

AN EVALUATIVE STUDY ON THE EFFECTS OF THE  
1970 OFF-SEASON FOOTBALL TRAINING PROGRAM ON THE  
PHYSICAL IMPROVEMENT OF THE PARTICIPANTS

by 9235

ROBERT WILLIAM STULL

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Major Professor

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## INTRODUCTION

In this day and age of specialization, football, like most other sports, requires a year around training program to prepare the athletes for the coming year of competition. According to George Allen, head football coach of the Los Angeles Rams, "Good physical condition is the most important factor in competitive sports. No matter how strong, how big, or how fast an athlete is, he is not going to succeed or be consistent unless he is in excellent physical condition."<sup>1</sup> Keeping this principle in mind, Kansas State has developed an off-season training program with the aim of developing the best physical condition possible in the nine weeks preceding spring football practice. This study examines the effectiveness of this program through a series of tests and measurements prior to and after the nine weeks of training. Records contained in the Appendix offer convincing evidence of its effectiveness.

### Statement of Problem

This study was to establish the results of Kansas State's off-season program on the physical improvement of the athletes over a nine-week period. Physical aspects involved in the study include strength, quickness, speed, and lung capacity.

### Limitations of Study

It was the intention of this study to confine the investigation to the effects of the off-season program on speed, strength, quickness, and lung capacity but not on improvement in playing football and to determine significant relations between the off-season program and the players' football ability.

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George Allen, "The Untapped 25%." Taken from Athletes In Action magazine reprint.

### Basic Principles of the Program

Circuit training - consists of performing 6 to 8 exercises which make use of all the major muscle groups. A form of strength training. Usually 2-3 circuits of the 6-8 exercises are used. Increase of repetitions and weight in each exercise is used to keep up training progress.

Exer-Geni principle - uses a device consisting of an engineered cylinder and a nylon rope through the cylinder with equal resistance in either direction. The cylinder allows quick adjustment to place up to 400 lbs. of resistance through friction upon the rope as it passes through the cylinder. The device combines isometrics (exercise without motion) with isotonics (exercise with motion), permitting the equivalent of an hour of weight-lifting in just six minutes. The theory is to tire the muscle isometrically and then move through a complete range of movement isotonicly.

Sprint training - involves running a given distance (40-50 yds.) at a pre-determined speed of  $\frac{7}{8}$  maximum, with a pre-determined, nearly complete, rest after each run.

### REVIEW OF LITERATURE

In conducting this study it was necessary to review related literature pertaining to the Kansas State University off-season program as well as some existing literature in fields related to the principles of the off-season program. The following review is presented to show the effectiveness of the theories behind the off-season program.

James Mosteller, (1968) in his thesis *Spring - Training Conditioning As Predictor of Football Player Performance*, states that lateral quickness was the



single best predictor of percentage plays correct concerning number of plays performed correctly during a season (predictor of player game performance).<sup>2</sup>

In his book, Application of Weight Training to Athletics, Gene Hooks states that the easiest and surest way to attain general physical fitness is with weights. He lists five benefits which can be derived from weight training. These benefits are as follows:<sup>3</sup>

1. Improved strength
2. Enlargement of the exercised muscles
3. Improved power, endurance, flexibility and speed
4. Improved body measurement
5. Improved confidence and feeling of well being

In a master's report done on the Circuit Training Phase of the Kansas State off-season program entitled, "Development and Use of an Eight Station Continuous Action Power Circuit to Increase the Explosive Power of College Football Players," written by Gaylord Bellamy in 1968, he states; "In general, the present investigation indicates that higher levels of strength can be developed by using the eight station continuous action power circuit than by the usual weight programs. Comparative achievement tests between 1967 and 1968 participants in the off-season program showed that individual players lifted an average of 36 percent more weight in the power clean and 21 percent more for the bench press at the end of the 1968 season than at the end of the 1967 season."

In reviewing literature done in relation to the Exer-Geni Principle, various contradictory results were reported. Gene A. Logan, Southwest Missouri

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<sup>2</sup>James I. Mosteller, Spring-Training Conditioning as a Predictor of Football Player Performance, Master Thesis, Kansas State University, Manhattan, Kansas, 1968.

<sup>3</sup>Gene Hooks, Application of Weight Training to Athletics, p. 27.

State, in his paper "Effect of Progressively Increased Resistance Through a Throwing Range-of-Motion on the Velocity of a Baseball," concluded that the velocity of a thrown baseball can be increased significantly by means of progressively increased resistance applied by the Exer-Geni through the overhand throwing range of motion.<sup>4</sup> This indicated that the Exer-Geni increases the strength of a muscle if exercised in the prescribed manner. Another experiment, published by the American Physical Fitness Company in Kansas City, Missouri, stated remarkable improvements in physical improvement as a result of an Exer-Geni program conducted on six submarine crews over a sixty-three day period. All crew members worked out with the Exer-Geni for six minutes per day. The results were as follows: average chest measurement increase - 2.36", biceps - 2.07" increase, forearm - 1.51" increase, thigh - 2.22" increase, waist - 1.73" loss in measurement, weight loss - an average of 5 lbs. 7 ozs., and the average pulse drop - 4 beats per minute.<sup>5</sup> Contradictory to these findings, David Laurid, in his master's report dealing with the Exer-Geni as compared with calisthenics regarding strength development in physical education classes, concluded that there was no statistically significant difference between the Exer-Geni and the calisthenics in strength results as conducted in this study.<sup>6</sup>

George B. Dintiman's study "Effects of Various Training Programs on Running Speed," showed that sprint training over an eight week period decreased the average

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<sup>4</sup>Gene A. Logan, "Effect of Progressively Increased Resistance Through a Throwing Range-of-Motion on the Velocity of a Baseball," Journal of the Association for Physical and Mental Rehabilitation.

<sup>5</sup>American Physical Fitness Company, Kansas City, Missouri, "Information and Background on the Research and Development of the Exer-Geni."

<sup>6</sup>Dave Laurie, "A Comparative Study of the Uses in Boy's Physical Education Classes of the Exer-Geni and Calisthenics for Strength Development," Master's report, p. 2.

time of the subjects .35 of a second in the 50 yard dash. A program of sprint training and weight training decreased the average time .45 of a second in the 50 yard dash.<sup>7</sup>

## METHODS AND PROCEDURES

### Description of Training Program

The Kansas State off-season program consists of four phases. They are termed weights, running, conditioning, and agility. Weights and running were combined on one day while conditioning and agility formed another. Each athlete in the program worked at each of the four stations twice a week. The players were divided into four groups.  $O_1$  and  $O_2$  consisted of offensive players while  $D_1$  and  $D_2$  were made of defensive players.  $O_1$  and  $O_2$  had weights and running on Monday and Wednesday while  $D_1$  and  $D_2$  had conditioning and agility. On Tuesday and Thursday the groups switched with  $O_1$  and  $O_2$  having conditioning and agility and  $D_1$  and  $D_2$  had weights and running. Each of the four groups went to their first station designated on each particular day and after a half hour of training at that station, would travel to the second phase of that day, with the corresponding group traveling to the station the other group had left. Example:  $O_1$  trained on Monday starting with weights, with  $O_2$  beginning with running. After a half hour of training,  $O_1$  would travel to running and  $O_2$  would move to weights.

Conditioning Phase: The conditioning phase of the program had two parts. The first part consisted of a five-station Exer-Geni circuit. The Exer-Geni circuit. The Exer-Geni system was selected to provide a resistance exercise program for a large group in the shortest period of time. Other information

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<sup>7</sup>George Dintiman, "Effects of Various Training Programs on Speed," Research Quarterly, December, 1964, p. 456.

concerning the details and principles of the Exer-Geni is found in the review of Literature.

Station #1 - Big 4. This station combined four exercises: the deadlift, knee bend, upright row, and the press. The movement began with athlete in a crouched position on the balls of his feet, standing on a footboard with an Exer-Geni attached to the board. The handle was held with both hands, palms down, arms straight, with handle flush with the Exer-Geni unit. The starting position, with a partner holding the trail line, the player tensed all muscles attempting to pull the handle up with all of the body. The athlete continued to hold this position for 10 seconds getting an isometric contraction with the partner providing the resistance by holding the rope secure. After the 10 second isometric contraction, he was allowed slowly to straighten his back, taking approximately 3 seconds, while keeping his hips down. As soon as his back was straight, the player continued the movement by straightening his legs slowly (3 seconds) by pressing hard into the footboard. Once the body was erect, the handle was pulled to the chin by pointing the elbows up (3 second). Finally at chin level, the handle was pressed overhead (3 second).

