The Effects of Applying Different Motivational Techniques During Training and in Testing Upon Strength Performance.

Barry L. Johnson

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THE EFFECTS OF APPLYING DIFFERENT MOTIVATIONAL TECHNIQUES DURING TRAINING AND IN TESTING UPON STRENGTH PERFORMANCE

A Dissertation

Submitted to the Graduate Faculty of the Louisiana State University and Agricultural and Mechanical College in partial fulfillment of the requirements for the degree of Doctor of Education in

The Department of Health, Physical and Recreation Education

by

Barry L. Johnson
B.S., Northwestern State College, 1957
M.S., Baylor University, 1959
August, 1965
Dedicated to my wife, Marie
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ABSTRACT

The purpose of this study was to determine the effects of applying different motivational techniques during training and in testing upon the development of strength. Subjects of above and below average levels of ability were also studied to determine whether effects of the different motivational training and testing techniques were influenced by the initial strength status of the individual.

In this study, the subjects were one hundred twenty male college students randomly divided into four groups: Group I trained without a purposefully-induced motivator; Group II trained with knowledge of scores being the only induced motivator; Group III trained with knowledge of scores, plus an assigned goal; and Group IV trained with knowledge of scores, an assigned goal, plus taking placebos as induced motivators.

At the beginning and end of a six-week training program, all subjects were tested on an isometric press, one at a time in a closed room, with only standard directions and a knowledge of what they pressed as motivation. During training, each subject's scores were recorded one day per week. Following the final training test, at the end of the training program, subjects were given an additional test using a special motivational situation consisting of the same exercise, but conducted under the influence of spectators, march music, picture taking, and competition.
The t-test was used to determine the significance of the difference between initial and final means, and between final training test and special motivational test means for each group. Analysis of covariance and regression were utilized to compare the four groups on best training scores and test scores. The t-test was also used to compare initial scores and gain scores of the above and below average strength groups.

The main findings in this study were:

1. Motivated groups showed significant strength gains in training, whereas the non-motivated group realized very little gain.

2. All four groups showed significant strength increases over final training test scores when tested in a special motivational situation.

3. Generally speaking, the best training scores, final training test scores, and the special motivational test scores of the subjects significantly increased in accordance with the number of purposefully-induced motivators.

4. The strength scores of all groups dropped sharply at the end of the first week of training.

5. The best training scores for motivated groups were recorded at the end of the fifth week of training, whereas the non-motivated group recorded its best training scores at the end of the second week.
6. There were no significant differences between the above and below average strength groups concerning mean gain in strength scores.

The following conclusions seem to be justified within the limitations of this study:

1. Motivated training promotes significant strength gains, whereas non-motivated training is of little practical value concerning strength improvement when tested under conditions of no consciously induced motivation.

2. A special motivation testing situation (with resemblance to an athletic contest) will significantly increase the strength scores of training groups over those scores achieved during training.

3. A special motivational testing situation will cause non-motivated training groups to make greater strength gains over final training test scores than do the motivated training groups, but the non-motivated training group's final scores remain significantly lower than the final scores of motivated training groups.

4. There is no significant difference in response of students of above and below average initial strength to the motivational techniques in strength training and testing employed in this study.
5. As measured in this study, a person's performance in the area of strength appears to be relative to the level of motivation present during training and testing.
CHAPTER I

STATEMENT OF THE PROBLEM

I. INTRODUCTION

Motivation is generally accepted as an invaluable aid in learning and training situations. Whether it be the learning of a simple motor skill or involvement in a long, arduous training program, it is generally believed that better and faster results are brought about through some form of motivation. In recognizing the importance of motivation, Kemman, Cassidy, and Jackson have stated that an individual may have strength and endurance but lack the motive to act for want of an incentive, drive, or purpose. A person tends to operate at a psychological limit rather than at a physiological limit in releasing power and can unbelievably extend this power under excitement, desperation, or other motivating forces.

Although motivation is generally accepted as necessary in the learning situation, the proper form of motivation has posed serious questions in the minds of educators. For example, there are those who would motivate students through fear or punishment, and feel justified in doing so, if learning were taking place both qualitatively and

\footnote{Wilda Kemman, Rosalind Cassidy, and Chester O. Jackson, \textit{Methods in Physical Education} (Philadelphia: W. B. Saunders Co., 1952), p. 31.}
quantitatively. There are others who would reject fear and punishment as motivational forces. These people believe that praise and reward will bring about greater learning and at the same time provide an enjoyable learning experience. Still another group would stand at the crossroads and deal out punishment on the one hand and reward on the other according to their subjective interpretation of what is best for the occasion.

While the above time-honored viewpoints have provoked considerable controversy among educators, Gates and Rissland concluded from experiments in 1923 that it was better to make encouraging remarks to students than to make discouraging remarks. The following year, Hurlock concluded from her investigation that praise and reproof are of equal value for motivational purposes. In a more recent study, Ulrich and Burke concluded that both success stressors and failure stressors will increase work output, but that success stressors produced greater mechanical efficiency and therefore should be preferred to failure stressors, if a choice is to be made.

While the above viewpoints are concerned with motivation of an extrinsic nature, there are these proponents of education who would

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reject such motivators as rewards and punishment, but would support learning through intrinsic motivation. The educators holding this view would be inclined to go into some detail to explain to students the inherent values which can be realized through improved performance in learning activities.

While a number of studies have been conducted to determine the effects of various types of motivation on learning or the improvement of some task, the writer has noted that contemporary literature contains few investigations devoted to the primary purpose of determining the effectiveness of motivational training programs upon strength improvement. Furthermore, there were no investigations noted which were concerned with determining the effects of a special motivational testing situation on a newly acquired strength level achieved through varying types of motivational training programs.

II. PURPOSES OF THE STUDY

The purposes of this study were as follows:
1. To determine whether an increase in motivational factors would bring about corresponding increases in strength improvement as measured in a six-week training program.
2. To determine whether a special motivational testing situation would further increase strength scores over those scores achieved on the final training program test.
3. To determine whether there initially was a significant
difference between the performance of strong students and weak students in their responses to the training programs and testing techniques.

III. NEED FOR THE STUDY

During recent years, national attention has been focused on the physical fitness of the youth of the nation due to the results of the Kraus-Weber Test as well as the results of other physical fitness data collected on American youth. This fact, coupled with the rise of automation and a seemingly more hectic, faster pace in our daily lives, gives rise to a need for further study in determining faster and more effective methods of strength improvement. From a review of previous studies on motivation, it has been noted that all studies, with the exception of the Marcel study,\textsuperscript{5} were concerned with a test-retest situation rather than the effects of motivation applied during the training task; and relatively few of these studies were concerned with strength improvement.

It is important that knowledge be extended concerning the desirability of regularly motivating students or athletes in extended training programs. It is felt that at the present time many physical educators are conducting training programs for strength development without giving due concern to motivational techniques which possibly

\textsuperscript{5}Norman A. Marcel, "The Effect of Knowledge of Results as a Motivation on Physical Performance," (unpublished study, Louisiana State University, Baton Rouge, Louisiana, 1961), 69 pp.
could bring about greater results in a shorter period of time. Nelson has noted that in too many instances the same has been true concerning motivation in testing situations.

With these factors in mind, it was believed by the writer that a careful, controlled investigation would be of value to physical educators in planning more effectively for a training program and the subsequent testing of its effectiveness.

IV. DELIMITATIONS OF THE STUDY

This study was limited to one hundred and twenty male college Caucasian students randomly selected from badminton classes at Northeast Louisiana State College, Monroe, Louisiana.

The study was limited to four training groups of thirty subjects per group, and one additional group of twenty subjects for the purpose of establishing the validity of the special motivational test. The groups were limited to one particular strength exercise of maximum exertion three days per week for six weeks.

All subjects were asked not to engage in strength development exercises out of class, however, it was impossible to actually control such activity.

V. DEFINITION OF TERMS

The terms basic to this study are listed and defined as follows:

Motivation. Motivation may be identified as a form of interest which is introduced to propel the subject toward some end. Kosman and others have referred to motivation as the "spark to action" in the learning situation.

Assigned goal. A type of motivation whereby the subject is given a goal to work toward. In this study, records were kept on each individual in order to set new goals which were obtainable and in keeping with individual capacity.

Placebo. "An inert substance given as a medication." In this study, the placebo was a specially prepared pill with no physiological value, but which the subject was led to believe was a fast-acting energy and vitamin supplement.

Isometric contraction. The development of tension without a shortening of muscle fiber.

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7Kosman, op. cit., p. 47.
CHAPTER II

REVIEW OF RELATED LITERATURE

Since this study was concerned with the effectiveness of motivational training programs upon strength improvement through the use of isometric exercise, the reviewed literature was divided into the following two categories: (1) motivational studies in psychology and education, and (2) motivational studies in physical education.

I. MOTIVATIONAL STUDIES IN PSYCHOLOGY AND EDUCATION

While there are numerous motivational studies in psychology and education, the studies presented in this section are limited to those that have a bearing on the types of motivational techniques employed in the current investigation. They are organized under the following subject headings: (1) Knowledge of Scores; (2) Incentive; (3) Competition; (4) Encouragement and Discouragement.

Knowledge of Scores

Upon the completion of an experiment with four subjects on a weight-pull apparatus for the arms and legs, Crawley found that through the use of such motivators as praise, blame, knowledge of

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scores, and individual and group competition, considerably more work was produced by the subjects.

Using fifty-nine college students, divided into three equivalent groups, Ross\(^2\) studied the effects of three degrees of information about results on a line drawing task. The degrees on information consisted of complete information, partial information, and no information. Results of the study indicated that performance task improves in accordance with the amount of information given to the subjects.

