

**THE EFFECTS OF FOUR SHORT DURATION
EXERCISE ROUTINES ON PHYSICAL
FITNESS OF MALE JUNIOR
COLLEGE STUDENTS**

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THESIS

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CHAPTER I

INTRODUCTION

The physical fitness state of the American citizen in recent years has developed rapidly into a major concern of national leaders as well as physical educators. This concern was expressed by President Eisenhower in 1956 when he formed the President's Council on Youth Fitness. He stated:

"National policies will be no more than words if our people are not healthy in body, as well as of mind, putting dynamism and leadership into the carrying out of these major decisions. Our young people must be physically as well as mentally and spiritually prepared for American Citizenship" (10, p. 1).

The President's action was prompted partially by results obtained from several studies which were conducted on the physical fitness condition of the American youth. Campbell discovered that a group of English youth exceeded an American group in the American Association of Health, Physical Education and Recreation Youth Fitness Test (7). Knuttgen studied the differences in American youth and Danish youth in terms of physical fitness. He administered the AAHPER Youth Test to 453 Danish school children (319 males and 134 females). The results of the test were compared to the established American standards. It was discovered that approximately

seventy per cent of the Danish boys' scores and eighty-six per cent of the Danish girls' scores were greater than the comparable American mean scores (5).

Ikeda conducted a similar study comparing the physical fitness condition of children in Iowa and Tokyo. (There were 395 Tokyo children and 355 Iowa children used as subjects during the experiment. The subjects were nine to twelve years of age.) Results of this study indicate that the Tokyo children scored better in all motor performance tests except one--sit-ups (2).

Karpin^os reported that during the Korean conflict three and one-half million American men underwent preinduction physical examinations. His study indicated that 619,000 or 17.7 per cent, American men were rejected from military service for physical reasons (3).

Of particular interest was a study conducted by Kraus and Hirschland comparing the physical fitness conditions of American and European youth (6). Kraus and Hirschland used the Kraus-Weber fitness test as a measuring instrument for their study. This test consists of six movements appraising strength and flexibility of trunk and leg muscles. Data concerning the Kraus-Weber test as administered by Kraus and Hirschland are presented in Table I.

TABLE I
RESULTS OF KRAUS-WEBER TEST ADMINISTERED
TO AMERICAN AND EUROPEAN YOUTH

	Austrian	Italian	Swiss	American
Number tested	678	1036	1156	4264
Failure	9.5%	8.0%	8.8%	57.9%
Incidence of Failure	9.7%	8.5%	8.9%	80.0%

The Kraus-Weber test was administered to 4,264 American children and 2,870 European children by Kraus and Hirschland. The subjects were aged six to nineteen years and came from comparable urban and suburban communities. The European children were selected from the following European countries: Austria, Italy and Switzerland. Six hundred and seventy-eight children were tested from Austria, 1,036 children were tested from Italy, and 1,156 children were tested from Switzerland. The composite results of the Kraus-Weber test indicated that 57.9 per cent of the American children failed to attain the minimum standards as compared with 8.7 per cent of the European children which failed to attain minimum standards. Most specifically, 9.5 per cent of the Austrian children, 8.0 per cent of the Italian children, 8.8 per cent of the Swiss children, and 57.9 per cent of the American children failed to attain the minimum standards of the test. The incidence of failure established for the Kraus-Weber test was as follows: 9.7 per cent

of the Austrian children; 8.5 per cent of the Italian children; 8.9 per cent of the Swiss children; and 80.0 per cent of the American children.

When John F. Kennedy assumed the office of President of the United States, he was obviously aware of the facts concerning the physical deficiencies of the American citizen. He immediately took action which added impetus to the national physical fitness crusade. After his election as President, and before he was inaugurated, President Kennedy publicly expressed his philosophy about physical fitness (4, p. 16). He stated:

For physical fitness is not only one of the most important keys to a healthy body, it is the basis of dynamic and creative intellectual activity. The relationship of the body and the activities of the mind is subtle and complex. Much is not yet understood, but we do know what the Greeks knew: that intelligence and skill can only function at the peak of their capacity when the body is healthy and strong; that hardy spirits and tough minds usually inhabit sound bodies.

In this sense, physical fitness is the basis of all the activities of our society. And if the body grows soft and inactive, if we fail to encourage physical development and prowess, we will undermine our capacity for thought, for work, and for the use of those skills vital to an expanding and complex America. Thus, the physical fitness of our citizens is a prerequisite to America's realization of its full potential as a nation, and to the opportunity of each individual citizen to make full and fruitful use of his capabilities.

Sheard studied the question, "Are physical educators doing all that they can to promote physical fitness?". He used as his subjects students enrolled in the male physical education service classes attending Idaho State College. These

subjects were administered the AAHPER Youth Fitness Test to determine if any degree of physical fitness had been perpetuated. The results of this study indicated that there was little increase in the physical fitness development of the subjects involved. Sheard wrote that it would seem that physical educators are teaching the same activities the same way, yet are supposedly developing some new elixir for the body(9).

The above facts are alarming. Two major questions need to be faced: (1) Why are not American youths as physically fit as their peers?; and (2) What must physical educators do to improve the physical fitness state of the youth? First, modern technological advances have contributed to the deterioration of the physical fitness state of the American youth. Mechanical devices have been created which reduce the amount of energy required to perform a given task. Consequently, the amount of physical activity formerly required in daily living has been reduced for both children and adults. Second, physical educators must realize that the American way of life contributes very little to the physical fitness development of our youth. It is a fact that physical fitness can be developed and maintained only by engaging in physical activities and exercises, and it is becoming apparent that the schools must orient the students to this fact. Physical educators must adopt a program that will improve the physical fitness development of their students. This program should be of

such a nature that it can be used in conjunction with regular physical education activity classes.

Statement of Problem

A study of four short duration exercise routines toward development of physical fitness for male junior college students.

Purposes of the Study

The following purposes were formulated:

1. To investigate the development of physical fitness through the medium of fifteen-minute exercise routines in junior college physical education classes.
2. To determine the relationship between each of four exercise routines and the improvement of physical development in a specific body area.
3. To compare the results of intensive, isometric, calisthenic, and continuous exercise routines to determine if any one routine was of greater value to three alternate routines in assisting the individual to attain a higher degree of physical fitness development.

Hypotheses

Consistent with the purposes, the study was designed to investigate into the following general hypotheses:

1. Student groups subjected to certain selected exercise routines will show significant improvement in each of seven selected measures of physical fitness.

2. Each of four selected exercise routines will prove to be of greater value than the three alternate routines in demonstrating improvement for certain specific measures of physical fitness.

3. One of the four selected exercise routines will prove to be of greater value than the three alternate routines in the development of physical fitness throughout a range of seven physical fitness test events.

The stated general hypotheses were converted to null hypotheses for purpose of statistical treatment:

1. There will be no significance of difference in mean scores between pre-test scores and post-test scores for each of seven test events of physical fitness within student Groups I, II, III, and IV respectively.

2. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group II.

3. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group III.

4. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group IV.

5. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group II and student Group III.

6. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group II and student Group IV.

7. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group III and student Group IV.

Background and Significance of Study

Many physical educators in the junior college field are faced with common problems related to the improvement of physical fitness and physical development. Some of these problems are dealt with through formal classroom situations, and others are dealt with through the medium of exercise activity classes. Two of the most common problems which affect the adequacy of physical education programs are (1) the number of students enrolled in the classes; and (2) the frequency of regularly scheduled class meetings. The men's physical education department at Wharton County Junior College experienced these common problems: (1) the enrollment in the physical education classes ranged as high as eighty-five to ninety students; and (2) each regularly scheduled physical education class met for only two periods per week. This situation challenged the physical education instructor to initiate procedures which were designed to insure to him and the students that each minute of each physical education class should be utilized effectively for building maximum physical fitness with each student.

**Men's Physical Education Facilities at
Wharton County Junior College**

The present study dealt with only male physical education students at Wharton County Junior College, Texas.

The large enrollment in physical education classes at Wharton County Junior College, coupled with the lack of adequate physical education facilities, created certain specific problems in the instruction of physical education. Following is a description of men's physical education facilities at Wharton County Junior College during the spring semester, 1966.

1. A gymnasium which included a regulation basketball court was available to the men. At approximately four feet from the sidelines were affixed permanent bleachers; at approximately eight from one end was the outside wall; and at approximately eight feet from the opposite end was a stage.

2. A single dressing room capable of housing only forty-five to fifty physical education students was in use. Included in this dressing room were approximately twelve shower heads, clothing hangers, and benches. This facility was located in the gymnasium.