Station #2 - Lat pull. In this exercise, the subject began by grasping the handle of the Exer-Geni which is attached at arms length overhead. With palms down, he leaned forward slightly while trying to pull the handle downward by keeping the arms straight and tensing the Latisamoun Dorsi muscle for a 10 second contraction which was governed by a partner who was providing the resistance with the trail line. After the 10 second isometric contraction, the handle was pulled slowly downward to the level of the waist taking approximately 10 seconds. While pulling the handle to the waist the arms were kept in a semi-flexed position.

Station #3 - bench press. Here the Exer-Geni was attached to a spot 2 inches

over the shoulder of the athlete. A 28 inch length of  $\frac{1}{2}$  inch pipe was used as a handle to allow for wider hand spacing. The player began the exercise by standing with his back supported against the post to which the Exer-Geni is attached. The athlete took a grip with palms down with pipe at chest level. In the starting position, he attempted to press the pipe away from the chest doing a 10 second contraction. Again the resistance was provided by a partner with a trail line. At the end of the 10 seconds isometric contraction, the pipe was pushed straight out slowly, again taking about 10 seconds, locking out elbows at full extension of arms.

Station #4 - Sit-up. At this station, the Exer-Geni was attached behind the athlete who was lying supine on his back with knees drawn up and legs bent. The handle was held behind the head in a palms down position. The partner had his knees on the exerciser's toes holding his feet down while holding the trail rope for the isometric contraction. From the starting position, the athlete raised his shoulders two inches from the floor, tensing his abdominal muscles for a 10 second isometric. At the end of the isometric contraction, the athlete sat up slowly, taking 10 seconds, and ended by touching his knees with his elbows.

Station #5 - bicycle. The method used in this exercise was with an Exer-Geni secured 18 inches above the floor. The athlete started by lying on his back with his head toward the anchor point of the Exer-Geni. His feet were put into loops at the end of the line. He then assumed a position so that one leg is as high as possible and the other leg is fully extended. Keeping his toes pointed and his knees locked, he did a 10 second isometric contraction by trying to lower the raised leg while the resistance is controlled by the other leg. After the isometric contraction, he released some of the resistance and lowered his

leg. As the leg came down, the other leg raised. Once the first leg is completely lowered, he repeated the exercise with the other leg.

Station 6 - Neck isometrics. Here the athlete assumed a position with the feet shoulder-width apart with elbows resting on knees and back parallel with the floor. His neck was held as stiffly as possible while a partner pushes down on the back of his head with as much pressure as the person can hold for 10 seconds. This same procedure was repeated with the partner pushing up with both hands on the forehead, and also with both hands on each side to give four positions in all.

When every athlete had completed two repetitions at each station, with the exception of the neck exercise (12-15 minutes), they went into the second part of the conditioning. This part of the program had seven stations: (1) stool jumps, (2) sit-ups, (3) push-ups, (4) chin-ups, (5) peg board, (6) rope climb, and (7) vertical steps. There were usually six athletes at each station and three were working, with exception of chin-ups, rope climb, and peg board, while the other three counted the number of times their partner could complete each exercise. Only one could work at a time on the chin-ups and peg board. Therefore, the other athletes were ready to go to work as soon as one was finished. As soon as each athlete completed his station, he reported to the coach and gave his name and number of times he had completed the task.

Stool jumps. In this exercise, the athlete jumped as many times as possible over a foam rubber block eighteen inches high and four inches wide within a time limit of 30 seconds. The athlete jumped laterally back and fourth across the stool staying as close to the stool on each side as possible to increase speed. If at any time during the movement the athlete either touched or knocked over the stool, that particular repetition did not count.



Chin-ups. Using a standard horizontal bar the athlete did as many chins as possible while using an over-grip. No hesitations were allowed, and the athlete was required to pull his chin over the bar in order for the chin-up to count.

Push-ups. Using the 30 second time limit, the athlete assumed a position with hands shoulderwidth apart, legs fully extended, head up, and back straight. On each repetition, the athlete's chest had to touch a 3 inch rubber block and had to be completed by completely extending the arms.

Sit-up. The sit-ups were performed on an incline board which had its end raised 18 inches from the floor. The athlete was instructed to lock his fingers behind his head and alternate elbow to opposite knee on each succeeding sit-up. The number of sit-ups done in 30 seconds constituted the score.

Rope climb. A stop watch measuring tenths of seconds was used to time the subject's ability to climb a standard climbing rope which was attached to the ceiling. The athlete started from a standing position and was allowed to jump, climbing hand-over-hand with the use of his feet to ascend to a height of fifteen feet.

Vertical steps. In this exercise, a wooden box eighteen inches high and two feet wide was used. The athlete began the exercise by placing his right foot on top of the box and stepping up, bringing his left foot up beside his right and standing on the box. Then, he continued to place his left foot back to the original position, followed immediately by his right. This represented one repetition in the 30 second time limit. The athlete was required to alternate his feet as he stepped on the box each time.

Peg board drill. Here the athlete tried to climb a board that was secured along the wall and placed about eight feet high. The board had four pairs of

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holes set six inches apart. The athlete, by the use of pegs, climbed up and down the board as many times as possible by placing the pegs in the holes and pulling himself. The number of holes he had climbed constituted the score.

Agility Phase. The agility phase of the off-season program had two sets of drills, "A" drills and "B" drills. "A" drills were performed on one day and "B" drills were used as an alternate. All drills began from a football position (a position in which feet are shoulder-width apart and parallel while in a half-squat position with back straight, head up, and arms down in front of the knees). On the command "set" the athlete started moving his feet and on the command "go" he began the actual drill. The men next in line assumed a football position on "set" and held this position until it was their turn. After a group had started the drill, the command "ready-ready" brought the group out of the drill and back to a football position moving their feet. The coach, when satisfied, would roll the group out. After rolling, the group would sprint to another coach, again assuming a football position. When that particular coach was satisfied he would roll the players. The players then sprinted to the end of the mat and assumed a football position where a senior or another coach would then send the group off the mat. The next group would assume the drill position ready to go. Any bending over or having head down while not in drill, resulted in a 50 sit-up penalty. The two sets of drills are as follows:

"A" Drills

1. Flash drill
2. Offensive wave
3. Standing roll



"A" Drills cont.

4. Mirror drill
5. Lateral quickness
6. Wrestling

"B" Drills

1. Quarter turns
2. Defensive wave
3. Seat roll
4. Wildcat roll
5. Stick drill

Flash drill. Three players lined up one yard apart, side by side, in a two point "football position." The coach, in a kneeling position, starts the players reacting by pointing up, down, left, or right. There were no verbal commands. If a "left" or "right" signal is given, the players turn their hips, legs, and feet in a quarter turn, staying low to the ground, and keeping their shoulders square to the coach, then returned to their original starting position. If a "down" signal was given, the players dropped to one knee and then quickly regained position, (they were not allowed to use their hands for balance). If an "up" signal was given, the players leaped into the air with arms extended, and then quickly recovered to a "football position." After five or six quick repetitions, the coach gave the "ready-ready" command which told the players to end the drill. A hard motion by the coach signaled them to roll to the next coach.

Offensive wave. Three players were lined up one yard apart, side by side, in a two point "football position." Elbows are tucked in and fists balled.

The concentration was on quick feet and perfect position. Being told to pay special attention to keeping elbows in, the coach moved them right, left, or down. A "ready-ready" command was given and normal dismount procedure ended the drill.

Standing roll. Three players were placed in line facing the coach in a "football position" moving their feet. The coach pointed to the direction the roll was made. The players were taught to break down the knee to the side they were making the roll, catching their hands as they fell so that they wouldn't hit flat on the ground. As they hit the ground, they pushed off with their hands and pivoted at the same time. After they had made the pivot, the players returned to a "football position" looking at the coach for the next direction. Dismount was by normal procedure.

Seat roll. This drill was executed exactly as above except it was performed from a four-point stance.

Mirror drill. Two players lined up behind one another, two yards apart, facing a ball carrier. They started the drill midway between a five yard area in which they moved laterally. On the "set" command the players moved their feet in short choppy steps. On "hike" the ball carrier ran in one direction or the other. He had to run laterally and couldn't leave the 5 yard area. He had the option to run, jump, or roll and the players facing him followed (mirrored) him. Normal dismount followed.

