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Leg Strength and Vertical Jump of Basketball Players as Affected by Two Select Exercise Programs Conducted Throughout the Competitive Season

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LEG STRENGTH AND VERTICAL JUMP OF BASKETBALL PLAYERS AS AFFECTED BY TWO SELECT EXERCISE PROGRAMS CONDUCTED THROUGHOUT THE COMPETITIVE SEASON

BY

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This thesis is approved as a creditable and independent investigation by a candidate for the degree, Master of Science, and is acceptable as meeting the thesis requirements for this degree, but without implying that the conclusions reached by the candidate are necessarily the conclusions of the major department.

Thesis Advisor — Date

Head, Health, Physical Education, and Recreation Department — Date

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Abstract

LARRY L. LUITJENS

Under the supervision of Professor Glenn E. Robinson

The purpose of this study was to determine the effects of two varying training programs, weight training and Exer-Genie training, upon the leg strength and explosive power of high school basketball players. The training programs were carried on during the competitive basketball season.

The twenty-two members of the De Smet High School basketball squad for the year 1967-1968 were selected for this study. The subjects were divided into two equated groups, according to results in the Sargent Jump Test. Groups were randomly designated. Group A participated in a 12 week weight-training program, consisting of three circuits of two exercises, three times per week. Group B trained with the Exer-Genie in a similar manner for 12 weeks.

All subjects were tested before the training, every three weeks during the training, and one and two weeks after the conclusion of the training period. Leg strength and explosive power were tested.

The data collected during the testing were recorded and analyzed to determine what effect the two training programs had upon leg strength and explosive power.

A comparison was made between the two training groups; from this comparison no statistical significance was found between groups.

But, there was a statistically significant increase in both leg strength and explosive power within each group.

The results of this study indicated that either weight training or Exer-Genie training could significantly increase leg strength and explosive power during the competitive basketball season.

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CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

For many years basketball coaches have felt that weight training during the competitive basketball season would have a negative effect on a player's performance. Even though the main purpose of a weight-training program for basketball players would be to strengthen the legs, most basketball coaches feel that any effective weight-training program involves the whole body. As a varsity basketball coach on the secondary level, this investigator wished to determine the effects of two select training programs during the competitive season on leg strength and explosive power.

I. THE PROBLEM

Statement of the problem. This study was designed to determine the effects of two varying training programs, weight training and Exer-Genie training, upon leg strength and explosive power of high school basketball players. The training programs were carried on throughout the competitive basketball season.

Importance of the study. In recent years, athletic coaches and athletes have shown an increased interest in weight training as a training method for increasing leg strength and explosive power. There is almost total agreement among basketball coaches that this weight training should not be a part of the in-season training program, as it may affect the players' performance. Outside the coaching

profession this attitude changes somewhat. Writing about strength, deVries had the following to say:

> The desirability of a "minimum quantity" of strength has long been recognized in athletics; however-until quite recently-the advantages of maximum levels of strength for all sports in which power is a factor were not recognized by physical educators, athletes, or coaches. This strange neglect of the strength factor in athletes was the result of an unscientific acceptance, by virtually everyone concerned, of an old wives' tale that claimed that the development of large amounts of strength in the musculature (through weight training, etc.) inevitably resulted in a condition known as "muscle bound." Being "muscle bound" was supposed to limit both range and speed of movement in those who participated in weight training, and therefore was anathema to all but the most "heretical" coaches.[1]

There have been many studies completed in regard to increasing explosive power through the use of progressive weight training; but most of these studies have been either pre or post season studies, with very few carried on during the competitive season. It is fairly well accepted that formal weight training will increase leg strength and explosive power. Roy states that strength is the most important element in explosive power.[2] McCloy has stated that men who score high in various strength tests, also will score high in general athletic ability.[3] Brown and Riley feel that increasing leg

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[1]Herbert A. deVries, Physiology For Physical Education and Athletics (Dubuque, Iowa: Wm C. Brown Company, Publishers, 1966) p. 303.

[2]Alvin Roy, Strength Program "In and Out" of Season (California: Sid Gillman-Alvin Roy Publishing Co., Inc., 1964), p. 8.

[3]Charles Harold McCloy, Tests and Measurements in Health and Physical Education (second edition; New York: Appleton-Century-Crofts, Inc., 1954), p. 142.

strength by weight training will increase vertical jump.[4]

Leg strength and explosive power are very important assets to athletes, especially in basketball, but weight training involves time and space. Recently, a new commercial strength "device," known as the Exer-Genie, has come on the market. The manufacturers of this device claim that it will increase strength, endurance, and flexibility in a limited amount of time.[5] A device, such as the Exer-Genie, could be more convenient if it could be shown that results in leg strength and explosive power would be comparable to those obtained with weights.

II. LIMITATIONS OF STUDY

1. This study was limited to twenty-two varsity and "B" team basketball players.

2. The training period lasted for twelve weeks with thirty-six training periods.

3. Individual body builds were not taken into consideration.

4. All of the subjects participated in football or cross country prior to basketball.

III. DEFINITIONS OF TERMS USED

Weight training. Weight training is lifting weights with a quick thrust through the entire range of the lift.

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[4]Robert J. Brown and Douglas R. Riley, "Effect of Weight Training on Leg Strength and Vertical Jump," Scholastic Coach, XXVII (December, 1957), pp. 44-47.

[5]Exer-Genie, (California: Exer-Genie, Inc., 1964), pp. 1-2.

Exer-Genie. The Exer-Genie is a commercial "device" used to increase strength.

Leg strength. Leg strength is the capacity of legs to exert force.

Explosive power. Explosive power is the ability of an individual to propel himself through the air in any direction.

Vertical jump. The vertical jump is the ability of an individual to propel himself upward in a vertical direction.

Leg dynamometer. The leg dynamometer is an apparatus used to measure the muscular strength of the legs. It was calibrated in pounds and capable of measuring a lift of at least 2,500 pounds.

Sargent Jump Test. The Sargent Jump Test is a test to meausre the explosive power in the vertical jump.

IV NULL HYPOTHESIS

There will be no change in leg strength and explosive power between two select groups of high school basketball players during the competitive season due to the application of two select training programs. There will be no change in leg strength and explosive power within two select groups of high school basketball players during the competitive season due to the application of two select training programs.

CHAPTER II

REVIEW OF THE LITERATURE

INTRODUCTION

Many studies have been completed attempting to increase leg strength and explosive leg power by using methods of weight training; but since the Exer-Genie is a relatively new strength developing device, little research has been reported employing its use. This review is primarily concerned with the effect of weight training or the Exer-Genie on leg strength and explosive power.