3. A physical education athletic play field, which was approximately 100 yards square, could have been utilized during periods of the spring when the weather permitted. This facility adjoined the gymnasium.

4. A regulation football field was located one and one half blocks from the gymnasium. This facility was used by the college only for intercollegiate football practices and games.

5. A field house which included a dressing room, equipment room, and weight room was reserved for specialized uses and was not available to the physical education classes. This facility adjoined the football field and was used only by varsity athletes.

6. A commercially owned skating rink was contracted to assist in alleviating the over crowded problem in the men's physical education classes. A skating program was operated in conjunction with the regularly scheduled physical education classes. The skating rink was located several blocks from the college campus, requiring that a school bus be provided to transport the students.

The following equipment was provided the men's physical education classes at Wharton County Junior College:

1. Several softballs, bats, and softball gloves
2. Several volleyballs and one volleyball net
3. Several footballs
4. Several basketballs and two goals
5. Two table tennis tables with several paddles, nets, and balls

At the time of the study the men's physical education department did not include such physical education equipment as parallel bars, trampolines, wrestling mats, side horses, archery equipment, tennis equipment, or golf equipment.

The program of physical education at Wharton County Junior College included little individual instruction for the

improvement of skills associated with activities which could be useful in the students' future or which would have carry-over values. The students were not required to engage in any type of warm-up exercise prior to participation in activities, and little, if any, regard was given to the physical fitness and development aspect of physical education.

Although physical fitness should be an integral part of physical education, most physical educators believe that physical fitness should not be stressed in such a manner that it becomes the only objective of the program. Consequently, most physical educators feel that it is just as necessary to provide a physical education program that will expose the student to many recreational skills which can be utilized after completion of the program as it is to improve their physical fitness and development. It is felt that a balance should be maintained between physical fitness development and recreational activities. Nixon and Cozens demonstrated support of this view when they stated: "The physical education curriculum should not be based primarily on physical fitness testing programs. Over emphasis of this object might jeopardize gains made in the achievement of other equally valuable objectives" (8, p. 216).

The present study seeks to discover a type of exercise routine that will assist in the improvement of physical fitness and physical development. Such an exercise routine will require only a small percentage, fifteen minutes, of the

physical education class, thus allowing enough time remaining to teach activities and skills that possess carry-over value in terms of improved physical development and function.

It is suggested that the proposed study may have value to physical education as follows:

1. The study should assist physical education instructors in organizing classes whereby physical fitness can be improved, using only a small percentage of the class period.

2. The study should present data which will indicate to physical education instructors the usefulness of the selected types of exercise routines.

3. The study should demonstrate to physical educators that physical fitness can be adequately promoted without adversely affecting the teaching of skills most often associated with physical education activities.

4. The study should aid students terminating their education at the junior college level in recognizing the importance of physical fitness and physical development.

The American Association of Health,
Physical Education and Recreation
Youth Fitness Test

The AAHPER Youth Fitness Test was utilized during the study to measure the subjects' physical competencies. Following are the seven test events which constitute the AAHPER Youth Fitness Test (1).

1. Pull-up test - The subject used a regular grasp and hung at arm's length from a high horizontal bar with his body

extended. Without swinging his body, or raising or kicking his legs, the subject raised his body until his chin was above the level of the bar. He lowered his body until his arms were extended. He performed as many pull-ups as possible.

2. Sit-up test - The subject assumed a back lying position with his legs extended and his feet spread approximately twenty-four inches apart. He placed his hands behind his head and interlocked his fingers. His heels were held to the floor throughout the test by a classmate. The subject performed a sit-up, rotating his trunk and touching his left knee with his right elbow. He returned to the starting position and repeated the sit-up movement, rotating his trunk to the right and touching his right knee with his left elbow. He performed the sit-up movement until he could perform no more or until he completed one hundred sit-ups.

3. Shuttle-run test - The subject stood behind a starting line and when the signal was given, he ran to a line thirty feet away, picked up a 2 x 2 x 4 inch wooden block that was placed behind the line, and then ran back and placed the block behind the starting line. He immediately turned around, ran back, and grasped a second block and returned past the starting line. The time to the nearest tenth second was recorded.

4. Standing Broad Jump test - The subject stood behind the starting line and jumped as far as possible. The longest of three jumps, recorded in feet and inches, was measured from the starting line to that part of the subject's body that touched the floor nearest the starting line.

5. Fifty-yard dash test - The subject ran fifty yards; his time was recorded to the nearest tenth second.

6. Softball throw test - The subject threw a twelve inch softball three times, using an overhand throw. He started his throw six feet behind a restraining line. The distance from the landing point of the best throw to the nearest point on the restraining line was recorded to the nearest foot.

7. Six hundred yard run/walk test - The subject traveled 600 yards by running as much as possible and walking a minimum distance. His time was recorded in minutes and seconds.

The four short duration exercise routines used in this study were designed to assist students in certain specific areas of physical development. These areas of physical development are as follows:

1. Body strength and power - This is attained when an individual increases his arm and shoulder strength, abdominal strength, and leg power. The pull-up, sit-up, standing broad jump, and softball throw test events were intended to be measures of the individual's current physical condition and improvement in these specific body areas.

2. Cardio-vascular improvement - This is attained when an individual increases the efficiency of his circulatory system. The 600-yard run/walk test event was intended to be the measure of the individual's current physical condition and improvement in this specific body area.

3. Agility - This is attained when an individual improves his ability to move quickly, easily, and dexterously. The shuttle run test event was intended to be the measure of the individual's current physical condition and improvement in this specific body function.

4. Rhythm - This is attained when an individual is able to better coordinate his body movements and when he is more graceful in his actions. The shuttle run test event was intended to be the measure of the individual's current physical condition and improvement in this specific body function.

5. Speed - This is attained when an individual improves his ability to run a specified distance in increasingly less time. The fifty-yard dash test event was intended to be the measure of the individual's current physical condition and improvement in this specific body function.

Definition of Terms

The following definitions are proposed for use in this study:

1. Intensives - movements using maximum effort for periods of short duration.

2. Isometrics - exercise based on the process of holding the body in varying static positions while contracting a particular muscle group with near maximum force.

3. Calisthenics - systematic exercise done in cadence and without apparatus.

4. Continuous exercise - a combination of selected exercises performed continuously for a fifteen-minute period.

5. Junior college - an educational institution composed of freshmen and sophomore college students.

6. Physical education - a program in the curriculum which provides each student with an opportunity to develop skill and understanding in a variety of physical activities that will tend to improve his physical development and function.

7. Physical fitness - the total functional capacity of an individual to perform a given task to its completion without undue fatigue.

8. AAHPER Youth Fitness test - an instrument to measure the physical condition of an individual developed by the American Association of Health, Physical Education, and Recreation.

9. College norm - the normal performance of the AAHPER Youth Fitness Test percentile scores for college men.

Limitations of the Study

The limitations of this study are as follows:

1. The subjects of the study included only male physical education students who attended Wharton County Junior College during the spring semester, 1966.

2. The frequency of exposure during the study was twice per week.

3. The study investigated only those selected components of physical fitness and development as defined within the AAHPER Youth Fitness Test.

Basic Assumptions

The basic assumptions of this study are as follows:

1. It is assumed that all classes will be taught by the same instructor. This assumption will assure that a group's improvement was attributed to the exercise routine rather than the administration of the routine.

2. It is assumed that the initial orientation will be identical for all groups because the same instructor will conduct all orientations.

3. It is assumed that upon completion of the particular short duration exercise routine by each group the remaining portion of the physical education class will be identical. This assumption assured that group differences would be attributed to the assigned exercise routine.

4. It is assumed that the groups, as selected, will be as equal as possible in physical abilities.

5. It is assumed that a small percentage of the student subjects will participate in physical activities outside the classroom. However, it is further assumed that this additional participation will not adversely affect the results of the study.

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CHAPTER II

SURVEY OF LITERATURE

Students selected as subjects in this study were subjected to four short duration exercise routines. One exercise routine consisted of intensive exercises. One exercise routine consisted of isometric exercises. One exercise routine consisted of calisthenic exercises, and one exercise routine consisted of several exercises scheduled in such a way that the subject performed continuously for the duration of the routine. Studies have indicated that these four exercise routines are capable of increasing the physical fitness and physical development of the user. A summary of selected studies follows:

Intensive Exercise

Woldemar Gershler, a German, is credited with the creation of interval or intensive training. The intensive exercise is designed to subject the performer to a maximum effort of exercise over a limited amount of time. The intensive training routine will develop speed, endurance, strength, power, and a positive psychological approach for the subject. The principle of this routine, when used for track athletic training, is one in which the subject is constantly running shorter distances than the race for which

he is training and at a faster speed than his race pace (3). Stein stated that these principles can be applied to conditioning exercises, the result being greater growth and development. Even though the interval exercise routine requires less time for each specific exercise, there will be increasing benefits from them (14).