Manser,\(^3\) using sixty-eight college men and sixty-eight college women studied the effect of knowledge of output on muscular work. The control group made fifty maximal contractions at intervals of fifteen seconds on a hand dynamometer. The experimental group made the first ten contractions without a knowledge of results; the next twenty contractions with a knowledge of results; and the last twenty contractions without a knowledge of results. The investigator concluded that a knowledge of results was accompanied by an increase in performance.

It was Smede's\(^4\) purpose to determine the effect of knowledge of achievement on learning and performance in a tracking task. Knowledge


of results was presented immediately during the tracking performance to the high information feedback group and information was presented at the end of the tracking performance to the low information feedback group. The results of the study indicated that the high information feedback group were superior at the end of the ninety second trial and maintained this superiority throughout the training. The investigator concluded that a high level of information feedback clearly facilitates performance.

Incentive

Noble attempted to determine the effects of incentive-motive conditions on a continuous tracking task. The investigator gave four hundred subjects a preliminary practice period in the performance of a two-handed tracking test, or coordination test. The experimental groups were informed at varying periods of practice of their average score and were told that they would have to improve if they were to pass. From the results of this experiment, the investigator concluded that the incentive-motive conditions did not affect performance.

In 1958, Fleishman gave preliminary training to four hundred subjects on a rudder control test which involved coordinating a Link

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trainer in response to visual signals. Dividing the subjects into two groups, the investigator gave one group motive-incentive instructions and the other group no instructions or incentive after the initial test. The results indicated that the performance of the motivated group was significantly better than that of the non-motivated group. After further dividing the groups into best half and poorest half on the basis of test scores, there was no significant difference found between the poorest half of the motivated group and the poorest half of the non-motivated group. However, the best performances in the motivated group had significantly better scores than the best half of the non-motivated group.

**Competition**

In a study of competitive consciousness, Whittemore\(^7\) stated that there was less competition with the group as a whole than with particular individuals, or with one's self. In this experiment, half of the subjects indicated that they did not like competitive work. Thus, the investigator concluded that worry of competition may sometimes reduce the efficiency of the performer in a particular task.

In 1927, Hurlock\(^6\) studied the effects of group rivalry in arithmetic. From the results of her study, the investigator concluded

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that rivalry was an effective incentive to use with children in the
elementary grades and that inferior students were more motivated by
this incentive than average or superior students.

In a study by Sims, the purpose was to determine the influence
of individual and group rivalry on improvement. The investigator had
the members of two sub-groups compete with each other in a situation
where the subjects were told the scores of each sub-group, but were
not told their own individual scores. These results were compared
with the results of groups in which each subject competed against a
personal rival and the subjects knew their own scores as well as their
rival's scores. The investigator concluded from his study that both
forms of rivalry were superior to a control group with no rivalry and
that the individual rivalry was superior to group rivalry.

In 1932, Forlano found that the average child works better for
individual gain rather than class interest and that competition between
sexes is a stronger motive than either of the other two. Thirty-four
children of both sexes were tested under the experimental conditions
of practice, individual class score, team competition, and competition
against the opposite sex as the means of determining the above results.

In an experiment with children, Stephens found that individual

9V. H. Sims, "The Relative Influence of Two Types of Motivation

10George Forlano, "An Experiment in Cooperation," *Journal of

competition was a much better motivator than group competition. The influence of competition was less distinguished when one class as a whole was trying to better the performance of another class than when one student was trying to out-perform or excel all other students. The investigator further pointed out that there is a greater increase in the amount of work performed when each competitor can see how well the others are doing, however, this does not necessarily mean an increase in quality or accuracy of performance.

Encouragement and Discouragement

Gates and Risland\(^\text{12}\) conducted a study to determine the effects of encouragement and discouragement upon the performance of a color-naming test. Using verbal comments to encourage or discourage the subjects while performing, the investigator found that it was better to make encouraging remarks than to make discouraging ones. Furthermore, it was noted from the results that the weaker subjects were more adversely affected by the discouraging remarks than the more proficient performers.

In a study to determine the value of praise and reproof as incentives for children, Hurlock\(^\text{13}\) tested four hundred and eight children under the following three conditions: (1) normal testing


\(^{13}\)Elizabeth B. Hurlock, "The Value of Praise and Reproof as Incentives for Children," *Archives of Psychology*, 71:75-78, July, 1924.
procedures; (2) praise and re-test; and (3) reproof and re-test. The results of the study enabled the researcher to conclude that praise and reproof are of equal value as incentives and may be used effectively as motivation for school work.

In 1925, Hurlock tested 257 white children and 151 Negro children for the purpose of studying the effects of praise and blame on test performance. After an initial test, groups of subjects of equal ability were organized and subjected to either praise or blame and then were re-tested. Results indicated that both praise and blame were effective in raising test scores, and that younger children and superior children were stimulated most by blame.

Berkowitz and Levy stated that their purpose in this study was to test the relationship between pride in group performance and task motivation under carefully controlled conditions. Seventy-five subjects received an initial trial on a simulated air defense task and were led to believe that they had been evaluated. For the second trial, twenty-five groups of three men per group were distributed among five conditions. Of the five conditions, two were favorably evaluated, two were unfavorably evaluated, and one served as a control. One of the

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favorably evaluated conditions and one of the unfavorably evaluated conditions received evaluations of the group as a whole while the other conditions received individual member evaluations. Results of the study indicated that those groups receiving favorable group evaluations had higher pride in group performance and greater concern with the assigned task than groups which received unfavorable group evaluations or individual member evaluations whether favorable or unfavorable.

II. MOTIVATIONAL STUDIES IN PHYSICAL EDUCATION

In this section, the writer has attempted to bring together those motivational studies dealing with human movement which have been conducted by physical education personnel.

The earliest motivational study found in the field of physical education was the Berridge experiment which was conducted in 1935. In this study, the investigator analyzed the effects of competition with three groups of students. Group I consisted of students tested alone with no knowledge of results; and Group II consisted of students tested alone with a knowledge of results; and Group III consisted of students tested in a group and with a knowledge of results. The exercise used in the experiment consisted of back lifts and leg lifts as measured by a Kellog dynamometer. From the results of the experiment, the investigator concluded that better lifts were made in the more

competitive situation, and especially in company with a knowledge of
results.

In 1951, Munro\textsuperscript{17} tested the speed of movement of sixty male
students. When their speed in grabbing a ball was slow, they received
an electric shock. The electric shock, serving as a motivator,
speeded up their reaction and the increased speed was transferred to
a second ball-match test. Later, another ball-match test was given
to determine whether or not the transferred speed-up of response due
to motivation was retained for an appreciable period of time. Using
a control group that did not receive shock motivation, it was found
that the major part of the improvement made by the experimental group
was due to the electric shock motivation. On the basis of the
obtained results, it was concluded by the experimenter that a period
of seven weeks is required for the increase in speed transferred from
a motivated simpler response to significantly retrogress toward the
initial speed of movement.

It was Henry's\textsuperscript{18} purpose to study the transfer of effects. His
results revealed that a motivated simple response transfers its
increase in speed to a more complex response and that motivation due

\textsuperscript{17} Sanford J. Munro, "The Retention of the Increase in Speed of
Movement Transferred from a Motivated Simpler Response," \textit{Research

\textsuperscript{18} F. M. Henry, "Increase in Speed of Movement by Motivation and
by Transfer of Motivated Improvement," \textit{Research Quarterly}, 22:219,
May, 1951.
to administering electric shock has a significant facilitating influence in speeding up the reaction or movement.

In another study, Henry\(^{19}\) measured sixty college men on a ball snatch coordination test, their responses being fractionated into reaction time and movement phases through the use of two chronoscopes. These students were further studied by dividing them into groups of ten. One group was utilised as a control group and the others were motivated by dim or bright light, electric shock plus bright light, or sound. Beginning at the median ball snatch response time for each individual, the motivation stimuli were applied automatically and persisted until the motor act was completed. The results indicated that all groups were significantly improved in reaction time and most of them in movement time, by whatever motivation stimulus they received. The results supported the hypothesis that improvement is due to the informative value of the motivation stimuli rather than to punishment as such.

Fairelough\(^{20}\) tested forty male students from a university physical education class as to speed on a hand coordination movement and a foot coordination movement for the purpose of determining whether motivated improvements in movement of one part of the body

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transfers to cause improvement in movement of some other body part. Also, half of the experimental subjects received sound as a motivator and half received shock so that the two different types of motivation could be compared. The results showed that motivated improvement in speed of movement in one body part (hand) can be transferred to cause a significant improvement in speed of a different type of movement of another body part (feet), under conditions where there is no transfer of training. No appreciable difference was found between sound and shock in causing reaction time improvement.

Howell\(^{21}\) conducted an investigation in 1953 using fifty male students between the ages of seventeen and thirty years to determine the influence of emotional tension on speed of reaction and movement. Electrical shock was used on the subjects to produce motivation and tension. Using several physiological measures of emotional tension, the investigator was able to classify each subject and place him into either a most tense group or a least tense group. The results showed that the most tense group displayed a significantly greater increase in speed of complete motor response under motivation than the less tense group.

Hipple\(^{22}\) tested thirty white boys and thirty Negro boys for

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speed of motor response in a laboratory situation to determine whether any racial differences existed in motivated reaction time and movement time. The results of the non-motivated test showed no statistically significant differences between the Whites and Negroes in reaction time or movement time. During the second half of the test, a loud sound was produced to notify the subject that he had made a slow response. The White motivated group made a significant improvement over the White control group in reaction time, movement time, and total time. Although the Negro motivated group improved, there was no clearly significant change in any of the above functions over the Negro control group. Results were not available concerning Negro versus White.

