

THE EFFECTS OF SYSTEMATIC WEIGHT TRAINING UPON POWER,
STRENGTH, SPEED OF MOVEMENT, AND ENDURANCE OF A
GROUP OF MEN STUDENTS AT KANSAS STATE
TEACHERS COLLEGE, EMPORIA

A Thesis

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

The nation-wide gravitation toward weight training is a phenomenon of recent origin. Over the past decade it has become an integral part of many athletic programs.¹ Many coaches and trainers in the field of physical education claim that weight training is extremely beneficial for athletes. Numerous colleges and universities have accepted weight training as an important part of physical education and athletics.

However, there still exist coaches and others associated with physical education and athletics who are of the opinion that training with weights will be detrimental to the ability of the individual.

Regardless of which point of view is taken, one cannot evade the fact that weight training is becoming increasingly popular throughout the country. This popularity has aroused the interest of many investigators in the medical profession along with physical educators, coaches, trainers, and players.

¹Joseph Goldenberg, "Should Athletes Work With Weights?" Scholastic Coach, 30:34, January, 1961.

I. THE PROBLEM

Statement of the problem. The purpose of this study was to investigate the physical effects of a weight training program on athletes.

Specific questions to be answered were: (1) Did the weight training program cause a significant increase in power and strength of specific body areas or muscle groups? (2) Did weight training produce a significant increase in power and strength of the individual in coordination of all muscle groups into one vigorous movement? (3) Was there an increase or decrease in the number of repetitions the individuals could perform resistive exercises in a sixty second period as a result of weight training?

The major hypothesis for this study was that weight training will produce a stronger and more powerful individual.

The second hypothesis was that an individual will improve speed of movement and endurance by training with weights.

Need for the study. Weight training has progressed immensely since it was introduced to the physical educators. In fact, weight training is now being integrated into many physical education and athletic programs in colleges and universities throughout the country. Hooks states:

More and more schools and colleges are recognizing the values to be derived from lifting weights, and by redirecting the emphasis from competitive lifting they are deriving many extra benefits. Weight training, as it is usually referred to in the physical education programs, is rapidly gaining recognition, and conceivably in a few years will be an accepted part of every high school and college program.²

Many of these programs are conducted on the assumption that they are beneficial to the individual involved.

Although some of the conceptions about weight training have been partially answered, there remains an increasing need for continuing research in this area.

Scope of the study. This study will be concerned with providing a panorama of the weight training program at the Kansas State Teachers College, Emporia, Kansas, and presenting the reader with the results attained by the individuals through the weight training. This study, however, will not be concerned with the physiology of the muscles during the actual weight training.

II. METHOD OF PROCEDURE

Method of procedure. The subjects used in this study were twenty-three voluntary athletes from the football program at the Kansas State Teachers College, Emporia, Kansas,

²Gene Hooks, Application of Weight Training to Athletics (Englewood Cliffs, N. J.: Prentice-Hall, 1962), p. 222.

for an eight week period during the second semester of the school year 1961-62.

This program was administered under the supervision of Keith Caywood, associate professor of physical education, Melvin "Shorty" Long, associate professor of physical education, and this investigator, a graduate assistant in physical education.

Analysis of data used in this study was computed from three tests of exercises given at three week intervals. Basic exercises, power exercises, and exercises of speed of movement and endurance constituted the three sets.

Testing of basic exercises, which were administered on March 9, and March 30, was accomplished by the individual properly executing one repetition with the maximum weight possible. Each subject was provided with three opportunities to lift the desired weight. If successful, the subject could add twice to the initial starting weight, according to the individual desires of the lifter. These basic exercises consisted of the overhead press, forward bend, curls, bench press, and squats.

The identical procedure was followed in testing the power exercises, administered on March 16, and April 5. These included the power clean, power press, power curl, power dead lift, and the power high pull-up.

Testing of speed of movement and endurance, which was conducted on March 23, and April 12, was administered by standardizing the bar weight and timing each individual with a stopwatch to determine the number of repetitions properly executed in one minute. Exercises used in the testing were the overhead press, forward bend, bench press, curls, leg raises, and chins.

All testing was administered by the supervisors. Standards and regulations were fixed in order to establish validity and to increase the safety factor involved.

Exercises were selected for the development of the entire body, not for the specialization of a particular area.

Techniques of analyzing data. In order to make the study meaningful the results from the exercises tested were analyzed by a statistician from the psychology department. A calculator was used to insure the accuracy of these results.

The following computations were made:

(1) The mean of each exercise was computed to show the mean weight lifted or the mean number of repetitions performed, depending upon the type of exercise being tested. This was done for both testings.

(2) The difference between the means of each of the exercises was computed to show the increase or decrease from

the first test to the second test. That is, did the group show an increase or decrease in its performance with regards to the amount of weight lifted or the number of repetitions?

(3) The standard deviation was computed for each exercise to reveal how the individual scores were distributed about their mean.

(4) The correlation coefficient was computed for each pair of test results. This was done to show the relationship of the individual scores on the two tests.

(5) T-tests were used to determine if the obtained differences between the means were significant. That is, were the differences between the means the result of weight training or merely chance differences. The 0.01 level of confidence was established as the criterion for determining significance.

(6) Critical ratios were computed to reveal the ratio of the difference between the obtained means on the examinations to the standard error of the means for the two tests.

III. DEFINITIONS OF TERMS USED

Weight training. This investigator used the term weight training in reference to a systematic plan of resistive exercises for the purpose of improving athletic ability.

Exercise. The term exercise referred to all lifts used in the program. For the purpose of this study, chins and leg raises were considered lifts.

Repetition. This term was used in reference to one complete execution performed by the athlete.

Strength. Throughout the study this term referred to the amount of force that a muscle was capable of exerting, such as pushing, pulling, or lifting.³

Power. Power was defined as the capacity for execution, resulting when strength is applied. In testing, power referred to any exercise in which the subject lifted the weight from the floor before beginning another repetition.

Speed of Movement. Speed of movement was considered the number of repetitions the individual could perform during a sixty second period. This term was used in relation to endurance.

Endurance. This term was used in the study as referring to the ability to continue the lifting while experiencing pain or fatigue as related to speed of movement.

³Ibid., p. 12.

CHAPTER II

REVIEW OF LITERATURE

Relatively few individuals trained with resistive weights previous to the 1940's. In the early 1900's the layman was led to believe, through pictorial literature displaying over-developed, out-of-proportion men, that the use of weights created a tight, musclebound physique. The athlete was apprehensive at the thought of over development to the state of becoming musclebound. Athletes were cautioned to refrain from the use of weights if they desired to retain their natural co-ordination. Many of these beliefs, plus the lack of knowledge regarding the proper use of weights, caused many coaches to completely disregard a program of weight training for their athletes.

However, in the last decade there has been considerable literature published concerning weight training. Nationally known men in the field of physical education have proclaimed weight training as having unlimited significance when integrated into areas within the field. Such leaders include Bud Wilkinson, chairman of the President's Council on Youth Fitness, and Bob Hoffman, coach of the United States Olympic weight lifting team in addition to being

instrumental in educating the public on the value of good healthful living through weight training.¹

Many physical educators and coaches are now devoting an increasing amount of time and effort to investigating the effects of weight training on the athlete by means of controlled studies and experiments. This chapter will be concerned with reviewing such studies.

Chui undertook a study to determine the effect of systematic weight training on athletic power. Chui divided the subjects, who were engaged in required physical education classes at the University of Iowa, into a control group of twenty-two and an experimental group of twenty-three. The experimental group trained with weights twice to three times a week for fifty minutes for a period of three months. The control group continued participating in the required physical education classes. Data were obtained at the beginning and completion of the three month period concerning body weight, Sargent jump-standing and running, standing broad jump, eight and ten pound shot-put, and a sixty yard sprint. The results from this study showed no significant improvement for the control group whereas the experimental group increased considerably in potential power

¹Walt Marcyan, "Breaking Through the Ignorance Barrier," Physical Power, 2:5, March-April, 1961.

and they indicated the probability of increasing speed through systematic weight training.²

Capen experimented with two groups of subjects at the University of Tennessee in an attempt to determine the effect of systematic weight training on strength, athletic power, and muscular endurance. The control group consisted of twenty-nine members of a conditioning class involved in conditioning tumbling and gymnastics, running, and combatives. The experimental group was a weight training class, consisting of forty subjects, with emphasis placed on developing the entire body. Both groups were tested on gripping, running and tests of performance at the beginning and ending of the eleven week period. Analysis of data concluded that the weight trainers showed greater general improvement in muscular strength and increased significantly more in the speed exercises. There were no sizeable differences in the muscular endurance of the two groups.³

Zorbas and Karpovich conducted a study to find whether or not training with heavy weights caused slower muscle contractions. Three hundred men with no previous

²Edward Chui, "The Effect of Systematic Weight Training on Athletic Power" (unpublished Master's thesis, The State University of Iowa, Iowa City, 1948).