REPORT OF PERTINENT FINDINGS

DeVries has stated in regards to the development of strength:

> It is known that the development of strength in any one individual is the result of increasing the size of the muscle fibers involved--not by increasing the number of fibers in the muscle. This increase in fiber size is called hypertrophy. Hypertrophy and strength are brought about only by subjecting a muscle to greater loads than those to which it is accustomed. This is known as the over-load principle.[6]

Brown and Riley conducted a study at Springfield College using forty basketball candidates from the freshman squad as subjects. By using the Rogers Physical Fitness Index Test, they were equated into two groups, weight training versus control. The weight-training program, conducted three days per week for five weeks, consisted of

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[6] Herbert A. deVries, Physiology For Physical Education and Athletics (Dubuque, Iowa: Wm. C. Brown Company, Publishers, 1966) p. 303.

heel raises on a two-inch board with two sets of ten repetitions and a third set of maximum repetitions. The original amount of weight was found by adding right and left leg scores from an ankle plantar flexion test. The weight-training group was tested prior to and on each Friday of the training period. Five pounds of weight were added each day to the previous weight lifted; and for each repetition over ten, one pound of weight was added. The Sargent Jump Test, using the chalk method, was used to test the vertical jump or explosive power, and leg strength was measured by administering the leg-lift-strength test on the "back and leg" dynamometer. The belt method was used in the testing. The vertical jump of the weight-training group increased 2.9 inches over the control group and was a significant increase at the .01 level of significance. The leg strength of the weight-training group increased 161 pounds over the control group, and this increase was also significant at the .01 level. From their study the authors concluded that weight training will increase leg strength and vertical jump.[7]

O'Conner and Sills conducted a six-to-eight-week pre-season training period using heavy resistance exercises for basketball players. They felt that the heavily muscled athlete showed less progress in increasing strength, but they felt if these athletes spent extra time

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[7]Robert J. Brown and Douglas R. Riley, "Effect of Weight Training on Leg Strength and Vertical Jump," Scholastic Coach, XXVII (December, 1957), pp. 44-47.

on the exercises it could make the difference.[8]

Wickstrom conducted a post-season weight-training program for thirteen of his University of Wichita varsity basketball players. The players who worked out three times per week for six weeks completed one set of each exercise per workout except leg exercises which were done in two consecutive sets with a three-minute rest between bouts. Subjects used heavy resistance with ten to twelve maximum lifts; and any time a subject could do fifteen lifts, ten pounds were added to the barbell and five pounds to the dumbbell. The exercises and the order in which they were completed are as follows: alternate dumbbell press, alternate dumbbell curls, sit-up with weight, one-half squats, bent-over rowing, squat jump with weight, and ordinary dead lift. Using the jump and reach test, Wickstrom found an average increase of 1.5 inches in the vertical jump. The range was from no increase to 3½ inches increase. It was also found that when the players returned the next year, they could jump as well as at the end of the previous basketball season. Wickstrom concluded that both pre-season and post-season weight-training programs have proven successful at the University of Wichita. The players have better jumping power, less low-back pain, and perhaps more confidence and more aggressiveness.[9]

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[8]Frank O'Conner and Frank Sills, "Heavy Resistance Exercises for Basketball Players," Athletic Journal, XXXVI (June, 1956), p. 6.

[9]R. L. Wickstrom, "Post-Season Weight Training for Basketball Players," Athletic Journal, XXXIX (April, 1959), pp. 38-40, 69-70.

Jacobsen tested the leg strength and vertical jump of the South Dakota State College varsity and freshman basketball squad during the entire basketball season. He used the leg dynamometer, belt method, to test leg strength and the Sargent Jump with moistened fingers to test the vertical jump. Jacobsen tested the squad four times during the season and found that there was a slight over-all decrease in vertical jump. No weight training was conducted previous to or during this study by the investigator. Leg strength increased between all tests at the .05 level of significance.[10]

Charles, in a five-week explosive weight-training program, found an increase in vertical jump but not at a stated significant level of confidence.[11]

Schlekeway studied the effect of weight training on explosive power and leg strength during the closing weeks of the basketball season. Weight training consisted of heel raises and one quarter walking squats. The study lasted four weeks, ending one week after the conclusion of the basketball season. In both the control and the weight-training group Schlekeway found an overall decrease in leg strength. The weight-training group had a mean gain of 2.8

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[10]Donald D. Jacobsen, "The Effects of a Basketball Season on Leg Strength and Explosive Power as Shown on a Select Group of Players at South Dakota State College" (unpublished Master's thesis, South Dakota State College, Brookings, 1962), pp. 25-26.

[11]Gary L. Charles, "The Effect of Selected Explosive Weight Training Exercises Upon Leg Strength, Free Running Speed and Explosive Power" (unpublished Master's thesis, South Dakota State University, Brookings, 1966), p. 35.

centimeters in explosive power, while the control group had a mean decrease of 1.0 centimeter. This, however, was not significant at the .01 level of confidence. Schlekeway concluded that a season of basketball may decrease the leg strength of the players.[12]

Masley, Harrabedian, and Donaldson found that after a six-week period of heavy resistance weight training, their subjects had an increase in strength, speed, and muscular co-ordination.[13]

Using 30 varsity basketball candidates from Springfield College as subjects, Ness and Sharos, studied the effect of a weight-training program on leg strength and vertical jump. The subjects were equated in two groups--weight-training group and control group--on the basis of their scores in the Sargent Jump Test. The training period was four weeks before the beginning of the basketball season. The weight group met three times per week and performed deep knee bends and heel raises. The vertical jump of the weight-training group showed a mean increase of 3.23 inches, while the control group had a mean decrease of .27 inches. This increase was statistically significant at the .01 level of significance. Leg strength of the

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[12]Laverne L. Schlekeway, "The Effect of Weight Training on Explosive Power and Leg Strength During a Basketball Season" (unpublished Master's thesis, South Dakota State University, Brookings, 1965), p. 20.

[13]Masley, Harrabedian, and D. Donaldson, "Weight Training in Relation to Strength, Speed, and Co-ordination," Research Quarterly, XXIV (October, 1953), pp. 308-315.

weight-training group was significant at the .01 level while the gain by the control group was insignificant.[14]

A booklet published by the manufacturers of the Exer-Genie stated:

> Exer-Genie is our much needed "break through" in that it combines the latest theories in resistive exercise. By starting each exercise isometrically we get the great strength benefits of this new school of exercise; and by combining it with isotonic movement, we get the benefits of endurance and flexibility. We save valuable time because by starting the exercise isometrically, we are working a tired muscle when we start our movement and this enables us to cut out the needless repetition of movements. The second great "break through" of Exer-Genie has been in our ability to isolate given muscle groups.[15]

SUMMARY

The literature that has been reviewed indicates that leg strength and explosive power can be increased by weight training. Since the Exer-Genie is a relatively new device, little research has been completed as to its value in replacing a weight program. The research cited also revealed that very little research has been done with weight training during the competitive basketball season.

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[14]Phillip E. Ness and Charles L. Sharos, "The Effect of Weight Training on Leg Strength and Vertical Jump" (unpublished Master's thesis, Springfield College, Springfield, 1956), pp. 21, 45.

[15]Exer-Genie Booklet, op. cit., p. 2.

CHAPTER III

PROCEDURES FOR OBTAINING DATA

I. INTRODUCTION

The procedure used for selecting the subjects, the instruments used for obtaining the data, and the training program are described in this chapter.

II. SUBJECTS

The subjects selected for this study were the 22 members of the De Smet High School, De Smet, South Dakota, basketball squad for the year 1967-1968.

The subjects were divided into two equated groups of 11 each - Group A and Group B - by the rank order method according to their scores on the Sargent Jump Test. Two cards with the letters A and B were placed into a hat. Having designated previously that the group drawn would be the weight training group, the high school principal then drew Group A out of a hat. Group B was then designated as the Exer-Genie group.

The investigator, in checking the time played in competition by each group, found that each played approximately the same amount of time. Also, each group contained approximately equal numbers of Varsity and "B" squad members.

The weight-training group was instructed not to engage in any activity connected with the Exer-Genie, or any other isometric-

isotonic exercises. The Exer-Genie group was instructed not to do any weight training. There were four boys in a physical education class that met twice weekly. Since this class was taught by the investigator, the boys participated in limited strenuous activities during the testing period.

