produced.

Workie (1974) focused his dissertation on how cooperation and competition affect productivity. Within the experiment, six hypotheses were tested. Using a card game as the task involved, Workie made a monetary reward contingent on the number of points scored in the game. Workie found cooperation significantly more effective than competition ($p < .01$) in increasing point acquistion in both intragroup and intergroup conditions.

Slevin (1970) used a novel motor skill to measure the effects of competition on performance. Eighty male subjects from high school physical education classes were taught a fencing lunge under conditions of noncompetition and of competition. Slevin found the competition group was judged significantly better in acquired performance than the noncompetitive group.

The hypothesis is suggested that noncompetition is more effective than competition in facilitating cognitive task performance while competition may work better for motor task situations. However, results from some past experiments support neither motive as superior to the other in generating productivity. Wheeler and Ryan (1973) performed an experiment using students from fifth and sixth grade social studies classes to examine whether competition was better than cooperation in facilitating learning. One-half of the students worked in discussion groups in a cooperative condition, while the other half worked individually in a competitive condition. Results showed that compared to the competitive group the cooperative group produced a more positive attitude toward social studies but failed to attain any significant difference in learning.

The question still exists: Which motive is superior in inducing productivity in each task category? This study will inquire further into the question just posed.

In the experiment a 2 x 2 x 2 design, with performance as the dependent variable, was employed. There were three factors involved:

1. The task factor which was divided into two conditions-motor and cognitive.

2. The motive factor which was divided into two conditions, competitive and noncompetitive.

3. The contingency factor which was divided into two conditions, group and individual.

There were three null hypotheses used in the experiment. The hypotheses were:

1. There will be no significant difference in productivity due to the task factor.

2. There will be no significant difference in productivity due to the motive factor.

3. There will be no significant difference in productivity due to the contingency factor.

Review of the Literature

Research concerning the effects of noncompetition and competition on group productivity has produced conflicting data. Some studies have supported one motive and some studies the other as more effective in eliciting productivity. This paper will review highlights from the studies of the literature from 1924 through the present. The division of literature will be under three headings:

1. Literature in which noncompetition and cooperation have been found to be the better motives to generate productivity.

2. Literature in which competition has been found as the better motive to generate productivity.

3. Literature in which neither cooperation nor competition has been found to be a better motive to generate productivity.

Noncompetition Superior

Wickens (1942) worked with college students in an experiment testing competition's effect on the solving of arithmetic problems. Four levels of arithmetic problems were involved as independent variables. Wickens found that competition was less effective than noncompetition in the more difficult problems, implying that competition is a poor motive to use for solving cognitive tasks.

Blau (1954) conducted an observation study of two groups of interviewers in a public employment agency. Twelve interviewers were observed over a period of five months. Six interviewers were placed in a cooperative situation and six placed in a competitive situation. Results showed the cooperative group was significantly more productive at the .01 level, finding jobs for 67% of the applicants coming to them, while the competitive group of interviewers found jobs for only 59% of the applicants. Blau used a correlation analysis to compare the two groups. He found interviewers not only more productive in cooperative groups but he also found they evaluated themselves as less anxious and more cohesive than the interviewers in competitive groups.

Shaw (1958) found cooperation more effective than competition in an experiment concerned with motor ability. Shaw used 22 trials of 550 subjects, half male and half female. The task involved was a driving task. For this test, subjects kept a marker on target by using a handwheel to control it. Two measures were used to examine the results. One measure was the average distance between the marker and the target. The other measure was the average amount of time the marker was kept on

target. The three conditions used in the experiment were:

1. A competitive condition where the subject attempted to do better on the task than a confederate.

2. A cooperative condition where the subject, with a confederate, attempted to obtain the best combined score on the task.

3. A control condition where the subject worked alone for a score.

Results supported cooperation as more productive than competiton in both of the measuring criteria.