³Edward K. Capen, "The Effect of Systematic Weight Training on Power, Strength, and Muscular Endurance," Research Quarterly, 21:83-94, May, 1950.

weight training experience composed one group and three hundred weight lifters, who had trained for a minimum of six months constituted the second group. The subjects were tested on a machine which automatically recorded the speed of rotary movements on an arm connected to the apparatus. Each individual was required to complete twenty-four rotations as rapidly as possible. According to the findings of this study, weight trainers were significantly faster on rotary movements than were non-lifters.⁴

Capen conducted an investigation to study four methods of weight training and determine the one method most beneficial to the development of strength. Eight groups of Tennessee University students were divided into four specific programs of weight training. Each program differed only in the amount of weight and number of repetitions used during the exercises. All subjects were tested before and following the twelve week period by strength-testing equipment used in the study. This investigation showed that the superior method of developing strength was by using heavy enough weights to permit a maximum of five repetitions on exercises.⁵

⁴William S. Zorbas and Peter V. Karpovich, "The Effect of Weight Lifting Upon the Speed of Muscular Contractions," Research Quarterly, 22:145-48, May, 1951.

⁵Edward K. Capen, "Study of the Four Programs of Heavy Resistance Exercises For Development of Muscular Strength," Research Quarterly, 27:132-42, May, 1956.

Calvin conducted a study to determine the effects of a program of progressive resistive exercises on the motor co-ordination of high school boys. Twenty subjects composed an experimental group emphasizing development of the upper body through weight training. Each experimental subject selected a partner identical in height, weight, and age to serve as a subject in the control group. This control group participated in general physical education activities for the four month period. Subjects were tested at the beginning and conclusion of the program by bouncing a basketball on the wall for speed, baseball target throw for accuracy, and by a test to measure dexterity of fingers and hands. The results of this investigation concluded that weight training did not prove detrimental to motor co-ordination. In fact, evidence indicated that weight training could favorably affect motor co-ordination of high school boys involved in an organized program.⁶

Burnham undertook a study to investigate the effects of weight training on ten varsity basketball players at McMurray College in Texas. These subjects performed seven basic exercises designed primarily to increase jumping ability. The players were tested preceding and following the

⁶Signey Calvin, "Effects of Progressive Resistive Exercises on the Motor Coordination of Boys," Research Quarterly, 30:387-98, December, 1959.

six week program on maximum vertical jump. Final results showed that each individual had increased jumping ability. The mean improvement for each man during the weight training program was 3.2 inches.⁷

Burnham, who was aroused by the improvement shown by the basketball players at McMurray College, conducted a study concerning the effects of weight training on football players. Twenty-two football players at Travis High School in Austin, Texas, served as the subjects in the six week program. The tests used in evaluating the subjects before and after the program were tests of total body reaction time, jump and touch, ankle plantar flexion, leg lift, grip strength, and pull-ups. Results from this study revealed a mean gain on all exercises.⁸

Reade and Alley undertook an experiment to determine the effect of weight training upon the starting speed of twenty-two football players at Plano, Illinois. After two weeks of early fall conditioning practice, the players were tested on how rapidly they could charge from a four-point stance one yard and hit a blocking dummy with either shoulder. This maneuver was timed electrically. Groups

⁷Stan Burnham, "Develop Your Rebounders With Weight Training," Scholastic Coach, 30:16, 17, 23, December, 1960.

⁸Stan Burnham, "A Conditioning Program For Football Players," Physical Power, 2:16-7, July-August, 1961.

were divided at random into a control group and an experimental group immediately following the first testing. The control group continued to participate in football only. The experimental subjects took part in football plus a short weight training program three times per week. At the completion of the football season the subjects were retested. Analysis of data showed that weight trainers increased starting times significantly as compared to the non-lifters.⁹

After carefully examining the related literature, it was noted that a high relationship existed between progressive resistive exercises in the form of weight training and increased muscular power and strength.

Other investigations have indicated that weight training does not slow the speed of muscular contractions. However, little attempt has been made to present the actual weight training program complete with the amount of weight that was used in the various exercises.

⁹Robert Reade and Louise E. Alley, "A Weight Training Program For Improving Speed of Charge of Football Linemen," Journal of the Coaching Professions, 7:11, 15, 24, April, 1962.

CHAPTER III

DESCRIPTION OF THE PROGRAM

I. SUBJECTS

The subjects who volunteered for this program of weight training were twenty-three students at the Kansas State Teachers College of Emporia, Kansas. The program was initiated with forty-eight students reporting. However, the group was reduced to the twenty-three individuals due to the inconsistency in attendance or withdrawal from the program by twenty-five of the original subjects.

Each individual utilized in this study had taken part in, or planned to participate in the football program at the college.

The subjects varied in academic classification from first semester freshmen to second semester juniors. Weights of the individuals ranged from 237 pounds, which was the heaviest, to 152 pounds, which was the lightest. The subjects trained with weights five school days per week during the first two weeks and Monday, Wednesday, and Friday for the remaining six weeks. Length of training periods was approximately one hour, depending upon the program to be followed on that particular day. Due to the differences in class schedules of the participants, the weight training could be performed at the student's convenience between one

o'clock and six o'clock in the afternoon of the training days. All exercise periods were supervised for the safety of the subjects and to provide assistance in any manner possible.

II. EQUIPMENT AND FACILITIES USED

Much of the equipment was constructed specifically for use in the weight training program. Many of the ideas for construction of certain machines and equipment were taken from recent publications by Hooks,¹ and George and Evans.²

For the purpose of providing the reader with a panorama of the weight training equipment and facilities used in the program, the following is presented:

Training rooms. The entire weight training program was conducted in three rooms at Welch Stadium, located at the north end of the college campus. The ceilings were high enough to permit the subjects to perform the exercises without limiting execution. Adequate space was available to accommodate eight to ten lifters simultaneously. Floors were

¹Gene Hooks, Application of Weight Training to Athletics (Englewood Cliffs, N. J.: Prentice-Hall, 1962), pp. 254.

²Elvan George and Ralph Evans, Weight Training for Football (Englewood Cliffs, N. J.: Prentice-Hall, 1959), pp. 159.

of cement and room temperature ranged from 70 degrees to 80 degrees. Adequate ventilation was provided by doors and windows.

Squat rack. This machine consisted of two parallel pipes four feet apart, extending from a stationary base to the ceiling, to which the pipes were secured. Through these pipes were drilled holes every five inches. Attachments were fitted on each pipe in such a way as to permit vertical movement on the pipes. A barbell was then connected to the attachments. Safety pins were placed in the holes, which had been drilled five inches apart in the pipes for adjusting the height of the bar. This was to prevent the weight from falling on the individual if control of the weight was lost. Additional pins could also be inserted above the bar to restrict movement, which provided isometric contraction exercises. This machine was used for numerous exercises throughout the program.³

Quadri-cep bench. This machine consisted of a bench with an adjustable foot bar on each side. The foot bar was approximately five inches above the floor level and was adjusted to the desired distance in front of the bench. The

³Bob Hoffman, "Announcing a Revolutionary Break Through in Exercise," Strength and Health, May, 1962, p. 45.

exact distance was determined by the individual. The bench could be utilized by four athletes simultaneously.⁴

Quadri-cep and hamstring machine. Two steel arms, two feet long, were welded together at a ninety degree angle. An identical mate of this was then constructed. These two frames were held two feet apart by two short barbells. The barbells passed through holes that had been drilled at the end of each arm. This machine was then bolted, at the angle of the arms, to the end of a padded trainer's bench. A subject could sit on the end of the bench and place his feet under the lower bar, or could lie in a prone position and place his heels against the top bar. Weight or resistance could be increased by placing weights on the lower bar, or by tightening the bolts that connected the machine to the bench.⁵

Chinning bar. A stationary chinning bar was provided that was $8\frac{1}{2}$ feet high and approximately three inches in diameter. This bar required the individual to use the hands and fingers in supporting the body weight. The squat

⁴Laurence E. Morehouse and Philip J. Rasch, Scientific Basis of Athletic Training (Philadelphia: W. B. Saunders Co., 1958), p. 120.

