EFFECT OF MAXIMUM LOADS FOR EACH OF TEN
REPETITIONS ON STRENGTH IMPROVEMENT

by

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CHAPTER I

INTRODUCTION

Progressive resistance exercise is considered the most effective method for the improvement of strength. This method simply employs the overload principle as practiced in the 6th century by Milo of Crotona. Milo carried a bull calf on his back each day until the bull was full grown. As he became stronger, a greater load in the form of the bull was lifted. He finally developed sufficient strength to carry a full grown bull twice around the arena at the Olympic games. The overload principle is used today in several fields to develop physical strength. Coaches use this principle especially in sports which require the athlete to move a heavy resistance such as in the shot, discus, and hammer throw.

(Physical therapists employ the overload principle in rehabilitation so that patients can function more effectively.) Since strength is basic for physical fitness, physical educators have employed weight training to improve physical fitness.

(Several studies have been done comparing the effects of two or more weight training programs on strength improvement. These studies have made comparisons between repetitions performed per set, number of training sessions per week, proportions of maximum used in training and a combination of these to determine the optimum training program for increasing strength. However, no studies have compared the effects of a weight training program involving a maximum or near maximum load for each repetition of a

set, to the effect obtained following the conventional manner of weight training where the same load is lifted repeatedly for a designated number of repetitions.)

Purpose of the Study

The purpose of this study was to determine whether a weight training program involving a maximum or near maximum load for each of ten repetitions of a set was as effective for increasing strength as a conventional program of weight training where the same load is lifted for ten repetitions a set.

Definition of Terms

1-RM is the load that can be raised for only one repetition using maximum muscular effort.

10-RM is the load that can be raised ten times using maximum muscular effort.

Set is any given number of repetitions performed successively.

Need for the Study

Coaches, physical educators, and physical therapists are continually in search of new methods to improve muscular strength. Coaches value strength in all types of athletes; this is especially true in activities like the shot put, discus, and hammer throw. An effective weight training program is also of value in activities where other aspects of performance, such as speed, agility, and coordination, need improvement.

«One of the primary objectives of physical education is the development of physical fitness. Since strength is an important aspect of physical fitness, it is evident that a weight training program will assist in attaining this goal.»

One of the tasks of the physical therapist is to increase the strength of weakened muscles so that patients can resume activities which were prohibitive due to their disability. Since the objective of the therapist is the rehabilitation of patients, a program involving rapid strength improvement is important.

It is hoped that the information gained from this study will help the physical educator, coach, and therapist reach their goals more effectively and in a minimum amount of time.

Review of the Literature

Several studies have been done to determine the effect of weight training on performance. Different weight training programs have been compared to determine the most effective method for increasing strength.

Effects of Weight Training on Performance

Keller (16) studied the effect of weight training on the high jumping ability of eight high school boys who had one to three seasons of experience in this event prior to the study. Three weeks before the commencement of weight training, the subjects high jumped until they were able to attain their previous best effort. The subjects then trained for eight weeks, three times

weekly, on weight training exercises consisting of the high pull-curl, walking squat, head-bent rowing motion, sit-ups, high rapid dead lift, side bend, press on toes, and straddle hop. After the completion of training, the subject's high jumping ability increased to the extent of 3.35 inches. It was concluded that weight training will increase leg power.

The effect of weight training on the vertical jump was studied by Garth (13). Nineteen basketball players were measured in vertical jump before and after a period of six weeks. During this period the subjects trained on the military press, curl, forward raise, lateral raise, and walking squat exercise. In addition, they performed twenty vertical jumps a day using only their body-weight. The mean increase in vertical jumping height was 2.47 inches with the right hand and 2.46 inches with the left hand. The values were significant at the .01 level and showed that weight training and/or twenty vertical jumps daily increased the vertical jump.