Hammond and Goldman (1961) conducted an experiment using undergraduate students at the University of Kansas as their subjects. The research involved 60 subjects randomly assigned either to one of four experimental groups or to a control group. All groups were discussion groups and there were five or six subjects in each group. The four experimental groups were (1) a group competition condition in which groups competed with other groups for grades, (2) an individual competition condition in which individuals competed with other individuals for grades, (3) a noncompetitive condition for the groups and for the individuals in which subjects worked for one grade which was the same within the group, and (4) a control group. The dependent variables were the number of remarks each individual made and his involvement in the group discussion. Results showed that noncompetitive treatments induced more remarks by participants and greater involvement by participants than competitive treatments produced.

Crawford and Sidowaski (1964) used a pushbutton task to determine the effects of noncompetition and competition involving a 2 x 2 design which used 18 pairs of subjects, 36 subjects in all. The task was to push one of two buttons in order to win money. When one subject pressed the button first he won and the other subject paired with him lost. Four conditions were implemented combining competitive and noncompetitive motives with monetary and no monetary incentives. Subjects could win up to $10 in the experiment. Results showed the noncompetitive groups were significantly more productive (.01 level) than the competitive groups.

Haines and McKeachie (1967) conducted a study with 83 University of Michigan undergraduate students to test achievement and satisfaction of students in competitive and cooperative conditions. The independent variable in the study was the teaching techniques used for classes. Grades in the classes depended on recitation performance. For two weeks a cooperation condition was employed followed by two weeks of competition for grades. Performance and satisfaction were the dependent variables. The students' grades during the cooperative phase of the experiment were significantly higher (.05 level) than their grades during the competitive phase. Tension was also significantly higher in this experiment in the competitive condition.

Deutsch (1973) conducted a study in which he found cooperation to be superior to competition in inducing subjects to solve intellectual puzzles. For this study, conducted at the Massachusetts Institute of Technology, Deutsch worked with fifty subjects. He divided the subjects

into two major conditions with five groups under each condition. The two conditions were:

1. A competitive condition in which subjects were told they would be graded in comparison with other group members.

2. A cooperative condition in which subjects were told all group members would receive the same grade. The grade was determined by how well each group solved the puzzles compared to the other four groups that were participating.

Deutsch found more agreement, more effective communication, more friendliness, and higher productivity in the cooperation groups than in the competition groups.

Workie (1974), in his dissertation, compared the effects of competition and cooperation on productivity using Deutsch's definition of terms. Workie used a 2 x 3 design with 60 groups and 240 subjects involved. The subjects were male, high school students from two upper-middleclass Jewish schools in New York City. Workie hypothesized that productivity would decrease in the following manner:

1. Intragroup cooperation with intergroup cooperation
2. Intragroup cooperation without reference
3. Intragroup cooperation with intergroup competition
4. Intragroup competition with intergroup cooperation
5. Intragroup competition without reference
6. Intragroup competition with intergroup competition

Workie used a card game as the task involved with the incentive a monetary reward system of cents for the most points scored. He found

cooperation was significantly more productive than competition at the .01 level for both intragroup and intergroup conditions. Workie concluded that cooperation exceeds competition as a motive to elicit production by individuals in groups.

Competition Superior

Whittmore (1924) conducted an experiment comparing competitive and noncompetitive situations. He used four female Radcliffe students and eight male Harvard students, assigning them into three groups, each group having one woman and three men. Subjects were asked to use a rubber type to print paragraphs for the press. The type was used to transfer print on to newspaper. The two conditions in the experiment involved a competitive condition in which subjects were told " do better than the others" within their group and a noncompetitive condition in which subjects were told "don't beat your fellow workers". A within subject design was used and results showed competition generated more work accomplished than noncompetition, but the work completed under competitive conditions was of poorer quality.

Sims (1929) conducted an experiment five years after Whittmore's experiment. The two tasks involved in Sims' experiment were:

1. A task of substituting numbers for digits (e.g. 2 for A).

2. A reading test. In this test 126 college students, divided into 12 groups were assigned to one of three conditions. In a control condition scores were taken without reference to a motive. In a group motivated condition subjects were told their scores would be examined against a standard. An individually motivated condition was one where

subjects were told scores would be compared for best performance. Results showed the individually motivated condition elicited the best performance, the group motivated condition elicited the second best performance, and the control group was the least productive.