⁵Walt Marcyan, "Pre-season Strengthening Exercises for Track and Field," Physical Power, January-February, 1961, p. 9.

rack bar, which could be converted into a chinning apparatus, was $1\frac{1}{2}$ inches in diameter. This smaller bar permitted the body weight to rest primarily on the hands of the subjects. The squat rack bar was for those subjects who desired to adjust the bar to a greater height than was provided by the stationary bar.

Climbing ropes. Four ropes were extended from the ceiling to the level of the floor. They were eleven feet long and two inches in diameter. Tape was overlapped around the ropes for the purpose of improving the grip of the climbers.

Exercise benches. Six benches were constructed approximately eight feet long, twelve inches wide, and thirty inches in height. These served as a place to rest for those subjects waiting to perform and as a station for specific exercises used in the program.⁶

Exercise mats. Golf mats of rubber were used for the subjects to stand on while performing all exercises in the program. These mats lessened the chances of the individual slipping during vigorous movements.

⁶George and Evans, op. cit., p. 3.

Weights. The Men's Physical Education Department at the college made available all the weights needed to conduct the program of weight training. Divisions of 60, 30, 25, 5, and $2\frac{1}{2}$ pound disc's were utilized in the program. The amount of weight was visibly indicated on the side of each disc.

Barbells. Five foot bars, weighing twenty pounds, and six foot bars, weighing twenty-five pounds, were used for most all exercises included in the weight training program. This weight was increased five pounds by the use of clamps which were fastened to the end of the bar to prevent the weights from shifting during exercises. The clamps also increased the safety of the subjects involved in the training.

Dumbbells. The use of hand dumbbells was somewhat limited in the weight training program. The dumbbells, weighing five pounds without weights attached, were employed only when a light weight was required, or when the type of movement eliminated execution with a barbell.

Wrist rollers. The wrist roller consisted of a handle, constructed of pipe, twelve inches long and two inches in diameter. At the center of the handle was drilled a hole in which a rope, five feet in length and a quarter of an inch in diameter, would pass through. A knot was tied at

one end of the rope to prevent it from slipping through the handle. The amount of weight desired was secured at the opposite end of the rope.⁷

III. ORIENTATION AND CONDITIONING

The first week of the program was devoted to orientation and conditioning of the athlete. Each subject was instructed concerning terminology, methods, techniques, and procedures to be followed for the duration of the weight training program.

All athletes were provided with the opportunity to learn and practice the exercises with emphasis placed on proper execution. These movements were performed with a maximum of forty pounds to prevent possible injury to the inexperienced weight trainer.

Warm-up exercises were emphasized to prepare the subjects for the actual weight training. According to Hooks:

These exercises increase the temperature and the blood circulation of the muscles and probably decrease the viscosity (resistance to change) of the muscle, thereby preventing injury to the muscle when it is called upon for vigorous contraction.⁸

The following exercises were included in the warm-up period. Specific instruction was provided for each subject

⁷Bob Hoffman, Better Athletes (York, Pennsylvania: Strength & Health Publishing Co., 1959), p. 339.

⁸Hooks, op. cit., p. 17.

concerning the proper methods of performing all training activities. No attempt will be made to give a description of all of these exercises.

1. Jogging two miles
2. Running in place
3. Running stadium steps
4. Skipping rope
5. Push-ups
6. Alternate toe touch
7. Warm-up exercise (with barbell)
8. Squat thrust

Mr. Long and this investigator observed the subjects performing all exercises during the first week of training. These careful observations were utilized to establish the starting weight for exercises employed in the second week of the program.

The second week was the beginning of the organized weight training for the subjects. Weight training was scheduled Monday through Friday, the purpose of which was to prepare the individuals for the maximum muscular contractions necessary in the first testing period.

All subjects received a mimeographed program daily explaining the exercises to be performed, weights to be performed with, repetitions required and the total number of sets to be performed.⁹ A performance sheet, for the purpose of keeping accurate records, was also distributed daily.¹⁰

⁹Appendix A

¹⁰Appendix B

Each subject recorded all training each day; then returned the sheet to a supervisor before leaving the weight room. These records were carefully checked by the supervisors at the completion of each training period. Data gathered from the performance sheets were extremely useful in planning the program for the following day.

It became increasingly evident at the completion of the second week of training, that two distinct groups existed. With this fact in mind, the supervisors divided the athletes into groups A and B.

Group A consisted of those individuals who needed to increase body weight. A specific program was designed that called for fewer repetitions, additional sets, and a rest period of one minute between each set.¹¹ Suggestions were also given by the supervisors concerning the value of proper dieting and adequate sleep. It was emphasized that without these factors there was little hope for increasing body weight during the weight training program.

Those subjects in need of losing body weight composed group B. Their program called for a greater number of repetitions, additional weight, and a fewer number of sets.¹² The rest period between sets was also decreased. Each

¹¹George and Evans, op. cit., p. 123.

¹²Ibid., p. 125.

subject was enlightened concerning additional methods of weight control.

Because of the nature of this study, no attempt was made to evaluate the differences between the two groups through testing. However, this is an area that is in need of thorough investigation.

IV. TESTING OF THE BASIC EXERCISES

In designing the program of weight training there was an attempt to develop not only coordination between muscle groups of the body but also to improve strength and power of each muscle group.

Basic Exercises

Basic exercises were employed specifically for the development of each of the body areas or muscle groups. The ultimate objective of these exercises was the increase in power and strength of each muscle group involved.

During the weight training program the following basic exercises were employed:

1. Overhead press
2. Curls
3. Reverse curls
4. Bench press
5. Chins
6. Shoulder shrug
7. Upright rowing
8. Stiff arm raise
9. Bent rowing
10. Forward bend

11. Dead lift (legs straight)
12. Sit-ups
13. Leg raises
14. Quadricep and hamstring machine exercises
15. Quadricep bench exercise
16. Toe raises
17. Wrist roll

Testing

The first testing of the basic exercises was conducted on Friday, March 9, 1962. By this time all subjects had perfected proper techniques for the resistive exercises that were to be employed in the evaluation.

At least one exercise for each of the major muscle groups was selected for testing. This testing was utilized to indicate, both to the subject and the supervisors, the maximum weight with which the athlete could properly execute one repetition. All subjects performed the exercises in an identical order with no two consecutive tests utilizing the same muscle group.

All exercises used in the testing were selected from the list of basic exercises previously mentioned. A list of those exercises selected, complete with a description of each movement, along with the standards that were established for the proper execution follows:

Overhead press. The barbell was held at the chest rest position with the overhand grip. Hands and feet were shoulder width apart. Knees were locked and remained so

throughout the complete execution. The subject pushed the barbell directly over his head until the arms were fully extended. This position was held for two seconds.

Disqualification occurred when:

1. The knees were not locked throughout the entire execution.
2. The pressing of the bar overhead was not continuous.
3. Balance could not be maintained with the bar overhead.

Forward bend. The barbell was held at the shoulder rest position with the overhand grip. Feet were shoulder width apart with the hands being slightly wider. Legs were straight with knees locked. The subject bent from the hips until the upper body was parallel to the floor; then returned to the original standing position. This constituted the complete execution. A tight grip was required to keep the barbell from rolling over the head of the lifter.

Fouls were recorded when:

1. The upper body was not parallel with the floor.
2. There was not continuous movement when returning to the standing position.

Bench press. Spotters placed the barbell in the hands of the subject who was in the supine position on an

exercise bench. An overhand grip was employed. Adjusting the hands the desired distance apart was permissible. Feet were kept flat on the floor. The bar was pressed directly above the chest till the arms were fully extended and the elbows were locked; then lowered to the chest.

The exercise was not recorded if:

1. Arching of the back occurred.
2. The feet were removed from the floor.
3. Elbows were not locked at the peak of the lift.
4. The barbell stopped during execution.

Squat. The shoulder rest position was assumed with the hands, using the overhand grip, just outside of the shoulders. The back was straight and feet were flat on the floor. The subject would squat until touching the exercise bench that was placed directly behind and then returned to the erect position.