Hesse attempted to examine the effects of self competition and team competition upon the performance and stated goals of sixth, eighth, and ninth grade girls. Testing seventy-five subjects in the standing broad jump and thirty-yard dash under a normal testing situation, a self competition situation, and a team competition situation, the investigator concluded from the results that performance scores were not significantly affected by the conditions of self and team competition. However, it was pointed out that due to a limited number of cases, plus difficulties in controlling extraneous variables, generalizations which could be drawn from the study were limited.

It was Walter’s purpose to compare the social integration and adjustment of motivated and non-motivated college women in a seven-week bowling class by means of personal distance ratings. The motivated group consisted of thirty-six students divided into four competitive teams. Team scores were posted for the motivated group at each class meeting and the two losing teams were to treat the two winning teams at the last class period. The non-motivated group consisted of sixty students and no mention was made of team competition or any other special devices for purposes of motivation. The results of the study indicated that both groups became more socially adjusted as a result of group participation, but the motivated group became better adjusted than the non-motivated group, and the good performer had greater acceptance as a member of the group than the poor performer.

In a study by Johnson twenty-five junior high school boys between the ages of twelve to thirteen were classified into stages of pre-pubescent, pubescent, and post-pubescent development. Each group performed two exercise trials on a bicycle ergometer, one trial motivated by personal urging and encouragement, and the other trial non-motivated. Before starting the motivational trial, each subject

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was informed that he was competing against boys from a rival school and also against his classmates. In the non-motivated trial the subject was told to pedal as fast as possible but he worked in the absence of encouragement. The results indicated that there were significant differences in work output between the puberal groups, but there was no significant difference between the motivated and non-motivated trials. Motivation tended to produce greater effort, as evidenced by increases in pace and more acute adjustments in heart and blood pressures, but this did not produce greater total work output.

In a study by Ulrich and Burke,26 it was their purpose to investigate the effects of encouraging reports of success and of discouraging reports of failure on work output, mechanical efficiency, and associated cardio-respiratory functions, and to determine sex differences in the above measurements. Nine men and nine women were tested on three different occasions on a bicycle ergometer. The first trial was non-motivated, but on the second and third trials the students either heard a bell indicating that they were setting a new record or a busser indicating that they were not doing well. The sound of the bell and busser was preplanned and was independent of the actual performance of the students.

The investigators concluded that the reaction of men and women to motivation is similar; that motivational techniques increase work

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output; and that motivational stressors indicating success produce greater mechanical efficiency than neutral stressors or failure stressors. Motivational stressors indicating success and those indicating failure will both increase work output, but if a choice is to be made between the two, those indicating success are to be preferred.

Twenty-eight subjects were studied by Hennis and Ulrich\textsuperscript{27} to investigate the effect of psychic stressors on depth perception, steadiness, blood pressure, and simple hand-eye coordination. Using Taylor's Manifest Anxiety Test at the first testing period, the administrators explained that the test was a test of personality, and that serious thought should be given to all answers. The second testing period was used to measure subjects with regard to blood pressure and steadiness; and the third testing period to measure depth perception and hand-eye coordination. Subjects in the second and third testing periods performed one at a time in the presence of only the investigator and silence was maintained throughout the tests. Testing periods two and three were repeated for the fourth and fifth testing sessions with the only difference being the presence of observers who appeared to take notes on the performance and to comment to each other in voices that were audible to the subjects. Results indicated that the psychic stressor employed elicited a response in the subjects which was

significantly different from the response found when there was an absence of the stressor. However, the response was not directional in any of the factors measured with the exception of blood pressure. Blood pressure was definitely elevated by the stressor.

It was Vallarga's\textsuperscript{26} purpose to determine the influence of perceptual stimulus intensity on the speed of large muscle motor movement and the influence of sound on the force of muscular contraction. The investigator used sound stimuli that were three intensities of a 3,000 cycle tone, namely soft (45 db.), medium (65 db.), and loud (85 db.). Using thirty-six male subjects in each experiment, thirty responses were made per subject for each of the three stimuli in the speed of movement test and forty-three in the muscular contraction tests. In order to control the effects of practice, a balanced order of administering the stimuli was used in each experiment. Using a spring loadedergograph in the second part of the experiment, the force of contraction of the forearm muscles was measured. An analysis of variance showed that the loud sound intensity produced the fastest speed of movement, but that the soft intensity produced a faster time than the medium tone. Concerning muscle strength, the medium sound produced the greatest contraction, although the loud sound resulted in a more forceful contraction than the soft sound.

Gerdes²⁹ investigated the use of motivational techniques in testing which required no specially constructed apparatus and which would be feasible to use in most physical education class testing situations. Using one hundred college students randomly assigned to five groups of twenty each, the investigator conducted tests in speed, strength, skill, and accuracy with different motivational techniques applied to each of the five groups. The motivational techniques used in the study are listed as follows: (1) no motivation; (2) scale scores on charts whereby each subject could determine his statute as excellent, good, poor, or unacceptable; (3) competition between four subjects; (4) all-out encouragement from instructor and class; (5) team competition; (6) telling the student that the lowest fifty per cent would be re-tested and then testing him before the group; (7) use of a given goal; and (8) combination of the above situations. Results of the study revealed that motivation brought about a significantly better performance in only two of the test items, namely, chin-ups from the strength category and the basketball wall volley from the skill category. The use of scale scores, with and without vocal encouragement, was significantly better than the other motivational techniques used in the chinning test, and the use of a given goal and team competition brought about a significant improvement.

in scores on the basketball wall volleyball test. No significant difference was found to exist between the effective motivational techniques.

Rochelle and others\(^{30}\) tested forty-six male students on a softball throw for distance without warming up and also with a five-minute related warm-up preceding throwing. Each student was allowed three throws for maximum distance on each test. In order to overcome the psychological effect of not throwing with maximum effort because of no preliminary warm-up, the investigators offered a monetary reward for each throw greater than the norm established for his weight, height, and body type. It was found that a significant difference existed at the one per cent level of probability between throws one and three when no warm-up preceded throwing, thus indicating that a monetary reward was beneficial in obtaining a maximum throw for distance and, under those conditions, a beneficial warm-up effect after only two throws. However, it was also found that subjects threw further when throws were preceded by a related warm-up period and this difference was significant at the one per cent level of probability.

Using forty-eight male college freshmen, Wireman\(^{31}\) studied the relative effectiveness of four approaches to increasing physical fitness. They are listed as follows: (1) a program of calisthenics, games and sports with a periodic knowledge of results given to the


subjects; (2) a program of calisthenics, games and sports with no
knowledge of the results for the subjects; (3) a program of games and
sports with a periodic knowledge of results given to the subjects;
and (4) a program of games and sports with no knowledge of the results
for the subjects. Using the Indiana Motor Fitness Test, the investi-
gator concluded that of the experimental conditions under consideration,
knowledge of results relative to progress or regression in physical
fitness status seemed to be the most effective.

Hartick\textsuperscript{32} trained ninety-seven university subjects on a bicycle
ergometer once a week for six weeks and then placed the subjects into
four equated groups. The groups were identified as follows: (1) a
group which rode the ergometer before an audience; (2) a group which
performed to reach a set goal (competition with own record); (3) a
group which performed for a money reward; and (4) a control group with
no added incentive. After testing each group under their assigned
type of motivation, the investigator concluded that the three incentives
applied on the final tests caused a significant increase over the
mean of the preliminary trial scores within each group at the one per-
cent level of confidence. Also, differences in means among the three
motivated groups were not significant at the five percent level of
confidence.

\textsuperscript{32}Fredrick J. Hartick, "The Effects of Various Incentives on
Performance in an Endurance Exercise," (unrecorded Master's thesis,
Pennsylvania State University, University Park, 1940), pp. 59-62.
In 1961, Martin tested eighty college women for the purpose of determining the effects of specific motivational techniques on the performance of the jump and reach test. The four motivational techniques used in the study were: (1) subjects performed alone and were given no information concerning scores; (2) subjects performed alone and were given immediate information following their performance; (3) the subjects were given no information, but performed in the presence of the other members; and (4) the subjects performed in the presence of the other members and received information concerning all scoring which took place. Results of the study indicated that there was a significant difference in mean scores favoring the two groups tested with immediate knowledge of results.

The following year, it was Nelson's purpose to determine the effects of various motivational situations on college men who exercised to the point of exhaustion on an elbow-flexion ergograph; and to determine the effects of these situations on strength decrement and recovery following exhaustive exercise. Using two hundred and fifty male students, the investigator tested twenty-five subjects in each of the following motivational situations: (1) normal testing

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instructions; (2) verbal encouragement; (3) individual competition; (4) group competition; (5) obtainable goal; (6) observer's presence; (7) instructor interest; (8) ego-involvement; (9) Air Force space program; and (10) competition with the Russians. The results of the study enabled the investigator to classify the various motivational situations into low, moderate, and high groups. The three motivational situations resulting in the lowest cumulative distance means on the ergograph were the normal instructions group, verbal encouragement group, and the instructor interest group. The four motivational situations placed in the moderate group were the obtainable goal group, observer's presence, group competition, and competition with Russians. The three situations placed in the high category were the ego-involvement group, Air Force space program, and individual competition group.