Lateral quickness. Three players were lined up 5 yards apart. Two players had 30 seconds in which to sprint from the middle man to the end. The number of times the player touched the middle and end constituted his score. The performers were instructed to keep their shoulders square during the drill.

Wrestling. Two players began by assuming a position on the mat with their hands on the opponents head while on their knees. No head holds or leaving the

knees was permitted. They wrestled for 30 seconds with the winner being the one that was on top at the end of the time period. Normal dismount procedure was followed. This drill was to develop a competitive attitude.

Stick drill. Two players faced each other on their knees gripping a two foot stick which has been covered with tape. The two fought to take possession of the stick. When one obtained it from the other, the drill was ended. Normal dismount followed.

Quarter turns. Three players lined up one yard apart, side by side, in a "football position." The coach commanded the athlete "right" or "left" and this was the direction of their turns. On each verbal command "hike" the players made a quarter turn in the pre-determined direction. On "set" the players returned to their original position in one move. After five or six repetitions, the drill ends and the players dismount.

Defensive wave. The drill started by lining three players up facing the coach with three other men lying down. On the "set" command, the athletes moved their feet and stayed in a low football position. On the "go" command, the coach waved the players to the left, right, or gave them a down signal which told them to hit the ground and come back up quickly, or on an upward signal to jump, as if to block a pass. The players kept their shoulders square to the coach at all times. Normal dismount was followed.

Wildcat roll. They started by putting three players in a four point position one yard apart, side by side. On the "go" command the middle man rolled under the man to his right. The outside man springs over the middle man and then rolled under the other outsideman. This maneuver was continued for an 8-10 second period. The players were then dismounted in the normal manner.

Weight-lifting phase. The weight lifting phase of the program was used to develop the strength and power of the athlete. The idea of a player being stronger than his opponent as a psychological advantage was also used as a principle for the weight program. Eight exercises were used in the weight program and were arranged in a circle around the weight room. At each exercise, the players performed two sets of between three and eight repetitions. Safety and correct form were stressed at all times with athletes who were waiting to perform serving as spotters. After all the players at each exercise had completed the two sets of the exercise, they were then moved to the next exercise by the coaches command "move," As the players reached the next exercise, the players would assume a "football position" on the coaches command "break down." The room was arranged in the manner shown below.

High pull. An olympic bar set at a weight of between 150-200 lbs. is grasped in an over-grip about shoulder width apart. With back flat, head up, and feet underneath the bar about 18-24 inches apart, the athlete pulled the weight from the floor to a position about nipple height and then returned it to the floor. This is repeated for three repetitions.

Low pull. The same technique is used as the high pull except the barbell is pulled to a position about waist high.

Curls. The athlete began this exercise by grasping a barbell set at a weight between 90-125 lbs. with an under grip (palms up), in a standing position. From this position, the weight is "curled" to the chin by flexing the bicep and keeping his elbows at his side, bending the arms at the elbows. It is then lowered and repeated for eight repetitions.

$\frac{1}{4}$  squats. An athlete assumed a position in a quarter squat position underneath a barbell that is set in a power rack (a apparatus designed for safety when using heavy weights). From his position, the weight was lifted from the rack by the athlete coming to a standing position with the barbell on his back. After arriving in the standing position, the player returned to the quarter squat position. This was repeated for eight repetitions with a weight of 225-400 lbs.

Power press. In this exercise, the player took a position with feet and hands shoulder width apart, using an over-grip, with a barbell weighing between 125-175 lbs. at chest level. His knees were kept locked as he pressed the weight from chest level to an overhead position and then returned to the chest. This was repeated for five repetitions.

Shoulder shrug. A barbell was grasped in an over-grip position and brought to a standing position with arms extended downward. From this position, the

shoulders were rotated upward and backward. This was repeated for eight repetitions.

Leg extensions. A player sits on what was termed a leg extension machine and placed the in-step of his foot under a bar that was attached to a bench so that it would swing freely in an arch of about  $90^{\circ}$ . The athlete performed the exercise by extending his legs from a normal sitting position to a position in which his legs were extended in a straight out position. The bar is then returned to starting position by bringing legs back to a normal sitting position. This was performed for eight repetitions.

Bench press. The athlete in this exercise lay on a bench with his back flat and his feet on the floor. A barbell was taken off a rack at arms length and brought to a position on his chest around the nipple area. From here, the weight is pushed back to arms length. This was performed for 5 repetitions.

Running phase. The running phase of the off-season program was designed to build speed and increase the lung capacity of the athlete. Running form was stressed at all times. Every running drill began in the same manner. Two players ran at the same time. On the command "set" the players either went into a three point football stance or began moving his feet in a two point "football position," depending on the drill. On the command "go," the two players, together, would start the actual drill. The entire running program looked like this:

1. Form running - 2, 50 yds.
2. Cross overs - 2, 50 yds.
3. Carioca - 2, 35 yds.
4. Backward run - 2, 35 yds.
5. Wave drill - 2, 35 yds.
6. Crab circle crab - 2, 35 yds.

7. Hand touches - 2, 50 yds.
8. Crab seat rolls - 2, 35 yds.
9. 40 yd. sprint for time (2)
10. 25 fifties

Form running. On command "set," the player assumed a three point stance. On "go" the athlete pushed off with his front foot and stepped with his rear foot with an explosive action. The athlete then strode 50 yds., emphasizing proper running form and not speed. Points stressed in form running included: running relaxed, good body lean, looking about 30 yds. down the track, good arm action with opposite arm and leg moving in unison while keeping the arms pumping parallel with each other and not across the body, and keeping the toes pointed straight ahead being sure to keep on the balls of the feet.

Cross-overs. On "set" the player assumed a three point stance. On "go," he drove off the board and then went into a jog keeping his knee action high stretching out his legs and crossing them back and fourth over an imaginary line. Speed was not emphasized and the exercise was more for stretching and loosening.

Carioca. On the command "set" the two players stepped across the board facing the coach and pumping their feet. On "go" they stepped with their right foot, tucking their tail and extending their arms as if to take on a blocker. Then they stepped parallel down the line with the left foot crossing behind the right foot and resetting. This was repeated for 35 yds., then on the command "go" from another coach, the player turned and sprinted across the line being sure not to let up as he crossed the finish line. The reverse procedure was used on the way back.



Backward running. On the command "set," the player turned a half turn with the legs pumping so that he was facing backward to the other end of the track. On "go" by another coach, would turn and sprint 15 yds. across the line.

Wave drill. On "set," the players stepped across the board, turning their backs to the other end and pumping their feet while watching the coach who was stationed so that they could see him. On "go" the player reacted to the coaches hard signal, getting depth quickly and staying on an imaginary line. Emphasis was placed on planting their rear foot and pivoting without taking any false steps. After 35 yds., on command, they turned and sprinted the last 15 yards.

Crab circle crab. On "set," the player assumed a four point stance, moving his feet. On "go" the athletes crabbed for 10 yards, ran around a circle on his right hand, crabbed 10 more yards and circled on his left hand, then turned a somersault and sprinted past the line.

Hand touches. On "set," the player went into a three point stance. On "go," they sprinted to a 10 yard marker where they rolled their tail under and touched both finger tips on the ground. He then sprinted to another marker where he followed the same procedure. He then performed a forward roll and sprinted to the finish line.

Crab seat rolls. On "set," the athletes assumed a four point stance moving their feet. On the command "go," they crabbed for 10 yards where they rolled to their right by placing a hand, seat and then the other hand to the ground. They then crabbed 10 more yards where they performed the same movement to the left. The drill was finished by the players doing a forward roll and sprinting past the finish line.

50 yard sprints. These were performed by sprinting the first 10 yards, striding the next 25 yards, and finishing by sprinting the last 15 yards.



### Test Procedures

Ten tests were used in testing the athletes in the 1970 off-season program. The initial tests, with the exception of five, were given February 2 and 3, 1970. The other four were administered February 9 and 10, 1970. The program began February 2, 1970, and the final testing was done March 25, 26, and 27, 1970.

Five of the tests were administered by the football staff at Kansas State University, while the other five tests were administered by the author of this paper.

A recording sheet was used for each test. These sheets contained each individual's name and score for the initial and the final test. The eleven tests were as follows: pull-ups, push-ups, sit-ups, 40 yd. dash, lateral quickness, hand dynamometer, leg dynamometer, back dynamometer, bench press, and spira-meter. The data obtained from the administration of these tests are found in the Appendix. The number of subjects tested varied due to varying circumstances.