Disqualification occurred when:

1. The buttocks failed to touch the bench.
2. The heels were raised from the floor.
3. The subject could not return to the standing position.

Curl. The individual began the exercise with the barbell at the thigh rest position. The underhand grip was used with the hands being shoulder width apart. Feet were

spread a comfortable distance; legs were straight. The bar was raised until touching the chest, while upper arms remained motionless, and then returned to the thigh rest position.

The exercise was void when:

1. Any part of the body moved other than the lower arms.
2. There was not a continuous motion of the barbell when being raised to the chest.

Each subject was given three opportunities to lift the maximum weight possible. If the subject was successful, he could add the weight desired. A limit of two adds was placed on the subjects.

All data gathered were judged and recorded by the supervisors. The results from the testing were made available to the subjects on the following Tuesday. This information provided each subject a record of the amount of weight with which each exercise was properly executed plus how he ranked in comparison to the group.

The identical procedure was followed at the completion of the sixth week of training, which was March 30. The maximum weight recorded during the first testing period for each of the exercises was used as the starting weight for the second testing. The results of the second testing were then compared to the initial testing.

V. TESTING OF THE POWER EXERCISES

The exercises selected for the weight training program were for the development of the entire body. Numerous movements were used to insure this development and in an attempt to find those most beneficial to the individuals participating in the program.

Power Exercises

Power exercises were included in the weight training program for the purpose of developing coordination between all muscle groups of the body. These were directly related to the powerful movements needed in many athletic activities. All body areas were involved in each execution rather than one specific muscle group.

All power exercises included in the weight training program were:

1. Power clean
2. Power curl
3. Power dead lift
4. Power high pull-up
5. Power press
6. Power reverse curl
7. Power shiver

Testing. The first testing of power exercises was conducted on Friday, March 14, 1962. Five movements were chosen to test the coordination between muscle groups of the body.

The testing was administered to indicate the maximum amount of weight that could be properly executed for one repetition. Spotters were used at all times for the safety of the participants.

The description of the five exercises selected, including disqualifying factors, follows:

Power clean. Assuming the crouch position with the overhand grip, the subject jerked the bar from the floor to the chest rest position. The back remained as straight as possible and the head was up. The feet were permitted to be adjusted during the movement for the purpose of allowing the subject to gain control of the barbell. The lift was completed when the bar and the subject were both motionless.

Violations occurred when:

1. The knees were used to assist the bar to the chest rest position.
2. The weight was not balanced at the chest rest position.

Power press. This exercise involved two distinct movements. First, the barbell was cleaned to the chest rest position. Secondly, the subject bent the knees; then by straightening the legs in one powerful movement pushed the weight directly overhead until the arms were fully extended.

This position was maintained for two seconds; then the bar was lowered to the floor.

This exercise was not properly executed when:

1. Failure to complete the movement in twenty seconds occurred.
2. The elbows were not locked in the overhead position.
3. Violations occurred in the cleaning of the bar.

Power curl. In a crouch position, the subject placed the hands shoulder width apart and employed the underhand grip. In one movement the bar was curled to the chest while the individual assumed a standing erect position. The barbell was then returned to the starting position.

Violations occurred if:

1. The feet were raised from the floor.
2. The subject did not touch his chest with the barbell.
3. Proper balance of the weight was not maintained.

Power dead lift. From the proper crouch position the subject raised the barbell to the thigh rest position. The shoulders were back, chest was out, and the weight was balanced for a period of two seconds. The weight was then lowered to the floor.

Reasons for disqualification were:

1. Improper balance of the weight at the thigh rest position.
2. Shoulders were not thrown back.
3. Removing the feet from the floor.

Power high pull-up. The subject assumed the crouch position placing the hands approximately six inches apart, using the overhand grip. A wide stance was taken by the trainer and the hands were positioned between the knees. The barbell was then jerked from the floor upward until it was just below the chin while the athlete was taking a standing position. The bar was held in this position for one second and then returned to the floor.

Exercises were not allowed if:

1. The bar was not raised above the chest.
2. The weight was not maintained at the peak of the movement for a period of one second.
3. The elbows were not above the bar at all times.

At the conclusion of the seventh week, April 10, the identical procedure was followed. The results from this testing were then compared to the data recorded at the completion of the third week of training.

VI. TESTING OF SPEED OF MOVEMENT AND ENDURANCE EXERCISES

Basic and power exercises required the individuals to exert all possible power and strength into one vigorous movement. The total emphasis in testing was placed on one execution with the maximum weight possible. No attempt had been made to stress speed of movement or the maximum number of repetitions possible in a specific period of time.

Speed of Movement and Endurance Exercises

All the exercises that had been learned by the subjects were employed during the fifth and eighth week of the program to facilitate speed of movement and endurance. Daily workouts called for light weights, approximately the identical number of total repetitions as the preceding weeks, and speed of performance. Both groups followed an identical program and were instructed to execute all movements as rapidly as possible.

Testing

The first testing concerning speed of movement and endurance was undertaken on March 21, 1962. Six exercises were employed to determine the number of repetitions that the subjects could properly perform during a period of sixty seconds.

On verbal command by the supervisor, the individual executed as many repetitions as possible. Only the properly performed repetitions were recorded. At the duration of the sixty second period the supervisor would halt the subject and record the number of repetitions completed. All timings were taken by a supervisor with the aid of a stopwatch.

From the list of the basic exercises mentioned previously in this chapter, a total of six were selected for testing the speed of movement and endurance of the subjects.

A description of each exercise will be provided to enlighten the reader as to the standards established for proper execution, along with the total resistance employed, if any, during the execution:

Overhead press. Repetitions began at the chest rest position with the barbell weighing sixty-five pounds. The subject forced the bar directly above the head until the arms were fully extended, then returned to the chest rest position. This movement constituted one repetition.

Forward bend. The exercise started with the barbell at the shoulder rest position with sixty-five pounds attached. The subject bent at the waist until the upper body was parallel to the floor; then returned to the erect position, completing one repetition.

Bench press. The subject assumed the supine position on an exercise bench with a barbell containing sixty-five pounds. Arms were fully extended at the beginning of the repetition. The barbell was lowered until touching the chest and then pressed to the standing position. This movement concluded one repetition.

Curls. A barbell weighing sixty-five pounds was employed for this exercise. One repetition was completed when the bar was raised from the thigh rest position until touching the chest; then lowered to the original position.

Leg raises. A supine position was assumed on the exercise mat by the subject. The hands were placed behind the head and the fingers were interlocked. The entire body was straight. A five pound disc was secured to the feet of the athlete by means of a rope. On command the legs were raised to the height of an exercise bench located next to the subject, and then lowered to the starting position. The legs were straight throughout the entire exercise.

Chins. An overhand grip was used in grasping the shinning bar. Adjustment of the distance between the hands was permissible. The subject pulled his body upward until his chin was above or level with the bar. The body was then lowered until the arms were fully extended and the elbows were locked. This movement completed one repetition.

At the conclusion of the eighth week, which was April 12, the exact procedure was once again undertaken. The results from the final testing were then compared to the data recorded during the first testing of the speed of movement and endurance exercises.

CHAPTER IV

ANALYSIS OF THE DATA

The purpose of this study was to investigate the physical effects of systematic weight training on twenty-three athletes concerning power, strength, speed of movement and endurance. Basic exercises, power exercises, and exercises of speed of movement and endurance were used to discover these effects.

The results from the first and second test of each of the exercises were utilized to compute the means and the differences between these means. A correlated t-test was used to determine if the obtained differences between the means were significant. The 0.01 level of confidence was established as the criterion for these comparisons. Critical ratios were computed to reveal the ratio of the differences between the obtained means on the examinations to their standard error of the means.

Basic Exercises

The basic exercise testing was administered March 9, 1962 and March 30, 1962. Emphasis was placed on executing one repetition with the maximum weight possible for all exercises. A detailed explanation and a table showing the results of these examinations will be given in this section.

Overhead press. The mean weight for the first testing was 134.347 pounds; the mean weight for the second test was 137.826 pounds, with the mean difference between the two tests being 3.479 pounds. The critical ratio for this comparison was 4.242, which surpassed the 0.01 level of significance.

Forward bend. Results of the initial test revealed a mean weight of 140.434 pounds, compared to 186.086 pounds for the second testing. This constituted a mean difference of 45.652 pounds, with the critical ratio being 9.731. This ratio far exceeds the 0.01 level of confidence.