Clark (1969) used a graduate student performance as a means to test competition and noncompetition on grades. Clark used two groups in his study which took place at the University of Washington and continued over a four week period. In one group subjects competed for grades on a research paper but did not compete for grades on the final examination of the course. In the other group, students did not compete on either assignment. Results showed that students competing for grades on the research paper had better performance than those students who did not compete. Grades on the examination showed no significant difference. Clark concluded that competition had affected performance on the research paper, but not on the examination.

In a dissertation, Robert Slevin (1970) found competition to be superior to cooperation in improving performance in a novel motor skill task, a fencing lunge. Slevin used 80 male subjects from two Louisiana high schools and divided them into four randomly assigned conditions. In a 2 x 2 design, two degrees of anxiety (high and low) were pitted against two kinds of conditions (competition and noncompetition), with improvement in the fencing lunge as the dependent variable. The analysis of variance on judged fencing performances found subjects in the competitive treatments showed greater improvement than those under the noncompetitive treatments.

Neither Competition Nor Cooperation Supported as Superior

Smith, Madden, and Sebel (1957) used discussion groups to examine competition and cooperation in regard to retention of material learned. They used 145 college students divided into 29 discussion groups. Half of the subjects were in a cooperation situation where a group grade was given and half the subjects were in a competition situation where each subject's grade depended on his performance compared to other group members. Results found subjects reported greater involvement and that they engaged in discussion more frequently in cooperative conditions than in competitive ones. Recall, however, was essentially the same for each group condition.

Wheeler and Ryan (1973) conducted a study involving 86 fifth and sixth graders in Minneapolis. Social studies classes were used in an 18 day experiment. Subjects were assigned to one of three groups; a cooperative group, a competitive group, or a control class in which unaltered teaching techniques were used. The cooperation group was designed so that group discussions were used to study history material. The competition group was designed so that students worked individually with study guides to learn material. Results showed the cooperation group produced a more positive attitude toward history, but no significant difference was found between the groups concerning the amount of material learned.

A pilot study was conducted November 16 and 17, 1976, in Smith-Wright Hall on the Appalachian State University campus. The study sought to determine if a noncompetitive motive or a competitive motive

provides better performance on cognitive tasks and on motor tasks. The null hypotheses stated that the type of task was unrelated to the type of motivation used to elicit productivity. The study involved 15 male subjects and one female subject recruited from introductory college psychology classes.

In a 2 x 2 design two primary variables were examined. The first variable involved the tasks used in the experiment, the cognitive and motor tasks. The second variable involved the motives used in the experiment which were the competitive and noncompetitive motives. In the competitive condition subjects attempted to outscore other group members on the task in which they were involved. In the noncompetitive condition subjects worked individually for scores on the tasks in which they were involved.

The cognitive task dealt with the solving of anagrams. Eighteen anagrams were presented in an eight minute period in which subjects attempted to solve as many anagrams as they could. The motor task involved the assembling of tinker toy parts into a construction identical to a model on display for the subjects to duplicate. The model was in the shape of an "A". A four minute time limit was allowed for construction.

Each anagram solved correctly and each tinker toy construction completed (identical to the model used for the demonstration) was assigned a score of one point.

A between groups analysis of variance showed a significant difference (.05 level) between the motives employed. The task factor

was found to be insignificant, while the interaction between the task and motive was significant at the .01 level.

A subsequent pilot study was conducted to ascertain the amount of material needed for the motor task. A group of four subjects was used in determining that the number of tinker toy parts used with the previous experiment was sufficient for a more complex experiment.

From the literature studied it appears that the task involved in an experiment may determine how competition and noncompetition affect productivity. Noncompetition appears a better motive when cognitive tasks are employed in the experiment. Conversely, competition appears a better motive when motor tasks are used. Noncompetition has been supported as a better motive in tasks involving discussion groups, card games, and puzzle solving situations. Competition has been supported in tasks involving learning a fencing lunge, in printing type for newspapers, and in a digit substitution test.