Chui (9) used a control group of twenty-two subjects and an experimental group of twenty-three subjects to study the effects of a general weight training program on athletic power. Subjects trained three times weekly for twelve weeks. The criteria for athletic power were the standing Sargeant Jump, running Sargeant Jump, standing broad jump, eight pound shot, twelve pound shot, and sixty yard dash. Both groups participated in a similar program of physical education activities, but the experimental group also engaged in

weight training. The experimental group improved more in athletic power than the control group.

Zorbas and Karpovich (25) tested 600 subjects to determine how fast they could complete twenty-four rotary arm movements. Half the subjects had participated in weight training at least six months and the other half had not. Each subject was given two trials with a three minute rest between trials. The best trial was taken as the score. The weight trainers were found to be significantly faster than the subjects who did not train with weights.

DeLorme and Ferris (11) studied weight training and its effect on muscle contraction time. They employed two groups of five subjects each. One group acted as the control group and the other as the experimental group. The experimental group trained four times weekly for four months on weight training exercises involving elbow flexion and knee extension. The reaction times of elbow flexion and knee extensions were recorded before and after the training period. The results showed no significant differences between the control group and experimental group in contraction time although arm and leg girth and strength were significantly greater in the experimental group.

The effect of increased strength on muscular coordination and speed of movement were studied by Masley (18). The control groups consisted of twenty-four students registered in a volleyball class and fifteen students not in any activity class. The experimental group consisted of twenty-four students who trained with

weights for six weeks, three times weekly. All groups were tested before and after six weeks on speed of movement, muscular coordination, and strength. Speed of movement was measured by recording the time a subject could rotate a wheel twenty-four revolutions with the arm. Muscular coordination was measured by coordinating an eye stimulus with a muscular response, and strength was measured by the Rodger's Strength Index. The groups were equated on strength and speed but not on coordination. The results showed that the weight trained group and the volleyball group increased significantly in strength, but that the inactive group did not. All groups improved in coordination, but the weight trained group was the only one that improved in speed. The investigator concluded that a greater increase in speed and coordination resulted from weight training than from volleyball or inactivity.

Mitchell (21) studied the effect of increased strength in overcoming the handicaps of added bodyweight. Fifty-six male subjects participated in weight training for nine weeks. Each subject was tested before and after this period for hand grip strength, back and leg strength on the dynamometer, chinning, dipping, shot put, Sargeant Jump, and 300 yard run. Each subject was tested four times on each measure; once without weight added to the body; second with five per cent of bodyweight; third with ten per cent added; and fourth with fifteen per cent added. The author concluded that an increase in strength, and in turn power, overcame the handicaps of added bodyweight.

DeLorme (10) trained the quadriceps muscle group of two hundred university men four times weekly for periods up to four months. Subjects were tested on an ergograph before and after training. The results showed that the initial ergographic test had a sharp fatigue curve in one-half to two minutes, but the final ergographic test resulted in better performance with fatigue occurring later than at the initial testing. The resistance employed on the ergograph was the same at both testing periods. This indicated that increased strength resulted in improved endurance.

Munroe (22) used thirty-three subjects to study the effect of weight training on the performance of beginning basketball players. Of the thirty-three subjects, seventeen were in a control group and sixteen in an experimental group. Each group was enrolled in a beginning basketball course at the University of Illinois. The experimental group was divided into two sub-groups of eight each. One of these sub-groups was trained with weight resistance exercises for the first five weeks of the study and the second group trained with weights during the second five weeks. All groups were measured before and after ten weeks and the experimental group was measured also at five weeks of training. The measurements involved shooting and dribbling ability and vertical jump. The two experimental sub-groups were equated on these measurements. The exercise program involved the military press, toe raise, straight arm pull-over, and deep knee bend. The results showed that the experimental group improved significantly in shooting ability ($P = .05$) whereas the

control group did not. The other criteria were not significantly different between the control and experimental groups after training.