Curls. The mean weight of 95.000 pounds was obtained on the first test as related to 103.695 pounds for the second test. The difference in the two means was 8.695 pounds, with the critical ratio being 4.868.

Bench press. The mean execution weight for the first test of the bench press exercise was 139.130 pounds. A mean weight of 153.043 pounds was achieved in the second testing, resulting in a mean difference between the two tests of 13.913 pounds. The critical ratio was 5.756; well above the 0.01 level of significance.

Squats. A difference of 60.435 pounds resulted between the first test, which had a mean weight of 328.478

pounds, and the second test, with a mean weight of 388.913 pounds. The critical ratio for this comparison was 5.926, which is well above the 0.01 level of confidence.

The correlation coefficient for the tests ranged from 0.60 for the squats to 0.92 on the overhead press.

The differences between the obtained means ranged from 3.479 pounds, which was the mean for the overhead press, to 60.435 pounds on the squats. The critical ratios for these comparisons varied from 4.242 for the overhead press exercise to 9.731 on the forward bend exercise.

Table I, page 40, shows the standard deviations, means, correlation coefficients, and the critical ratios for the results of the five basic exercises.

Power Exercises

Power exercises, as did the basic exercises, placed emphasis on one repetition with the maximum weight possible. These power exercises involved the coordination of all the muscles of the body into one powerful movement by the subject. The first test was conducted March 15, 1962, and the second test on April 5, 1962.

An explanation and table will be presented in this section to show the results of the testing of the power exercises.

TABLE I

STANDARD DEVIATIONS, MEANS, CORRELATION COEFFICIENTS,
AND CRITICAL RATIOS FOR EACH OF THE BASIC EXERCISES
ON EACH OF THE TWO EXAMINATIONS

Exercise	Standard Deviation		Mean Weight		Correlation Coefficient	Critical Ratio
	1st test	2nd test	1st test	2nd test		
Overhead press	14.167	15.799	134.347	137.826	.92	4.242
Forward bend	17.050	28.121	140.434	186.086	.60	9.731
Curls	16.922	17.851	95.000	103.695	.88	4.868
Bench press	21.567	20.656	103.695	153.043	.85	5.756
Squats	56.658	52.374	328.478	388.913	.60	5.926

N=23

0.01 level of significance=2.82

Power clean. The mean weight for the first test of the power clean was 165.217 pounds; while the mean weight for the second test was 185.000 pounds. This constituted a mean weight difference of 19.783 pounds. The critical ratio was 6.636, somewhat above the 0.01 level of confidence.

Power press. Results from the initial test indicated a mean weight of 154.347 pounds was used in performing the power press; whereas the second test mean weight was 170.000 pounds. A mean weight difference between the two tests was 15.653 pounds. A critical ratio of 7.710 was well beyond the 0.01 level of significance.

Power curl. A mean weight difference of 21.304 pounds was cited between the two tests of the power curl. A mean weight of 149.565 pounds for the first test was recorded as compared to 170.869 pounds on the second test. This exercise resulted in a critical ratio of 11.970, surpassing the 0.01 level of significance.

Power dead lift. A mean execution weight of 336.521 pounds was recorded for the power dead lift at the second testing which was a 42.174 pound increase over the 294.347 pound mean weight for the initial testing. This particular exercise resulted in a critical ratio of 10.472, which far exceeded the 0.01 level of confidence.

Power high pull-up. The mean weight for the first test of the power high pull-up was 144.652 pounds. A mean weight gain of 21.000 pounds resulted when the mean weight for the second testing was 165.652 pounds. The critical ratio was 9.985; very impressive when compared to the 0.01 level of significance.

The correlation coefficient of the exercises ranged from 0.84, which was found for both the power clean and the power high pull-up, to 0.89 established on the power press.

The differences between the obtained means ranged from 15.653 pounds on the power press to 42.174 pounds for the power dead lift. The critical ratios ranged from 6.636 for the power clean to 11.970 on the power curl.

Table II, page 43, sights the standard deviations, means, correlation coefficients, and the critical ratios for the results of the five power exercises.

Speed of Movement and Endurance Exercises

The speed of movement and endurance exercises were employed to determine the total number of repetitions the subject could perform in a sixty second period. A weight of sixty-five pounds was used for all those exercises requiring a barbell.

Results of the first test, which was conducted on March 23, 1962, were compared to the second test, administered April 12, 1962. A complete explanation and a table

TABLE II
STANDARD DEVIATIONS, MEANS, CORRELATION COEFFICIENTS, AND
CRITICAL RATIOS FOR EACH OF THE POWER EXERCISES
ON EACH OF THE TWO EXAMINATIONS

Exercise	Standard Deviation		Mean Weight		Correlation Coefficient	Critical Ratio
	1st test	2nd test	1st test	2nd test		
Power Clean	16.130	17.451	165.217	185.000	.84	6.636
Power Press	19.789	21.267	154.347	170.000	.89	7.710
Power Curl	16.231	15.348	149.565	170.869	.85	11.970
Power Dead Lift	35.075	37.419	294.317	336.521	.86	10.472
Power High Pull-Up	18.819	19.731	144.652	165.652	.84	9.985

N=23

0.01 level of significance=2.82

will be utilized in this section to indicate the results of the tests.

Overhead press. The mean number of repetitions for the first test was 25.478 as compared to 33.913 executions the second test. The mean repetition difference between the two tests was 8.435. A critical ratio for the overhead press was 6.197, exceeding the 0.01 level of significance.

Forward bend. The mean number of repetitions for the first test of the forward bend was 34.869; whereas the mean number of executions was 46.695 for the second testing. This indicated a mean difference of 11.826 repetitions between the two tests. The critical ratio was an impressive 14.011, a high for all the exercises employed in the program.

Curls. The mean repetitions for the initial testing of the curls was 27.043; the second testing being 42.869 repetitions, with a difference between the means of 15.826 repetitions. A 9.249 critical ratio far exceeded the 0.01 level of significance.

Bench press. A mean difference of 11.000 repetitions resulted between the first test, when the mean was 36.913 repetitions, and the second testing, when the mean number of

repetitions was 47.913. This particular exercise indicated a critical ratio of 12.731.

Leg raises. The mean number of repetitions for the initial testing of the leg raises was 40.043; whereas the mean executions for the final testing was 50.478. This constituted a mean difference of 10.435 repetitions. The critical ratio was 5.127, surpassing the 0.01 level of confidence.

Chins. Results of the first test revealed the mean number of repetitions was 7.391, as compared to 11.347 executions the second testing. The differences in the two means was 3.956, with the critical ratio of 6.571, far exceeding the 0.01 level of significance.

The correlation coefficient for the speed of movement and endurance exercises ranged from 0.45 for the curls, to 0.86 on the bench press.

The differences between the obtained means ranged from 3.959 repetitions for the chins, to a difference of 15.826 repetitions on the bench press. The critical ratios ranged from 5.127 for the leg raises to 14.011 for the forward bends.

Table III, page 47, reveals the standard deviations, means, correlation coefficients, and the critical ratios

indicated from the testing of the six speed of movement and endurance exercises.

TABLE III

STANDARD DEVIATIONS, MEANS, CORRELATION COEFFICIENTS, AND CRITICAL RATIOS FOR EACH OF THE SPEED OF MOVEMENT AND ENDURANCE EXERCISES ON EACH OF THE TWO EXAMINATIONS

Exercise	Standard Deviation		Mean Repetitions		Correlation Coefficient	Critical Ratio
	1st test	2nd test	1st test	2nd test		
Overhead Press	5.736	7.792	25.478	33.913	.57	6.197
Forward Bend	4.939	5.708	34.869	46.695	.72	14.011
Curls	7.113	8.401	27.043	42.869	.45	9.249
Bench Press	7.579	8.011	36.913	47.913	.86	12.731
Leg Raises	9.354	14.566	40.943	50.478	.75	5.127
Chins	3.041	3.511	7.391	11.347	.62	6.571

N=23

0.01 level of significance=2.82

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The purpose of this study was to investigate the physical effects of systematic weight training on twenty-three students concerning power, strength, speed of movement, and endurance. Basic exercises, power exercises, and exercises of speed of movement and endurance were employed to test these effects.

The subjects used in this study were voluntary athletes from the football program at the Kansas State Teachers College, Emporia, Kansas. The subjects trained for an eight week period during the second semester of the school year 1961-62.