The investigator concluded that different motivational situations performed under stress did affect the physical performance of college men and that subjects who exerted more effort under the influence of the motivational situations had greater strength decrement and recovered more slowly from their strength loss than those less motivated.

Strong\textsuperscript{35} stated that the purpose of his study was to determine

the effect of six motivating conditions on the performance of sixth-
grade children on seven physical fitness items. The investigator
used thirty-four elementary school boys and girls and divided them
into seven groups (six experimental groups performing under a parti-
cular motivating condition and one control group). The six motivating
conditions used were competition against self, team competition, level
of aspiration, competition to establish class records, competition
against someone of near equal ability, and competition against someone
of markedly different ability. From the results of the experiment,
the investigator concluded that motivating conditions bring about
better performance than non-motivating conditions and that level of
aspiration and team competition are most effective than the other
types of motivation used in the study.

It was Marcel's\textsuperscript{36} purpose to compare the differences in
performance achieved by one group of subjects working with knowledge
of results with the differences in performance achieved by a second
group of subjects working without knowledge of their results. Two
groups of thirty subjects each participated in identical workouts for
a period of six weeks. The results obtained from the study indicated
that both groups increased significantly in their performance in all
measured exercises, but the group working with knowledge of their
results had greater mean gains in all exercises than the group working
without a knowledge of their results.

\textsuperscript{36} Marcel, \textit{op. cit.}, pp. 33-35.
Using hypnosis to control the psychological variable, Massey, Johnson, and Kramer\textsuperscript{37} studied the effect of warm-up exercise upon the muscular performance of fifteen subjects riding a bicycle ergometer. The subjects were tested four times, two times following a warm-up period and two times without a warm-up. The subjects were placed in a hypnotic state prior to each test and were not aware of whether they had warmed-up or not. The study failed to find statistically significant differences in mean performances.

Johnson and Kramer\textsuperscript{38} used ten subjects to study the effects of different types of hypnotic suggestions upon physical performance. The exercise consisted of pressing a 47-pound barbell from a supine position after receiving hypnotic suggestions in the following four conditions: (1) stereotype suggestions in trance, performance in hypnosis; (2) pep-talk suggestions (urgent but not hysterical in trance, performance in hypnosis; (3) suggestions in trance to be activated post-hypnotically by signal during exercise; and (4) post-hypnotic failure suggestion to reduce performance out of hypnosis.

The subjects were not aware that any suggestions were given to them in any of the conditions. Post-hypnotic failure suggestions scores were significantly lower than scores achieved under the other


three conditions. The best individual performance occurred in the 
pep-talk suggestion condition with none of the lower scores of the 
study occurring in this condition.

In another investigation by Johnson and Kramer,\(^39\) it was their 
purpose to compare the effects of non-hypnotic, hypnotic, and post-
hypnotic suggestions upon strength, power, and endurance when the 
suggestions were stereotyped and minimum criteria of trance depth 
were imposed. The tests used to measure strength, power, and endurance 
were, respectively, the hand dynamometer, jump and reach test, and a 
supine press of a 47-pound barbell to exhaustion. It was found that 
two of the hypnotic conditions were significantly better than the 
non-hypnotic condition in endurance. There were no statistically 
significant findings concerning grip strength or power.

Eighty male subjects divided into four matched sub-groups were 
used by Ryan\(^40\) to determine the effects of four types of motive-
incentive conditions on grip strength. The first group was told to do 
as well as possible on the retest, the second group was verbally 
exhorted to do better than on the first test, the third group had a 
knowledge of the results of the preliminary test and was allowed to 
watch the dynamometer dial on the retest, and the fourth group was told

\(^{39}\) Warren R. Johnson and George F. Kramer, "Effects of Stereotyped 
Non-hypnotic, Hypnotic, and Post-hypnotic Suggestions upon Strength, 

\(^{40}\) E. Dean Ryan, "Effects of Differential Motive-Incentive 
Conditions on Physical Performance," Research Quarterly, 32:83-87, 
that failure to improve would trigger an electrical shock. The results of the investigation indicated that there were no differences in performance among the four motive-incentive conditions. The investigator concluded from his study that as long as subjects understand that it is important to give a maximum effort, there is no need for additional incentive.

In 1962, Ryan\textsuperscript{41} tested the hypothesis that externally induced tension would facilitate performance on a relatively easy motor skill, but impair performance on a more difficult skill and would not influence learning. Using two groups of twenty subjects each on the easy motor skill, the investigator exposed the experimental group to unavoidable electric shock and the other group to no shock. Four groups of twenty subjects each were used to perform the difficult motor skill with two of the groups receiving unavoidable electrical shock and two receiving no shock. The results of the study failed to support the hypothesis that tension improves performance of an easy motor task, but it did support the hypothesis that increased tension impairs performance of a difficult motor task, and that for either difficult or easy skills, the rate of learning is independent of the state of tension.

In 1963, it was Nelson's\textsuperscript{42} purpose to investigate the effect


of selected music on human performance as measured by an all-out 90-second exercise on the bicycle ergometer. Using forty-eight subjects, no significant differences were found among the groups which performed under conditions utilizing different types of music. From the results of the study, it was concluded by the investigator that music, pure rhythmical tones, or music intensity, in and of themselves, will have no beneficial effect on an all-out 90-second exercise in a bicycle ergometer test.

In a laboratory study, Morehouse and Miller had subjects perform on an arm ergograph. They found that an observer caused students to accomplish 1 1/2 times more work than when they worked alone. When cheered by observers at the first signs of fatigue, the work output of subjects increased 2 1/2 times that of solitary work. However, the authors pointed out that the subjects for their study were trained athletes and hypothesized that the performance of a novice might possibly diminish in the presence of observers or cheering.

III. SUMMARY OF RELATED STUDIES

Section I of this chapter was concerned with motivational studies in psychology and education. The majority of studies in this section indicated that motivation is beneficial to the learning situation. However, in two of the studies reviewed, the investigators


44 Sims, Stephens, Gates and Riegel, Burlock, Crawley, Ross, Forlano, Manser, Berkowitz and Levy, Smrede, and Fleishman, *ibid.*
did not find that performance was necessarily improved by the forms of motivation that were employed.\textsuperscript{45,46}

Section II was concerned with motivational studies in physical education. The majority of studies in this section reported motivation as being beneficial to the testing situation\textsuperscript{47} while six studies failed to find significant improvement by employing motivational techniques while testing.\textsuperscript{48} Only two studies in this section investigated the effects of motivation during training. Both of these studies concluded that motivation was beneficial in training programs of physical exertion.\textsuperscript{49}

\textsuperscript{45}Noble, loc. cit.

\textsuperscript{46}Whittemore, loc. cit.

\textsuperscript{47}Berridge, Munro, Henry, Fairclough, Howell, Hipple, Walters, Ulrich and Burke, Vallerga, Gerdes, Rochelle, Wireman, Martin, J. K., Nelson, Strong, Johnson and Kramer, and Morehouse and Miller, loc. cit.

\textsuperscript{48}Johnson, Hennis and Ulrich, D. O. Nelson, Hesse, Massey, and Ryan, loc. cit.

\textsuperscript{49}Hartick and Marcel, loc. cit.
CHAPTER III

PROCEDURE FOR THE STUDY

I. INTRODUCTION

This study was conducted during the first nine weeks of the 1964 fall session at Northeast Louisiana State College, Monroe, Louisiana. The initial test, which consisted of a two-hand press upward on an isometric bar and scale apparatus, was administered to one hundred and twenty male college students in physical education badminton activity classes. The subjects were randomly assigned to four experimental groups consisting of thirty subjects each. Each group participated in an isometric training program in which they reported one at a time to the investigator for their particular type of training three days a week for six weeks. Subjects in Group I trained without any induced motivation; Group II trained with a knowledge of scores; Group III trained with a knowledge of scores, plus being assigned a specific goal; and Group IV trained with a knowledge of scores, an assigned goal, plus the oral administration of a placebo. A final training test (identical to the initial test) was administered at the end of the sixth week of training. The final training test was followed by a special testing situation in which students were tested under conditions similar to an athletic contest.

A statistical comparison of the initial and final training tests was used to determine the effectiveness of the four training programs.
The scores achieved on the special situation test were then compared with the final training scores for each group to determine what additional effects were brought about by the motivated testing situation.

II. SUBJECTS

A total of one hundred twenty male students in the morning badminton classes meeting on Monday, Wednesday, and Friday were selected as participants in the experiment. Those students who were engaged in an outside exercise program or who were incapacitated due to any disability were not included in the study. After testing all subjects on three consecutive class days, the highest score for each student was recorded as his initial test score.

The procedure for the assignment of subjects to training groups was as follows:

1. Scores were ranked from highest to lowest for all subjects in the training program.

2. The highest one-fourth of the scores and the lowest one-fourth were separated from the middle one-half.

3. The middle one-half of the scores were then randomly assigned into four groups.

4. The upper one-fourth of the scores were then randomly assigned to the four groups as were those subjects in the lower one-fourth of the initial scores.
5. The student cards were placed in four piles, then four slips of paper with the name of each training group were folded and placed in a container and mixed thoroughly so that the investigator had no knowledge of which group number would be drawn first. The four slips were then drawn and placed on top of each stack of score cards, thus completing the procedure for assigning the subjects to groups.