The effect of weight training on reaction time was investigated by Anderson (1). An experimental group of fourteen students, registered in a weight training class, trained three times weekly for one semester. The control group consisted of fourteen students registered in a physical fitness development class who were trained three times weekly for one semester. At the beginning and completion of training, both groups were given a visual reaction time test, an auditory reaction time test, and a test combining both auditory and visual reaction times. The results showed that both groups improved significantly in reaction time but that no significant differences existed between groups. The author concluded that weight training decreased reaction time as measured in this study.

These studies have shown that an improvement in strength by weight training will increase power, speed and coordination, and endurance.

Comparison Between Weight Training Programs

(Walters (24) compared two programs of weight training for the development of strength and muscular endurance. The groups trained twice a week for seven weeks on different weight training programs. The first group performed ten to twelve repetitions per set, and the second group performed twenty to twenty-two repetitions per set. The exercises employed were the curl and bench press.

Maximum strength was measured at the beginning and end of the study with these two lifts. Endurance was measured by the number of repetitions a subject could perform with a forty-five pound barbell. The results showed that the first group improved significantly over the second group in the maximum curl but not in the maximum bench press. The first group showed significant improvement over the second group in all endurance tests. It was concluded that ten to twelve repetitions and twenty to twenty-two repetitions will increase strength and endurance significantly, but that ten to twelve repetitions were more effective for this purpose.)

Seventy subjects were used by Krusen (17) to determine the effects of two different programs of weight training on weakened quadriceps muscles of poliomyelitis patients. The forty-four subjects in the experimental group performed the knee extension exercise for three sets of five repetitions twice daily. Fifteen repetitions were performed in the morning and fifteen in the evening, five times per week. The 5-RM and 1-RM were determined once a week as a basis for the following week's exercise level. Two groups were formed from the experimental group. Group I of the experimental group trained with twenty-five per cent of the 5-RM for the first set, fifty per cent with the second set, and seventy-five per cent with the last set. The subjects in this group trained from three to twenty-three weeks (averaged ten weeks). Group II of the experimental group trained for three sets with one hundred per cent of the 5-RM for the first set, one hundred twenty-five per cent for the

second set, and one hundred fifty for the last set. The subjects attempted to raise the load as high as possible when full movements could not be performed for all repetitions. The subjects in this group trained from three to nineteen weeks (averaged 9.7 weeks). The control group used in the study followed a program of uncontrolled and unsupervised exercises. Both experimental groups surpassed the control group in strength improvement, but the results between the two experimental groups were not significantly different.

The DeLorme and McCloy programs of weight training for strength improvement were compared by Henry (15). DeLorme's method involved training with one-half the 10-RM for the first set and the 10-RM for the second set. McCloy's method employed the 10-RM for the first and the second set for as many repetitions as possible. One subject trained with DeLorme's method on the left arm and right leg and with McCloy's method on the right arm and left leg. The subject trained five times weekly. After eight weeks of training, there were no significant differences between the two methods in ability to improve strength.

Faulkner (12) used one subject to compare DeLorme's and McCloy's programs of weight training. The subject trained five times weekly for eight weeks. McCloy's method applied to the subject's right arm and left leg, and DeLorme's method to the left arm and right leg. Forearm and leg flexors and extensors were exercised. A dynamometer was used to measure strength and the 10-RM to measure endurance. Faulkner inferred that the program

as used by DeLorme seemed superior for strength development and the McCloy program for the development of endurance. This conclusion was not verified statistically.

The differential effects of three programs of weight training were investigated by McGovern and Luscombe (19). The subjects were divided into three groups with five subjects in each group. The groups trained five times weekly for three weeks. One group performed five repetitions with one-half the 10-RM for the first set and the 10-RM for the second set. The second group performed the first set with the 10-RM, the second set with three-fourths of the 10-RM for ten repetitions, and one-half the 10-RM for ten repetitions for the last set. The third group trained with one-half the 10-RM for ten repetitions for the first set; three-fourths the 10-RM for ten repetitions for the second set; and the 10-RM for the third set. No significant differences in strength improvement were found between the three training programs.