The review of literature provides no clear answers to the questions are there some types of tasks in which competition motivates better productivity than noncompetition and are there other types of tasks in which noncompetition produces better results than competition? However, the results of the pilot study and some of the past studies reviewed in the literature suggest that, though not conclusive, there is a possibility that noncompeting subjects do better on cognitive tasks while competing subjects do better when motor tasks are involved.

Method

Design

The design used in this research was a 2 x 2 x 2 between group analysis of variance. The first factor involved the tasks used in the experiment which were divided into two conditions, cognitive and motor tasks. Motive was the second factor. Two conditions of motive were used with competition as one condition and noncompetition the other condition. The third factor employed in the experiment was contingency. Subjects worked under one of two contingency conditions, either group or individual conditions. In the group contingency condition subjects worked under the belief that the group score would represent their productivity, while in the individual contingency condition subjects were informed that each individual score would represent that individual's productivity. (See Appendix A for diagram of overall design.)

Subjects

Used in this research were 128 high school students as subjects. The subjects were volunteers from freshman physical education classes at West Wilkes High School in Wilkesboro, NC. The subjects were all male and ranged in age from 14 to 16 years. None of the subjects was informed as to the purpose of the experiment. Parental consent for the subjects to participate in the experiment was not sought as the nature of the tasks involved did not seem to warrant the need for such consent.

Apparatus

The two tasks employed in the study were a cognitive task and a motor task. The cognitive task dealt with the solving of anagrams.

The anagrams were obtained from Mayzner's (1962) article, "Anagram Solution Times: A Function of Word Transition Probabilities", and Thorndike's Teacher's Handbook of 30,000 Words. Eighteen anagrams were presented in an eight minute period in which subjects attempted to produce as many words from anagrams as they could. The anagrams used came from words which appeared in common reading (over 100 times in one million words) and all anagrams consisted of five letters. (See Appendix B for list of anagrams.)

The motor task involved the assembling of tinker toy parts into a construction identical to a model on display for subjects to see. The model was in the shape of an " A " an consisted of 20 separate parts. Subjects had eight minutes in which to construct models.

Subjects worked in one of two motive conditions, competitive or noncompetitive. In the competitive condition subjects were instructed that they were competing for points to win a contest. For the cognitive task this involved producing the most anagram solutions with a point value of one assigned to each anagram solved. For the motor task a point value of one was assigned for each model constructed. In the noncompetitive conditions subjects were instructed only to obtain as many points as they could without reference to winning or losing a contest. Subjects were assigned randomly to either a group condition or an individual condition. In the individual condition subjects were instructed that their individual score represented their productivity.

Procedure

The experiment occurred on two days in April 1977 at West Wilkes High School. The place of testing was a room adjacent to the gymnasium

in which health classes were normally taught. The only furniture in the room was one square table and four chairs. Subjects involved in the motor task were brought to the testing room in groups of four by their gym teacher. Upon arriving in the room, the subjects were instructed to place the four chairs around the table in the center of the room. Subjects were told they were going to be asked to participate in a task involving tinker toys. The tinker toys were then placed in a cardboard box in the center of the table. Instructions as to how to perform the task were then read. (See Appendix C for instructions.) Any questions the subjects had concerning the task were answered. Subjects then worked for eight minutes. At the end of the alloted eight minutes, the models which had been assembled by the subjects were counted and the subjects were then asked to disassemble their models. Subjects then returned to gym class.

Subjects involved in the cognitive task, after being brought to the testing room in groups of four, were seated at the table and given a piece of paper with 18 anagrams written on it. They were also given a pencil. The anagram sheet was kept face down until testing began. Subjects were read the instructions for the anagram task. (See Appendix C for instructions) Any questions regarding the instructions were answered prior to the actual performing of the task. Subjects then worked for eight minutes. After the alloted time had expired, the anagram sheets were collected and subjects were dismissed.