In an intensive exercise routine the following variables should be considered:

1. A time limit should be considered for each exercise.
2. The number of times that a specific exercise is repeated by each student in the allocated time.
3. The length of the rest period between each specific exercise.

Because of these variables, changes can easily be made to adapt the exercise to the exercise tolerance of the performer. In events where the performer tends to become exhausted in a short time, a modified and easier method of performing them can be used. This insures that the performer is exercising at his maximum level at all times (3).

Westering stated that with the intense intermittent exercise routine a high degree of physical fitness can be attained in half the time consumed by the conventional exercise routines. The time saved by this routine can be utilized effectively for the additional teaching of activities to the physical education student. Westering also stated that the student is motivated to do his best because he is competing

against himself--this encourages each student in the program to exceed his previous performance record (16). Walters reported Westering's statement when she discovered that short intense periods of exercise will increase physical fitness (15).

Isometric Exercise

Research has proven that isometric exercise routines may be effectively used for physical fitness and development. Four distinct advantages to the use of isometric exercises are:

1. Isometric exercises are of such a nature that they are not time-consuming.
2. Isometric exercises are of such a nature that no special equipment is required.
3. Isometric exercises are of such a nature that no special uniform is required.
4. Isometric exercises are of such a nature that they are not physically tiring to the performer.

A study by Dennison and others examined the improvements in arm strength by comparing results of experimental groups using isotonic exercise routines and groups using isometric exercise routines. The isotonic groups used standard weights and followed a standard weight training routine. The isometric groups used the Commander Set of exercise routines. Both groups followed their specific exercise routine twice

a week for an eight-week period. The results of this experiment indicated that both exercise groups improved significantly in muscular endurance of the upper arm. It was also established that these results were obtained even though the isometric group exercised only ten minutes per day as compared to thirty minutes per day for the weight training group (7).

Mathews and Krause used one hundred and twenty male college students in their study concerning isometric exercises. Sixty of these students participated in an isometric exercise routine and the remaining sixty participated in an isotonic exercise routine. The results of this study indicated that the group subjected to the isometric exercise routine showed a greater number of individuals with improved strength than did the isotonic group (11).

A study by Howell and others compared the effects of isometric and isotonic routines upon improvement of muscular endurance. This study was conducted with three groups of eleven students enrolled in a required physical education program at the University of Alberta. The first group was assigned a weight training (isotonic) exercise routine, the second group was assigned the Commander Set of isometric exercise routines, and the third group participated in a normal physical education class. At the conclusion of the eight-week experimental period a retest of the subjects indicated that there were no significant differences in muscular endurance improvement in the group using isometric exercises and in the group using isotonic exercises (10).

Berger conducted a study using static (isometric) and dynamic exercise routines. This study was conducted with college male students and covered a twelve-week period. As a result of this study, Berger concluded that static exercises may produce a greater increase of strength than will dynamic exercises. He found that the fatigue factor permitted the subjects' use of static exercises to engage in more training sessions (11). Clarke confirmed Berger's conclusions when he discovered that strength recovery was much faster after a static exercise routine than was the strength recovery after a dynamic exercise routine (2).

Hettinger concluded that muscle tension is the important point in training. He stated that one single contraction per day is adequate for the maximum training effect for a particular muscle group (9). Muller stated further that more strength can be exerted by static, isometric, contraction than by dynamic contraction. Muller stated also that strength is gained faster by one static contraction executed against a resistance of at least more than forty per cent of the subjects' maximum strength than can be gained by more than one dynamic contraction (12).

A study by Wolbers and Sills adds to the evidence of Hettinger and Muller. By analyzing the results obtained from twenty test subjects, these investigators concluded that a static contraction held for a duration of six seconds will cause significant increases in strength (17).

Calisthenic Exercise

According to Staley, calisthenics are used for the purpose of attaining four objectives: (1) the development and maintenance of body health, (2) the development and maintenance of good body mechanics, (3) the development and maintenance of body suppleness, and (4) the development and maintenance of body control (13).

A study by Henry and Prue, as reported in an unpublished dissertation by Coyne, used calisthenics as an exercise routine. Their findings indicated that out of the twenty-one subjects participating in the study nineteen demonstrated improvement in physical fitness. Twelve of the twenty-one experienced a loss of weight during the study. Henry and Prue subjected the experimental group to the XBX system developed by the Royal Canadian Air Force.

Coyne also reported that Phoenix, Arizona has offered a challenge to any high school physical education department in the country to compare physical fitness results. In addition to their regular physical education activities, the Phoenix students are subjected to fifteen minutes of daily calisthenics. The results have been outstanding (5).

A study by Fabricus compared the physical fitness development of fourth grade boys and girls participating in a regular physical education class with an experimental group participating in a similar physical education class to which three minutes and nine seconds of selected calisthenics were added. Results

showed that the experimental group improved significantly more than did the control group (8).

Culver examined the effects of a ten-minute period of body conditioning exercises taught concurrently with a unit on basketball. She experimented with seventy-two high school girls. The results obtained indicate that a ten-minute period of calisthenics was effective in improving physical fitness. It was also concluded that the loss of the ten minutes from the instructional period was not detrimental to the learning of basketball (4).

Continuous Exercise

Dr. Thomas K. Cureton has designed a system of rhythmic continuous exercises as a means of improving physical fitness. This thirty minute non-stop exercise routine incorporates features of both circuit and interval (intensive) training. Dr. Cureton's continuous exercise routine intersperses muscular endurance exercises with walking, jogging, running, hopping, swinging the arms, deep breathing, and kicking. This routine starts mildly, builds up to an intensity in the middle, and tapers off at the end. Cureton believes that long continued exercise is needed in order to warm the body and its organs thoroughly, and that such warming is essential for effective muscular and circulatory endurance.

The continuous exercise routine will assist in counter-acting deficiencies in cardio vascular fitness. It will also

aid the user in bettering his agility, strength, flexibility, balance, and coordination. Carleton followed the five basic principles listed below when he developed his thirty minute non-stop exercise routine.

1. Never start a work-out fast or end it fast.
2. Warm up the group before moving to a more vigorous or strenuous exercise.
3. Give the students the opportunity to recuperate between exercises by slowing down the pace and exercising different muscles and parts of the body. Do not stop the exercise routine until the time is up.
4. Include plenty of deep-breathing exercises and have the students swing their arms when walking.
5. Work the group up to a peak slowly and gradually slow the pace down as the routine draws to a close (6).

Walters studied the effects of a continuous strenuous exercise routine on the physical efficiency of twenty-three college women. The exercise periods were from seven and one-half minutes to twelve minutes daily. The exercises were designed for the improvement of cardio-respiratory endurance and the development of grip strength. Results obtained after eleven consecutive days of exercise periods indicated that the continuous exercise did improve physical fitness in terms of cardio-respiratory endurance and grip improvement (15).

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CHAPTER III

METHODS AND PROCEDURES

In order to collect, analyze, and interpret data pertinent to the study of the effects of short duration exercises on physical fitness development, the following methods and procedures were appropriate.

Student Selection and Grouping

The investigator instructed five sections of physical education classes that dealt with the improvement of physical fitness and physical development at Wharton County Junior College during the spring semester of 1966. These physical education classes were identified as sections 02, 03, 04, 05, and 08. A portion of the students enrolled in sections 02, 03, 04, and 05 were utilized as subjects during this study. Section 08 was composed of students participating in varsity athletics; consequently, these students were not utilized during this study.

The time of day, day of week, enrollment, student participants and non-participants for each of the four physical education class sections utilized in this study are presented in Table II.

TABLE II
SCHEDULES AND ENROLLMENT OF PHYSICAL EDUCATION
CLASSES UTILIZED DURING THE STUDY

Class Section Number	Day	Time	Total Enrollment	Participants in Study	Students Not in Study
02	MW	8:55- 9:45	74	46	28
03	MW	9:50-10:40	89	56	33
04	MW	10:45-11:35	76	43	33
05	TTh	11:00-11:50	60	35	25

The total number of students enrolled in the four physical education classes utilized in this study was 299. The number of students per section in each of the four sections was as follows: section 02, seventy-four; section 03, eighty-nine; section 04, seventy-six; and section 05, sixty. Of the total enrollment of 299 students, one hundred and eighty students were selected as subjects for this study. Participants in this study were required to maintain regular attendance during the time the study was being conducted. Thus, a student's attendance record for physical education during the first six weeks of the spring semester, 1966, was used to determine the student participants. Those students with two or more absences were not used as participants in the study. They participated in a skating program operated in conjunction with the regularly scheduled physical education class. In section 02 there were

forty-six student subjects selected and twenty-eight skaters. In section 03 there were fifty-six student subjects selected and thirty-three skaters. In section 04 there were forty-three student subjects selected and thirty-three skaters, and in section 05 there were thirty-five student subjects selected and twenty-five skaters.