III. INSTRUMENTS FOR OBTAINING INFORMATION

Leg strength and explosive power were measured at the beginning, during the training, and after the completion of the training sessions to determine the effect the two different training programs had upon leg strength and explosive power.

Leg Strength Test

The Medart-Chatillion back and leg dynamometer was used to measure leg strength. The "belt method" as employed by Everts and Hathaway was used to aid the tester in obtaining more objective results.[16] The equipment had previously been calibrated by the Engineering Department of South Dakota State University (Figure 1).

The investigator also used a goniometer, which measured the angle of flexion of the leg prior to the leg strength test.[17]

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[16]Edgar W. Everts and Gordon J. Hathaway, "The Use of Belt to Measure Leg Strength Improves the Administration of Physical Tests." Research Quarterly, IX (October, 1938), p. 62.

[17]Ibid.

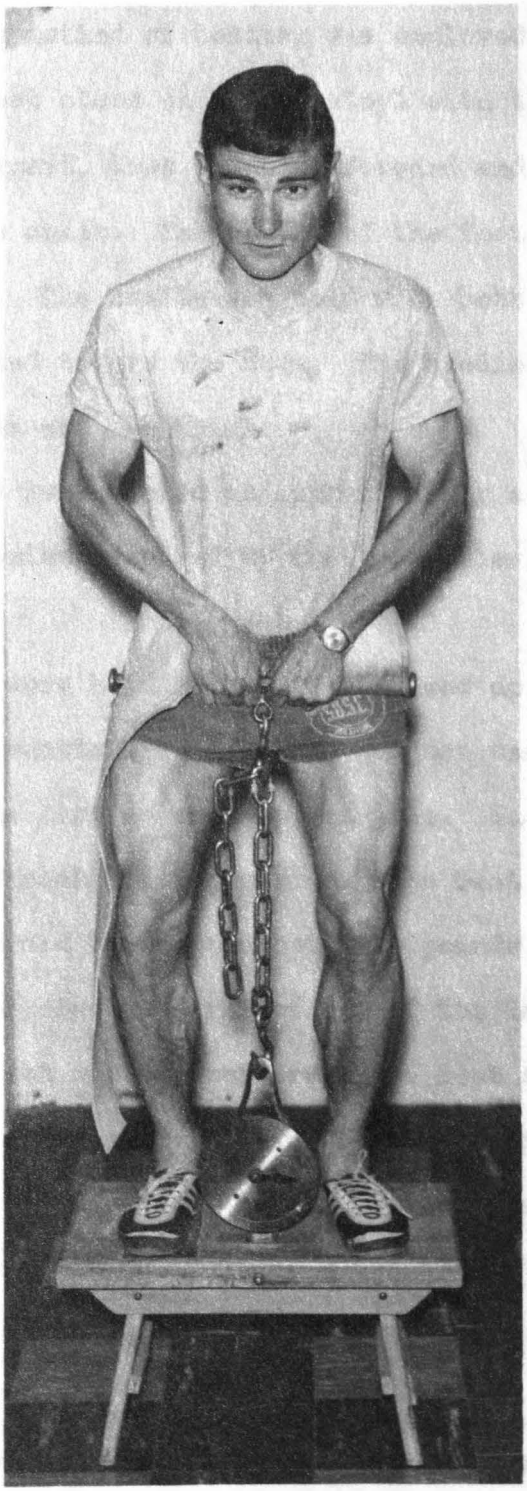

FIGURE 1

BACK AND LEG DYNAMOMETER

The following method of testing was employed:

1. The subject stood on a foot stool with the feet approximately eight inches apart, toes pointing forward and the centers of his feet opposite the chain. The center of the foot was measured by the arch of the foot. The handle was held with both hands near the chain and palms pointed toward the body. The handle rested at the bend between the trunk and the thigh.

2. The knees were flexed at approximately a 120 degree angle with the angle of flexion measured by the goniometer. The chain was then attached.

3. The arms were held straight, the head up and chest straight (chest parallel to a vertical wall). The subject was instructed to try and straighten the legs as much as possible. Each subject was given three trials at each testing period. The best reading of the three trials was recorded to the nearest five pounds for statistical use. The investigator conducted all phases of the leg strength test making certain that each subject performed the test as instructed.

The test was given at 3:15 P. M. on the Tuesday following each three week training period and one and two weeks after the completion of the training. There was no training given on the day of the test.

Explosive Power Test

The explosive power of the subject was measured by a variation of the Sargent Jump known as the "jump and reach" method (Figure 2).

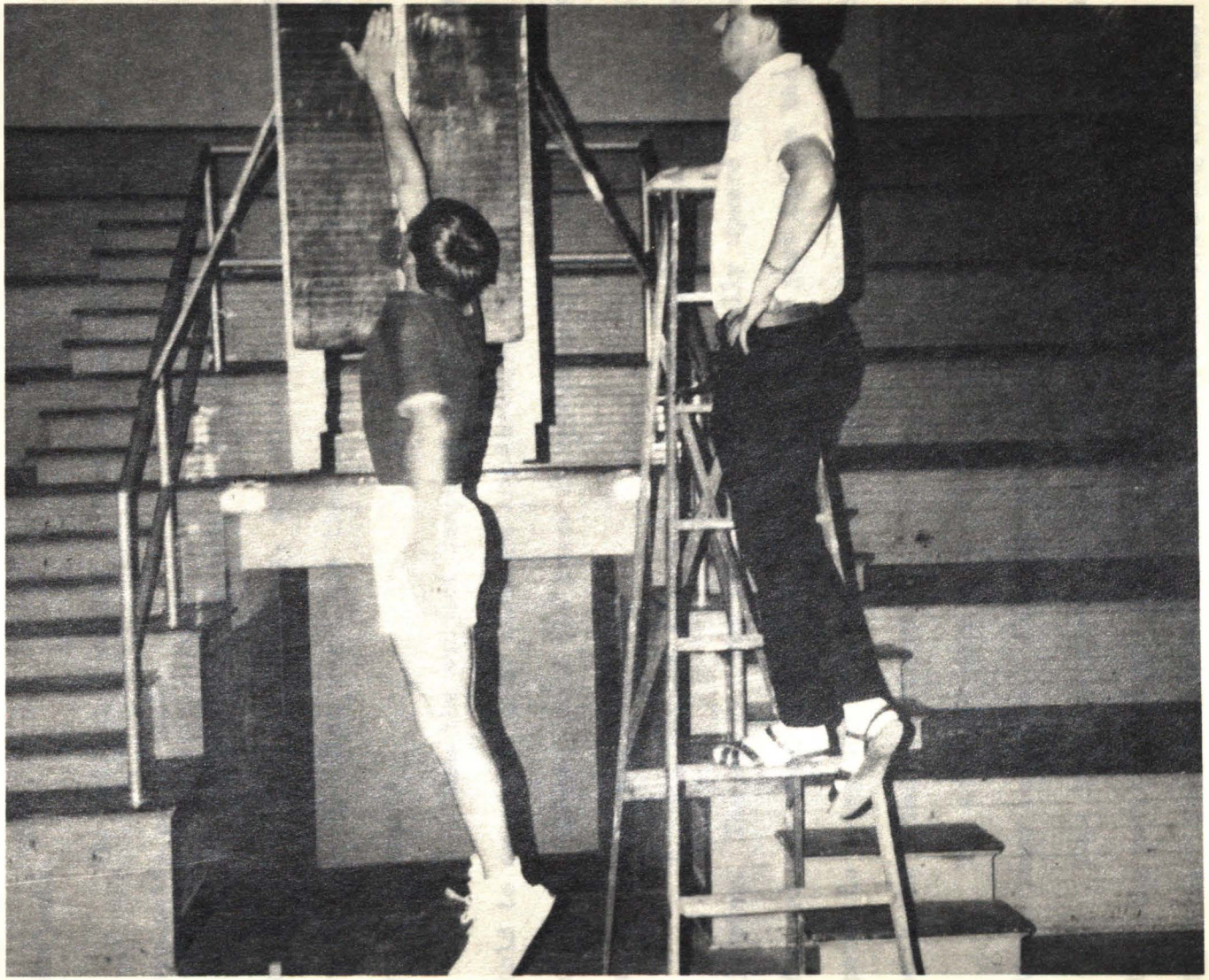

FIGURE 2

SARGENT JUMP TEST

The wet finger method was used to mark the reach established by the subjects.[18]