For twelve weeks, five days weekly, the DeLorme technique and the Modified Oxford technique of weight training were compared by McMorris and Elkins (20). The right triceps brachii muscle was trained by six subjects in each of two groups. The DeLorme technique of training was followed by one group and consisted of one set performed with one-fourth the 10-RM; the second set with one-half the 10-RM; the third set with three-fourths; and the last with the 10-RM. Four sets were also required for the Modified Oxford technique, but the order was reversed from the DeLorme technique.

Both groups showed a significant improvement in strength, but the groups were not significantly different in strength.

Berger (2) compared the improvement in strength among three groups, each of whom followed a different weight training program. One group performed two repetitions per set (2-RM), another group six repetitions per set (6-RM), and the third group ten repetitions per set (10-RM). The exercise used in training was knee extension and all groups performed three sets each training session. The training period lasted for five weeks and training occurred three times weekly. The four subjects in each group were tested before and after training for static and dynamic strength. Static strength was measured with the tensiometer and dynamic strength with the 1-RM. There were no significant differences in static or dynamic strength improvement between groups at the completion of the training.

Nine different weight training programs were compared by Berger (3) to determine which were more effective for increasing strength. Variations in training between the groups involved one, two, and three sets, and two, six, and ten repetitions per set. Training involved three weekly sessions for a twelve week period. The results showed that training with three sets was significantly more effective for increasing strength than training with one or two sets. Training with six repetitions per set for three sets was more effective for increasing strength than training with two repetitions or ten repetitions for three sets. The method of training

involving the 6-RM for three sets was found to be nearer the optimum program for strength improvement.

Berger (4) compared several weight training programs to determine the optimum number of repetitions with which to train for quickest strength improvement. Nine groups, consisting of a total of 199 male college students, were tested before and after twelve weeks of progressive resistance exercise. Each group trained differently in repetitions per set. Resistances employed were 2-RM, 4-RM, 6-RM, 8-RM, 10-RM, and 12-RM for one set. The optimum number of repetitions for strength improvement was found to be between 3 and 9.

Berger (5) compared two methods of training to determine whether training maximally each training session was more effective for increasing strength than training with sub-maximal loads. He used twenty-eight male college students. They were tested for 1-RM on the bench press lift before and after twelve weeks. During this interim two methods were used; one method of training involved the 10-RM for one set, each of three weekly training sessions. The second method involved performing ten repetitions with ninety per cent of the 10-RM twice and the 10-RM once a week. No significant difference was found between the two methods in strength improvement.

Berger (6) compared three different weight training programs. Three groups totaling 48 college students were trained with progressive resistance exercises for a period of nine weeks, three times weekly. Each group used a different method of training. The investigator

assumed that training with heavy loads did not result in sufficient number of repetitions being performed to stimulate optimum strength improvement. Conversely, training with lighter loads for more repetitions did not permit sufficient effort for each repetition to result in optimum strength improvement. To examine these assumptions, the amount of strength improvement resulting from a weight training program involving the 5-RM followed immediately by five more repetitions with eighty per cent of the 5-RM was determined and compared to strength improvement resulting from training with the 2-RM and 10-RM. The 5-RM plus eighty per cent of the 5-RM for five repetitions more required maximum or near maximum effort for each repetition, but still the number of repetitions was high. No significant differences in strength improvement between the three methods of weight training were noted.

(Berger (7) did a study to determine whether weight training for two days weekly was as effective for increasing strength as training three times weekly among students who had little previous experience in weight training. Forty-eight male college students were tested to determine the 1-RM bench press before and after a twelve week training program. Half the subjects trained on Tuesday and Thursday and half the subjects trained on Monday, Wednesday, and Friday. Each group performed the bench press lift for three sets of ten repetitions using the 10-RM load. The analysis of covariance test showed that no significant difference existed between the two groups in strength improvement.)