A description of the tests are as follows:

Pull-ups. Using a horizontal bar, the subject was required to start from a dead hand position. Another subject was stationed under the bar to prevent the person being tested from swinging. The subject was required to get his chin above the bar and was not allowed to hesitate between chins. Only complete chin-ups were counted. All subjects were required to use a reverse grip (palms down). No time limit was used.

Push-ups. The subject was required to perform as many push-ups as possible in a 30 second time limit. The subject was required to keep legs and back straight and touch his chest on a three inch foam runner block. A complete extension of arms was also required on each repetition. A failure to follow any of the above requirements on a repetition made that repetition non-countable.

Sit ups. On an incline board that was set 18 inches high at its end, the subjects performed as many sit-ups as possible in a 30 second time limit. Their hands were required to be kept behind the head at all times and each repetition had to have the opposite elbow touch the opposite knee in order for it to be countable.

40 yard dash. A six inch wide board was used as a starting block for the subjects. The subjects were required to sprint 40 yards four times. A stop watch measuring tenths of a second was used in this test. The clock began on the movement of the subject and was stopped with the first step over the finish line.

Lateral quickness. A subject sprinted back and forth between two other subjects five yards apart. He was required to keep his shoulders square while running side ways back and forth. The subject was required to touch each subject on either side. The number of times he touched each side constituted his score. Thirty seconds was allowed as the time limit.

Hand manometer. The manometer used for this test was manufactured by Narragansett Machine Co., Providence, Rhode Island. The dial was calibrated in pounds with 20 lbs. per interval. The range of the manometer was 0-200 pounds. The test was given by placing the manometer in the hand with the dial inward. Either hand was used, but if the subject used, for example, his right hand in the initial test, he was required to use the same hand in the final test. The arm could use any range of motion but was not allowed to touch the body at any time. As soon as the hand contraction was concluded, the subject handed the manometer over, and the score was recorded.

Back dynamometer. The back and leg dynamometer used for this test was manufactured by T. A. Upham, Boston, U.S.A. The measurement was in Kilo-grams.

The range was from 0-500 Kilo-grams. The subject on this test was required to stand on the dynamometer holding the bar of the dynamometer at knee level. The legs and arms were kept straight. The subjects were then asked to pull straight up using back strength only. The meter was read and recorded immediately.

Leg dynamometer. The same instrument was used as in the back dynamometer test. The only difference in the test was that the bar was placed on the top of the thighs of the subject who's legs were at a forty-five degree angle. Hands were placed on the bar, but were not used to aid the legs in the test. The subject was required to use leg strength only to apply pressure on the dynamometer. The score was read and recorded the same as before.

Wet spirometer. A wet spirometer, which measured tenths of liters, was used to test the subjects lung capacity. The subject was required to take three preliminary deep breaths and on the fourth, blow the air into the tube of the spirometer. The measurement was taken in liters and tenths of liters.

Bench press. Using a supine bench manufactured by York Barbell Co., York, Penn., the subject was required to lay flat on the bench with feet flat on the floor. From this position, a barbell was taken off the rack connected to the bench and lowered to the chest. From the chest the barbell was pushed back to arms length. The amount of weight used for a single repetition constituted the score.

## RESULTS AND DISCUSSION

The findings of this study have presented evidence on the effects of the eight week off-season training program upon the strength, speed, agility, and lung capacity of the football team at Kansas State University. Tests used to determine its effectiveness were: bench press, hand manometer, leg dynamometer, back dynamometer, spirometer, lateral quickness, pull-ups, chin-ups, sit-ups, and 40 yd. dash.

All the subjects tested either retained their original score or showed definite improvement.

Of the ten tests measured, chin-ups proved to have best results with a mean increase of 41 percent while the hand manometer test showed the least improvement with a mean increase of only 3 percent. The two contrasting percentages can be accurately justified due to the fact that the hand manometer test measured only the strength of an isolated small muscle group (the muscles of the hand and forearm) while the chin-up test measured the strength of several large muscle groups working together (back, chest, arm).

The mean score before and after the eight weeks were tabulated in all of the tests along with the mean increase and percentage of increase.

Table I shows the analysis of central tendency and mean gain of the wet spirometer test.

TABLE I

	Initial Test	Final Test		
	Mean	Mean	Mean Gain	% of increase
Spirometer (liters of air)	5.74	5.94	.2	3.3

In the wet spirometer test, trying to determine the effect of the program (especially the runnign phase) on the capacity of the lungs, 44 subjects were tested. Of the 44, 9 had a reading of 6.5 liters which was the maximum reading of the spirometer. At the end of the eight weeks 12 had reached the 6.5 liter mark. The highest increase was .6 liters. This was accomplished by a lineman who, because of an injury, was required to participate in the running program every day. But the mean increase of .2 liters indicates that the off-season program increases the lung capacity significantly over the brief eight

Table II gives an analysis of central tendency and mean gain of the bench press.

TABLE II

Test	Initial Test	Final Test		
Bench Press (lbs.)	Mean	Mean	Mean Gain	% of increase
	235.9	257.0	21.1	8

I In analyzing the results of the bench press it must be understood that all of the subjects have had to some degree, experience with weights. This is important since increases were actually record attempts, not the results of a beginners eight week program, in which results would probably be much greater.

Also taken into consideration is the fact that this is the result of only the eightweek training and not a comparison from the previous year. This test showed an average increase of 21.1 lbs., an increase of about 8% over the initialtest. A fact worth mentioning shows that although the bodyweight of the subjects only varied .5 lbs. during the program, their strength improved appreciably. Thus, their strength in proportion to their bodyweight actually increased.

Table III shows the analysis of central tendency and mean gain of the man-uometer test.

TABLE III

Test	Initial Test	Final Test		
Manuometer (kilograms)	Mean	Mean	Mean Gain	% of increase
2.2 lbs.				
	131	136	5	3

Of the 85 subjects that took the hand menuometer test, 34 failed to show any improvement, while 4 subjects increased 40 kilograms or more during the same period. Little can be deduced concerning this since no particular exercise in the program was designed to improve these muscles (hand and forearm).

Strength increases in this area would have to be attributed to the gripping of weights and exercises such as chin-ups, rope climb, and the peg board in the conditioning phase of the program.

Table IV shows the analysis of central tendency and mean gain in the leg dynamometer test.

TABLE IV

Test	Initial Test	Final Test		
Leg Dynamometer (kilograms)	Mean	Mean	Mean Gain	% increase
2.2 lbs.				
	270	317	47	17

Static leg strength improved very noticeably over the eight week period, showing an increase of 17 percent. Only 3 of the 85 tested failed to show any improvement. The average increase in kilograms was 47, with 8 improving 90 kilograms or better. The results of this test indicated that the combination of weight lifting, jumping, and running in the program appeared to have a definite effect on the improvement of leg strength.

Table V shows an analysis of central tendency and mean gain of the back dynamometer test.

TABLE V

Test	Initial Test	Final Test		
Back Dynamometer (kilograms) (2.2 lbs.)	Mean	Mean	Mean Gain	% increase
	213	234	21	9

In the back dynamometer test 85 subjects were also tested. 21 of these failed to score higher on the final test, although the rest showed substantial improvement of an average of 21 kilograms. The resulted improvement can be basically related to the high and low pull movements in the weight training phase of the program.

Table VI shows the analysis of central tendency and mean gain of the 40 yard dash.

TABLE VI

Test	Initial Test	Final Test		
40 yd. Dash (Sec. and tenths of sec.)	Mean	Mean	Mean Gain	% increase
	5.1	4.84	.26	5

The times of the subjects in the 40 yard dash reduced very significantly as the average subject dropped .26, almost .3 of a second in the eight week period. The fastest time recorded was 4.3 and the slowest recorded was 5.5. At the start of the program 4.5 was the best time and 5.7 was the worst. By the end of the eight weeks, eight participants had equaled or fell below the



4.5 mark and only 6 were below the mean initial test of 5.1. These results indicated the effectiveness of the running program on speed.

Table VII shows the analysis of central tendency and mean gain of the push-up test.

TABLE VII

Test	Initial Test	Final Test		
Push-ups (repetitions in 30 seconds)	Mean	Mean	Mean Gain	% increase
	32.2	38.4	6.2	19

Fifty was the highest score recorded in the push-up test, with the average being 38.4 and the lowest 29 at the end of the program. The average increase of 19% in the push-up test can be credited partially to weight program as the same muscles are used in the bench press as the push-up.

Table VIII shows the analysis of central tendency and mean gain of the chin-up test.