Results

Scores were obtained for each subject by assigning a value of one to each model constructed correctly in the motor task and a value of one

to each anagram solved correctly in the cognitive task. A two way between group analysis of variance was used to examine the significance of these raw scores. The three primary null hypotheses which were tested were:

1. There will be no significant difference in performance due to the motive factor.

2. There will be no significant difference in performance due to the task factor.

3. There will be no significant difference in performance due to the contingency factor.

The results of the ANOVA indicate that none of the factors was statistically significant and thus none of the null hypotheses was rejected. The obtained F values for each factor were: Task F = 0.0 not significant, Motive F = .016 not significant, and Contingency F = .040 not significant. The four interaction effects of the factors were also found to be nonsignificant. The F values for each interaction were: Task X Motive F = 0.04 not significant, Task X Contingency F = 0.016 not significant, Motive X Contingency F = 0.016 not significant, and Task X Motive X Contingency F = 1.048 not significant. Table 1, page 19, presents the analysis of variance for the three primary effects and four interactions.

In the cognitive groups, the cognitive individual competition group and the cognitive group noncompetitive group means were higher (5.1875) as compared to the cognitive individual noncompetitive group and the cognitive group competitive means (4.75).

Table 1

Analysis of Variance

	SS	df	MS	F	P
Task	0.0	1	0.0	0.0	
Contingency	0.125	1	0.125	0.016	NS
Motive	3.125	1	3.125	0.040	NS
Task x Motive	3.125	1	3.125	0.04	NS
Task x Contingency	0.125	1	0.125	0.016	NS
Motive x Contingency	0.125	1	0.125	0.016	NS
Task x Motive x Contingency	8.0	1	8.0	1.048	NS .05
Total	929.875	127	7.322		
Error	915.25	120	7.627		

The largest group mean of the eight groups tested was found in the motor task, individual noncompetition group (5.62). The smallest group mean (4.4375) was found in the motor task, individual competitive group. Table 2, page 21, presents a listing of the sum of group scores, group means, and standard deviations.

Results of the present study support the hypotheses that there are no significant differences in performance between cognitive and motor task groups, group and individual contingency groups, and competitive and noncompetitive motive groups.

Discussion

There was a failure to reject any of the null hypotheses tested in the experiment. Consequently, efficiency of motive (competition or noncompetition) and type of task (cognitive or motor) could not be linked. Several reasons might be presented to attempt to explain the nonsignificant results produced by this experiment. One important factor could be the population used in testing. The high school students involved in the experiment appeared to approach each task in the same manner regardless of the instructions the examiner gave. A prevailing trend toward competing among each other for the highest score seemed evident within each group of students. Perhaps the age group of the population tested and the developmental level of these high school subjects affected the scores which were obtained.

Another factor which seemed influential in the experiment was the lack of reward as incentive for subjects to perform well. Most pertinent experiments reviewed in the literature had some type of

Table 2

Group Means, Standard Deviation, and Sum of Raw Scores

	EX	$\bar{X}$	SD
Cognitive Individual Competition Group	83	5.1875	2.64
Cognitive Individual Noncompetition Group	76	4.75	3.71
Cognitive Group Competition Group	76	4.75	3.49
Cognitive Group Noncompetition Group	83	5.1875	2.64
Motor Individual Competition	71	4.4375	2.39
Motor Individual Noncompetition	90	5.62	2.22
Motor Group Competition	78	4.875	2.13
Motor Group Noncompetition	79	4.9375	2.43

incentive system to motivate subject performance. Deutsch (1973) and Workie (1974) used a monetary reward to motivate subjects while other experimenters used, among other things, grade points as motivation. The absence of an incentive may have affected the results obtained but obviously it had not been anticipated.

Still another feature of the experiment which might have affected results was the tasks used. The motor task employed in the experiment seemed appropriate for the population tested, but the cognitive task used did not. The anagrams used as the cognitive task of the experiment seemed to be too difficult for most of the subjects. The mean for the four cognitive task groups was 4.9 with a mean standard deviation of 3.05. The relationship of the standard deviation to group mean indicates that the results obtained on the cognitive task were not precise, prompting a question regarding the construct validity of this task.