A study was done by Berger (8) to determine the optimum proportion of the 1-RM to be used in an effective weight training program. Seventy-nine male subjects, divided into three groups, trained twice weekly with 66, 80, or 90 per cent of the 1-RM, plus one weekly effort with the 1-RM. A fourth group trained three times weekly with the 1-RM; a fifth group, with 66 per cent of the 1-RM three times weekly; a sixth group, with the 1-RM only once weekly; and the seventh group acted as a control. The criterion used in this study was the 1-RM deep knee bend. Results showed that training with 66 per cent of the 1-RM for one set, three times weekly, will not increase strength in six weeks. However, training with 66 per cent of the 1-RM, twice weekly, and the 1-RM once weekly did improve strength significantly.

(Harris (14) determined whether weight training at a slow, moderate, or fast rate would result in different improvements in strength and endurance. Three groups of male college students, consisting of twenty-three in each group, trained with a different weight training program for eight weeks. One group performed four repetitions, a second group, eight to ten repetitions, and a third group, eighteen to twenty repetitions within a time interval of twenty-five seconds. Subjects were tested at the beginning and conclusion of eight weeks training for maximum 1-RM bench press and endurance. Endurance was measured by the number of repetitions able to be performed with one-half the 1-RM bench press strength. The t-test for small correlated groups showed that all groups were

highly significant in improvement in strength and endurance ($P < .01$). The analysis of covariance showed that there were no significant differences in improvements between the groups in strength and endurance. \

O'Shea (23) studied the effects of varying the number of repetitions in a set on the development of strength and muscle hypertrophy of the upper leg. Thirty students were chosen by random from beginning weight lifting classes at Michigan State University. Following a two-week conditioning period, the subjects were divided into three groups of ten each. The programs were as follows: Group A, 3 sets of 9-10 repetitions; Group B, 3 sets of 5-6 repetitions; and Group C, 3 sets of 2-3 repetitions. Subjects handled maximum weight loads for the number of repetitions each was required to perform. Training lasted for six weeks, three times weekly. The effectiveness of the programs were determined by three criteria: (a) thigh girth, (b) dynamic strength as measured by 1-RM on the deep knee bend, and (c) static strength as measured on the dynamometer. No significant differences were found between the three systems of training on any of the criteria. All training procedures resulted in the improvement of static and dynamic strength.

These studies have shown that training with submaximal loads as low as two-thirds or more of maximum strength twice weekly, and maximal loads once weekly, will result in as much strength improvement as training maximally three times weekly (5) (7). Training with submaximal loads of two-thirds of maximum for one set,

three times weekly, will not increase strength significantly more than training two times weekly with the same weight (7). The load with which to train for optimum improvement in strength, when training three times weekly for one set each, lies between the 3-RM and 9-RM (4). Training with the 2-RM for six sets, three times weekly, is as effective for increasing strength as training with the 6-RM for three sets, three times weekly (6). Training with the 6-RM for three sets, three times weekly, is more effective for increasing strength than training with either the 2-RM or 10-RM for three sets, three times weekly (3). Training once weekly with the 1-RM for one set will increase strength significantly after the first week of training and each week up to at least the sixth week (3). Weight training with the 10-RM for three sets, twice weekly, is just as effective for increasing strength as training the same way three times weekly (7). No particular sequence of performance in training with different proportions of 10-RM maximum strength will be more effective than any other sequence for strength improvement as long as one set of 10-RM is performed each training session (19) (15) (20).

CHAPTER II

PROCEDURE

Coaches, physical educators, and physical therapists frequently recommend and use weight training to improve performance and strengthen injured muscles. Information on a more effective program for increasing strength will be of great benefit to these professions.

Many studies have been done to determine the most effective training program. Most of these studies varied in the number of sets and repetitions performed, the proportion of the 10-RM used in training, and the training sequence with different proportions of the 10-RM. None of the studies have varied the load of each repetition of a set to keep each repetition at a maximum or near maximum load.