TABLE VIII

Test	Initial Test	Final Test		
Chin-up (number of repetitions in 30 sec)	Mean	Mean	Mean gain	% increase
	9.5	13.4	3.9	41

Chin-ups showed the greatest improvement having the mean increase of 41%. The number of chins ranged from 4-29 at the start of the program and ranged from 5-34 at the end of the eight weeks. Some of the improvement can be attributed



to weight losses of several of the heavier subjects. For example, one subject lost 13 lbs. and increased his chins from 14 to 22, an increase of 8 which is double the mean increase.

Table IX analysis of central tendency and mean gain of the sit-up test.

TABLE IX

Test	Initial Test	Final Test		
Sit-ups (number of repetitions in 30 sec)	Mean	Mean	Mean Gain	% increase
	25.	32.6	7.6	30

The sit-up test seemed basically a matter of regaining abdominal conditioning and endurance. The average at the beginning was 25 while at the end it was 32.6, slightly over the one-a-second mark, which seemed to be a standard speed and endurance mark of the last couple years, although several went beyond this mark, with one subject going as high as 42. This indicates that the sit-ups and the Exer-Geni sit-up are enough to regain and improve abdominal strength and condition during the eight weeks.

Table X shows an analysis of central tendency and mean gain in the lateral quickness test.

TABLE X

Test	Initial Test	Final Test		
Lateral Quickness (number of repetitions in 30 sec.)	Mean	Mean	Mean Gain	% increase
	21.1	26.3	5.2	24

Lateral quickness, which is the chief indicator of player performance according to James Mosteller's master's thesis, "Sprint-Training Conditioning as a Predictor of Football Player Performance,"<sup>8</sup> had an average increase of 24% among the subjects. The highest score at the end of the program was 28 and the lowest was 24, with the average being 26.3. This shows that there is little difference among the subjects in this test.

The heights and weights of the subjects varied little as a whole during the program. An average of .5 lbs. were gained by the subjects during the period, with their heights remaining the same throughout. Although the average showed little group variance, there was a considerable individual variance ranging from a gain of 13 lbs. to a loss of 14 lbs.. The weight of the subjects at the end of the program was a mean of 211.5 lbs., where as the beginning was recorded at 211 lbs. The height remained constant at 6'1".

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<sup>8</sup>James I. Mosteller, op. cit.

## SUMMARY AND CONCLUSION

### Summary

To find the effectiveness of Kansas State's off-season football training program, members of the Kansas State football squad were tested to find out improvement of speed, quickness, strength, and lung capacity over the period eight weeks in which the program was administered. To determine this, ten tests were administered at the beginning and at the end of the training program. These tests were; bench press, hand dynamometer, back dynamometer, leg dynamometer, spirometer (lung capacity), chin-ups, sit-ups, lateral quickness, and the 40 yard dash.

The data consisted of records of performance on individual test items. Statistical treatment of the data was made to calculate means for the total score of each item at the initial and the final testing. A subtraction of the final test gave the mean gain for the group. A division of the mean gain by the initial total mean gave the percentage of increase.

### Conclusion

From the data presented in this study, it is apparent that the Kansas State University off-season football training program produces marked improvement in these particular subjects strength, speed, quickness, and lung capacity. It is also apparent from the data that all phases of the off-season training program contributed to the physical improvement of the subject.

All tests indicated considerable improvement while chin-ups showed the greatest percentage of improvement. The combination of the four phases of the off-season conditioning program are all valid, result producing programs for developing a athlete physically.

## ACKNOWLEDGMENTS

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APPENDIX I  
SPIROMETER (LUNG CAPACITY)

<u>NAME</u>	<u>INITIAL TEST</u> Score in Liters Tenths of Liters	<u>FINAL TEST</u> Score in Liters
YANKOWSKI	5.8	6.0
DUBOIS	6.5	6.5
MILLER	5.4	5.6
HEATH	6.5	6.5
MCCLAIN	5.5	5.7
MCCARTHY	6.0	6.1
ROBERTSON	5.5	5.7
ELLER	5.9	6.0
KIMBAL	5.4	5.8
CARVER	5.0	5.6
JONES	6.5	6.5
DRAPER	5.8	5.8
ROBERTS	6.5	6.5
ALEXANDER	5.4	5.7
DWYER	5.9	5.9
DICKEY	6.3	6.4
BUTLER	5.8	5.8
HOLMBECK	5.0	5.1
WYATT	6.0	6.5
POWIERZA	5.7	5.7
CRAIN	6.5	6.5

<u>NAME</u>	<u>INITIAL TEST</u> Score in Liters Tenths of Liters	<u>FINAL TEST</u> Score in Liters
DICKERSON	5.6	5.8
DUKELOW	6.5	6.5
MONTGOMERY	6.3	6.4
OWENS	5.9	6.1
GIBSON	6.3	6.5
BROUHART	5.2	5.6
BATTAGLIA	5.5	5.6
BLATZ	6.4	6.5
VAY	5.4	6.0
CLARINGTON	4.5	4.6
YOUNG	5.2	5.4
COLQUITT	5.1	5.1
BEYRLER	5.8	6.1
MEYER	5.8	5.8
REPART	5.2	5.2
MICHOLSON	4.4	4.6
SHATERNICK	6.5	6.5
O'NEIL	5.3	5.8
MELCHER	5.5	5.6
PAYNE, VIRGIL	6.5	6.5
BARTELL	6.0	6.1
GOERGER	6.2	6.2
ACKER, D.	6.5	6.5

## APPENDIX II

## BENCH PRESS

<u>NAME</u>	<u>INITIAL TEST</u> (Score in lbs.)	<u>FINAL TEST</u>
BROSIUS	340	400
BRODMAN	225	275
GLANTZ	295	305
DICKERSON	195	215
HOPKINS	225	250
ELLERS	195	215
WILLIAMS	245	285
GIBSON	300	320
KOLICH	225	245
YANKOWSKI	300	310
MONTGOMERY	275	300
CLOQUITT	300	310
FERGUSON	300	310
LANCASTER	225	365
NICHOLSON	225	235
YARNELL	235	245
WYATT	230	245
HILTON	205	225
JEDLOT	225	235
NOWAK	320	350
CLARINGTON	295	320
HAMILTON	255	285
VOHOSKA	235	280

<u>NAME</u>	<u>INITIAL TEST</u> (Score in lbs.)	<u>FINAL TEST</u>
PAYNE, DON	215	230
KIMBALL	195	2;5
DUBOIS	235	245
DRAPER	195	215
ACKER, J.	275	300
SCOTT, C	195	205
CARVER	265	300
ALEXANDER	245	255
MELCHER	295	300
STEELMAN	225	245
JONES	285	310
COPPENBERGER	205	230
KUMIS	195	205
O'NEIL	245	285
BROUHARD	275	285
VAY	255	275
COX	225	235
CAFFERTY	205	250
OUTLAW	235	275
BAILEY	245	250
SCOTT, B.	234	240
STILES	230	250
BUTLER	265	300
BROWN	225	245



<u>NAME</u>	<u>INITIAL TEST</u> (Score in lbs.)	<u>FINAL TEST</u>
HOLMBECK	215	245
FAUBUS	235	265
HEATH	235	265
MEYER	275	310
CHESWALLA	195	235
LATIMORE	285	300
CRANE	225	245
CRESWELL	225	250
PAYEN, DAVE	240	250
MILLER	225	230
WEST	225	245
SANFORD	225	250
BRITTAİN	205	225
ACKER, D.	275	300
YOUNG	225	230
CREED	250	265
BROWN	215	225
POPE	215	245
HARRISON	265	275
POWIERZA	195	245
CHAPAIN	285	inj.
MORRISON	195	205
KIMBALL, B.	235	265

<u>NAME</u>	<u>INITIAL TEST</u> (Score in lbs.)	<u>FINAL TEST</u>
STEALY	215	240
BRUMELY	245	245
JOHNSON	195	205
GOERGER	215	235
DUKELOW	275	340
HAWTHORNE	235	255
DWYER	205	230
OWENS	225	250

# APPENDIX III

## HAND DYNAMOMETER

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
CRESWELL	120	160
HEATH	120	120
CARVER	120	120
YOUNG	130	135
BRITTAIN	100	120
CRANE	120	120
LATIMORE	120	170
PAYNE	140	145
HOLMBECK	140	150
FAUBUS	170	170
ACKER, D.	150	150
KELLER	140	140
CHESWALLA	140	140
WEST	130	130
MEYER	110	135
MILLER	110	130
YOUNG	120	125
KIMBALL	120	160
BROWN	130	165
DUKELOW	120	140
GOERGER	110	110
RAPPERT	120	130