III. TESTING AND TRAINING EQUIPMENT

The testing and training equipment is shown in Figure 1. This equipment consisted of a nylon strap with numerous slots for the purpose of adjusting two metal bars at any desired distance apart. The slots of the nylon strap also permitted the fastening of an iso-scale\(^1\) which indicated the pounds of pressure exerted by each subject on the apparatus. A small platform for the purpose of providing better balance was constructed to fixate the lower exercise bar upon which the person ordinarily stands during a two-hand press with this isometric kit. The scale itself is repeatable and measures up to 600 pounds of pressure, while the nylon strap is strong enough to withstand several thousand pounds of pressure over an extended period of time. A satisfactory degree of reliability of the testing and training apparatus was

FIGURE 1

SUBJECT DEMONSTRATING THE TWO-HAND ISOMETRIC PRESS WITH THE ISO-KIT AND SCALE
established by the manufacturer at the time of production. The author also demonstrated reliability in a pilot study with nineteen subjects. In a test-retest situation, a coefficient of correlation of .91 was obtained.

IV. PROCEDURE FOR TESTING

All subjects were initially tested on a two-hand press without induced motivation other than the giving of general directions and the words, "press upward as hard as you can." Students were tested one at a time in a small room closed to outside observation, with the best of three trials determining their initial scores. The same procedure was followed in the final training test. The students were aware of their scores on both the initial and final tests.

At the beginning of the experiment, the upper bar was inserted in a loop in the strap so as to be at a point between the eyebrows and the hairline for each individual. The loop number was recorded, on each subject's card to insure that all subjects would perform this exercise during training at the same level as when tested.

Each subject was instructed to stand on the platform so that the outside edges of the feet were along the edges of the platform sides and so that the toes and heels were approximately at equal distances from a line drawn across the platform. All subjects were also instructed to keep each hand in the grated area of the bar on each side of the strap so that greater standardization could be achieved.
V. EXPERIMENTAL GROUPS

Each of the four experimental groups was composed of subjects participating in required physical education classes meeting between the hours of 7:45 a.m. and 11:45 a.m. on Monday, Wednesday, and Friday. Thus, each badminton class contained subjects from each of the four experimental groups to offset the possibility of a time variable influencing the scores of a particular group.

Group I—The Non-Motivated Training Group

Thirty subjects in Group I served as an experimental group working on the isometric press three times per week for six weeks without any purposefully-induced motivator. The exercise consisted of a two-hand press for six seconds at maximum exertion on the isometric apparatus previously described, except that the scale indicator was covered so that neither the student nor investigator could observe how much the subject pressed. Actually, the investigator recorded Group I's scores one day each week by removing the covering from the scale after the subject had left the room.

Group II—The Knowledge of Scores Training Group

The thirty subjects in this group performed the same isometric exercise as the subjects in Group I, three times per week for six weeks. However, the gauge was uncovered and the investigator verbally called out the readings on the dial as they pressed on the bar. Knowledge of results was the only purposefully-induced motivator. The scores were
recorded each week in order to plot their progress throughout the training period.

**Group III—The Assigned Goal Training Group**

Thirty subjects in this group worked at the isometric press three times per week for six weeks with a knowledge of scores, plus being assigned a reasonable goal of approximately five to ten pounds above the previous score. The exercise was the same as for Groups I and II, and scores were recorded one day each week. On each exercise day, the subject was reminded of his previous score, was assigned the goal, and following each exertion, was told whether he failed, achieved, or surpassed his goal for that day.

**Group IV—The Placebo-Effect Training Group**

Thirty subjects were assigned to this experimental group which performed the isometric exercise three times per week for six weeks with a knowledge of scores, an assigned goal, plus taking a non-stimulating pill which they were led to believe was a quick-energy and vitamin supplement pill. In actuality, the pill contained magnesium oxide, an anti-acid which could have no effect on strength performance. The exercise was the same as for the other experimental groups and scores were recorded one day each week. On each exercise day, each subject took one pill in the presence of the investigator, and, as in Group III, was reminded of his previous score and given an assigned goal of approximately five to ten pounds above that score. Following
each exertion, the subject was told whether he failed, achieved, or surpassed his goal for that day.

**Below Average Group**

This group was formed by the lower one-third of the subjects in each of the three motivated training groups. The group was merely formed statistically and did not exercise specifically as a group.

**Above Average Group**

This group was formed by the upper one-third of the subjects in each of the three motivated training groups. The group was merely formed statistically and did not exercise specifically as a group.

**VI. THE FINAL TRAINING TEST**

On the last day of the six-week training program, all subjects were told that they would be given a final training test which was to be conducted during the next three class meetings. During the actual test, each subject pressed without induced motivation other than the giving of general directions and the words, "press upward as hard as you can." The testing procedure for the final training test was the same as that of the initial test.

**VII. THE SPECIAL MOTIVATIONAL TESTING SITUATION**

(See Figure 2)

Following the final training program test for the experiment, the testing apparatus was placed in the gymnasium in front of the
FIGURE 2

SUBJECT BEING TESTED DURING THE SPECIAL MOTIVATIONAL TESTING SITUATION
seating area. Spectators were brought in from physical education dance classes, march music was played on a phonograph, and a photographer and movie camera operator were in action during this testing situation. Prior to the special testing, the writer informed the subjects and audience that it was extremely important that all subjects increase their scores because Louisiana Polytechnic Institute (an arch rival) had been conducting a similar experiment for the past few weeks and that whichever school showed the greatest strength gains would receive a $75,000 research grant from the Aeronautic Space Agency for purposes of developing an isometric physical fitness program for Astronauts while in prolonged flight. The subjects were informed at the completion of the experiment that the statements concerning a research grant were not true but used only as a motivational device. Each subject was then called on, one at a time, to press before approximately one hundred cheering spectators amid march music and picture taking. Upon the completion of each subject's press, the writer would call out the number of pounds of increase or decrease from the final test which had been completed two days earlier. The purpose of this situation was to see if a highly motivating test situation would raise or lower the newly acquired strength level achieved through the motivated training programs. Prior to the beginning of the initial test for the experiment, a special group of seventeen subjects was tested one at a time and then retested under the special motivational testing situation to verify the belief that such a situation was motivating enough to significantly
raise scores. A significant gain at the .01 level of confidence proved the validity of the special motivational test.

VIII. STATISTICAL ANALYSIS

The data were analysed to establish the significance of the mean gains in strength scores on the initial and final tests, and the final training and special motivational situation tests. These analyses were made by utilizing the t-test of the significance of difference between two correlated means for each of the training groups.

In order to determine if there were significant differences among the four groups concerning the initial test, best training scores, final test, and special motivational situation test, an analysis of covariance was used. In those cases where covariance revealed significance, orthogonal comparisons with regression were made to determine whether the additive effects of added motivation were linear, quadratic, or cubic in nature.

The standard error of the difference between two independent means was used to determine if there were significant differences between the gains of an above average group and below average group on the initial and final training test. The same statistical procedure was used to compare the final training test scores with the special motivational situation test scores for these two groups.
CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

I. INTRODUCTION

Three statistical techniques were used in this study for purposes of determining the effects of motivation upon strength performance. The three techniques used were: (1) the significance of difference between two correlated means; (2) analysis of covariance and regression; and (3) the standard error of the difference between two independent means.

The data in this study consisted of initial scores, best training scores, final training scores, special motivational situation scores, and gain scores between initial and final tests and between final and special motivational tests.

II. ESTABLISHING THE SIGNIFICANCE OF THE MEAN GAINS IN STRENGTH SCORES

In establishing the significance of the mean gains in strength scores, t-tests were computed to compare the initial and final training scores of each group as seen in Table I, and to compare the final training scores with the special motivational test scores for each.
<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Initial Mean</th>
<th>Final Mean</th>
<th>Improvement</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I</td>
<td>30</td>
<td>112.73</td>
<td>114.67</td>
<td>0.94</td>
<td>.94</td>
<td>NS</td>
</tr>
<tr>
<td>(No Motivation)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group II</td>
<td>30</td>
<td>112.97</td>
<td>122.97</td>
<td>10.00</td>
<td>5.99</td>
<td>.01</td>
</tr>
<tr>
<td>(Knowledge of Scores)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group III</td>
<td>30</td>
<td>112.70</td>
<td>125.67</td>
<td>12.97</td>
<td>5.02</td>
<td>.01</td>
</tr>
<tr>
<td>(Knowledge plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assigned Goal)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group IV</td>
<td>30</td>
<td>112.43</td>
<td>124.73</td>
<td>12.30</td>
<td>5.72</td>
<td>.01</td>
</tr>
<tr>
<td>(Knowledge plus</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goal plus Placebo)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* t needed at .05 level = 2.04
* t needed at .01 level = 2.76
group as shown in Table II, page 48. The significance of difference between two correlated means was used.¹

Comparison of Initial and Final Training Test Strength Scores

In Table I, page 46, it can be seen that the t-ratio resulting from the comparison of the initial and final training strength tests of the non-motivated training group (Group I) was .94. The required t-ratios for 29 (30-1) degrees of freedom were found to be 2.04 and 2.76 at the .05 and .01 levels of confidence, respectively. Since the t of .94 is well below the .05 level, it may be stated that non-motivated isometric training was not effective in producing strength gains. A mean gain of only 1.93 pounds was evidenced by this group following the six-week training period.

Group II, the knowledge of scores group, realized a mean gain of ten pounds. The computed t-ratio was 5.99 which was well above the 2.76 ratio needed at the .01 level of confidence. Thus, it may be stated that isometric training with a knowledge of scores resulted in significant improvements in strength.