The purpose of this study was to compare the effects on strength of a weight training program using a maximum or near maximum load for each of ten repetitions to a program using the 10-RM for ten repetitions.

Experimental Design

This study employed fifty male subjects from three weight training classes at Texas Technological College. Each of two classes were randomly assigned to one of the two experimental treatments. The third class was divided into half with each half participating in one of the two treatments. The 1-RM bench press

was used to measure the strength of all subjects at the beginning and end of the training period of eight weeks. The bench press lift was performed with the subject in a supine position on a bench. The bar was placed at the chest with the hands grasping the bar shoulder width apart, palms facing upward. The bar was raised vertically until the arms were fully extended. This lift was chosen because its execution could be easily standardized and did not require any particular skill to perform. It was also suitable because of its high reliability which was found to be .98 by the test-retest procedure with 30 subjects. The maximum load a subject could lift in this manner was called the one repetition maximum (1-RM).

This was determined by increasing the load on the bar by ten pounds after each successful lift until the load became difficult to raise. Then the load was increased by five pounds until the maximum was obtained. Each subject rested two to three minutes between lifting attempts. This same lift was used during the training program.

All subjects spent three days, one week prior to the first testing, to become familiar with the bench press lift and accustom the muscles to the activity. The prior training period of one week also permitted fewer trials in the determination of the 1-RM because the subjects knew their approximate 1-RM before the test. From 1.5 to 2 minutes before training, all subjects warmed up by performing ten repetitions with a load which was 50 per cent of the 1-RM.

The Universal Gym¹ was used in the study because it permitted a rapid change of weights on the bar so the pause between repetitions was similar for both groups.

Statistical Analysis

The t-test within groups was used to determine whether significant improvements in strength occurred after the training period of eight weeks. Analysis of covariance was used to determine whether significant differences in strength improvement occurred between groups. Since the groups were not matched initially, analysis of covariance adjusted the initial means to a common mean and made corresponding adjustments in the final means. This permitted valid comparisons between groups which could not be equated initially.

¹Manufactured by Universal Athletic Sales Company, Fresno, California.

CHAPTER III

PRESENTATION AND ANALYSIS OF RESULTS

Application of the overload principle in weight training is considered the most effective method for developing muscular strength. The gradual load increase permitted in weight training produces a physiological stress on the muscles, a consequence of which is an increase of strength. Comparisons between weight training programs involve variations in the application of the overload principle. These variations in training were in numbers of sets and repetitions performed, the proportion of the 10-RM used in training, and the training sequence with different proportions of the 10-RM. The common factor in all these studies is that the same load was used for each repetition of a set. The purpose of this study was to determine whether weight training with maximum or near maximum loads for each of ten repetitions of a set was as effective for increasing strength as performing ten repetitions with the 10-RM load (the load permitting only ten repetitions using maximum muscular exertion).

Two groups of 24 and 26 male college subjects each were employed in this study. Before and after an eight-week training period, all subjects were tested for 1-RM bench press strength. Subjects in Group I used the conventional method of weight training by performing ten repetitions with a 10-RM load, lifting the same load for ten repetitions. Subjects in Group II did ten repetitions, but each

repetition required a maximum or near maximum effort. Both groups trained one set, each of three weekly sessions.

Results and Discussion

Actual and adjusted group means, standard errors, and t-ratios within groups are presented in Table 1. Groups I and II increased significantly in bench press strength after eight weeks of training. This was expected since most weight training studies have shown significant improvements in strength. As mentioned previously, the group means were adjusted by the analysis of covariance to permit valid comparisons between groups which could not be equated initially.