Orientation

The initial orientation for the selected subjects was presented by the investigator on March 7 and 8, 1966, and covered the following items:

1. An explanation of the purposes of the study.
2. An explanation of the AAHPER Youth Fitness Test and how it was to be utilized.
3. An explanation of the four selected short duration exercise routines.
4. A statement concerning the importance of regular attendance during the experimental period.
5. An opportunity for students to discuss and ask questions concerning the study.

Pre-AAHPER Youth Fitness Test

On March 9-10 and 14-17, 1966, the student subjects were administered the pre-AAHPER Youth Fitness Test (1). Due to the limited length of the class period, three test periods were required for each physical education class to complete

the test. The following procedures were used to administer the pre-test.

1. The pull-up, sit-up, shuttle run, and standing broad jump test events were conducted in the gymnasium, and the results of each test event were recorded for each student subject.

a. The pull-up test event was performed on a one and one-half inch pipe secured to a scaffold.

b. The sit-up test event was performed in a designated area in the gymnasium.

c. The shuttle run test event was performed across a volleyball court marked in the gymnasium. The side-lines of this court were thirty feet apart and were used as the restraining lines.

d. The standing broad jump test event was performed in a designated area in the gymnasium. The end boundary line to the basketball court was used as the starting line, and a graduated feet and inches scale was taped to the floor.

2. The fifty-yard dash, softball throw and 600-yard run/walk test events were conducted out-of-doors, and the results of each test event were recorded for each student subject.

a. The fifty-yard dash test event was performed on a grass area measured on the athletic play field.

b. The softball throw test event was performed on the varsity football field. This facility was utilized

because the yard lines were available for measuring the distance of each throw.

c. The 600-yard run/walk test event was performed on a grass course measured on the athletic play field.

The student subjects' scores for the seven test events of the AAHPER Youth Fitness Test were recorded on a form similar to the individual scoring form recommended in the AAHPER Youth Fitness Test Manual, Appendix A: The name, age, height and weight of the student subject were recorded in the designated area of this form. The appropriate date of the specific test was recorded in the designated area. The scores attained in each test event by the student subject were recorded opposite the appropriate test event. A percentile score for each test event was determined by consulting table thirty-nine of the AAHPER Youth Fitness Test Manual (1)--Physical Fitness Test Norms, Percentile Scores for College Men. This percentile score was recorded on the profile record portion of the form. These percentile scores were plotted, indicating the physical fitness profile of the subject.

A form similar to the class composite record form recommended in the AAHPER Youth Fitness Test Manual was utilized to record the specific group's composite raw and percentile scores. In Appendix B, the name, age, height and weight of the student subjects were recorded in the designated areas of the form. The raw score and percentile score for each test event were recorded in the appropriate space on the form.

Exercise and Activities Administration

The selected exercise routines--intensives, isometrics, calisthenics, and continuous--were assigned to specific groups within each physical education class as presented in Table III.

TABLE III
SHORT DURATION EXERCISE ROUTINE ASSIGNMENT
IN EACH PHYSICAL EDUCATION CLASS

Class Section Number	Intensive	N	Isometric	N	Calisthenic	N	Continuous	N
02	Group I	12	Group II	12	Group III	11	Group IV	11
03	Group I	13	Group II	14	Group III	14	Group IV	15
04	Group I	11	Group II	11	Group III	10	Group IV	11
05	Group I	9	Group II	9	Group III	8	Group IV	9

The student subjects in each of the four physical education classes utilized in this study, sections 02, 03, 04, and 05 were divided into four separate groups. This division was accomplished according to an alphabetical listing of the subjects' last names. Each of the separate groups in the four physical education classes was assigned one of the selected exercise routines. The intensive exercise routine was assigned to Group I in each physical education class. The isometric exercise routine was assigned to Group II in each physical education class. The calisthenic exercise routine was assigned to Group III in each physical education class. The continuous

exercise routine was assigned to Group IV in each physical education class. Physical education class section 02 had the following number of subjects in each exercise group: Group I, twelve; Group II, twelve; Group III, eleven; and Group IV, eleven. Physical education class section 03 had the following number of subjects in each exercise group: Group I, thirteen; Group II, fourteen; Group III, fourteen; and Group IV, fifteen. Physical education class section 04 had the following number of subjects in each exercise group: Group I, eleven; Group II, eleven; Group III, ten; and Group IV, eleven. Physical education class section 05 had the following number of subjects in each exercise group: Group I, nine; Group II, nine; Group III, eight; and Group IV, nine.

After completion of the group assignments, each group selected one of its members to lead the group during the exercise periods. The investigator assisted the selected group leaders in administering their specific exercises to their specific groups.

The following short duration exercise routines were assigned to the appropriate groups and were used each class day for an eight-week period.

Intensive Exercise Routine

The intensive exercise routine prepared by Frosty Westering was used during this study (5). This short duration exercise routine consisted of the four following exercises:

1. The pull-up - The subject grasped, with his palms away from his body, a high horizontal bar and hung with his arms fully extended. Without swinging his body or raising or kicking his legs, the subject raised his body until his chin was above the level of the bar. He then lowered his body until his arms were completely extended. He performed as many pull-ups as possible in the thirty seconds allocated.

2. The push-up - The subject assumed a front lying position and supported his body on his hands and toes. His legs, with his feet together and knees straight, were extended backward. He held his hips, legs, and head in a straight line, and his hands were placed palms down in a position parallel with his shoulders. His arms were fully extended. He lowered his body by bending his elbows until his chest touched the fist of his partner. (The partner had placed his fist on the floor directly under the subject's chest). The subject then returned to the original position. He performed as many push-ups as possible in the thirty seconds allocated.

3. The bent knee sit-up - The subject assumed a back lying position with his knees bent upward. His feet were together and were held to the floor by his partner. The subject placed his hands behind his head and interlocked his fingers. He performed a sit-up, rotating his trunk and touching his left knee with his right elbow. He returned to the starting position and repeated the sit-up movement, rotating his trunk to the right and touching his right knee with his left elbow.

The performer returned to the starting position. He performed as many bent knee sit-ups as possible in the thirty seconds allocated.

4. The speed run - The subject ran on his toes, in place, as fast as possible for ten seconds. He then rested for ten seconds. The subject performed five repetitions of the speed run.

The four intensive exercises were administered to Group I of each physical education class as follows:

1. All subjects worked in pairs as partners to execute all exercises.

2. The partner not performing the exercise assisted the subject when a particular exercise so directed.

3. The subject performed the exercise while his partner counted the number of repetitions completed.

4. After the subject completed the exercise, the partner immediately changed positions with the subject and performed the exercise for the allocated time.

5. After each pair completed a specific exercise, they assumed their original positions and began the next exercise.

6. Each subject completed as many repetitions as possible of each exercise within the allocated time.

7. The exercises were performed on each physical education class day during the eight-week experimental period.

Isometric Exercise Routine

The Commander Set of isometric exercise routines, as prepared by Arthur H. Steinhaus in collaboration with the late Commander Charles D. Giague, USNR, was used during this study (4). This short duration exercise routine consisted of the thirteen following exercises:

1. The reach - The subject stood with his left arm extended high over his head. He reached up as high as possible while keeping both heels on the floor. The subject repeated the same procedure with his right arm.

2. The elbow push - The subject stood with his back to a wall, raised his elbows to shoulder height, raised his hands with palms down to collarbone level and touched the wall with his elbows. The subject pressed his elbows and the back of his neck as hard as possible against the wall.

3. The hand push - The subject placed his palms together with his fingers pointing upward; then he pressed his hands together as hard as possible.

4. The muscle maker - The subject extended his arms out from his sides and bent both elbows upward, relaxed his hands, and contracted his biceps as hard as possible.

5. The finger stretch - The subject held his arms in front of his body and extended his fingers as hard as possible.

6. The front flattener - The subject assumed a back lying position with his hands placed on his hips; while keeping his elbows off the floor, he raised his head, shoulders, and feet off the floor as high as possible.

7. The curver - The subject assumed a front lying position and placed his hands on his hips; while keeping his knees straight, he raised his head, shoulders, and feet off the floor as high as possible.

8. The arch raiser - The subject sat on the floor with the soles of his feet turned in toward each other; then he curled his toes under as far as possible.