The t-ratio found in comparing the initial and final training tests of the assigned goal group (Group III) was 5.02 which was well above the .01 level of confidence. Their mean gain was 12.97 pounds, thus it can be seen that isometric training with a knowledge of scores,

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Final Training Test Mean</th>
<th>Special Motivational Test Mean</th>
<th>Mean Improvement</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group I (No Motivation)</td>
<td>30</td>
<td>114.67</td>
<td>123.77</td>
<td>9.10</td>
<td>4.60</td>
<td>.01</td>
</tr>
<tr>
<td>Group II (Knowledge of Scores)</td>
<td>30</td>
<td>122.97</td>
<td>129.70</td>
<td>6.73</td>
<td>3.62</td>
<td>.01</td>
</tr>
<tr>
<td>Group III (Knowledge plus Assigned goal)</td>
<td>30</td>
<td>125.67</td>
<td>129.57</td>
<td>3.90</td>
<td>2.06</td>
<td>.05</td>
</tr>
<tr>
<td>Group IV (Knowledge plus goal plus placebo)</td>
<td>30</td>
<td>124.73</td>
<td>130.07</td>
<td>5.34</td>
<td>3.17</td>
<td>.01</td>
</tr>
</tbody>
</table>

_t needed at .05 level = 2.04_
_t needed at .01 level = 2.76_
plus an assigned goal stimulated significant improvements in strength, as measured in this study.

Group IV, the placebo group, had a mean gain of 12.30 pounds during the six-week training program. The resultant t-ratio was also beyond the 2.76 ratio needed for the .01 level of confidence. Therefore, it also may be stated that isometric training with a knowledge of scores, an assigned goal, and the added effect of administering a placebo resulted in significant improvements in strength.

Comparison of Final Training Test and Special Motivational Situation Strength Test Scores

As shown in Table II, page 48, the mean gain of 9.10 pounds and the resulting t-ratio found in comparing the final training test and the special motivational test scores of the non-motivated training group (Group I) was 4.60 which was well above the 2.76 ratio required for significance at the .01 level of confidence. Therefore, it may be stated that the special motivational test brought about a significant strength increase over and above that posted on the final training test by those students who trained without a purposefully induced form of motivation. It should be noted that this group had shown no significant improvement during the six-week training program.

The t-ratio resulting from comparing the final and special motivational test scores of the knowledge of scores group (Group II) was 3.62 which was significant at the .01 level of confidence. Thus, the special motivational test brought about a significant strength
increase over and above that posted on the final training test by those students who were informed of their scores during training. The mean gain for this group was 6.73 pounds.

Group III, the subjects having an assigned goal each training session in addition to knowing their scores improved 3.90 pounds on the special motivational test. The t of 2.06 was slightly above the 2.04 ratio required for the .05 level of confidence. Therefore, it may be stated that the special motivational test brought about a significant strength increase over that recorded on the final training test by students who trained with two purposefully induced forms of motivation.

A comparison made of the final and special motivational test scores of the placebo group (Group IV) revealed a t of 3.17 which was beyond the 2.76 ratio required for the .01 level of confidence. The gain realized from the final training strength test to the special motivational test for Group IV was 5.34. Therefore, it was found that the three motivation groups improved their scores significantly on the special motivational test over that recorded on their final training test in addition to the fact that they all had significantly gained in strength during the training program.

III. ANALYSIS OF COVARIANCE

An analysis of covariance was used to determine if there were significant differences in the scores among the four groups on each
of the tests. This statistical method represents an extension of the analysis of variance method in order to allow for the correction of final means for any differences that may have existed in the initial means of the test. Thus, when there is a high correlation between initial status and gains made, analysis of covariance adjusts for this relationship. Consequently, when there is a high correlation among scores and a low correlation among means, covariance will often lead to a significant $F$ whereas the analysis of variance method may fail to reveal significant differences among the final means. Analyses were made of the best training scores, the final test scores, and the special motivational test scores. Concerning the initial scores, an analysis of variance revealed that the groups were essentially equal at the start of the experiment. The results of the analysis of covariance are shown in Table III. To reach significance, an $F$-ratio of 2.69 was required for the .05 level of confidence and of 3.96 at the .01 level. For those tests where significant $F$-ratios were found, further analysis by regression was undertaken using orthogonal polynomials, as shown in Fisher and Yates' statistical tables. The orthogonal polynomials that were used are as follows:

<table>
<thead>
<tr>
<th></th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linear</td>
<td>-3</td>
<td>-1</td>
<td>+1</td>
<td>+3</td>
</tr>
<tr>
<td>Quadratic</td>
<td>+1</td>
<td>-1</td>
<td>-1</td>
<td>+1</td>
</tr>
<tr>
<td>Cubic</td>
<td>-1</td>
<td>+3</td>
<td>-3</td>
<td>+1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Test</th>
<th>Source of Variation</th>
<th>Corrected SS</th>
<th>df</th>
<th>Mean Squares</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Best Training Scores</td>
<td>Total</td>
<td>17225</td>
<td></td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Among Groups</td>
<td>5255</td>
<td>3</td>
<td>1752</td>
<td>16.85</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>11970</td>
<td>115</td>
<td>104</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Tests</td>
<td>Total</td>
<td>18211</td>
<td></td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Among Groups</td>
<td>2314</td>
<td>3</td>
<td>771</td>
<td>5.59</td>
<td>.01</td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>15897</td>
<td>115</td>
<td>138</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Special Motivational</td>
<td>Total</td>
<td>18469</td>
<td></td>
<td>118</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Test</td>
<td>Among Groups</td>
<td>559</td>
<td>3</td>
<td>186</td>
<td>1.69</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Error</td>
<td>17910</td>
<td>115</td>
<td>116</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

F .01 = 3.96
F .05 = 2.69

TABLE III
ANALYSIS OF COVARIANCE FOR THE BEST TRAINING SCORES, FINAL TEST SCORES, AND THE SPECIAL MOTIVATIONAL TEST SCORES
Best Training Scores

An analysis of the best training scores data revealed an F-ratio that indicated significant differences among groups. As shown in Table III, page 52, the F-ratio was 16.85 which was highly significant beyond the .01 level of confidence.

Since significant differences between the groups concerning best training scores were indicated, further study of the data was made using regression based on orthogonal comparisons as shown on page 51. In this comparison, an F-ratio of 3.93 was required for significance at the .05 level of confidence and 6.87 for the .01 level of confidence. The purpose of these comparisons was to determine whether the regression was linear, quadratic or cubic. Comparisons of best training score data are shown in Table IV. The regression was first tested for linearity and was found to be significantly linear at the .01 level of confidence. Since the linear sum of squares of 4622 accounted for most of the treatment sum of squares (5255), it was rather obvious that the regression line was almost totally linear. A test of this assumption would be to subtract the remaining sum of squares from the treatment sum of squares and test the remainder for significance. The remaining sum of squares (429) has two degrees of freedom since there are two more allotted comparisons. Therefore, the mean square was 215 and when divided by the error mean square of 104, yielded an F-ratio of 1.98 which was not significant. However, for illustrative purposes the quadratic and cubic comparisons were computed and are shown in Table IV. It can be
**Table IV**

*F*-ratios of orthogonal comparisons for best training scores as measured by the two-hand isometric press for the four training groups

<table>
<thead>
<tr>
<th>Comparison</th>
<th>SS</th>
<th>df</th>
<th>Mean Square</th>
<th>F-ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Linear</td>
<td>4822</td>
<td>1</td>
<td>4822</td>
<td>46.4</td>
<td>.01</td>
</tr>
<tr>
<td>2. Quadratic</td>
<td>357.08</td>
<td>1</td>
<td>357.08</td>
<td>3.43</td>
<td>—</td>
</tr>
<tr>
<td>3. Cubic</td>
<td>36.02</td>
<td>1</td>
<td>36.02</td>
<td>.35</td>
<td>—</td>
</tr>
<tr>
<td>Error</td>
<td>11969.86</td>
<td>115</td>
<td>104</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Corrected Best Training Score**

- **Group I** (Non-Motivated Training) = 113.2
- **Group II** (Knowledge of Scores) = 123.3
- **Group III** (Knowledge of Scores + Assigned Goal) = 127.5
- **Group IV** (Knowledge of Scores + Assigned + Placebo) = 130.7

*F* .01 = 6.87; *F* .05 = 3.93
seen that neither comparison is significant. The resultant plotting of the regression line of the relationship of the group's method of training with their strength performance scores is shown in Chart I.

From Chart I, it can be seen that training scores increase in an almost direct relationship to the number of purposefully induced motivators. Thus, the greater the motivation present during training, the greater will be the strength performance scores of subjects involved.

Final Training Test Scores

The F-ratio found from an analysis of the final training test scores indicated significant differences among groups. As shown in Table III, page 52, the F-ratio was 5.59 which was significant at the .01 level of confidence.

Orthogonal polynomials were again used to determine the regression line. F-ratios of 3.91 and 6.82 were required for significance at the .05 and .01 levels of confidence, respectively. Comparisons of final test scores are shown in Table V, page 57. Testing first for linearity, the regression was found to be significant at the .01 level of confidence. Further testing revealed that the regression was significantly quadratic at the .05 level of confidence while cubic comparison proved to be non-significant. The plotting of the regression line may be observed in Chart II, page 58.