The analysis of covariance showed that the two groups were significantly different with Group II having the higher mean ($P < .05$). The sum of squares and cross products for the analysis of covariance are presented in Table 2. The analysis of covariance on strength is shown in Table 3. Apparently, the greater physiological stress on the muscles involved in the bench press lift, among subjects in Group II, resulted in the significantly greater increase in strength than occurred in Group I. The difference in strength improvement between the groups did not seem to be due to the total amount of work performed each training session since the mean ft./lbs. of work were found to be approximately 3100 and 2990, respectively, in Groups I and II.

TABLE 1

GROUP MEANS, STANDARD ERRORS, AND t RATIOS WITHIN GROUPS ON STRENGTH

GROUP	N	ACTUAL	ADJUSTED ^{T1}	ACTUAL ^{T2}	ADJUSTED	S.E.	t
I	24	155.00 lbs.	160.40 lbs.	176.66 lbs.	182.17 lbs.	1.70	12.70@
II	26	165.38 lbs.	160.40 lbs.	195.19 lbs.	190.11 lbs.	2.31	12.90@

@ Significant beyond the .01 level.

TABLE 2

SUM OF SQUARES AND CROSS PRODUCTS FOR STRENGTH

SOURCE OF VARIATION	d.f.	SUM X^2	SUM XY	SUM Y^2
Within	48	31697	32274	38709
Between	1	1345	2400	4266
Total	49	33042	34674	42975

TABLE 3

ANALYSIS OF COVARIANCE ON STRENGTH

SOURCE OF VARIATION	SUM OF SQUARES OF ERRORS OF ESTIMATE	d.f.	MEAN SQUARE	F
Total	6589	48		
Within (error)	5848	47	124.42	5.950
Adjusted between	741	1	741.00	

@ Significant beyond the .05 level.

CHAPTER IV

SUMMARY, RESULTS, AND CONCLUSIONS

Summary and Results

The purpose of this study was to determine whether a weight training program involving a maximum or near maximum load for each of ten repetitions of a set was as effective for increasing strength as a conventional program of weight training where the 10-RM load is lifted for ten repetitions a set. Two groups of 24 and 26 male college subjects each were employed in this study. Before and after an eight week training period, all subjects were tested for 1-RM bench press strength. Training took place three times per week for one set each session.

Group I used the conventional method of weight training by performing ten repetitions with a 10-RM load. Group II did ten repetitions, but each repetition required a maximum or near maximum effort. The first repetition was performed with the 1-RM load and the succeeding repetitions were performed with reduced loads that were commensurate to a subject's strength at each repetition.

The t -test within groups showed that both groups improved significantly in strength ($P < .01$). The analysis of covariance showed that the two groups were significantly different with Group II having the higher mean ($P < .05$). The adjusted means were 182.17 lbs. and 190.11 lbs., for Groups I and II, respectively.

Conclusion

The weight training program employing maximum or near maximum loads for each of ten repetitions is more effective for increasing strength than a program involving the performance of ten repetitions with the 10-RM. This was true among male college students who had no previous lifting experience and trained three times weekly for eight weeks.

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APPENDIX

Basic Data

(Group I)

<u>Subject No.</u>	<u>T₁</u>	<u>T₂</u>
1	175	215
2	130	155
3	170	180
4	160	180
5	160	175
6	150	180
7	160	190
8	180	215
9	140	150
10	165	185
11	185	215
12	160	170
13	130	155
14	150	180
15	150	185
16	140	160
17	100	120
18	120	140
19	170	190

Basic Data (Continued)

(Group I)

Subject No.	T_1	T_2
20	195	215
21	180	195
22	160	170
23	130	145
24	160	175

(Group II)

1	165	180
2	140	170
3	150	170
4	120	165
5	170	190
6	200	220
7	185	220
8	220	260
9	115	150
10	110	130
11	150	175
12	130	145
13	150	185

Basic Data (Continued)

(Group II)

Subject No.	T_1	T_2
14	160	185
15	160	215
16	180	205
17	155	190
18	180	190
19	205	240
20	180	200
21	200	235
22	195	230
23	170	195
24	190	205
25	170	235
26	150	190