The following method of testing was employed for the explosive power test:

1. The subject was told to stand with his side toward the board, feet flat on the floor, and extend his arm as far as possible on the board. This reach was then recorded by the investigator and his assistants.

2. Then the subject dampened his fingers. The subject was told to swing his arms downward and backward, incline the body slightly forward, bend the knees at approximately a 90 degree angle and raise on his toes.

3. The subject was to pause in this position a moment before jumping. The subject was then to jump vertically upward swinging arms forward and upward to a vertical position, and just before the highest point to swing the free arm down to the side and to touch the board with the moistened fingers.

The subjects were given three trials with the best of the three jumps recorded. All jumps were recorded to the nearest $\frac{1}{4}$ inch.

This test was given on the Monday following each three week training period, and one and two weeks after the completion of the training. The testing was completed before the training for that particular day began.

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[18]Deabold Van Dalen, "New Studies in the Sargent Jump," Research Quarterly, Volume II, (May, 1940), p. 113.

Weight Training Program

The investigator, through his readings of pertinent literature and an interview with Roger Eischens, co-ordinator of the South Dakota State University weight-training program, selected the following two exercises for the weight program: heel raises with a two-inch board under the subject's toes, and three-quarter squats. Three-quarter squats are defined as squats starting with the thighs less than a 120 degree angle with the floor (Figure 3).

The subjects were divided into three groups of three and one group of two in order to expedite the training program. The starting weight for both exercises was approximately the weight of the subject. The subjects would do three sets of eight, six, and four repetitions with twenty pounds of weight added after the first set and twenty pounds added after the second set. When a subject could do four repetitions with the added weight, he would start the next training period with twenty additional pounds of weight. The subjects would stay at the same starting weight until they could do eight, six, and four repetitions with the added weight.

The subjects would do a few loosening-up exercises when they first arrived at practice, and then they would go directly to the squat rack to do their weight-training exercises. There were always two managers to assist in changing the weights and to record the days' lifts.

The training period was held every Monday, Wednesday, and Friday at the beginning of practice. When the subjects had Friday

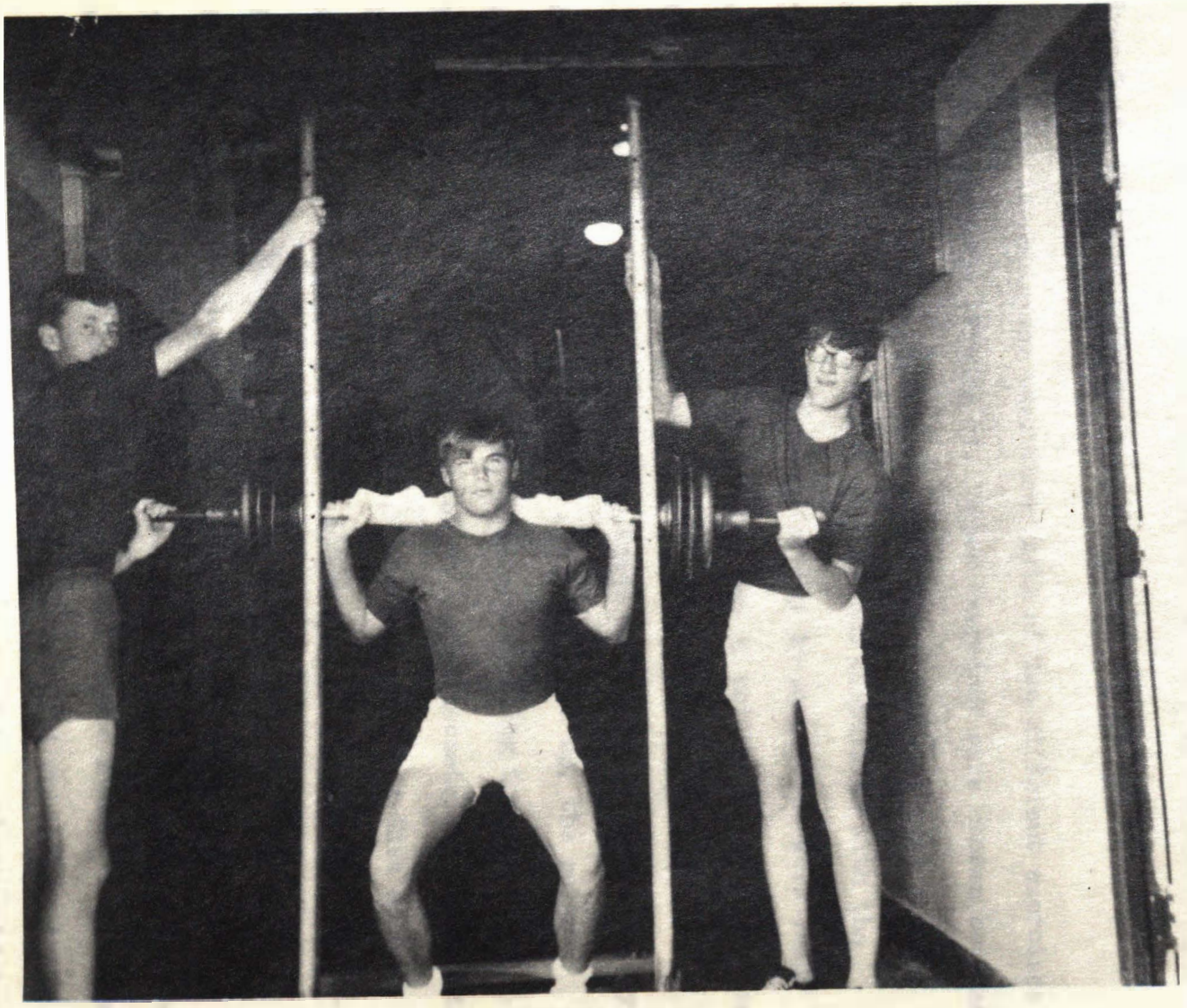

FIGURE 3

WEIGHT TRAINING EXERCISE

basketball games, the training was completed either on Thursday or the Saturday following the game. The training period lasted for twelve weeks, finishing two weeks before the district tournament.

Exer-Genie Training Program

The investigator used three sets of two different exercises with the Exer-Genie (Figure 4). These exercises were chosen because of their similarity to the exercise in the weight-training group and were chosen after extensive reading and discussion with the investigator's advisor. There was no way to equate the work loads of the two training groups, but the range of motion of the exercises was similar.