9. The grip - The subject made a fist with each hand and gripped as hard as possible.

10. The twist - The subject extended his arms forward and tightly interlocked his fingers. He then tried to twist his arms inward. He repeated the same procedure outward.

11. The spread - The subject stood with the left side of his body against a wall; while keeping his left leg straight, he pressed his left foot as hard as possible against the wall. He repeated the same procedure with his right side.

12. The half squat - The subject stood with his hands on his hips and half bent his knees while keeping his heels off of the floor.

13. The heel stand - The subject stood with his back to a wall and with his heels approximately eight inches from the wall. He then stood on his heels and used the wall for balance.

The thirteen isometric exercise routines were administered to Group II of each physical education class as follows:

1. Each student subject performed the thirteen isometric exercise routines for six seconds at maximum strength of contraction.

2. The isometric exercise routine was performed on each physical education class day during the eight-week experimental period.

Calisthenic Exercise Routine

The calisthenic exercise routine illustrated in Level C of Chart 3 of the Royal Canadian Air Force's 5BX system was used during this study (3). The short duration exercise routine consisted of the five following exercises:

1. The body bend - The subject stood with his feet approximately thirty-six inches apart and held his arms upward with his hands together. On the count of one he bent his body to the left and touched the floor with his finger tips at approximately six inches outside his left foot. On the count of two, and without raising his body, the subject touched the floor between his feet with his finger tips. On the count of three the subject raised his body to the original position, and on the count of four he bent to the right and touched the floor with his finger tips approximately six inches outside his right foot. On the count of five he returned to the original position and bent backward as far as possible. The subject repeated the body bend as many times as possible for a two-minute period.

2. The sit-up - The subject assumed the back lying position with his feet together and interlocked his fingers tightly behind his head. On the count of one he sat up to a vertical position, keeping his hands behind his head and keeping his feet in contact with the floor. On the count of two he returned to the starting position. The subject repeated the sit-up as many times as possible for a one-minute period.

3. The back archer - The subject assumed a front lying position and interlocked his hands behind his back. On the count of one he lifted his head, shoulders, chest and both legs as high as possible. The subject was required to keep his legs straight and to raise his chest and both thighs completely off the floor. On the count of two he relaxed his body to the front lying position. He maintained the exercise position for ten seconds and the relaxed position for five seconds. The subject performed the back archer for a one-minute period.

4. The push-up - The subject assumed a front lying position and supported his body on his hands and toes. His legs, with his feet together and knees straight, were extended backwards. He held his hips, legs, and head in a straight line, and his hands were placed palms down in a position parallel with his shoulders, with his arms fully extended. On the count of one the subject lowered his body by bending his elbows and touched the floor in front of his hands with his chin. On the count of two he touched the floor behind his hands with

his forehead. On the count of three he returned to the original position. The subject performed as many push-ups as possible in a one-minute period.

5. The stationary run - The subject ran in place as fast as possible, lifting his feet off of the floor four inches, for seventy-five steps (a step was counted each time the left foot touched the floor). After completing the seventy-five steps, the subject performed ten bobbing jumps. One bobbing jump consisted of the subject placing his feet together and his hands on his hips; on the count of one he bent his knees until he was sitting on his heels; on the count of two he extended his body to an upright position. He was required to keep his feet in contact with the floor and his back straight.) After the subject completed ten bobbing jumps he continued the running in place. The subject performed the stationary run as many times as possible during a six-minute period.

The five calisthenic exercise routines were administered to Group III of each physical education class as follows:

1. Each student subject was required to perform the specific exercise routine for the entire time allocated that routine.
2. Each student subject was permitted a one-minute rest period between each of the five exercise routines.
3. The calisthenic exercise routine was performed on each physical education class day during the eight-week experimental period.

Continuous Exercise Routine

A thirty minute non-stop exercise routine created by Dr. Thomas K. Cureton was modified to a fifteen-minute exercise routine for use during this study (2). This short duration exercise routine consisted of the eleven following routines:

1. The walk and jog - (a) The subject walked one and one-half laps around the outside boundary of a regulation basketball court. (b) The subject jogged slowly for two laps around the outside boundary of a regulation basketball court. (Routine number one lasted one and one-half minutes.)

2. The windmill - The subject stood with his legs spread approximately thirty-six inches apart and extended his arms to the side. On the count of one he rotated his body to the left and bent over and touched his left toe with his right hand. The subject was required to keep his legs and left arm straight. On the count of two he returned to the original position. On the count of three he bent over and touched his right toe with his left hand. The subject was required to keep his legs and right arm straight. On the count of four he returned to the original position. The subject performed as many repetitions of the windmill exercise as possible for a one and one-half minute period.

3. The walk and jog - (a) The subject walked one and one-half laps around the outside boundary of a regulation basketball court. (b) The subject jogged three laps around the outside boundary of a regulation basketball court. (Routine number

4. The push-up and side straddle hop - (a) The subject assumed a front lying position and supported his body on his hands and toes. His legs, with his feet together and knees straight, were extended backward. He held his hips, legs, and head in a straight line, and his hands were placed palms down in a position parallel with his shoulders; his arms were fully extended. On the count of one the subject lowered his body by bending his elbows until his chest was approximately two inches from the floor. On the count of two he returned to the original position. The subject performed as many push-ups as possible in a forty-five second period. (b) The subject stood erect with his feet together and arms extended downward, hands to his sides. On the count of one he jumped into the air and thrust his legs to the side approximately thirty-six inches apart; concurrently, he placed his hands over his head, keeping his arms extended and raising them out from his side. On the count of two he returned to the original position. The subject performed the side straddle hop as many times as possible in a forty-five second period. (Routine number four lasted for one and one-half minutes.)

5. The walk, skip and jog - (a) The subject walked one lap around the outside boundary of a regulation basketball court. (b) The subject skipped two laps around the outside boundary of a basketball court. (c) The subject ran two laps around the outside boundary of a regulation basketball court. (Routine number five lasted for a two-minute period.)

6. The squat thrust and run in place - (a) The subject stood erect with his feet together, arms extended downward and hands to his sides. On the count of one he bent forward and placed his hands on the floor in a position three inches in front of and three inches outside his feet; on the count of two he thrust both feet backward until his legs were completely extended, landing on his toes. On the count of three he lowered his body to a position two inches above the floor, supported only by his hands and toes. On the count of four he extended his arms and raised his body, still with only his hands and toes supporting his body. On the count of five the subject thrust his feet under his body and between his hands. On the count of six he returned to the original position. The subject performed fifteen squat thrust movements. (b) The subject ran, in place, as fast as possible for a forty-five second period. (Routine number six lasted for one and one-half minutes.)

7. The jog - The subject jogged slowly around the outside boundary of a regulation basketball court for a one-minute period.

8. The walk - The subject walked briskly around the outside boundary of a regulation basketball court while breathing deeply and swinging his arms in a windmill style. Routine number eight lasted for a one-minute period.

9. The trunk bend and mountain climb - (a) The subject stood erect with his hands on his hips and feet approximately

twelve inches apart. On the count of one the subject bent forward from the waist; on the count of two he bent to the right from the waist; on the count of three he bent backward from the waist; and on the count of four he bent to his left from the waist. The subject performed the trunk bending exercise ten repetitions to the right and ten repetitions to the left. (b) The subject assumed an all fours position. He placed his hands on the floor at shoulder width, his feet were placed approximately thirty-six inches behind his hands, and his back was held straight. On the count of one he thrust his right foot into a position even with and outside his right hand, and on the count of two he returned his right foot to the original position. On the count of three he thrust his left foot into a position even with and outside his left hand, and on the count of four he returned his left foot to the original position. The subject performed the mountain climb for ten repetitions. (Routine number nine lasted for a two-minute period.)

10. The walk - The subject walked slowly around the outside boundary of a regulation basketball court for a thirty-second period.

11. The hop and walk - (a) The subject hopped on his right foot as many times as possible in a fifteen-second period. He hopped on his left foot as many times as possible in a fifteen-second period. (b) The subject completed the continuous exercise routine by walking slowly around the outside boundary of a

regulation basketball court for thirty seconds. (Routine number eleven lasted for a one-minute period.)

The eleven continuous exercise routines were administered to Group IV of each physical education class as follows:

1. The student subjects were required to complete the entire routine exactly as directed and without stopping.
2. The exercise routine was performed on each physical education class day during the eight-week test period.

An electric basketball clock was utilized by all groups during the fifteen-minute exercise periods.

Each regularly scheduled physical education class at Wharton County Junior College was fifty minutes in length. However, only thirty-five minutes were utilized for instructional purposes, with the remaining fifteen minutes being utilized by the students for dressing at the beginning and end of each class. During the present study, the selected exercise routines consumed fifteen minutes of each physical education class period; twenty minutes were devoted to participation and instruction in physical education activities.