Five basic exercises were used for the purpose of measuring the increase or decrease in strength and power of specific muscle groups. These exercises consisted of the overhead press, forward bend, curls, bench press, and the squats.

Power exercises were included in the weight training program for the purpose of measuring the development of coordination between all muscle groups of the body, in relation to power and strength. Exercises selected for this

testing were the power clean, power press, power curl, power dead lift, and the power high pull-up.

Speed of movement and endurance exercises were employed in the program to facilitate speed of executing the movements and increasing the number of repetitions in a sixty second period. Exercises used in this testing were the overhead press, forward bend, bench press, curls, leg raises, and chins.

All testing was administered by the supervisors. There was a time interval of three weeks between the first test and the second test of each set of exercises. Standards and regulations were fixed in order to establish validity and to increase the safety factor involved.

The results from the first and second test of each of the exercises were utilized to compute the means and the differences between these means. A correlated t-test was used to determine if the obtained differences between the means were significant. The 0.01 level of confidence was established as the criterion for these comparisons. Critical ratios were computed to reveal the ratio difference between the obtained mean scores on the examinations and the standard error of the means.

The results from the five basic exercises showed that the correlation coefficients for the tests ranged from 0.60 for the squats to 0.92 for the overhead press. The

differences between the obtained means ranged from 3.479 pounds, which was the mean increase for the overhead press, to 60.435 pounds for the squats. The critical ratios for these comparisons varied from 4.242 for the overhead press exercise to 9.731 on the forward bend exercise.

The results from the five power exercises indicated that the correlation coefficients for the tests ranged from 0.84, which was found for both the power clean and the power high pull-up, to 0.89 established on the power press. The critical ratios ranged from 6.636 for the power clean to 11.970 on the power curl.

The correlation coefficients for the speed of movement and endurance exercises ranged from 0.45 for the curls, to 0.86 on the bench press. The differences between the obtained means ranged from 3.959 repetitions for the chins, to a difference of 15.826 repetitions on the bench press. The critical ratios ranged from 5.127 for the leg raises, to 14.011 for the forward bend.

II. CONCLUSIONS

After carefully examining the results derived from the weight training program, the following conclusions were drawn:

(1) The results from the testing of the basic exercises indicated that the subjects increased significantly

regarding power and strength in specific muscle groups of the body.

(2) The results from the power exercise testing showed conclusive evidence that the individuals improved significantly the power and strength used in coordinating all the muscle groups of the body into one vigorous movement.

(3) The results derived from testing the speed of movement and endurance exercises indicated that the subjects showed significant improvement in the speed of performing resistive exercises and in the total number of repetitions properly executed in a sixty second period.

III. RECOMMENDATIONS

After conducting this study concerning weight training, the following recommendations were drawn.

(1) It is recommended that evaluation be applied to all programs of weight training. Far too many programs are conducted throughout the country on the assumption that weight training is beneficial to the individuals involved. Some form of testing should be used for the purpose of determining what effects have been derived by the subjects participating.

(2) This investigator recommends that a study be conducted for the purpose of evaluating the differences

between one group of individuals training in a program designed with fewer repetitions and added sets, as compared to a group of subjects training with additional repetitions and fewer sets.

(3) The use of a squat rack is recommended to increase the safety of the individuals while performing exercises with heavy weights. A program in which very heavy weights are required would not be advised by this investigator unless a squat rack is provided.

(4) Weight training, for high schools and colleges alike, should be organized and supervised by personnel who have had experience in weight training. Without a program selected to meet the needs of the individual group, there is a chance of the training being detrimental to the subjects.

(5) This investigator recommends that a study be undertaken which uses baseball players as a control group and a group of individuals training with weights composing an experimental group. All subjects should be tested before actually participating in their respective activities and immediately following a period of approximately eight weeks.

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APPENDIX A

Table 1

WEIGHT TRAINING PROGRAM
February 26, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging	2 miles		1
Squat Thrust	10	40	1
Rope Skin	2 minutes		2
Power Exercises:			
Power Press	10 - 10 - 6	60	3
Power Curl	10 - 10 - 6	60	3
Power Dead Lift	10 - 8	75	1
Basic Exercises:			
Wrist Roll	5 - 5	10	2
Chins	Build		
Quadri- cep Strengthen- er	follow program		2
Overhead Press	10 - 10 - 6	60	3
Two Arm Curl	10 - 10 - 6	40	3
Dead Lift (straight leg)	10 - 10	40	2
Set-ups	25 - 25		2
Bench Press	10 - 10 - 6	60	3
Squats	12 - 10 - 6	75	3
Rope Climb	build		

WEIGHT TRAINING PROGRAM
February 27, 1962

<u>EXERCISES</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Rope Skip	2 min		2
Alternate toe touch	40		2
Squat thrust	10	40	1
Power Exercises:			
Power Clean	10 - 8 - 6	60	3
Power Curl	10 - 8 - 6	60	3
Power Press	10 - 8 - 6	60	3
Basic Exercises:			
Chins	All can get		Build
Quadri- ceps Strengthen- er	18 - 18		2
Overhead press	10 - 8	60	2
Dead Lift (Straight leg)	10 - 8	40	2
Two Arm Curl	10 - 8	40	2
Set ups	25 - 25		2
Bench Press	10 - 8 - 6	70	3
Squats	10 - 8 - 6	70	3
Rope Climb	All can get		Build

Work for speed of performance at weight set. Lets learn to make quick moves with resistance. Be sure that you do the total number of repetitions that is assigned to each exercise even if you have to do extra sets. One of the most important fundamentals that we must all work on is the crouch position used for setting weights back to the floor and lifting weights from the floor. This is a fundamental position that will help you in lifting and will improve your abilities as a athlete.

WEIGHT TRAINING PROGRAM
February 28, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging	2 miles		1
Rope Skip	2 minutes		2
Squat Thrust	10	40	1
Alternate Toe Touch	10		1
Power Exercise:			
Power Press	10 - 8 - 6	60	
Power Curls	10 - 8 - 6	60	
Basic Exercises:			
Chins	Build		
Quadriceps Strengtheners	19 - 19		
Overhead Press	10 - 8 - 6	70	
Stiff Legged Dead Lift	10 - 8 - 6	75	
Two Arm Curl	10 - 8 - 6	45	
Bench Press	10 - 8 - 6	60	
Sit Ups	25 - 25		
Squats	10 - 8 - 6	75	
Rope Climb	Build		

WEIGHT TRAINING PROGRAM
March 1, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging	2 miles		1
Squat Thrust	10	40	1
Power Exercises:			
Power Clean	8 - 8 - 6	70	3
Power Curls	8 - 8 - 6	60	3
Power Dead Lift	10 - 8 - 6	75	3
Basic Exercises:			
Chins	Build		
Quadriceps Strengtheners	20 - 20		2
Overhead Press	10 - 8 - 6	70	3
Two Arm Curl	10 - 8 - 6	45	3
Bench Press	10 - 8 - 6	60	3
Sit ups	25 - 25		3
Squats	10 - 8 - 6	75	3
Rope Climb	Build		

WEIGHT TRAINING PROGRAM
March 2, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging	2 miles		1
Squat Thrust	10	40	1
Rope Jump	2 minutes		2
Power Exercises:			
Power Clean	5 - 3 - 1	75	3
Power Curls	5 - 3 - 1	75	3
Power Press	5 - 3 - 1	75	3
Power Dead Lift	4 - 3 - 1	75	3
Basic Exercises:			
Chins	Build		
Quadri- ceps Strengthener	21 - 21		2
Overhead Press	4 - 3 - 1	75	3
Two Arm Curl	4 - 3 - 1	45	3
Bench Press	5 - 3 - 1	75	3
Squats	5 - 3 - 1	100	3
Rope Climb	Build		

WEIGHT TRAINING PROGRAM
March 5, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging	2 miles		1
Coordination Ex. 8set (dumbell)	8	40	1
Power Exercises:			
Squat Thrust	10 - 10	40	2
Power Dead Lift	10 - 8	75	3
Power Press	10 - 8	70	3
Power Curl	10 - 8	60	3
Quadricep Strengtheners	22 - 22		2
Basic Exercises:			
Wrist Roll	4 - 4	5	2
Chins	Build		
Overhead Press	10 - 10	75	
Forward bend (stiff leg)	10 - 10	30	
Two Arm Curl	10 - 10	50	
Bench Press	10 - 10	60	
Squats	10 - 8 - 6	80	
Set-ups	25 - 25		2
Rope Climb	Build		