In the first exercise, the knees were bent in approximately a 120 degree angle. The back was straight, head up, the palms grasping the handle of the Exer-Genie and pointing toward the body. The subjects would start with an eight second isometric pull. At this point the subject would complete an isotonic pull for five seconds straightening the legs to about a 160 degree angle. Then they completed another eight second isometric pull. In the conclusion of the exercise, the subjects would continue to straighten their legs isotonically until they reached the 180 degree angle. The subjects would repeat this exercise three times with a one minute rest interval.

In the second exercise the subjects would stand with their feet flat on the board, legs fully extended and then they would try for ten seconds to isometrically go up on their toes with a partner controlling the pressure. At the end of ten seconds they would be

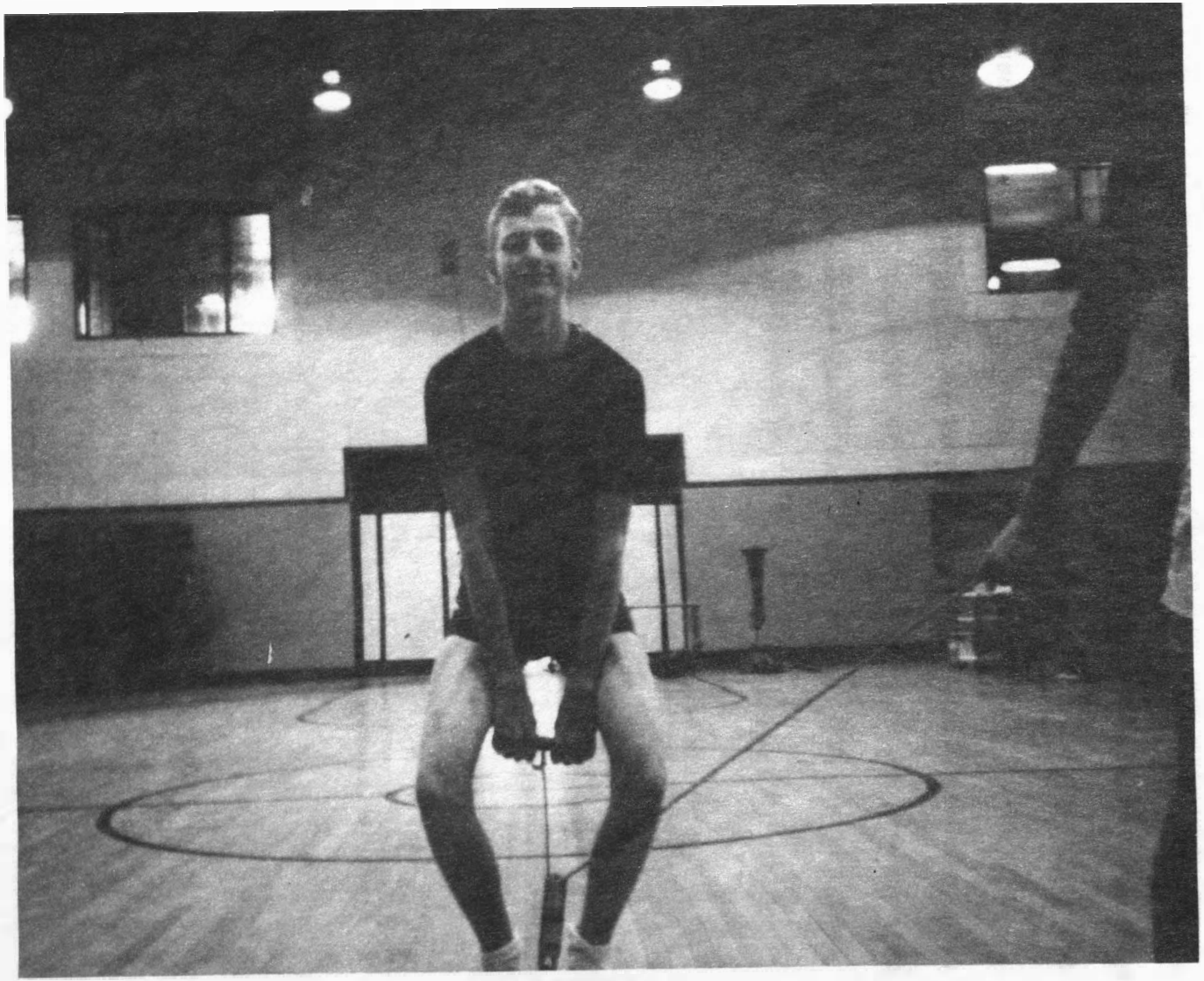

FIGURE 4

EXER-GENIE TRAINING EXERCISE

allowed to isotonically go up on their toes. Each boy would also do three repetitions of this exercise with a one minute rest interval.

The Exer-Genie group also trained three times per week for twelve weeks. The subjects were tested in two groups on three Exer-Genies. The subjects worked in pairs; one subject controlling the pressure on the Exer-Genie and the second subject completed the training. The investigator timed the isometric and isotonic pulls and set the pressure on the Exer-Genie. Each week the pressure on the Exer-Genie would be increased by one notch, with the original setting arrive at arbitrarily.

CHAPTER IV

ANALYSIS OF DATA

I. INTRODUCTION

The procedure used for the analysis of the data, the statistical methods employed, and the treatment of data are described in this chapter.

II. SCORING OF DATA

The raw scores on the leg-strength test were recorded in pounds, correct to the nearest five pounds, and the raw scores obtained from the explosive-power tests were recorded in inches, correct to the nearest quarter of an inch.

III. ANALYSIS OF DATA

The analysis of data within this investigation dealt statistically with the mean gain or loss difference between the two experimental groups and the mean gain or loss difference within each group. The investigator employed the statistical procedures as suggested by Steel and Torrie within groups.[19] Statistical procedures as employed by Garrett were used between groups.[20]

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[19]Robert G. D. Steel and James H. Torrie, Principles and Procedures of Statistics (New York: McGraw-Hill Book Company, Inc., 1960), pp. 79, 82.

[20]Henry E. Garrett, Statistics in Psychology and Education, (fifth edition; New York: Longmans, Green and Company, 1958), p. 227.

The .05 level of confidence was chosen to test significance by application of the *t* test. The *t* ratios that were statistically significant at or beyond the .05 level of significance necessitated a rejection of the null hypothesis.

For comparison between the Exer-Genie and weight-training groups 20 degrees of freedom were present. The null hypothesis was rejected if the obtained *t* ratio was equal to or greater than 2.09. Ten degrees of freedom were present within each group, and the null hypothesis was rejected if the obtained *t* ratio was equal to or greater than 2.23.

IV. RESULTS AND DISCUSSION

Tables I through IV show the summary of the difference between the means of the Exer-Genie and weight-training groups.

Tables V through XIV show the summary of the changes in the means within the Exer-Genie and weight-training groups.

Leg Strength Tests Between Groups

Table I indicates there was no statistical significant difference between the Exer-Genie and weight-training groups in leg strength from the initial test to the twelfth-week test.

TABLE I

DIFFERENCES BETWEEN MEANS FOR WEIGHT TRAINING AND EXER-GENIE GROUPS IN LEG STRENGTH FROM INITIAL TO TWELVE WEEK TESTS

	Mean Change	Mean Difference	$SE_{\bar{d}}$	t*
Weight Training	393	34	189	.18
Exer-Genie	427			

* $t_{.05}(20) = 2.09$

Table II indicates there was no statistical significant difference between the Exer-Genie and weight-training groups in leg strength from the initial test to the fourteen week test.