The review of literature coupled with the results of this experiment leave clouded issues as to when competition is a superior motive to noncompetition in facilitating productivity, when noncompetition is superior to competition in motivating production, and when neither motive will be superior. The question of which is more appropriate for facilitating productivity in which task remains unsettled.

A number of factors in experimentation may be the cause of the discrepancy in findings. Demand characteristics involved in experimentation could be a variable affecting the results of past studies. The tendency for subjects to attempt to comply with the experimenter's wishes in some past experiments could be a factor affecting the

outcome of the experiments. In Whittmore's experiment (1924) the instruction "don't beat your fellow workers" might have solicited less effort and poorer performance on the task involved.

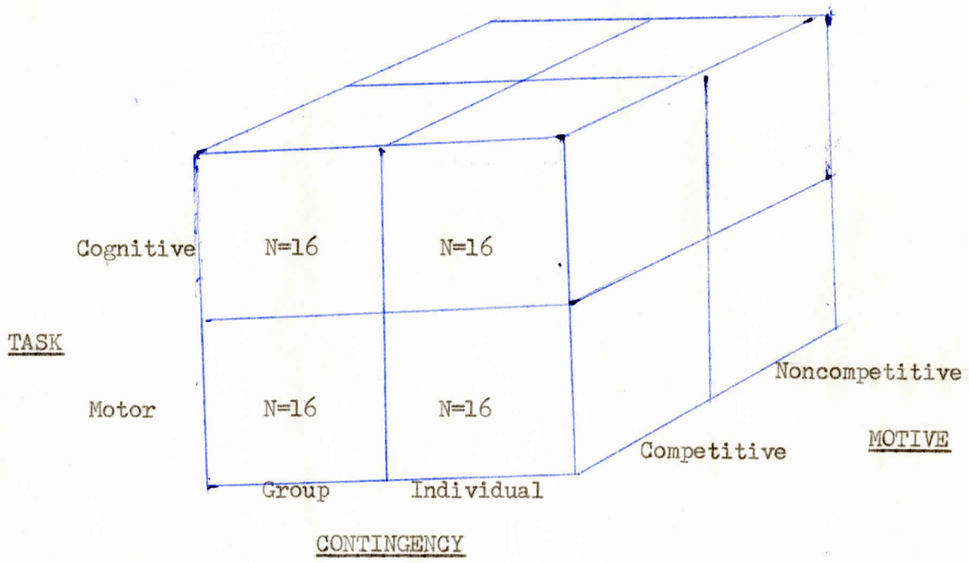
The nature of some of the tasks chosen by experimenters to measure productivity may also have affected the outcome of experiments. Some type of tasks seem to elicit a more competitive response on behalf of subjects than other tasks. This competitive factor was evident in the study performed for this thesis. Subjects involved in the motor task were consistently aware of how their peers were performing, regardless of instructions presented to them. This competitive factor was not visible in the cognitive task.

The means of measuring productivity and the type of tasks employed to measure productivity are by no means standardized in past experiments. This fact lends support to the notion that the specific task used and the specific means of scoring used affected the results of a particular experiment. There exists a difficulty to generalize from results of a single experiment.

The compendium of literature in association with this study would indicate that there are no definite findings as to whether competition or noncompetition is superior in obtaining better production. The present study was unable to provide clarification of the clouded issues related to these motives. There appears to be a further need for continued research in this field.

Appendix A

2 x 2 x 2 Factorial Design



Appendix B

ANAGRAMS	SOLUTIONS
AEWTR	WATER
EUOHS	HOUSE
NRDKI	DRINK
IPTNA	PAINT
OHTNM	MONTH
MHNUA	HUMAN
UODNP	POUND
OEWRP	POWER
EGUJD	JUDGE
EOCVI	VOICE
IUEGD	GUIDE
IUFTR	FRUIT
IUMCS	MUSIC
AEUVL	VALUE
AUGDR	GUARD
EUCNL	UNCLE
SRGUA	SUGAR
OTNRH	NORTH
EOACN	OCEAN
TRAFE	AFTER
OBLDO	BLOOD
RALYE	RELAY or EARLY
IETHG	EIGHT