WEIGHT TRAINING PROGRAM A
March 7, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Rope Jump	2 Min.		2
Stadium Step Run	10	40	
Power Exercises:			
Power Curls	5 - 5 - 5	60	3
Power Press	5 - 5 - 5	60	3
Power Dead Lift	5 - 5 - 5	80	3
Basic:			
Rowing Bent Over	10 - 10	40	2
Chins	All Can Do		
Wrist Roll	3 - 3		2
Quadricep Strengtheners	24 - 24		2
Overhead Press	5 - 5 - 5 - 5	60	4
Forward Bend	5 - 5 - 5	40	4
Two Arm Curl	4 - 4 - 4	60	3
Bench Press	4 - 4 - 4	60	3
Sit Ups	25 - 25		2
Squats	10 - 10	100	2
Rope Climb	All Can Get		

WEIGHT TRAINING PROGRAM B
March 7, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Rope Jump	2 min		2
Stadium Step run	10	50	
Power Exercises:			
Quadri- ceps Strengtheners	24 - 24		2
Power Curls	5 - 5 - 5	75	3
Power Press	5 - 5 - 5	80	3
Dead Lift Crouch	5 - 5 - 5	100	3
Basics:			
Rowing Upright	10 - 10	50	2
Chins			2
Wrist Roll	3 - 3	5	2
Overhead Press	10 - 10	70	2
Forward Bend	10 - 10	70	2
Two Arm Curl	8 - 8	70	2
Bench Press	8 - 8	70	2
Sit Ups	25 - 25		2
Squats	15 - 15	100	2
Rope Climb	All Can Get		

WEIGHT TRAINING PROGRAM A
March 12, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging 440	1	40	1
Warm-up exercise	8 - 8	40	2
Power Exercises:			
Power High pull-up	10 - 5 - 5 - 4	60	4
Power Press	10 - 5 - 5 - 4	70	4
Power Curl	10 - 5 - 5 - 4	70	4
Basic Exercises:			
Shoulder Shrugs	8 - 8	40	2
Wrist roll	2 - 2	10	2
Upright rowing	8 - 8 - 8	40	3
Overhead press	7 - 6 - 5 - 4	75	4
Two arm curl	8 - 7 - 5 - 4	50	4
Dead Lift (straight legs)	7 - 6 - 6 - 5	50	4
Set-ups	35 - 35		2
Bench Press	7 - 6 - 5 - 4	75	4
Squats	7 - 7 - 6	100	3
Chins	5 - 5		2

WEIGHT TRAINING PROGRAM B
March 12, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging 440	1		1
Warmup exercise	8 - 8	40	2
Power Exercises:			
Power High Pull-up	10 - 8 - 6	60	3
Power Press	10 - 8 - 6	70	3
Power Curl	10 - 8 - 6	70	3
Quadri- ceps Strengtheners	25 - 25		2
Basic Exercises:			
Shoulder Shrugs	8 - 8	40	2
Wrist Roll	2 - 2	10	2
Upright Rowing	8 - 8 - 8	40	3
Overhead Press	8 - 8 - 6	75	3
Two Arm Curls	10 - 8 - 6	50	3
Dead Lift (straight leg)	8 - 8 - 8	50	3
Setups	35 - 35		
Bench Press	8 - 8 - 6	75	3
Squats	10 - 10	100	2
Chins	10		10

WEIGHT TRAINING PROGRAM A
March 14, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:	8 - 8 - 4	40	3
Power Exercises:			
Power Clean	6 - 5 - 5	70	3
Power Press	6 - 5 - 5	70	3
Power Curl	6 - 5 - 5	70	3
Power High Pull-up	6 - 5 - 5	70	3
Quadricep Strengtheners	37 - 37		2
Power Dead Lift	6 - 5 - 5	80	3
Basic Exercises:			
Wrist Roll	2 - 2	10	2
Shoulder Shrugs	8 - 8 - 4	50	2
Forward Bend	8 - 8 - 4	40	2
Chins	12		12
Overhead Press	8 - 6 - 4	60	2
Stiff Leg Dead Lift	8 - 6 - 4	60	2
Two Arm Curl	8 - 6 - 4	50	2
Bench Press	8 - 6 - 4	60	2
Sit Ups	35 - 35		2
Squats	8 - 6 - 4	100	2
5 - Quadriceps Prone Table - 20 lbs.			
3 - Hamstrings - no weight			

WEIGHT TRAINING PROGRAM B
March 14, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:	10 - 10	40	2
Power Exercises:			
Power Clean	8 - 8	70	2
Power Press	8 - 8	70	2
Power Curl	8 - 8	70	2
Power High Pullup	8 - 8	70	2
Quadricep Strengtheners	37 - 37		2
Power Dead Lift	8 - 8	100	2
Basic Exercises:			
Wrist Roll	2 - 2	10	2
Shoulder Shrugs	10 - 10	50	2
Forward Bend	10 - 10	50	2
Chins	12		12
Overhead Press	9 - 9	60	2
Stiff Leg Dead Lift	9 - 9	60	2
Two Arm Curl	9 - 9	50	2
Bench Press	9 - 9	60	2
Sit Ups	35 - 35		2
Squats	9 - 9	100	2
15 - Quadriceps Prone Table - 20 lbs.			
5 - Hamstrings - no weight			

WEIGHT TRAINING PROGRAM A
March 19, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging 440	1		1
Warm up exercise	10 - 8 - 6	40	3
Power Exercises:			
Power Clean	6 - 4 - 2	80	3
Power Press	6 - 4 - 2	80	3
Power Curl	6 - 4 - 2	80	3
Power Dead Lift	6 - 4 - 2	80	3
Power High Pull-up	6 - 4 - 2	80	3
Quadricep Strengtheners	40 - 40		2
Basic Exercises:			
Wrist Roll	3 - 3	10	2
Chins	14		14
Sit Ups	39 - 39		2
Overhead Press	10 - 8 - 6	60	3
Reverse Curls	10 - 8 - 6	40	3
Dead Lift (Straight leg)	8 - 6	60	2
Bench Press	10 - 8 - 6	60	3
Squats	10 - 8 - 6	100	3
Rope Climb	Build		

8 - Rep - on-Table machine - no weight.

4 - Rep - on-Table machine - no weight.

WEIGHT TRAINING PROGRAM B
March 19, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jogging 440	1		1
Warmup Exercise	8 - 8 - 8	40	3
Power Exercises:			
Power Clean	6 - 6	80	2
Power Press	6 - 6	80	2
Power Curl	6 - 6	80	2
Power Dead Lift	6 - 6	80	2
Power High Pull-up	6 - 6	80	2
Quadriccep Strengtheners	40 - 40		2
Basic Exercises:			
Wrist Roll	2 - 2 - 2	10	3
Chins	14		14
Sit Ups	39 - 39		2
Overhead Press	12 - 12	60	2
Reverse Curls	12 - 12	40	2
Dead Lift (straight legs)	7 - 17	60	2
Bench Press	12 - 12	60	2
Squats	12 - 12	100	2
Rope Climb	Build		

10 - Reps - on Table machine - 10 lbs. weight
 5 - Reps - on Table machine - no weight

WEIGHT TRAINING PROGRAM
March 21, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Warm-up Exercise	10 - 8 - 6	40	2
Wrist Curls	10 - 10	10	2
Power Exercises:			
Power Clean	8 - 8 - 4	80	3
Power Press	8 - 8 - 4	80	3
Power Curls	8 - 8 - 4	80	3
Power Dead Lift	8 - 8 - 4	100	3
Power High Lift	8 - 8 - 4	80	3
Quadricep Strengthener	25 - 25		2
Basic Exercises:			
Toe Raises	10 - 10 - 10	60	3
Reverse Curls	6 - 6 - 6	40	3
Leg Raises	12 - 12 - 12	2 $\frac{1}{2}$ - 5 - 10	3
Bent Rowing	6 - 6 - 4	40	3
Overhead Press	10 - 8 - 6	60	3
Forward Bend	10 - 8 - 6	60	3
Two Arm Curl	10 - 8 - 6	60	3
Bench Press	10 - 8 - 6	60	3
Sit Ups	25 - 25		3
Squats	10 - 8 - 6	100	3
Chins	15		15

3 foot positions + straight ahead, pigeon toed, pronated
 12 reps prone table machine, no weight
 6 reps supine table machine, no weight

WEIGHT TRAINING PROGRAM B
March 21, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Warm up Exercise	12 - 12	40	2
Wrist Curls	10 - 10	10	2
Power Exercises:			
Power Clean	10 - 10	80	2
Power Press	10 - 10	80	2
Power Curls	10 - 10	80	2
Power Dead Lift	10 - 10	100	2
Power High Lift	10 - 10	80	2
Quadricep Strengtheners	25 - 25		2
Basic Exercises:			
Toe Raises	10 - 10 - 10	60	3
Reverse Curls	10 - 8	40	2
Leg Raises	12 - 12 - 12	2 $\frac{1}{2}$ - 5 - 10	3
Bent Rowing	8 - 8	40	2
Overhead Press	12 - 12	60	2
Forward Bend	12 - 12	60	2
Two Arm Curl	12 - 12	60	2
Bench Press	12 - 12	60	2
Sit-Ups	25 - 25		2
Squats	12 - 12	100	2
Chins	15		15

12 reps prone table machine, 10 lbs. weight
6 supine table machine, no weight.