As can be seen in Chart II, there is a rather rapid corresponding increase in final test scores with an increase in the number of
CHART I

RELATIONSHIP OF ADDITIVE MOTIVATORS TO BEST STRENGTH PERFORMANCE SCORES OF 120 COLLEGE MEN

Best Strength Training Scores

Groups

110
115
120
125
130

I
II
III
IV
**TABLE V**

F-RATIOS OF ORTHOGONAL COMPARISONS FOR FINAL TEST SCORES AS MEASURED BY THE TWO-HAND ISOMETRIC PRESS FOR THE FOUR TRAINING GROUPS

<table>
<thead>
<tr>
<th>Comparison</th>
<th>SS</th>
<th>df</th>
<th>$\bar{R}^2$</th>
<th>F-ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Linear</td>
<td>1723.8</td>
<td>1</td>
<td>1723.8</td>
<td>12.50</td>
<td>.01</td>
</tr>
<tr>
<td>2. Quadratic</td>
<td>567.68</td>
<td>1</td>
<td>567.68</td>
<td>4.11</td>
<td>.05</td>
</tr>
<tr>
<td>3. Cubic</td>
<td>2.50</td>
<td>1</td>
<td>2.50</td>
<td>.02</td>
<td>—</td>
</tr>
<tr>
<td>Error</td>
<td>15897</td>
<td>115</td>
<td>138</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

**Corrected Final Test Score Means**

- Group I (Non-Motivated Training) = 114.7
- Group II (Knowledge of Scores) = 122.7
- Group III (Knowledge of Scores + Assigned Goal) = 125.7
- Group IV (Knowledge of Scores + Assigned Goal + Placebo) = 125.0

$F_{.01} = 6.82; F_{.05} = 3.91$
CHART II

RELATIONSHIP OF ADDITIVE MOTIVATORS TO THE FINAL STRENGTH TEST SCORES OF 120 COLLEGE MEN

Final Strength Test Scores

125
120
115
110

Groups

I  II  III  IV
motivational factors present during training. This rise continues up to the third group where there were two purposefully induced motivators. Then it can be observed that there was a very slight drop in the regression line from Group III with two motivators. This indicates the quadratic nature of the regression line. Conceivably, this could be interpreted as indicating a point of diminishing returns.

Special Motivational Situation Test

An analysis of the special motivational test scores revealed an F-ratio that failed to indicate significant differences among groups. As shown in Table III, page 52, the F-ratio was 1.69 which was well below the F-ratio of 2.69 required to meet the .05 level of confidence. Ordinarily there would be no reason for further analysis as this indicates that there are no significant differences among the groups. However, from examination of the means of the four groups, it appeared that there should be significant differences. It is well known in statistics that an F is always subject to error in that at the .05 level of probability there is a one in twenty chance and at the .01 level the chances are one in one hundred that a true difference does actually exist even though the F indicates non-significance and vice versa. Therefore, since the mean of Group I seemed considerably lower than the means of the other three groups, the following orthogonal comparison was computed:

<table>
<thead>
<tr>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>+3</td>
<td>-1</td>
<td>-1</td>
<td>-1</td>
</tr>
</tbody>
</table>
Through the above computation, Group I was compared with the other three groups and the resulting F of 6.98 was found to be highly significant beyond the .01 level. Therefore, significant differences did exist among the groups. Accordingly, a regression line was obtained using the same orthogonal polynomials as in the best training scores and final training test scores. The linear, quadratic and cubic characteristics of the regression line are shown in Table VI. Testing first for linearity, the regression was found to be significant at the .05 level of confidence. However, further testing concerning quadratic and cubic comparisons proved to be non-significant at the .05 level of confidence. The plotting of the regression line may be observed in Chart III, page 62.

As can be seen in Chart III, there is a sharp increase from Group I (non-motivated group) to Group II (Knowledge of scores group.) From Group II there is a very gradual increase in the regression line to Group III with two purposefully induced motivators and likewise to Group IV with three purposefully induced motivators. This indicates the linearity of the regression line and distinctly points out the value of motivated training over non-motivated training.

IV. ANALYSIS OF STRENGTH PERFORMANCE FOR ALL GROUPS

THROUGHOUT TRAINING PERIOD (See Chart IV)

Total Strength Scores of the Groups

All recorded total strength scores for each of the training
### TABLE VI

**F-RATIOS OF ORTHOGONAL COMPARISONS FOR SPECIAL MOTIVATIONAL TEST SCORES AS MEASURED BY THE TWO-HAND ISOMETRIC PRESS FOR THE FOUR TRAINING GROUPS**

<table>
<thead>
<tr>
<th>Comparison</th>
<th>SS</th>
<th>DF</th>
<th>$M^2$</th>
<th>F-ratio</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Linear</td>
<td>600</td>
<td>1</td>
<td>600</td>
<td>5.17</td>
<td>.05</td>
</tr>
<tr>
<td>2. Quadratic</td>
<td>173</td>
<td>1</td>
<td>173</td>
<td>1.49</td>
<td>—</td>
</tr>
<tr>
<td>3. Cubic</td>
<td>54</td>
<td>1</td>
<td>54</td>
<td>.47</td>
<td>—</td>
</tr>
<tr>
<td>Error</td>
<td>17910</td>
<td>115</td>
<td>116</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Corrected Special Motivational Test Score Means**

- **Group I** (Non-Motivated Training) = 123.8
- **Group II** (Knowledge of Scores) = 129.4
- **Group III** (Knowledge of Scores + Assigned Goal) = 129.6
- **Group IV** (Knowledge of Scores + Assigned Goal + Placebo) = 130.4

$F .01 = 6.82; F .05 = 3.01$
CHART III

RELATIONSHIP OF ADDITIVE MOTIVATORS TO THE SPECIAL MOTIVATIONAL TEST SCORES OF 120 COLLEGE MEN

Special Motivational Test Scores

<table>
<thead>
<tr>
<th>Group</th>
<th>I</th>
<th>II</th>
<th>III</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Score</td>
<td>120</td>
<td>125</td>
<td>130</td>
<td>130</td>
</tr>
</tbody>
</table>
CHART IV

GRAPHICAL ANALYSIS OF TOTAL WEEKLY STRENGTH TEST SCORES FOR THE FOUR TRAINING GROUPS
groups were plotted on a graph for the purpose of visually following each group's progress from the initial test throughout the experiment. Each group's progress will be discussed separately in reference to the illustration in Chart IV, page 63.

**Group I (Non-Motivated Training Group)**

An examination of Chart IV reveals that Group I was essentially equal to the other three training groups as measured by the initial test, however, Group I recorded much lower scores than motivated groups during training and on the final training and special motivational situation tests. The alternating increase-decrease pattern of this group throughout training indicated the uncertainty which can result from the lack of knowledge of scores. The sharp increase brought about in the final training and special motivational situation tests clearly demonstrate the effectiveness of motivation in raising strength scores.

**Group II (Knowledge of Scores)**

It can be seen in Chart IV, page 63, that Group II was similar to the other three training groups as measured by the initial test, but maintained better scores than Group I throughout the experiment and poorer scores than those of Group III and Group IV. Other than having a distinctive leveling-off period during weeks three and four, Group II followed the same general pattern as groups III and IV.

**Group III (Knowledge of Scores and Assigned Goal)**

As shown in Chart IV, Group III resembled the other three
training groups as measured by the initial test, but maintained better scores than groups I and II throughout the experiment and slightly poorer scores than Group IV, with the exception of the final training test where Group III had the highest score. Groups III and IV followed an almost identical pattern throughout the experiment.

**Group IV (Knowledge of Scores and Assigned Goal and Placebo Effect)**

As seen in Chart IV, Group IV paralleled the other three training groups as measured by the initial test but maintained better scores than Groups I and II, and for the most part slightly better scores than Group III throughout the experiment. Thus, it appears in analyzing raw data by means of graphical interpretation that strength scores increase in accordance with the number of motivational factors present during training.

The following points of interest were revealed from the graphical analysis of raw data:

1. The strength scores for all groups took a sharp drop at the end of the first week of training which is typical of the temporary slump athletes frequently experience following the initial week of practice.

2. The best training scores for each group were recorded at the end of the fifth week of training, except for Group I (Non-motivated group) which recorded its best score at the end of the second week of training.

3. The strength scores for all groups took a sharp drop at the
end of the sixth week which seems to indicate that when
the subjects knew the end was near, interest and effort
falter somewhat.

4. The strength scores for all groups during the final training
test increased sharply over the previous week's recorded
scores. This increase could be attributed to the fact
that all subjects were told that they were taking their
final test. Also, all subjects knew that their scores
were being recorded during final testing whereas during
training all of the subjects did not know whether their
scores were going to be recorded or not.

5. The strength scores for all groups during the special
motivational testing situation increased sharply over
the previous week's recorded scores during the final
test. This seems to illustrate that strength measures
are greatly influenced by the level of motivation present
during testing.

V. DETERMINING THE SIGNIFICANCE OF THE DIFFERENCE IN THE MEAN GAINS
OF THE ABOVE AVERAGE AND BELOW AVERAGE INITIAL
STRENGTH GROUPS

The below average and above average groups were formed statistically-
ly from the three motivated training groups. The below average group
was formed, using initial strength scores, from the lower one-third of
the subjects in the motivated training groups, and the above average
group was formed from the upper one-third of the subjects.
In determining the significance of the differences in the mean gains of the above average from that of the below average initial strength groups, the statistical technique known as the standard error of difference between two independent means was used. The following three comparisons were made: (1) initial means, to establish the fact that the above average group was significantly stronger than the below average group; (2) gain scores between the initial and final training tests; and (3) gain scores between the final training test and the special motivational situation tests.

Comparison of Initial Means

The t-ratio computed from a comparison of the initial means of the above average and below average strength groups was 46.67. Entering the table of t with 58 \((30-1) + (30-1)\) degrees of freedom, t entries needed for significance were found to be 2.00 and 2.66 at the .05 and .01 levels of confidence, respectively. Since the t of 46.67 was well above that needed for the .01 level, it is obvious that the above average group was significantly better than the below average group on the initial strength test.