ANAGRAMS	SOLUTIONS
TRFOH	FORTH
IITVS	VISIT
GYUNO	YOUNG
VYAHE	HEAVY
PYAHP	HAPPY
WANMO	WOMAN

Appendix C

Instructions for Cognitive and Motor Tasks

Individual Competitive Cognitive Task

In this experiment we are examining cognitive skills. We will be working with anagrams. An anagram is a word whose letters have been mixed up so it appears to be a nonsense word. If you put the letters in the correct order they will spell a word. Your task is to solve as many anagrams as you can within the alloted time. Your score will be determined by how many anagrams you solve correctly in comparison to other group members. The person who solves the most anagrams will receive 5 points and win the contest. The person who solves the second most anagrams will receive 4 points and finish second in the contest. The person who solves the third most anagrams will receive 3 points and finish third in the contest. The person who solves the least number of anagrams will receive 2 points and finish last in the contest. Work hard so as to get as many points as you can.

Group Competitive Cognitive Task

In this experiment we are examining cognitive skills. We will be working with anagrams. An anagram is a word whose letters have been mixed up so it appears to be a nonsense word. If you put the letters in the correct order they will spell a word. Your task is to solve as many anagrams as you can within the alloted time. Your score will be determined by how many anagrams your group solves correctly in comparison to the other groups. The group who solves the most anagrams will receive 5 points and win the contest. The group who solves the

second most anagrams will receive 4 points and finish second in the contest. The group who solves the third most anagrams will receive 3 points and finish third in the contest. The group who solves the least number of anagrams will receive 2 points and finish last in the contest. Work hard so as to get as many points as you can.

Individual Noncompetition Cognitive Task

In this experiment we are examining cognitive skills. We will be working with anagrams. An anagram is a word whose letters have been mixed up so it appears to be a nonsense word. If you put the letters in the correct order they will spell a word. Your task is to solve as many anagrams as you can within the alloted time. Your individual score will be determined by how many anagrams you solve correctly in the alloted time. You will receive 1 point for each anagram you solve. Work hard so as to get as many points as you can.

Group Noncompetition Cognitive Task

In this experiment we are examining cognitive skills. We will be working with anagrams. An anagram is a word whose letters have been mixed up so it appears to be a nonsense word. If you put the letters in the correct order they will spell a word. Your task is to solve as many anagrams as you can within the alloted time. Your group score will be determined by how many anagrams your group solves correctly in the alloted time. The group score will be multiplied by one-half and the resulting number will be how many points you receive. Each member in the group will receive the same score. Work hard so as to get as many points as you can.

Individual Competition Motor Task

In this experiment we are examining motor skills. Your task is to assemble as many items identical to the model as you can within the alloted time. You are to use the tinker toys provided in the center of the table. You must work alone without aid from each other. Your score will be determined by how many models you construct in comparison to other group members. The person who constructs the most models will receive 5 points and win the contest. The person who constructs the second most models will receive 4 points and finish second in the contest. The person who constructs the third most models will receive 3 points and finish third in the contest. The person who constructs the fourth most models will receive 2 points and finish last in the contest. Work hard so as to get as many points as you can.

Group Competition Motor Task

In this experiment we are examining motor skills. Your task is to assemble as many items identical to the model as you can within the alloted time. You are to use the tiner toys provided in the center of the table. You must work alone without aid from each other. Your score will be determined by how many models your group constructs compared to the other groups. The group who constructs the most models will receive 5 points and win the contest. The group who constructs the second most models will receive 4 points and finish second in the contest. The group who constructs the third most models will receive 3 points and finish third in the contest. The group who constructs the fourth most models will receive 2 points and finish last in the contest. Work hard so as to get as many points as you can.

Individual Noncompetition Motor Task

In this experiment we are examining motor skills. Your task is to assemble as many items identical to the model as you can within the alloted time. You are to use the tinker toys provided in the center of the table. You must work alone without aid from each other. Your individual score will be determined by how many models you construct within the alloted time. You will receive 1 point for each model you construct. Work hard so as to get as many points as you can.