TABLE II

DIFFERENCES BETWEEN MEANS FOR WEIGHT TRAINING AND EXER-GENIE GROUPS IN LEG STRENGTH FROM INITIAL TO FOURTEEN WEEK TESTS

	Mean Change	Mean Difference	$SE_{\bar{d}}$	t*
Weight Training	551	26	256	.10
Exer-Genie	577			

* $t_{.05}(20) = 2.09$

Explosive Power Tests Between Groups

Table III indicates there was no statistical significant difference between the Exer-Genie and weight-training groups in explosive power from the initial test to the twelve week test.

TABLE III

DIFFERENCES BETWEEN MEANS FOR WEIGHT TRAINING AND EXER-GENIE GROUPS IN EXPLOSIVE POWER FROM INITIAL TO TWELVE WEEK TESTS

	Mean Change	Mean Difference	$SE_{\bar{d}}$	t*
Weight Training	1.54	.28	.86	.33
Exer-Genie	1.82			

* $t_{.05}^{(20)} = 2.09$

Table IV indicates there was no statistical significant difference between the Exer-Genie and weight-training groups in explosive power from initial to fourteen week tests.

TABLE IV

DIFFERENCES BETWEEN MEANS FOR WEIGHT-TRAINING AND EXER-GENIE GROUPS IN LEG STRENGTH FROM INITIAL TO FOURTEEN-WEEK TESTS

	Mean Change	Mean Difference	$SE_{\bar{d}}$	t*
Weight Training	1.86	.69	1.15	.60
Exer-Genie	2.55			

* $t_{.05}^{(20)} = 2.09$

Leg Strength Within the Groups

Both groups increased significantly in leg strength during the first six weeks of training as shown in Table V.

TABLE V

DIFFERENCES IN LEG STRENGTH WITHIN GROUPS FROM INITIAL TO SIXTH-WEEK TEST

	Initial Test	6 Week Test	D_m	SE_D	t*
Weight Training	688	878	190	47.4	4.02
Exer-Genie	672	866	194	48.0	4.04

* $t_{.05}^{(10)} = 2.23$

Table VI indicates that both groups increased significantly in leg strength during the first twelve weeks of training.

TABLE VI

DIFFERENCES IN LEG STRENGTH WITHIN GROUPS FROM INITIAL TO TWELFTH-WEEK TEST

	Initial Test	12 Week Test	D_m	SE_D	t^*
Weight Training	688	1080	392	61.3	6.41
Exer-Genie	672	1099	427	43.5	9.84

* $t_{.05}^{(10)} = 2.23$

Table VII indicates that from the sixth to the twelfth week both groups again increased significantly in leg strength.

TABLE VII

DIFFERENCES IN LEG STRENGTH WITHIN GROUPS FROM SIXTH-WEEK TO TWELFTH-WEEK TEST

	6 Week Test	12 Week Test	D_m	SE_D	t^*
Weight Training	878	1080	202	48.4	4.18
Exer-Genie	866	1099	233	29.3	8.26

* $t_{.05}^{(10)} = 2.23$

From twelve to fourteen weeks, after the conclusion of the training, both groups continued to significantly increase in strength, as indicated in Table VIII.

TABLE VIII

DIFFERENCES IN LEG STRENGTH WITHIN GROUPS FROM TWELFTH TO FOURTEENTH-WEEK TEST

	12 Week Test	14 Week Test	D_m	SE_D	t*
Weight Training	1080	1239	159	32.3	4.89
Exer-Genie	1099	1249	150	62.5	2.39

* $t_{.05}(10) = 2.23$

Since the subjects in both groups continued to increase in leg strength, the level of confidence between the initial and fourteenth-week tests was also significant.

TABLE IX

DIFFERENCES IN LEG STRENGTH WITHIN GROUPS FROM INITIAL TO FOURTEENTH-WEEK TEST

	Initial Test	14 Week Test	D_m	SE_D	t*
Weight Training	688	1239	551	61.8	8.92
Exer-Genie	672	1249	577	70.6	8.16

* $t_{.05}(10) = 2.23$

Explosive Power Within Groups

Table X indicates that from the initial test to the sixth-week test, both groups increased their explosive power as measured by the Sargent Jump Test. The increase within the Exer-Genie group was significant at the .05 level of confidence; however, the increase within the weight-training group was not statistically significant.

TABLE X

DIFFERENCES IN EXPLOSIVE POWER WITHIN GROUPS FROM INITIAL TO SIXTH-WEEK TEST

	Initial Test	14 Week Test	D_m	SE_D	t*
Weight Training	18.73	19.50	.77	.565	1.36
Exer-Genie	18.68	19.66	.98	.92	2.33

* $t_{.05}^{(10)} = 2.23$

Table XI indicates that from the initial to the twelfth-week test, both groups increased in explosive power.

TABLE XI

DIFFERENCES IN EXPLOSIVE POWER WITHIN GROUPS FROM THE INITIAL TO TWELFTH-WEEK TEST

	Initial Test	12 Week Test	D_m	SE_D	t*
Weight Training	18.73	20.27	1.54	.396	3.91
Exer-Genie	18.68	20.50	1.82	.438	4.16

* $t_{.05}(10) = 2.23$

From the sixth to the twelfth week both groups significantly increased in explosive power as indicated in Table XII.

TABLE XII

DIFFERENCES IN EXPLOSIVE POWER WITHIN GROUPS FROM SIXTH TO TWELFTH-WEEK TEST

	6 Week Test	12 Week Test	D_m	SE_D	t*
Weight Training	19.50	20.27	.77	.289	2.66
Exer-Genie	19.66	20.50	.84	.376	2.24

* $t_{.05}(10) = 2.23$

Table XIII indicates that in the two-week period after the completion of the training, both groups increased in explosive power

as measured by the Sargent Jump Test. The increase in the weight-training group however, was not significant; whereas, the increase in the Exer-Genie group did represent a significant gain.

TABLE XIII

DIFFERENCES IN EXPLOSIVE POWER WITHIN GROUPS FROM TWELFTH TO FOURTEENTH-WEEK TEST

	12 Week Test	14 Week Test	D_m	SE_D	t*
Weight Training	20.27	20.59	.32	.195	1.64
Exer-Genie	20.50	21.23	.73	.21	3.46

* $t_{.05}^{(10)} = 2.23$

When comparisons were made in both groups between the initial test and the fourteenth-week test, both groups had increased significantly in explosive power as indicated in Table XIV.

TABLE XIV

DIFFERENCES IN EXPLOSIVE POWER WITHIN GROUPS FROM INITIAL TO FOURTEENTH-WEEK TEST

	Initial Test	14 Week Test	D_m	SE_D	t*
Weight Training	18.73	20.59	1.86	.43	4.33
Exer-Genie	18.68	21.23	2.55	.51	4.98

* $t_{.05}^{(10)} = 2.23$

DISCUSSION OF FINDINGS

The findings indicated there was no statistical difference between the Exer-Genie and weight-training groups in the development of either leg strength or explosive power. When the groups were considered individually, however, both experienced statistically significant gains in leg strength and explosive power at all reported testing periods except two. The weight-training group did not significantly increase in explosive power from the initial to the sixth-week test and from the twelfth to the fourteenth-week test. Figure V and VI graphically indicate the changes in leg strength and explosive power throughout the entire study.