Differences Between Initial and Final Training Strength Test Scores

The t ratio found in a comparison of the above average and below average strength groups concerning the gain scores between initial and final training tests was .94 which was well below that ratio required for the .05 level of confidence. Therefore, it may be
stated that there were no significant differences between the strength gain scores of above average and below average groups participating in the three motivational training programs in this study.

**Differences Between Final Training and Special Motivational Strength Tests**

The t-ratio found in a comparison of the above average and below average strength groups concerning the strength gains between the final training and special motivational tests was 1.01 which also did not reach significance at the .05 level of confidence. Therefore, it was concluded that above average and below average groups did not differ significantly concerning strength gain scores brought about by the special motivational testing situation. (See Table VII)
TABLE VII
DIFFERENCES IN INITIAL MEANS AND MEAN GAINS OF ABOVE AVERAGE
AND BELOW AVERAGE GROUPS

<table>
<thead>
<tr>
<th>Type of Scores</th>
<th>Observed Mean Difference</th>
<th>SE Difference</th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial</td>
<td>39.67*</td>
<td>.85</td>
<td>46.67</td>
<td>.01</td>
</tr>
<tr>
<td>Gain Scores (between Initial and</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final tests)</td>
<td>2.40*</td>
<td>2.55</td>
<td>.94</td>
<td>—</td>
</tr>
<tr>
<td>Gain Scores (between Final and Special Motivational Situation Test)</td>
<td>2.51**</td>
<td>2.49</td>
<td>1.01</td>
<td>—</td>
</tr>
</tbody>
</table>

* t needed at .05 level = 2.00
** t needed at .01 level = 2.66

* In favor of the above average group
** In favor of the below average group
CHAPTER V

SUMMARY, FINDINGS, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

It was the purpose of this study to determine the effects of applying different motivational techniques during training and during testing upon strength performance. Subjects of above average and below average initial strength were also compared to determine whether the different motivational techniques employed in the study in training and testing were more effective for one level of ability than another.

The subjects for this study were one hundred twenty male students at Northeast Louisiana State College, Monroe, Louisiana. The subjects were randomly divided into four isometric training groups of thirty subjects each: (1) Group I, trained without a purposefully-induced motivator; (2) Group II, trained with a knowledge of scores being the only purposefully-induced motivator; (3) Group III, trained with a knowledge of scores, plus an assigned goal; and (4) Group IV, trained with a knowledge of scores, an assigned goal, plus taking placebos as the purposefully-induced motivators.

At the beginning of the experiment, all subjects were administered the initial two-hand isometric press test one at a time in a closed room without benefit of any purposefully-induced motivation other than
standard directions and a knowledge of what they had pressed. During
the six weeks of training, each subject's scores were recorded one
day per week. At the end of the training program, a final two-hand
isometric press test was given under the same conditions as in the
initial test. Two days following the final test, all subjects were
then given a special motivational situation test, which consisted of
the same exercise, but was conducted under conditions which included
spectators, march music, picture taking, and a competitive situation.

The $t$-test was used to determine the significance of the
difference between initial and final means on the two-hand isometric
press test, and between the final training test and special motivational
test means for each group. An analysis of covariance was utilized to
compare the four motivational programs on best recorded training
scores, final training test scores, and special motivational situa-
tion test scores. The statistical technique of the standard error of
the difference between two independent means was used to compare initial
scores and gain scores of the above average and below average initial
strength groups. In addition to the above techniques, a graphical
analysis of weekly training scores was presented.

II. FINDINGS

The findings of this study were as follows:

1. The three motivated groups showed significant strength gains

   at the .01 level whereas the non-motivated group (Group I)
did not significantly gain from initial to final training test scores.

2. All four groups performed significantly higher on the special motivational test than on their final training test.

3. Through the analysis of variance, it was shown that no significant differences existed between the four training groups at the start of their training programs.

4. A significant difference at the .01 level of confidence was found in a comparison of groups on best training scores and final training test scores. Further analysis revealed linear regression in that scores significantly increased in accordance with the number of purposefully-induced motivators applied during training. The orthogonal comparison for linearity revealed significance at the .01 level for both types of scores. However, in the final training test scores there was a leveling off noted between Groups III and IV which was significantly quadratic at the .05 level of confidence.

5. Although all groups had their highest scores on the special motivational test, regression analysis still revealed a significantly linear effect. Therefore, despite the fact that the non-motivated group's only significant gain in strength was brought about by this special test, a direct relationship was still maintained between performance and number of induced motivators.
6. The most important findings noted through a graphical analysis of weekly strength performance are listed as follows:
   a. The strength scores of all groups dropped sharply at the end of the first week of training revealing a temporary, unexplained slump.
   b. The best training scores for the motivated groups were recorded at the end of the fifth week of training whereas the non-motivated group (Group I) recorded its best training scores at the end of the second week of training.
   c. The strength scores of the non-motivated group during six weeks of training remained below their recorded scores on the initial test. Only the motivation of the final training test and the special motivational test raised this group's scores, which indicated importance of a knowledge of results.
   d. After reaching a peak in the fifth week, the scores of the motivated groups dropped during the final week. The scores improved again during the final training test but, nevertheless, remained below the fifth week's performance.

7. The only significant difference found in comparison of
above average and below average groups was on the initial test which clearly indicated the above average group to be superior to the below average group in strength. There was no significant difference between the groups concerning mean gain scores between the initial and final training test, or between the final training test and special motivational test.

Discussion of Findings

The belief that motivation may greatly affect strength scores in training and testing programs was substantiated by the findings of this study. Since the motivated groups made significant gains while the non-motivated group made very little gain as measured by the initial and final training tests, it appears that motivation is more important than the actual training itself. Thus, the evidence from this study indicates that in the absence of any motivation, training is of little practical value insofar as strength development is concerned. The non-motivated group's mean gain of only 1.93 pounds, after six weeks of training, substantiates this.

Several studies have shown that muscular endurance can be significantly increased through motivational testing situations, however, a review of literature failed to reveal similar findings concerning strength. In this study it was found that strength measures may be greatly increased through the use of a motivational testing
situation. As measured in this study, all groups significantly increased their strength scores over their final test scores on a special motivational situation test.

The findings of this study indicated that best training scores and final scores increased in an almost direct relationship to the number of purposefully induced motivators. However, in this study the greatest number of motivators used in a single training group's program was three. Thus, while significant linearity can be expected with three motivators, it remains to be seen what will happen when more than three motivators are used. It is quite possible that more than three motivators will cause a leveling off, resulting in a more quadratic pattern as was seen in the regression line for the final training test scores.

It has been pointed out before that the special motivational test included a number of conditions that are typically found in athletic contests. In this study it was seen that while the non-motivated training group tended to gain more than the motivated groups on this special test, it should be emphasized that the non-motivated groups' test scores remained inferior to the scores of the motivated training groups on this special test. Thus, this finding suggests that motivation is of considerable value in training in order to obtain optimum performance. On the other hand, attention should be called to the fact that the final, specially motivated test scores of Group I were almost equal to the other three groups' final training test scores.
This indicates that the subjects in Group I were evidently not pressing as hard as they could during training due to lack of motivation. It might also be hypothesized that had the special motivational test been repeated for Group I that their scores might have equaled the other three groups due to the learning of what an all-out of nearly all-out effort consisted.

It was hypothesized that a significant difference might exist between strong students and weak students in response to the type of motivational techniques employed in the training and testing, however, the findings of this study failed to reveal such differences. Thus, it appears that both strong and weak subjects respond similarly to motivational techniques in strength training and testing, as employed in this study.

III. CONCLUSIONS

Within the limitations of this study, the following conclusions appear to be justified:

1. Motivated training promotes significant strength gains, whereas, non-motivated training is of little practical value concerning strength improvement when tested under conditions of no consciously induced motivation.

2. A special motivational testing situation (with resemblance to an athletic contest) will significantly increase the strength scores of training groups over those scores achieved during training.
3. Generally speaking, best training scores, final training test scores, and scores on a special motivational test, as measured in this study, increase in accordance with the number of motivational factors utilized in training.

4. A special motivational testing situation will cause non-motivated training subjects to make significant strength gains over those obtained in their training program. However, the final scores of non-motivated training group remain lower than the scores of the subjects that were purposefully motivated during training.

5. The best training scores for motivated groups occur during the latter weeks of training, whereas non-motivated subjects seem to lose interest relatively early and therefore do not perform as well in the latter stages of their training.

6. There is no significant difference in the response of students of above and below average initial strength to the motivational techniques employed in this study in strength training and testing.

7. Strength measures are greatly influenced, as measured in this study, by the level of motivation present during training and testing.

IV. RECOMMENDATIONS

In consideration of the findings of this study, the writer
recommends for further study:

1. An experiment to determine whether more than three purposefully induced motivators applied in training will cause a leveling off concerning strength gains, or a continuation of linear significance.

2. A study designed to show performance brought about by periodic changes in motivation whenever a leveling off occurs.

3. An investigation to determine the relationship between muscular endurance and the frequency of applying motivation during training.

4. A study where the initial test consists of the special motivational conditions employed in the present experiment and then proceed along the lines of the present study.
SELECTED BIBLIOGRAPHY
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A. BOOKS


B. PERIODICALS


C. UNPUBLISHED MATERIALS


The author was born in DeKalb, Texas on August 11, 1934. He received his elementary and high school education in Texarkana, Texas where he graduated from Texas High School in 1952.

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Title of Thesis: The Effects of Applying Different Motivational Techniques During Training and in Testing Upon Strength Performance

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