Group Noncompetition Motor Task

In this experiment we are examining motor skills. Your task is to assemble as many items identical to the model as you can within the alloted time. You are to use the tinker toys provided in the center of the table. You must work alone without aid from each other. Your group score will be determined by how many models your group constructs in the alloted time. The group score will be multiplied by one-half and the resulting number will be how many points you receive. Each member in the group will receive the same score. Work hard so as to get as many points as you can.

Appendix D

Motor Task Raw Scores

Noncompetitive Individual	Noncompetive Group
4	6
7	3
6	3
7	2
8	6
9	6
7	8
8	8
4	4
7	4
7	9
5	7
2	5
2	5
3	3
4	0

Motor Task Raw Scores

Competitive Individual	Competitive Group
5	5
3	5
6	5
6	0
5	4
5	7
5	6
1	4
0	7
7	3
8	8
6	6
5	6
6	1
3	5
0	6

Cognitive Task Raw Scores

Competitive Individual	Competitive Group
3	3
5	5
3	5
8	6
8	2
9	5
7	4
4	5
5	16
4	2
2	8
8	3
6	1
3	2
0	5
8	4

Cognitive Task Raw Scores

Noncompetitive Individual	Noncompetitive Group
3	3
4	4
3	5
4	4
2	5
6	6
4	7
1	0
3	4
6	5
11	9
9	12
14	4
4	6
1	5
1	4

Bibliography

Blau. P.M. Cooperation and Competition in a Bureaucracy. American Journal of Sociology, 1954, 59, 530-535.

Clark, Cecil D. Competition for Grades and Graduate Student Performance. Journal of Educational Research, 1969, 62, 253-278.

Crawford, Z. and Sidewski, J.B. Monetary Incentive and Cooperative Competition Instructions in Minimal Social Situations. Psychological Reports, 1964, 15, 233-234.

Deutsch, M. The Resolution of Conflict Constructive and Destructive Process. New Haven and London: Yale University Press, 1973.

Haines, D.B. and McKeachie, W.J. Cooperative Versus Competitive Discussion Methods in Teaching Introductory Psychology. Journal of Educational Psychology, 1967, 58, 386-390.

Hammond, L.K. and Goldman, M. Competition and Noncompetition and Its Relationship to Individual and Group Productivity. Sociometry, 1961, 29, 46-60.

Linquist, E.F. Design and Analysis of Experiment in Psychology and Education. Boston: Houghton Mifflin Co., 1953, 9, 207-219.

Mayzner, M.S. and Tresselt, M.E. Anagram Solution Times: "A Function of World Transition Probabilities". Journal of Experimental Psychology, 1962, 63, 510-513.

Shaw, M.E. Some Motivational Factors in Cooperation and Competition. Journal of Personality, 1958, 26, 155-169.

Sims, V.M. The Relative Influence of Two Types of Motivation on Improvement. Journal of Educational Psychology, 1929, 19, 480-484.

Slevin, R.L. The Influence of Trait and State Anxiety Upon the Performance of a Novel Gross Motor Task: Dissertation to Louisiana State University, 1970.

Smith, A.J., Madden, H.E., and Sobel, R. Productivity and Recall in Cooperative and Competitive Discussion Groups. Journal of Psychology, 1957, 43, 193-204.

Thorndike, E.L. Teacher's Handbook of 30,000 Words. New York: Yale University Press, 1965.

Wheeler, R. and Ryan, F.L. Effects of Cooperative and Competitive Classroom Environments on the Attitudes and Achievements of Elementary School Students Engaged in Social Studies Inquiry Activities. Journal of Educational Psychology, 1973, 65, 402-407.

Whittmore, I.C. The Influence of Competition on Performance: An Experimental Study. Journal of Abnormal and Social Psychology, 1924, 19, 236-253.

Wickens, D.D. The Effects of Competition on the Performance of Tasks of Differing Degrees of Difficulty. Psychological Bulletin, 1942, 39, 595.

Workie, A. Relative Productivity of Cooperation and Competition. Journal of Social Psychology, 1974, 92, 225-230.