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
GLATZ	130	180
HAMILTON	120	120
POWELL	110	120
JEDLOT	110	110
NOVAK	120	120
WYATT	110	110
BROUHARD	120	130
BRODMAN	120	150
GIBSON	120	120
CLARINGTON	130	150
VAY	120	130
HILTON	110	120
HUDSON	110	150
FERGUSON	150	175
WILLIAMS	140	140
COLQUITT	130	150
NICHOLSON	110	110
CHAPIN	120	175
STEALY	130	140
OUTLAW	160	165
JOHNSON	165	165
BRANDT	110	110
PEPPERMAN	100	100
KELLER, RON	120	120
RIITIER	130	140

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
MCCARTHY	160	160
MORRISON	100	120
CREED	130	130
ARREGUIN	150	150
DRAPER	130	
POWERIZA	110	140
KOLICH	110	120
HARRISON	120	150
LAMB	125	150
BRUMLEY	150	150
THOMAS	140	140
JONES	120	125
YANKOWSKI	140	180
ALEXANDER	110	110
ELLERS	110	130
SALMI	130	130
OUTLAW	100	120
STEELMAN	100	120
JONES	130	130
SHATERNICK	140	140
OWENS	100	110
YARNELL	140	140
PAYNE	130	150
COX	100	120
COPPERBARGER	130	150

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
DUBOIS	120	140
BAILY	120	120
KUMIS	130	140
VOHOSKA	120	120
MONTGOMERY	130	140
SPARE	100	110
SCOTT	110	140
O'NEIL	120	130
BROWN	110	110
ROBERTS	100	110
KIMBAL	120	120
SCOTT, C.	130	130
HOPKINS	110	120
STILES	130	130

## APPENDIX IV

## LEG DYNAMOMETER

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
CRESWELL	270	280
HEATH	230	320
CARVER	280	310
YOUNG	210	240
BRITTAIN	220	330
CRANE	260	270
LATIMORE	240	250
PAYNE	260	290
HOLMBECK	340	370
FAUBUS	330	370
ACKER, D.	280	340
KEPPER CHESWALLA	350	360
WEST	260	360
MAYER	330	370
MILLER	210	280
YOUNG	250	250
KIMBALL	200	220
BROWN	200	270
DUKELOW	300	410
GOERGER	240	250
RAPPORT	380	380

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
GLATZ	290	360
HAMILTON	280	290
POWELL	250	310
JADLOT	290	300
NOVAK	260	300
WYATT	260	370
BROUHARD	230	290
BRODMAN	280	290
GIBSON	300	370
CLARINGTON	300	320
VAY	280	300
HILTON	280	300
HUDSON	230	300
FERGUSON	300	320
WILLIAMS	260	320
COLQUITT	330	340
NICHOLSON	210	300
CHAPIN	270	330
STEALY	220	240
OUTLAW	240	330
JOHNSON	290	360
KELLER, RON	315	320
BUTLER	370	380



<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
MCCARTHY	360	370
MORRISON	230	240
CREED	240	260
ARREGUIN	250	260
KOLICH	290	295
HARRISON	290	300
LAMB	220	300
BRUMLEY	280	300
THOMAS	320	330
JONES	280	320
YARNKOWSKI	300	375
ELLERS	290	360
SALMI	330	340
OUTLAW	280	330
STEELMAN	290	320
JONES	280	320
SHATERNICK	350	370
OWENS	280	300
YARNELL	260	280
PAYNE	290	320
COX	200	290
COPPERCARGER	360	340

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
DUBOIS	300	310
BAILY	320	320
KUMIS	290	330
VOHOSKA	300	370
MONTGOMERY	250	310
SPARE	220	440
SCOTT	300	430
O'NEIL	300	300
BROWN	280	300
ROBERTS	260	280
KIMBAL	240	280
SCOTT, C.	250	270
HOPKINS	260	300
STILES	200	270

## APPENDIX V

## BACK DYNAMOMETER

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
CRESWELL	200	250
HEATH	170	210
CARVER	230	260
YOUNG	190	220
CRANE	160	170
LATIMORE	220	240
PAYNE	180	200
HOLMBECK	250	250
FAUBUS	230	230
ACKER, D.	260	260
KELLER	270	270
CHESWALLA	200	210
WEST	200	210
MEYER	210	210
MILLER	200	200
KIMBALL	190	210
BROWN	180	200
DUKELOW	250	260
GOERGER	190	200
RAPPORT	210	220

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
GLATZ	250	270
HAMILTON	250	280
POWELL	190	220
JADLOT	200	210
NOVAK	180	200
WYATT	190	200
BROWHARD	200	250
BRODMAN	250	260
GIBSON	250	260
CLARINGTON	250	270
VAY	200	230
HILTON	200	200
HUDSON	200	200
FERGUSON	230	250
WILLIAMS	250	260
COLQUITT	210	240
NICHOLSON	200	200
CHAPIN	190	230
STEALY	120	220
OUTLAW	180	180
JOHNSON	210	220
BRANDT	190	220
PEPPERMAN	190	190
KELLER, RON	220	220
BUTLER	190	220

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
MCCARTHY	250	260
MORRISON	220	220
CREED	210	220
ARREGUIN	220	240
POWERIZA	190	210
KOLICH	250	260
HARRISON	280	280
LAMB	180	210
BRUMLEY	210	220
THOMAS	230	240
JONES	220	230
YANKOWSKI	250	350
ALEZANDER	250	250
ELLERS	200	210
SAMI	260	270
OUTLAW	180	180
STEELMAN	220	220
JONES	220	230
SHATERNICK	280	300
OWENS	220	220
YARNELL	240	280
PAYNE	170	190
COX	170	200

<u>NAME</u>	<u>INITIAL TEST</u> (Score in Kilograms)	<u>FINAL TEST</u>
DUBOIS	220	220
BAILY	250	260
KUMIS	220	220
VOHOSKA	200	240
MONTGOMERY	210	240
SPARE	280	283
SCOTT	180	240
O'NEIL	220	250
BROWN	250	270
ROBERTS	250	260
KIMBAL	200	200
SCOTT, C.	210	210
HOPKINS	200	220
STILES	240	240

## APPENDIX VI

## CHIN-UPS

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ACKER, D.	6	12
ANDING	00	00
BEYRLE	9	9
BRITTAIN	7	9
CHESEWALLA	6	9
CRANE	4	10
CRESWELL	10	10
FAUBUS	6	10
HEATH	8	9
LATTIMORE	11	14
MILLER	8	10
MYERS	7	9
PAYNE	9	11
SANFORD	7	10
WEST	7	14
YOUNG	9	11
BAILEY	10	12
COPPENBERGER	14	21
DUBOIS	13	17
KIMBALL, R.	14	22
MELCHER	12	17
O'NEIL	9	14

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ROBERTS	7	10
SCOTT, B.	9	12
BEST	10	13
CARRERTY	15	19
BRODMAN	11	15
BROUHARD	4	10
COLQUITT	12	20
ELLER	5	10
GIBSON	10	24
HAMILTON	5	5
HILTON	7	11
HOPKINS	4	10
HUDSON	9	10
JADLOT	4	8
LANCUSTER	7	9
NICHOLSON	4	8
NOVAK	6	12
WILLIAMS	6	8
DOWELL	11	12
YANKOWSKI	16	22



<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
BRANDY	7	12
BROWN, D.	10	14
BRUMLEY	12	16
BUTLER	15	16
CHAPIN	29	34
CREED	17	20
GOERGER	12	25
KELLER, R.	10	16
KIMBALL, B.	20	28
LANGE	9	15
MCCARTHY	10	14
MORRISON	12	18
PEPPERMAN	8	10
POPE	10	13
STEALEY	13	21
THOMAS	10	15

## APPENDIX VII

## STOOL JUMPS

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ACKER, D.	40	65
BEYRL	48	53
BRITTAIN	41	56
CHESEWALLA	52	59
CRANE	33	50
CRESWELL	50	57
FAUBUS	48	56
HEATH	50	60
LATTIMORE	30	63
MYERS	52	58
PAYNE	58	65
SANFORD	40	56
WEST	51	58
YOUNG	46	58
BAILEY	44	57
COPPENBERGER	58	59
COX	55	60