WEIGHT TRAINING PROGRAM
March 26, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jog 440	1		1
Warm-up Exercise	10	40	1
Power Exercise:			
Power Clean	10	60	1
Power Press	10	60	1
Power Curls	10	60	1
Power High Pull-up	10	60	1
Power Shiver	10	20	1
Basic Exercises:			
Reverse Curls	10	30	1
Stiff Arm Raise	10	20	1
Toe Raises	10	60	1
Leg Raises	10	10	1
Overhead Press	10	40	1
Forward Bend	10	40	1
Curls	10	40	1
Bench Press	10	40	1
Squats	10	40	1
Chins	Build		

WEIGHT TRAINING PROGRAM
March 28, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jog 440	1		2
Warm-up Exercise	8 - 8	40	2
Power Exercise:			
Power Clean	8 - 8	40	2
Power Press	8 - 8	40	2
Power Curls	8 - 8	40	2
Power High Pull-up	8 - 8	40	2
Power Shiver	8 - 8	40	2
Power Dead Lift	8 - 8	40	2
Basic Exercises:			
Reverse Curls	8 - 8	30	2
Stiff Arm Raise	8 - 8	20	2
Toe Raises	8 - 8	80	2
Leg Raises	8 - 8	10	2
Overhead Press	8 - 8	40	2
Forward Bend	8 - 8	40	2
Curls	8 - 8	40	2
Bench Press	8 - 8	40	2
Squats	8 - 8	40	2
Chins	10		

WEIGHT TRAINING PROGRAM
April 2, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jog 440	1		1
Warm-up	10 - 8 - 6	50	3
Power Exercises:			
Power Clean	8 - 6 - 4	100 - 110	3
Power Press	8 - 6 - 4	85 - 95	3
Power Dead Lift	8 - 6 - 4	100 - 110	3
Power Curls	8 - 6 - 4	100 - 110	3
Power High Pull-up	8 - 6 - 4	75 - 85	3
Power Shiver	8 - 6 - 4	20	3
Basic Exercises:			
Toe Raises	10 - 8 - 6	110	3
Stiff Arm Raise	4 - 4 - 2	20	3
Leg Raises	5 - 5	15	2
Overhead Press	6 - 4 - 2	85 - 95	
Upright Rowing	6 - 4 - 2	75 - 80	
Curls	6 - 4 - 2	65 - 75	
Bench Press	6 - 4 - 2	100 - 120	
Squats	6 - 4 - 2	200 - Loader or Rack	
Chins	10		
Quadricep Bench - 50 Repetitions			
Quadricep Machine - 12 - 6 - 20 lbs.			
ADD LAST WEIGHT - LAST SET REPETITION			

WEIGHT TRAINING PROGRAM
April 4, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jog 440	1		1
Warm-up	10 - 8 - 6	40	3
Power Exercises:			
Power Clean	6 - 6 - 3	100 - 120	3
Power Press	6 - 6 - 3	85 - 95	3
Power Curls	6 - 6 - 3	100 - 110	3
Power Dead Lift	6 - 6 - 3	100 - 110	3
Power High Pullup	6 - 6 - 3	75 - 85	3
Power Reverse Curls	6 - 6 - 3	60 - 60	3
Basic Exercise:			
Reverse Curls	8 - 6 - 4	40	3
Toe Raises	8 - 8 - 8	100	3
Leg Raises	8 - 8	15	2
Overhead Press	6 - 4 - 2	85 - 95	3
Upright Rowing	6 - 4 - 2	75 - 80	3
Curls	6 - 4 - 2	65 - 75	3
Bench Press	6 - 4 - 2	100 - 120	3
Squats	6 - 4 - 2	200 - Loader Rack	3
Chins	10		

WEIGHT TRAINING PROGRAM
April 9, 1962

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up:			
Jog 440	1		1
Warm-up Exercise	8 - 8	40	2
Power Exercise (Light Weights - work for speed):			
Power Clean	8 - 8 - 8	40	3 3 3 3 3 3
Power Press	8 - 8 - 8	40	
Power Curls	8 - 8 - 8	40	
Power High Pull-up	8 - 8 - 8	40	
Power Shiver	8 - 8 - 8	40	
Power Dead Lift	8 - 8 - 8	40	
Basic Exercises (Light weights - work for speed):			
Reverse Curls	8 - 8	30	2 2 2 2 2 2 2 2 2 2
Stiff Arm Raise	8 - 8	20	
Toe Raises	8 - 8	80	
Leg Raises	8 - 8	10	
Overhead Press	8 - 8 - 8	40	
Forward Bend	8 - 8 - 8	40	
Curls	8 - 8 - 8	40	
Bench Press	8 - 8 - 8	40	
Squats	8 - 8 - 8	40	
Chins	10		

OFF-SEASON WEIGHT TRAINING PROGRAM
Used throughout the remainder of the spring.

<u>EXERCISE</u>	<u>REPETITION</u>	<u>WEIGHT LOAD</u>	<u>SETS</u>
Warm-up	10 - 8 - 6	40	3
Toe Raises	10 - 8 - 6	80	3
Curls	10 - 8 - 6	40	3
Power Dead Lift	10 - 8 - 6	40	3
Overhead Press	10 - 8 - 6	40	3
Quadriцеп Bench	30 - 30		2
Forward Bend	10 - 8 - 6	40	3
Reverse Curl	10 - 8 - 6	30	3
Squats	10 - 8 - 6	40	3
Bench Press	10 - 8 - 6	40	3
Sitpups	50		1
Chins	12		1

First two sets will be with weight indicated.
Third set is with 15 lbs. less than maximum lifted on arm exercises, 5 lbs. less than maximum lifted on leg exercises.

When you can do 10 repetitions on the last set, add 5 lbs. on arm exercises, add 10 lbs. on leg exercises.

NOTE: This weight will then be added on all 3 sets.

APPENDIX B

A vertical grid table with 20 empty rows and 1 column. The grid is located on the right side of the page and consists of a single column of 20 rectangular cells. There is no text or data within the cells.

FOOTBALL PERFORMANCE SHEET

Name _____

Date _____

Lift or Item Performed	Weight Load	10	<u>Repetitions</u> 8	6
<u>Daily</u>				
Rope Skip				
Squat Thrust				
Burpee				
Toe Touch				
Overhead Press				
Dead Lift				
Two Arm Curl				
Bench Press				
Sit-Up				
Squats				
Rope Climb				
Chins				
<u>Specials</u>				
Modified Clean				
Power Press				
Power Curl				
Knee Flexor				
Knee Extensor				
Shoulder Shrug				
Upright Rowing				
Wrist Roller				

WEIGHT TRAINING PERFORMANCE
February 27, 1962

Name _____

Exercise performed	Repetitions			Weight	Sets
	10	8	6		
<u>Warm up Exercises</u>	10	8	6		
1. Rope Skip					
2. Alternate toe touch					
3. Squat thrust					
4. Chins					
<u>Power Exercises</u>					
1. Power Clean					
2. Power Curl					
3. Power Press					
4. Quadriцеп Strengthenер					
<u>Basic Exercises</u>					
1. Overhead Press					
2. Dead Lift (Straight leg)					
3. Two Arm Curl					
4. Set Ups					
5. Bench Press					
6. Squats					
7. Rope Climb					