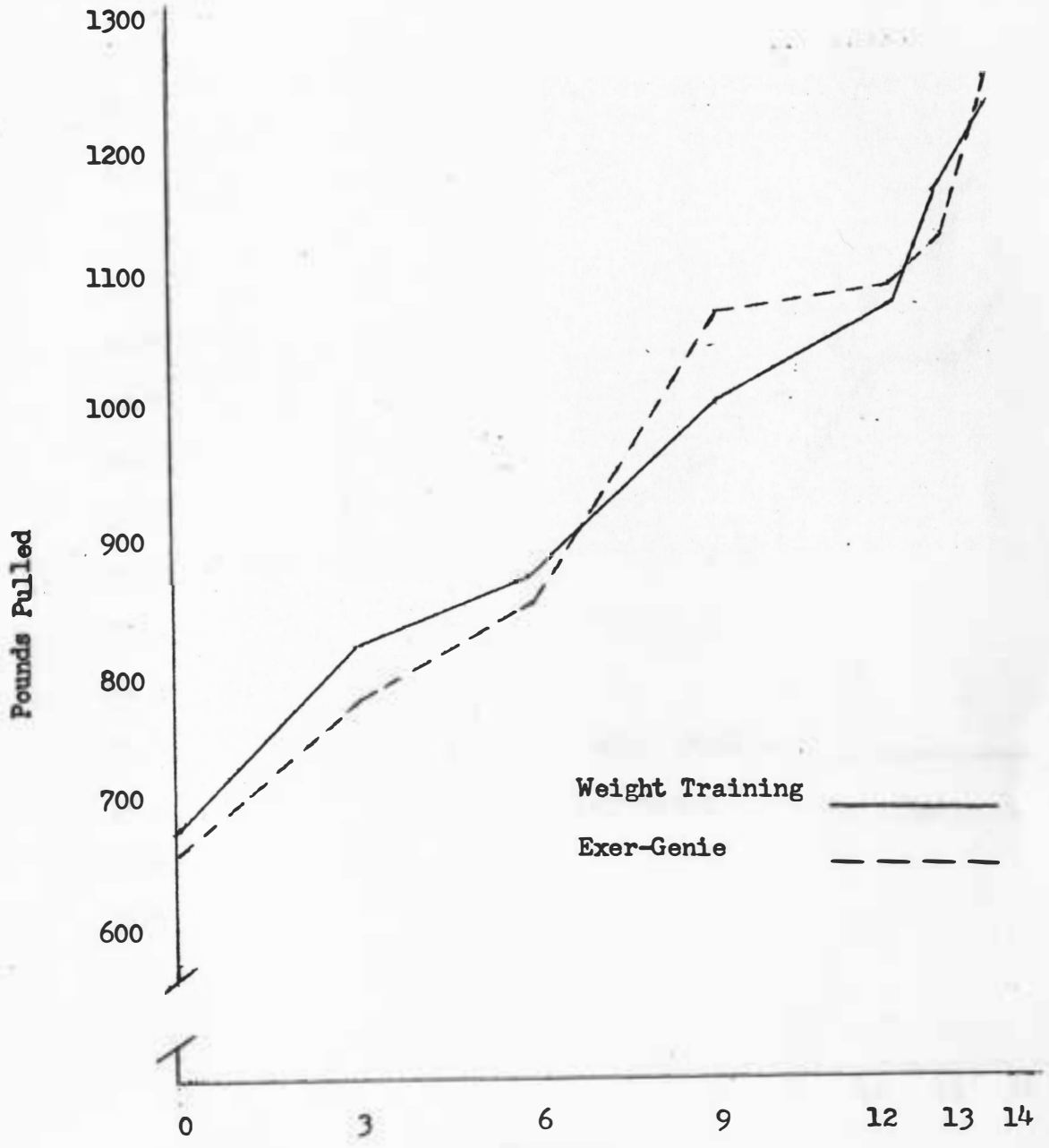

FIGURE 5

CHANGE IN LEG STRENGTH MEANS FOR THE WEIGHT TRAINING AND EXER-GENIE GROUPS FROM ZERO TO FOURTEEN WEEKS

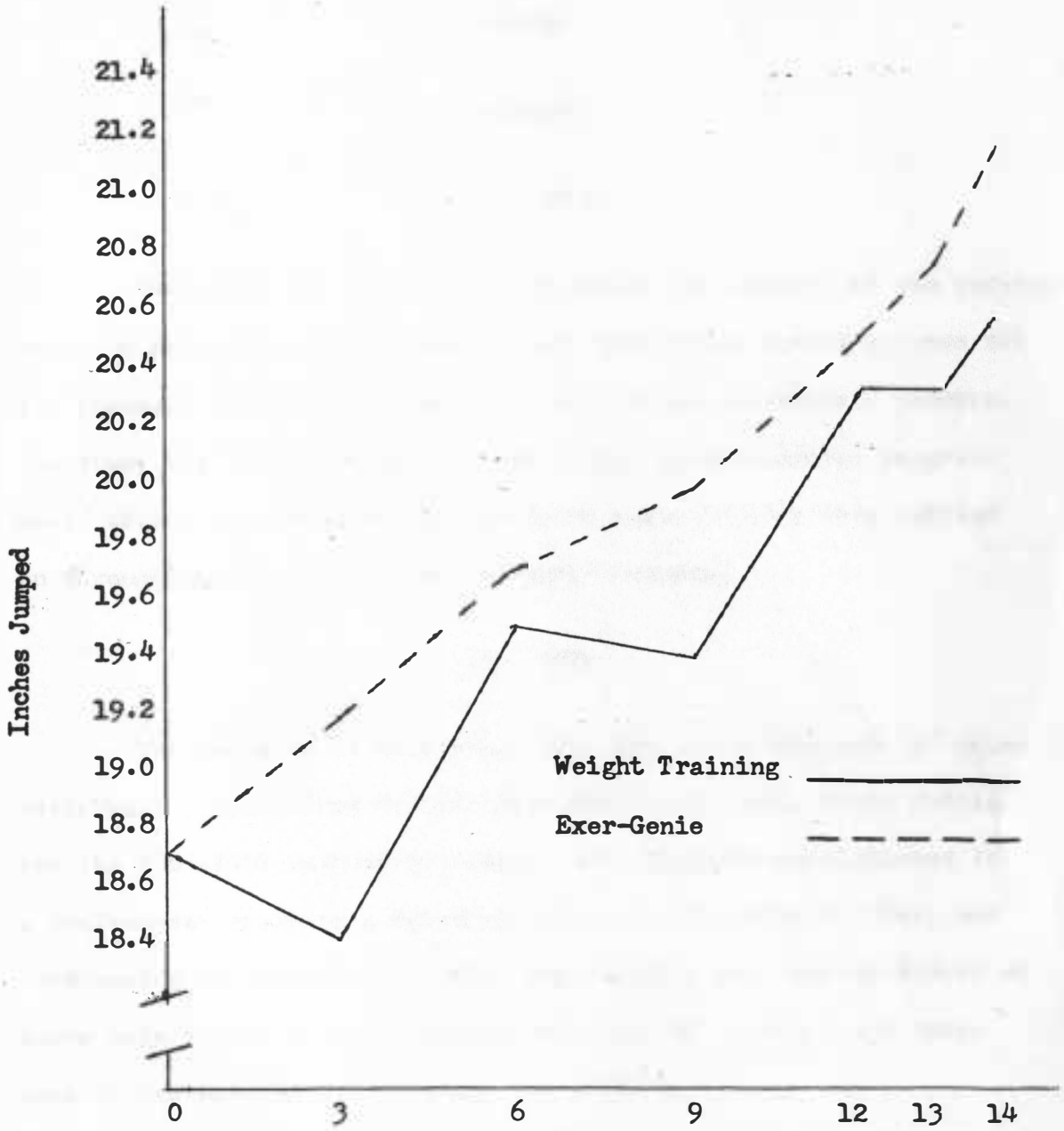

FIGURE 6

CHANGE IN EXPLOSIVE POWER MEANS FOR THE WEIGHT TRAINING AND EXER-GENIE GROUPS FROM ZERO TO FOURTEEN WEEKS

CHAPTER V

SUMMARY

I. PROBLEM

The study was designed to determine the effects of two varying training programs, weight training and Exer-Genie training, upon the leg strength and explosive power of high school basketball players. The study was also designed to observe how these training programs would affect leg strength and explosive power if they were carried on throughout the competitive basketball season.