A schedule was created to insure that each exercise group was exposed to identical activities and to the same amounts of physical education activities as was possible in addition to the four selected exercise routines. This procedure assured that the results obtained at the end of the experimental period reflected the benefits of the specific exercise routine rather than those of the physical education activity.

The activity schedule created for each group is presented in Table IV.

TABLE IV
ACTIVITY SCHEDULE

Date	Group I	Group II	Group III	Group IV
March 21 (22)	VB*	VB	TT*	VB
23 (24)	VB	VB	VB	TT
29 (29)	TT	VB	VB	VB
30 (31)	VB	TT	VB	VB
April 4 (5)	VB	VB	TT	VB
6 (7)	VB	VB	VB	TT
(12)	TT	VB	VB	VB
13 (14)	VB	TT	VB	VB
18 (19)	VB	VB	TT	VB
20 (21)	VB	VB	VB	TT
25 (26)	SB*	SB	FB*	FB
27 (28)	FB	SB	SB	FB
May 2 (3)	FB	FB	SB	SB
4 (5)	SB	FB	FB	SB
9 (10)	TT	VB	VB	VB
11 (12)	VB	TT	VB	VB

*VB, Volleyball; TT, Table Tennis; SB, Softball;
FB, Touch Football

For the eight-week period of this study, beginning March 21, 1966, and ending May 12, 1966, in addition to the four short duration exercise routines, each exercise group received equal instruction in four physical education activities--volleyball, table tennis, softball, and touch football. Groups I, II, III, and IV each received nine periods of volleyball instruction, three periods of table tennis instruction, two periods of softball instruction, and two periods of touch football instruction.

All groups met an equal number of days for an equivalent number of minutes.

Post-AAHPER Youth Fitness Test

The post-AAHPER Youth Fitness Test was administered to 173 of the 180 original subjects on May 16-19 and 23-24, 1966. Seven student subjects were not administered the post-test because of excessive absences during the experimental period. The procedures used for testing and recording in the pre-AAHPER Youth Fitness Test were duplicated in the post-test.

Treatment of Data

The following procedures were used to treat the data obtained from the pre-test and post-test administered to the student subjects:

1. The data were transferred from the original forms to IBM tabulating cards.
2. The results of the test were statistically treated by applying the Fisher χ^2 test for significance of difference

between the means and the standard deviation of the pre-test and post-test. These data were analyzed both within each individual group and between each individual group.

3. Significance of difference at the .05 level of confidence was arbitrarily selected for use in the study.

4. The IBM Computer Center at North Texas State University computed all data obtained during this study.

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CHAPTER IV
PRESENTATION AND ANALYSIS OF
DATA AND CONCLUSIONS

Three basic purposes were considered of primary importance to the effects of short duration exercises on physical fitness, namely: (1) to determine the effects of selected fifteen-minute exercise routines (intensive, isometric, calisthenic, and continuous) on the physical fitness development of junior college physical education students; (2) to determine the relationship between each of the four exercise routines and the improvement of physical development in a specific body area and (3) to determine if any one of the four selected exercise routines was of greater value than three alternate routines in assisting the individual to attain a higher degree of physical fitness development.

The following data are presented to assist in determining the value of the present study in relationship to the stated purposes.

Data comparing the pre-test and post-test performance of Group I in the seven test events are presented in Table V.

TABLE V
 COMPARISON OF GROUP I (INTENSIVE) PRE-TEST AND
 POST-TEST FOR ALL SEVEN TEST EVENTS

Seven Test Events	Pre-Test N=43		Post-Test N=43		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	6.35	2.95	8.67	3.50	-8.69	.001
Sit-up (Number)	45.88	17.10	57.65	16.45	-6.53	.001
Shuttle Run (Seconds)	10.21	6.70	9.60	.56	8.04	.001
Standing Broad Jump (Inches)	89.02	10.27	92.12	11.41	-4.09	.001
50 Yard Dash (Seconds)	6.85	.42	6.78	.46	2.04	.05
Softball Throw (Feet)	177.88	30.69	185.77	29.79	-2.96	.01
600 Yd. Run (Seconds)	121.65	21.81	114.91	15.83	3.68	.001

An examination of Table V will show the intensive exercise group, Group I, produced significant gains between the pre-test and post-test in each of the seven test events. Group I produced a mean gain of 2.32 repetitions on the pull-up; this gain is significant at the .001 level. Group I produced a mean gain of 11.77 repetitions on the sit-up; this gain is significant at the .001 level. Group I produced a mean gain of .61 seconds on the shuttle run; this gain is significant at the

.001 level. Group I produced a mean gain of .07 seconds on the fifty yard dash; this gain is significant at the .05 level. Group I produced a mean gain of 7.89 feet on the softball throw; this gain is significant at the .01 level. Group I produced a mean gain of 6.74 seconds on the 600 yard run/walk; this gain is significant at the .001 level.

Data comparing the pre-test and post-test performances of Group II in the seven test events are presented in Table VI.

TABLE VI
COMPARISON OF GROUP II (ISOMETRIC) ON PRE-TEST AND POST-TEST FOR ALL SEVEN TEST EVENTS

Seven Test Events	Pre-Test N=45		Post-Test N=45		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	6.13	2.96	6.24	3.19	- .35	NSD
Sit-up (Number)	52.64	23.94	57.09	17.35	-1.51	NSD
Shuttle Run (Seconds)	10.22	.62	9.65	.56	7.46	.001
Standing Broad Jump (Inches)	87.24	7.76	91.16	8.31	-4.65	.001
50 Yard Dash (Seconds)	6.84	.41	6.80	.39	1.03	NSD
Softball Throw (Feet)	177.00	27.88	184.22	28.21	-2.65	.02
600 Yd. Run (Seconds)	114.22	12.95	112.60	10.45	.99	NSD

An examination of Table VI will show the isometric exercise group, Group II, produced significant gains between the pre-test and post-test in three of the seven test events. Group II produced a mean gain of .57 seconds on the shuttle run; this gain is significant at the .001 level. Group II produced a mean gain of 3.92 inches on the standing broad jump; this gain is significant at the .001 level. Group II produced a mean gain of 7.22 feet in the softball throw; this gain is significant at the .02 level. Group II demonstrated no significant gain in the pull-up, sit-up, fifty-yard dash or 600-yard run/walk test events.

Data comparing the pre-test and post-test performances of Group III in the seven test events are presented in Table VII.

TABLE VII
COMPARISON OF GROUP III (CALISTHENIC) ON PRE-TEST AND
POST-TEST FOR ALL SEVEN TEST EVENTS

Seven Test Events	Pre-Test N=39		Post-Test N=39		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	6.79	3.31	7.08	3.77	-1.01	NSD
Sit-up (Number)	51.10	21.25	63.51	20.82	-5.60	.001
Shuttle Run (Seconds)	10.18	.59	9.62	.54	8.04	.001
Standing Broad Jump (Inches)	88.21	7.31	92.10	6.32	-4.69	.001
50 Yard Dash (Seconds)	6.82	.44	6.76	.38	1.20	NSD
Softball Throw (Feet)	175.31	24.60	179.00	24.07	-1.58	NSD
600 Yd. Run (Seconds)	114.05	9.65	110.31	12.20	2.63	.02

An examination of Table VII will show the calisthenic group, Group III, produced significant gains between the pre-test and post-test in four of the seven test events. Group III produced a mean gain of 12.41 repetitions on the sit-up; this gain is significant at the .001 level. Group III produced a mean gain of .56 seconds on the shuttle run; this gain is significant at the .001 level. Group III produced a mean gain of 3.89 inches on the standing broad jump; this is significant at the .001 level. Group III produced a mean gain of 3.74 seconds on the 600-yard run/walk; this gain is significant at the .02 level. Group III demonstrated no significant gain in the pull-up, fifty-yard dash or the softball throw test events.

Data comparing the pre-test and post-test performances of Group IV in the seven test events are presented in Table VIII.