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
O'NEIL	52	62
ROBERTS	50	70
SCOTT, B.	50	62
STEELMAN	59	69
VOHASKA	56	69
KOLICH	54	65
BEST	50	63
CAFFERTY	52	64
BRODMAN	52	62
BROUHARD	52	56
COLQUITT	54	62
ELLER	48	55
GIBSON	56	63
GLATZ	59	70
HAMILTON	41	61
HILTON	36	59
HUDSON	44	65
JADLOT	47	58
LANCASTER	47	57
NICHOLSON	37	53
NOVAK	41	63
POWELL	53	64
WILLIAMS	51	55

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
BRANDT	39	62
BRUMLEY	50	68
BUTLER	58	62
CHAPIN	63	76
CREED	53	60
GOERGER	50	69
HARRISON	55	63
KELLER, R.	55	60
LANGE	53	62
MCCARTHY	45	62
MORRISON	52	60
PEPPERMAN	54	54
POPE	48	59
STEALEY	49	69
THOMAS	46	66

## APPENDIX VIII

## SIT-UPS

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ACKER, D.	25	36
BEYRLE	25	26
BRITTAIN	18	31
CHESWALLA	23	29
CRANE	16	28
CRESWELL	26	27
FAUBUS	27	34
HEATH	28	30
LATTIMORE	20	30
MILLER	19	32
MYERS	21	30
PAYNE	27	33
SANFORD	19	30
WEST	21	33
YOUNG	21	34
BAILEY	20	35
COPPENBERGER	26	36
DUBOIS	27	35
KIMBALL, R.	28	34
MELCHER	25	37

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
O'NEIL	25	34
ROBERTS	30	33
SCOTT, B.	29	35
STEELMAN	31	36
VOHASKA	33	42
BEST	29	31
CAFFERTY	30	35
BRODMAN	30	32
BROUHARD	30	32
COLQUITT	31	37
ELLER	30	38
GIBSON	32	35
GLATZ	27	34
HAMILTON	20	30
HILTON	24	34
HOPKINS	28	32
HUDSON	22	36
JADSOT	24	29
LANCASTER	20	36
NICHOLSON	18	20
NOVAK	20	37
POWELL	31	36
WILLIAMS	25	32
YANKOWSKI	27	30

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
BRANDT	22	37
BROWN, D.	27	30
BRUMLEY	26	29
BUTLER	26	31
CHAPIN	28	36
CREED	26	28
GOERGER	29	33
HARRISON	27	32
KELLER, R.	24	34
KIMBALL, B.	25	31
LANGE	30	32
MCCARTHY	25	31
MORRISON	25	34
PEPPERMAN	20	29
POPE	22	35
STEALEY	27	37
THOMAS	15	27

## APPENDIX IX

## PUSH-UPS

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ACKER, D.	29	49
BEYRLE	30	32
BRITTAIN	24	36
CHESEWALLA	25	38
CRANE	23	25
CRESWELL	30	43
FAUBUS	30	36
HEATH	37	43
LATTIMORE	40	42
MILLER	25	32
MYERS	28	41
PAYNE	35	38
SANFORD	36	41
WEST	22	36
YOUNG	23	36
BAILEY	17	37
COPPENBERGER	32	38
DUBOIS	27	40
KIMBALL, R.	35	40
MELCHER	39	43



<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
O'NEIL	28	49
ROBERTS	50	58
SCOTT, B.	30	38
STEELMAN	37	39
VOHASKA	36	48
KOLICH	35	39
BEST	30	38
BRODMAN	41	41
BROUHARD	31	44
COLQUITT	34	36
ELLER	30	32
GIBSON	41	41
GLATZ	37	43
HAMILTON	36	38
HILTON	30	35
HOPKINS	20	36
HUDSON	23	44
JADLOT	27	37
LANCASTER	26	42
NICHOLSON	24	31
NOVAK	36	38
POWELL	25	29
YANKOWSKI	33	35

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
BRANDT	21	39
BROWN, D.	35	42
BRUMLEY	38	40
BUTLER	38	46
CHAPIN	38	50
CREED	35	38
GOERGER	38	40
HARRISON	27	36
KELLER, R.	38	39
KIMBALL, B.	28	43
LANGE	24	36
MCCARTHY	30	39
MORRISON	31	34
PEPPERMAN	31	31
POPE	22	37
STEALEY	37	50
THOMAS	23	34

APPENDIX X  
LATERAL QUICKNESS

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ACKER, D.	22	25
BOYRLE	20	28
BRITTIAN	19	28
CRESWELL	20	28
FAUBUS	20	28
HEATH	21	28
KELLER	20	26
LATTIMORE	19	26
MILLER, W.	19	25
PAYNE, D.	23	27
BRODMAN	23	25
BROUHARD	22	26
COLQUITT	24	26
ELLER	22	25
FERGUSON	25	26
GIBSON	24	26
GLATZ	23	27
HAMILTON	21	25
HILTON	20	27
HOPKINS	20	25

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
HUDSON	24	26
JADLOT	19	25
LANDASTER	23	26
NOWAK	21	25
POPE	22	25
POWELL	22	26
SCOTT	21	25
WYATT	20	25
BRANDT	21	26
BROWN, D.	19	25
BUTLER	22	27
CHAPIN	19	24
CREED	21	26
DUCKERS	22	26
GOERGER	20	26
HARRISON	21	26
KELLER, R.	19	25
LANGE	21	25
MCCARTHY	22	26
MORRISON	20	25
PEPPERMAN, R.	20	25
STEALEY	22	26
THOMAS	22	25

<u>NAME</u>	<u>INITIAL TEST</u>	<u>FINAL TEST</u>
ACKER	20	27
BAILEY	20	26
BROWN, L.	22	26
BRUMLEY	20	24
COPPENBARGER	22	28
COX	20	26
DUBOIS	23	26
KIMBALL	17	26
MELCHER	21	25
O'NEIL	23	27
PAYNE, D.	22	27
ROBERTS	23	26
SCOTT, C.	24	28
STEELMAN	24	26
VOHASKA	23	26
KIMBALL, B.	17	26

## APPENDIX XI

## RUNNING, HEIGHT, AND WEIGHT

Name	BEGINNING		END		START 40	AVG 40	BEST 40	WEIGHT		TENTHS	
	HT	WT	HT	WT				+	-	+	-
ARREGUIN	6'1"	193	6'1"	193	5.0	5.0	5.0	0		0	
BARTELL	6'2"	192	6'2"	203	Track			+9			
BRANDT	6'3½"	210	6'4½"	214	5.1	5.0	5.0	+4		-1	
BROWN, D.	6'4"	193	6'3½"	198	5.0	4.8	4.7	+5		-3	
BUTLER	6'	203	6'	205	4.8	4.6	4.6	+2		-2	
CHAPIN	5'10½"	171	5'10½"	176	4.7	4.6	4.5	+5		-2	
CREED	6'1"	198	6'1"	198	4.7	4.8	4.6	0		-1	
DUCKERS	5'11"	195	5'11½"	195	5.0	4.8	4.7	+7		-3	
GOERGER	5'11"	167	6'½"	174	4.7	4.7	4.6	+4		-1	
HARRISON	6'1"	212	6'1"	216	4.7	4.5	4.4	-1		-3	
JOHNSON	6'6"	218	6'6"	217	inj		4.9	-1		0	
KELLER, R.	6'1½"	200	6'2"	199	4.6	4.6	4.6	-1		0	
LANGE	6'	181	6'	181	4.7	4.7	4.6	0		-1	
MCCARTHY	6'2½"	198	6'3"	198	5.0	5.0	5.0	0		0	
MCLANE	6'1"	220	6'1½"	215	4.9	4.7	4.7	-5		-2	
MONTGOMERY	6'2"	201	6'3¼"	209	4.7	4.6	4.6	+8		-1	
MORRISON	6'3½"	190	6'3½"	195	4.7	4.8	4.7	+5		-1	
OUTLAW	6'2"	240	6'3"	208	4.8	4.6	4.6	+4		-1	
PEPPERMAN	5'8"	169	5'9"	162	5.0	5.0	5.0	-7		-2	
STEALEY	5'9½"	166	5'10"	168	4.6	4.5	4.5	+2		0	
THOMAS	5'11"	197	5'10½"	198	5.0	4.9	4.9	+1		-1	
YARNELL	6'1"	193	6'1½"	189	4.9	4.8	4.8	-4		-1	