II. DATA

The subjects in this study were the 22 varsity and "B" squad basketball players from De Smet High School, De Smet, South Dakota, for the 1967-1968 basketball season. The subjects participated in a twelve-week training program commencing on November 6, 1967, and terminating on January 29, 1968. The training sessions consisted of three sets of two weight-training exercises for Group A and three sets of two Exer-Genie exercises for Group B.

Leg strength and explosive power tests were administered to both groups at the beginning of the training program, at three week intervals until the conclusion of the training program, and one and two weeks after the twelve-week training program.

The data employed in the statistical procedures were recorded in actual pounds for the leg-strength tests and in inches for the

explosive-power tests. The recordings were statistically treated to determine the effect of the two training programs upon leg strength and explosive power. Data were treated statistically between the two groups and within each group.

III. FINDINGS

Between the Weight-Training Group and the Exer-Genie Group

In the leg-strength test, the mean scores of both groups increased. The difference between the mean increase of the weight-training group and the mean increase of the Exer-Genie group was not statistically significant at the .05 level of confidence for any testing interval.

In the explosive power test the mean scores of both groups increased. The difference between the mean increase of the weight-training group and the mean increase of the Exer-Genie group was not statistically significant at the .05 level of confidence for any testing interval.

Within Weight-Training Group

In the leg-strength test, the mean scores of the weight-training group increased. The mean increases from the initial to the sixth-week test, initial to the twelfth-week test, initial to the fourteenth-week test, sixth to the twelfth-week test and the twelfth to the fourteenth-week test were statistically significant at the .05 level of confidence.

In the explosive-power test the mean scores of the weight-training groups also increased at all reported testing intervals. The increase from the initial to the sixth-week test and from the twelfth to the fourteenth-week test were not significant at the .05 level of significance.

Within Exer-Genie Group

In the leg-strength test the mean scores of the Exer-Genie group increased significantly, at all reporting intervals, at the .05 level of significance. The difference between the mean increase of the initial and the fourteenth-week test was particularly significant beyond the .05 level of confidence.

In the explosive-power test, the mean scores of the Exer-Genie group increased significantly, at all reporting intervals, at the .05 level of significance.

CONCLUSIONS

The findings of this study appear to indicate that either a weight-training program or an Exer-Genie training program will significantly increase leg strength and explosive power during a competitive basketball season. The investigator is of the opinion that either training program would prove to be an asset to coaches and athletes by increasing leg strength and explosive power. The writer is also of the opinion that the Exer-Genie training may be more valuable to the coach during the competitive season as it is less time consuming.

It also appears that the training programs did not seem to affect the teams' shooting ability. The only evidence to support this assumption is that the 1967-1968 team shot 5% better from the field (45% to 40%) and 13% better from the free throw line (67% to 54%) than the 1966-1967 team.

The team had a 17-9 record, losing in the final game of the regional tournament.

IV. RECOMMENDATIONS FOR FURTHER STUDY

The following are the investigator's recommendations for possible future study in the area of training for leg strength and explosive power.

1. That a similar study be undertaken with a control group added to the two training groups.

2. A similar study be completed employing a larger sample.

3. The experiment could be expanded to include other areas of strength, rather than just leg strength.

4. A similar study could be carried out during either the competitive football or track seasons.

5. A similar study could be carried out at the level of college basketball.

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APPENDIX A

Raw Scores

Group "A" - Vertical Jump (Recorded in inches)

Subject	Initial Test	3 wk Test	6 wk Test	9 wk Test	12 wk Test	13 wk Test	14 wk Test
1	23	20	20	20.5	22	22	22
2	22	20.5	22	21	22.5	22	22
3	21	21.5	21.5	22.5	23.5	21.5	22.5
4	19.5	17	18	19	19.5	19	20
5	19.5	18.5	20.5	20	21.5	22	22
6	18	16.5	18	18	18.5	18.5	19
7	18	19	20	20.5	21	21.5	21.5
8	17	18	18	18	19.5	20	19.5
9	16.5	18	19.5	20	19	19	20
10	16	17	19	17	18.5	19.5	19.5
11	15.5	16.5	18	17.5	17.5	17.5	18.5
Means	18.73	18.41	19.50	19.45	20.27	20.23	20.59

APPENDIX B

Raw Scores

Group "B" - Vertical Jump (Recorded in inches)

Subjects	Initial Test	3 wk Test	6 wk Test	9 wk Test	12 wk Test	13 wk Test	14 wk Test
1	23	22.5	22.5	22	22.5	23.5	23.5
2	22.5	23	22	24.25	24	24	24.5
3	18	18.5	18.5	19.5	20.5	21	22.5
4	20	20.5	19	21	21	20	20.5
5	19	19	19.5	20	20.5	20.5	21
6	19	19	19.5	19	19	19.5	20
7	18	18.5	19.5	19.5	20.5	20.5	20.5
8	18	18	20.5	19	20	21	21.5
9	16.5	17	18.75	19	21.5	22	22.5
10	16.5	20	20	20	19	20	20
11	15	15.5	16.5	16.5	17	17	17
Means	18.68	19.23	19.66	19.98	20.50	20.82	21.23

APPENDIX C

Raw Scores

Group "A" - Leg Strength (Recorded in pounds)

Subject	Initial Test	3 wk Test	6 wk Test	9 wk Test	12 wk Test	13 wk Test	14 wk Test
1	745	810	850	900	1150	1210	1340
2	880	1060	1350	1650	1615	1780	1730
3	670	800	950	940	1010	1000	1000
4	670	850	670	720	600	650	825
5	680	840	900	1140	1010	1175	1110
6	730	1010	1180	1180	1190	1330	1550
7	610	710	740	890	930	885	1120
8	790	860	860	870	1170	1450	1310
9	710	900	910	1150	1170	1400	1420
10	510	550	530	700	840	1000	1020
11	570	800	720	1000	1200	985	1200
Means	688	835	878	1013	1080	1170	1239

APPENDIX D

Raw Scores

Group "B" - Leg Strength (Recorded in pounds)

Subject	Initial Test	3 wk Test	6 wk Test	9 wk Test	12 wk Test	13 wk Test	14 wk Test
1	525	600	600	850	840	780	900
2	510	510	400	750	850	890	1100
3	900	1190	1220	1600	1480	1420	1250
4	665	740	730	975	850	850	1175
5	710	820	820	900	1110	1020	950
6	640	640	1120	1250	1300	1420	1720
7	640	790	875	1010	1075	1075	1250
8	510	600	660	800	900	950	975
9	725	910	1020	1100	1100	1250	1325
10	895	1030	1200	1500	1530	1550	1610
11	675	850	890	1050	1120	1360	1480
Means	672	789	866	1077	1099	1142	1249