TABLE VIII
COMPARISON OF GROUP IV (CONTINUOUS) ON PRE-TEST AND
POST-TEST FOR ALL SEVEN TEST EVENTS

Seven Test Events	Pre-Test N=46		Post-Test N=46		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	7.26	3.82	7.50	3.56	-.95	NSD
Sit-up (Number)	51.15	21.39	64.54	22.38	-7.40	.001
Shuttle Run (Seconds)	10.35	.92	9.59	.65	7.30	.001
Standing Broad Jump (Inches)	90.43	11.22	93.15	9.20	-3.50	.01
50 Yard Dash (Seconds)	6.74	.46	6.65	.44	2.74	.01
Softball Throw (Feet)	183.67	29.52	190.74	30.08	-3.57	.001
600 Yd. Run (Seconds)	113.87	20.79	106.87	13.63	3.29	.01

An examination of Table VIII will show the continuous exercise group, Group IV, produced significant gains between the pre-test and post-test in six of the seven test events. Group IV produced a mean gain of 13.39 repetitions on the sit-up; this gain is significant at the .001 level. Group IV produced a mean gain of .76 seconds on the shuttle run; this gain is significant at the .001 level. Group IV produced a mean gain of 2.72 inches on the standing broad jump; this gain is significant at the .01 level. Group IV produced a mean gain of .09 seconds on the fifty-yard dash; this gain is significant at the .01 level. Group IV produced a mean gain of 7.07 feet in the softball throw; this gain is significant at the .001 level. Group IV produced a mean gain of 7.00 seconds on the 600-yard run/walk; this gain is significant at the .01 level. Group IV demonstrated no significant gain on the pull-up test event.

Data comparing the mean differences between pre-test and post-test of Group I and Group II on seven test events are presented in Table IX which appears on the following page.

An examination of Table IX will show that the intensive exercise group, Group I, produced significant gains over the isometric exercise group, Group II, in three of the seven test events. Group I produced a mean gain of 2.32 repetitions on the pull-up; when compared to a mean gain of .11 repetitions by Group II, this difference was significant at the .001 level. Group I produced a mean gain of 11.77 repetitions on the sit-up; when compared to a mean gain of 4.45 repetitions by Group

TABLE IX
 COMPARISON OF MEAN DIFFERENCES BETWEEN
 PRE-TEST AND POST-TEST OF GROUP I
 (INTENSIVE) AND GROUP II
 (ISOMETRIC) ON SEVEN
 TEST EVENTS

Seven Test Events	Intensive Group I N=43		Isometric Group II N=45		Fisher	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	- 2.32	1.74	- .11	2.10	-5.63	.001
Sit-up (Number)	-11.77	11.69	-4.45	19.51	-2.32	.05
Shuttle Run (Seconds)	.61	.49	.57	.51	.29	NSD
Standing Broad Jump (Inches)	- 3.10	4.90	-3.92	5.58	.73	NSD
50 Yard Dash (Seconds)	.07	.21	.04	.24	.52	NSD
Softball Throw (Feet)	- 7.89	17.29	-7.22	18.08	- .19	NSD
600 Yd. Run (Seconds)	6.74	11.89	1.62	10.91	2.02	.05

II, this gain is significant at the .05 level. Group I produced a mean gain of 6.74 seconds on the 600-yard run/walk; when compared to a mean gain of 1.62 by Group II, this gain is significant at the .05 level.

Group I produced greater mean gains on the shuttle run, fifty-yard dash and softball throw than did Group II; however, these differences were not significant at the .05 level.

Group II produced a greater mean gain in the standing broad jump, but when compared to the mean gain by Group I, this difference was not significant at the .05 level.

Data comparing the mean differences between pre-test and post-test of Group I and Group III on seven test events are presented in Table X.

TABLE X
COMPARISON OF MEAN DIFFERENCES BETWEEN PRE-TEST
AND POST-TEST OF GROUP I (INTENSIVE)
AND GROUP III (CALISTHENIC)
ON SEVEN TEST EVENTS

Seven Test Events	Intensive Group I N 43		Calisthenic Group III N 39		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	- 2.32	1.74	- .29	1.72	-5.01	.001
Sit-up (Number)	-11.77	11.69	-12.41	13.65	.20	NSD
Shuttle Run (Seconds)	.61	.49	.56	.43	.45	NSD
Standing Broad Jump (Inches)	- 3.10	4.90	- 3.89	5.12	.69	NSD
50 Yard Dash (Seconds)	.07	.21	.06	.30	.11	NSD
Softball Throw (Feet)	- 7.89	17.29	- 3.69	14.37	-1.18	NSD
600 Yd. Run (Seconds)	6.74	11.89	3.74	8.79	1.14	NSD

An examination of Table X will show that the intensive exercise group, Group I, produced a significant gain over the calisthenic exercise group, Group III, in one of the seven test events. Group I produced a mean gain of 2.32 repetitions on the pull-up; when compared to a mean gain of .29 by Group III, this gain was significant at the .001 level.

Group I produced greater mean gains on the shuttle run, fifty-yard dash, softball throw, and 600-yard run/walk than did Group III; however, these differences were not significant at the .05 level.

Group III produced greater mean gains in the sit-up and standing broad jump, but when compared to Group I, these differences were not significant at the .05 level.

Data comparing the mean differences between pre-test and post-test of Group I and Group IV on seven test events are presented in Table XI which appears on the following page.

An examination of Table XI will show that the intensive exercise group, Group I, produced a significant gain over the continuous exercise group, Group IV, in one of the seven test events. Group I produced a mean gain of 2.32 repetitions on the pull-up; when compared to a mean gain of .24 by Group IV, this gain was significant at the .001 level.

Group I produced greater mean gains in the standing broad jump and softball throw than did Group IV; however, these differences were not significant at the .05 level.

TABLE XI
COMPARISON OF MEAN DIFFERENCES BETWEEN PRE-TEST AND
POST-TEST OF GROUP I (INTENSIVE) AND
GROUP IV (CONTINUOUS) ON
SEVEN TEST EVENTS

Seven Test Events	Intensive Group I N=43		Continuous Group IV N=46		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	- 2.32	1.74	- .24	1.68	-5.34	.001
Sit-up (Number)	-11.77	11.69	-13.39	12.13	.52	NSD
Shuttle Run (Seconds)	.61	.49	.76	.70	-1.32	NSD
Standing Broad Jump (Inches)	- 3.10	4.90	- 2.72	5.20	- .34	NSD
50 Yard Dash (Seconds)	.07	.21	.09	.21	- .42	NSD
Softball Throw (Feet)	- 7.89	17.29	- 7.07	13.27	- .24	NSD
600 Yd. Run (Seconds)	6.74	11.89	7.00	14.28	- .10	NSD

Group IV produced greater mean gains on the sit-up, shuttle run, fifty-yard dash and 600-yard run/walk, but when compared to the mean gain of Group I, the differences were not significant at the .05 level.

Data comparing the mean differences between pre-test and post-test of Group II and Group III on seven test events are presented in Table XII.

TABLE XII
COMPARISON OF MEAN DIFFERENCES BETWEEN PRE-TEST AND
POST-TEST OF GROUP II (ISOMETRIC) AND
GROUP III (CALISTHENIC) ON
SEVEN TEST EVENTS

Seven Test Events	Isometric Group II N=45		Calisthenic Group III N=39		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	- .11	2.10	- .29	1.72	.42	NSD
Sit-up (Number)	-4.45	19.51	-12.41	13.65	2.46	.02
Shuttle Run (Seconds)	.57	.51	.56	.43	.18	NSD
Standing Broad Jump (Inches)	-3.92	5.58	- 3.89	5.12	.01	NSD
50 Yard Dash (Seconds)	.04	.24	.06	.30	- .40	NSD
Softball Throw (Feet)	-7.22	18.08	- 3.69	14.37	-1.00	NSD
600 Yd Run (Seconds)	1.62	10.91	3.74	8.79	- .82	NSD

An examination of Table XII will show that the calisthenic exercise group, Group III, produced a significant gain over the isometric exercise group, Group II, in one of the seven test events. Group III produced a mean gain of 12.41 repetitions on the sit-up; when compared to a mean gain of 4.45 by Group II, this gain was significant at the .02 level.

Group III produced greater mean gains on the pull up, fifty-yard dash, and the 600 yard run/walk than did Group II; however, these differences were not significant at the .05 level.

Group II produced greater mean gains on the shuttle run, standing broad jump, and softball throw, but when compared to Group II, these differences were not significant at the .05 level.

Data comparing the mean differences between pre-test and post-test of Group II and Group IV on seven test events are presented in Table XIII, which appears on the following page.

An examination of Table XIII will show that the continuous exercise group, Group IV, produced significant gains over the isometric exercise group, Group II, in two of the seven test events. Group IV produced a mean gain of 13.39 repetitions on the sit-up; when compared to a mean gain of 4.45 repetitions by Group II, this difference was significant at the .001 level. Group IV produced a mean gain of 7.00 seconds on the 600-yard run/walk; when compared to a mean gain of 1.62 seconds by Group II, this gain was significant at the .05 level.

Group IV produced greater mean gains on the pull-up, shuttle run and fifty-yard dash than did Group II; however, these differences were not significant at the .05 level.