NAME	BEGINNING		END		START 40	AVG 40	BEST 40	WEIGHT		TENTHS	
	HT	WT	HT	WT				+	-	+	-
ALEXANDER	5'11½"	220	6'¼"	217	5.0	4.9	4.8	-3		-2	
BRODMAN	6'	201	6'½"	206	5.1	5.0	4.9	+5		-2	
BROSIUS	6'3"	245	6'3"	253	inj	4.9	4.9	+8		0	
BROUHARD	6'	220	6'3/4"	215	4.9	4.9	4.9	-5		0	
CLARINGTON	6'2"	237	6'1"	235	4.8	4.7	4.5	-2		-1	
COLQUITT	6'2½"	220	6'3"	220	4.6	4.5	4.5	0		-1	
ELLER	6'1"	240	6'1¼"	237	5.5	5.3	5.3	-3		-2	
FERGUSON	6'	245	6'1"	245	5.0	5.0	5.0	0		0	
GIBSON	6'1½"	235	6'1½"	235	4.9	4.9	4.8	-		-1	
GLATZ	6'2"	240	6'2½"	235	5.0	5.0	4.9	-5		-1	
HAMILTON	5'11"	227	6'	230	4.9	5.1	4.9	+3		0	
HILTON	6'2½"	217	6'3½"	218	4.8	4.9	4.8	+1		0	
HOPKINS	6'1½"	244	6'2"	243	5.1	4.9	4.9	-1		-2	
HUDSON	6'1"	211	6'1"	219	4.7	4.6	4.5	+8		-2	
KUMIS	5'10"	202	5'10"	193	4.9	4.9	4.9	-9		0	
LANCASTER	5'11"	210	6'	211	5.4	5.3	5.2	+1		-2	
NICHOLSON	5'8"	227	5'8"	216	5.1	5.1	5.1	-11		0	
NOWAK	6'1"	209	6'1"	209	5.0	5.0	5.0	0		0	
POPE	6'4"	201	6'4¼"	206	4.9	4.9	4.8	+5		-1	
POWELL	6'2½"	222	6'2"	219	4.8	4.7	4.7	-2		-3	
SCOTT, B.	6'1"	209	6'1½"	214	4.9	4.8	4.8	+3		-1	
WYATT	6'2"	229	6'23/4"	227	5.0	4.8	4.7	+3		-3	
YANKOWSKI	6'4"	215	6'4½"	218	4.9	4.8	4.8	+3		-1	

NAME	BEGINNING		END		START 40	AVG 40	BEST 40	TENTHS		WEIGHT	
	HT	WT	HT	WT				+	-	+	-
ACKER, J.	5'11½"	222	5'11½"	220	4.7	4.7	4.7	-2		-2	
BAILEY	6'4"	204	6'4"	212	4.6	4.7	4.6	+8		-1	
BROWN, L.	6'1"	218	6'1½"	219	5.0	4.9	5.0	+1		+1	
BRUMLEY	6'2½"	198	6'2½"	200	4.7	4.7	4.7	+2		0	
CAFFERTY	6'2"	187	6'3"	188	4.9	5.0	4.9	+1		-1	
COPPENBERGER	6'1"	201	6'1½"	200	4.7	4.7	4.6	0		-1	
COX	6'1"	203	6'1"	203	4.9	5.0	4.9	-1		0	
DICKERSON	6'4"	193	6'3½"	193	4.6	4.6	4.5	-1		0	
DUBOSIS	6'1"	220	6'1"	221	4.8	4.8	4.8	-1		-1	
HOLMBECK	6'	204	6'	201	4.9	4.9	4.8	-1		-3	
JONES	6'2½"	214	6'3"	217	4.6	4.6	4.6	0		+3	
KIMBALL	6'	193	6'	180	4.6	4.7	4.6	-1		-13	
KOLICH	6'	202	6'	188	4.9	4.9	4.8	0		-14	
KUHN	6'3"	204	6'3"	204	4.9	4.9	4.9	-1			
MELCHER	5'11"	197	5'11¾"	204	4.8	4.9	4.7	-1		+7	
O'NEIL	6'2"	205	6'2"	210	4.8	5.0	4.8	-2		+5	
PAYNE, D.	6'3"	188	6'3"	193	4.9	5.0	4.9	-1		+5	
ROBERTS	5'10½"	170	5'10"	176	4.8	4.8	4.8	0		+6	
ROBERTSON	6'4½"	192	6'4½"	194	4.7	4.9	4.5	-4		+2	
SCOTT, C.	6'1"	175	6'½"	179	4.5	4.7	4.5	-2		+4	
STEELMEN	5'10½"	199	5'11"	199	4.8	4.9	4.7	-2		0	
STILES	6'2"	225	6'2½"	220	5.0	4.9	5.0	+1		-5	
VOHASKA	6'1½"	191	6'2½"	193	4.7	4.9	4.7	-2		+2	
KIMBALL, B.	5'10"	182	5'10½"	180	4.8	4.8	4.8	0		-2	



NAME	BEGINNING		END		START 40	AVG 40	BEST 40	WEIGHT		TENTHS	
	HT	WT	HT	WT				+	-	+	-
ACKER, D.	6'3"	237	6'4"	242	5.2	5.1	5.1	+5		-1	
ANDING	6'2½"	222	6'2½"	235	4.9	4.9	4.9	+13		0	
BERYLE	6'4"	242	6'4"	246	4.9	4.9	4.9	+4		0	
BRITTIAN	6'6"	227	6'6"	227	4.9	4.8	4.8	0		-1	
CARVER	6'4"	242	6'4"	243	inj			+1		-1	
CHESHEWALLA	6'1"	237	6'13/4"	232	5.4	5.3	5.3	-5		-1	
CRANE	6'3"	263	6'3¼"	254	5.7	5.5	5.5	-9		-2	
CRESWELL	6'4½"	263	6'43/4"	264	5.3	5.1	5.0	+1		-3	
FAUBUS	6'2"	220	6'2"	220	5.1	5.1	5.0			-1	
HEATH	6'3½"	229	6'3½"	230	5.1	5.0	4.9	0		-2	
KELLER, L.	6'1"	222	6'1"	220	5.2	5.1	5.1	+1		-1	
LATTIMORE	6'	250	6'1"	244	5.0	4.9	4.8	-2		-2	
MILLER	6'2"	223	6'1¼"	225	5.3	5.3	5.3	-6		0	
MYERS	6'1"	226	6'2"	227	5.3	5.1	5.0	+2		-3	
OWENS	6'4½"	225	6'5"	231	5.3	5.0	4.9	+1		-3	
PAYNE, DAVE	6'1½"	235	6'13/4"	238	5.2	5.1	4.9	+6		-3	
POWIERZE	6'1"	209	6'1"	207	5.2	5.2	5.1	+3		-1	
SANFORD	6'3½"	220	6'3½"	220	5.4	5.4	5.3	-2		-1	
SHATERNICK	6'4"	237	6'43/4"	249	4.9	5.0	4.9			0	
VAY	5'10"	237	5'10½"	236	5.1	5.1	5.1	+12		0	
WEST	6'2"	212	6'2"	210	4.9	5.0	4.9	-1		0	
WILLIAMS	6'	245	6'	245	5.1	4.9	4.8	-2		-3	
YOUNG	6'	229	6'1"	225	5.5	5.1	5.1	-4		-4	

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AN EVALUATIVE STUDY ON THE EFFECTS OF THE  
1970 OFF-SEASON FOOTBALL TRAINING PROGRAM ON THE  
PHYSICAL IMPROVEMENT OF THE PARTICIPANTS

by

ROBERT WILLIAM STULL

B. A., Kansas State University, 1968

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AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Physical Education

KANSAS STATE UNIVERSITY  
Manhattan, Kansas

1970

The purpose of this study was to evaluate the effects of the off-season football training program in relation to improvement of the participants in strength, speed, quickness, and lung capacity.

In order to evaluate the success of the training program on these physical qualities, members of the football team participating in the program were tested at the start and again at the end of the eight week training program. Ten tests were used. These were; bench press, 40 yard dash, hand dynamometer, back dynamometer, leg dynamometer, stool jumps, push-ups, sit-ups, chin-ups, later quickness, and a spirometer test to determine lung capacity.

The number of subjects tested varied due to variations in the number of participants because of injuries, classes, and participants missing the initial test.

Results of the tests showed definite improvements in all of the areas of the off-season program. The average speed of the participants increased .26 of a second in the 40 yard dash which is a credible improvement considering only a eight week training period. In conjunction with the running program, the subjects increased .19 liters of air in the spirometer test. All other tests also showed noticable improvement with chin-ups having the greatest percentage of increase at 41%.

The data obtained from this study gave convincing proof of the effectiveness of the off-season football training program on the physical improvement of this specific group at Kansas State University.