Group II produced greater mean gains on the standing broad jump and the softball throw, but when compared to Group IV, these differences were not significant at the .05 level.

TABLE XIII
COMPARISON OF MEAN DIFFERENCES BETWEEN PRE-TEST AND
POST-TEST OF GROUP II (ISOMETRIC) AND
GROUP IV (CONTINUOUS) ON
SEVEN TEST EVENTS

Seven Test Events	Isometric Group II N=45		Continuous Group IV N=46		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	- .11	2.10	- .24	1.68	.33	NSD
Sit-up (Number)	-4.45	19.51	-13.39	12.13	2.88	.001
Shuttle Run (Seconds)	.57	.51	.76	.70	-1.63	NSD
Standing Broad Jump (Inches)	-3.92	5.58	- 2.72	5.20	-1.08	NSD
50 Yard Dash (Seconds)	.04	.24	.09	.21	- .96	NSD
Softball Throw (Feet)	-7.22	18.08	- 7.07	13.27	- .05	NSD
600 Yard Run (Seconds)	1.62	10.91	7.00	14.28	-2.16	.05

Data comparing the mean differences between pre-test and post-test of Group III and Group IV on seven test events are presented in Table XIV which appears on the following page.

An examination of Table XIV will show that neither the calisthenic exercise group, Group III, nor the continuous exercise group, Group IV, demonstrated significant improvements when their mean gains on the seven test events were compared.

TABLE XIV
 COMPARISON OF MEAN DIFFERENCES BETWEEN PRE-TEST AND
 POST-TEST OF GROUP III (CALISTHENIC) AND
 GROUP IV (CONTINUOUS) ON
 SEVEN TEST EVENTS

Seven Test Events	Calisthenic Group III N-39		Continuous Group IV N-46		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-up (Number)	- .29	1.72	- .24	1.68	- .11	NSD
Sit-up (Number)	-12.41	13.65	-13.39	12.13	.30	NSD
Shuttle Run (Seconds)	.56	.43	.76	.70	-1.74	NSD
Standing Broad Jump (Inches)	- 3.89	5.12	- 2.72	5.20	-1.03	NSD
50 Yard Dash (Seconds)	.06	.03	.09	.21	- .53	NSD
Softball Throw (Feet)	- 3.69	14.37	- 7.07	13.27	.96	NSD
600 Yd Run (Seconds)	3.74	8.79	7.00	14.28	-1.26	NSD

Group IV produced greater mean gains on the sit-up, shuttle run, fifty-yard dash, softball throw and 600-yard run/walk than did Group III; however, these differences were not significant at the .05 level.

Group III produced greater mean gains in the pull-up and standing broad jump, but when compared to Group IV, these differences were not significant at the .05 level.

Conclusions

Within the limits of this study the following conclusions, consistent with the stated null hypotheses, are presented.

1. There will be no significance of difference in mean scores between pre-test scores and post-test scores for each of seven test events of physical fitness within student Groups I, II, III, and IV, respectively.

a. Data presented in Table V indicate that Group I produced significant gains between pre-test and post-test in each of seven test events. The portion of null hypothesis number one concerning Group I is therefore rejected.

b. Data presented in Table VI indicate that Group II produced significant gains between pre-test and post-test in three of the seven test events. The portion of null hypothesis number one concerning Group II is rejected on the shuttle run, standing broad jump, and softball throw test events. The portion of null hypothesis number one concerning Group II is accepted on the pull-up, sit-up, fifty-yard dash, and 600-yard run/walk test events.

c. Data presented in Table VII indicate that Group III produced significant gains between pre-test and post-test in four of seven test events. The portion of null hypothesis number one concerning Group III is rejected on the sit-up, shuttle run, standing broad jump, and 600-yard run/walk test events. The portion of null hypothesis

number one concerning Group III is accepted on the pull-up fifty-yard dash, and softball throw test events.

d. Data presented in Table VIII indicate that Group IV produced significant gains in six of the seven test events. The portion of null hypothesis number one concerning Group IV is rejected on the sit-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600-yard run/walk test events. The portion of null hypothesis number one concerning Group IV is accepted on the pull-up test event.

2. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group II.

Data presented in Table IX indicate that there was no significance of difference in mean score changes from pre-test to post-test scores between Group I and Group II on the shuttle run, standing broad jump, fifty-yard dash, and softball throw test events. Null hypothesis number two is accepted on these four test events; however, null hypothesis number two is rejected on the pull-up, sit-up, and 600-yard run/walk test events. Group I produced significant gains over Group II in the pull-up, sit-up and 600-yard run/walk test events.

3. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group III.

Data presented in Table X indicate that there was no significance of difference in mean score changes from pre-test

to post-test scores between Group I and Group III on the sit-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600-yard run/walk test events. Null hypothesis number three is rejected on the pull-up test event. Group I produced a significant gain over Group III in the pull-up test event.

4. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group IV.

Data presented in Table XI indicate that there was no significance of difference in mean score changes from pre-test to post-test scores between Group I and Group IV on the sit-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and the 600-yard run/walk test events. Null hypothesis number four is accepted on these six test events; however, null hypothesis number four is rejected on the pull-up test event. Group I produced a significant gain over Group IV on the pull-up test event.

5. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group II and student Group III.

Data presented in Table XII indicate that there was no significance of difference in mean score changes from pre-test to post-test scores between Group II and Group III on the pull-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600-yard run/walk test events. Null hypothesis

number five is rejected on the sit-up test event. Group III produced a significant gain over Group II in the sit-up test event.

6. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group II and student Group IV.

Data presented in Table XIII indicate that there was no significance of difference in mean score changes from pre-test to post-test scores between Group II and Group IV on the pull-up, shuttle run, standing broad jump, fifty-yard dash, and softball throw test events. Null hypothesis number six is accepted on these five test events; however, null hypothesis number six is rejected on the sit-up and 600-yard run/walk test events. Group IV produced significant gains over Group II in the sit-up test event.

7. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group III and student Group IV.

Data presented in Table XIV indicate that there was no significance of difference in mean score changes from pre-test to post-test scores between Group III and Group IV on any of the seven test events. Null hypothesis number seven is therefore accepted.

CHAPTER V

SUMMARY, INFERENCES, AND RECOMMENDATIONS

Summary

The present study sought to examine the effects of four selected short duration exercise routines on development of physical fitness for junior college students.

The three purposes of the study were:

1. To investigate the development of physical fitness through the medium of fifteen-minute exercise routines in junior college physical education classes.

2. To determine the relationship between each of four exercise routines and the improvement of physical development in a specific body area.

3. To compare the results of intensive, isometric, calisthenic, and continuous exercise routines to determine if any one routine was of greater value to three alternate routines in assisting the individual to attain a higher degree of physical fitness development.

Consistent with the purposes, the study was designed to test these general hypotheses:

1. Student groups subjected to certain selected exercise routines will show significant improvement in each of seven selected measures of physical fitness.

2. Each of four selected exercise routines will prove to be of greater value than the three alternate routines in demonstrating improvement for certain specific measures of physical fitness.

3. One of the four selected exercise routines will prove to be of greater value than the three alternate routines in the development of physical fitness throughout a range of physical fitness test events.

The following null hypotheses were converted from the stated general hypotheses:

1. There will be no significance of difference in mean scores between pre-test scores and post-test scores for each of seven test events of physical fitness within student Groups I, II, III, and IV, respectively.

2. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group II.

3. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group III.

4. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group I and student Group IV.

5. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group II and student Group III.

6. There will be no significance of difference in mean score changes from pre-test scores to post-test scores between student Group II and student Group IV.

7. There will be no significance of difference in mean score change from pre-test scores to post-test scores between student Group III and student Group IV.

A summary of the procedures used to collect data relevant to this study is as follows:

1. One hundred and eighty student subjects were selected from four physical education classes at Wharton County Junior College conducted during the spring semester, 1966.

2. The student subjects within each class were divided into four groups. Each group was assigned one selected short duration exercise routine as follows: Group I, Intensive; Group II, Isometric; Group III, Calisthenic; Group IV, Continuous.

3. The student subjects were pre-tested with the AAHPER Youth Fitness Test.

4. The student subjects began exercising according to the direction of their specific short duration exercise routine. These exercises were performed by the student subjects the first fifteen minutes of each physical education class for an eight-week period, twice weekly, experimental period.

5. One hundred and seventy-three subjects were post-tested with the AAHPER Youth Fitness Test at the conclusion of

the eight-week experimental period. Seven subjects were not post-tested because of excessive absences during the experimental period.

6. The data obtained from the pre-test and post-test were statistically treated to determine the effects of the specific short duration exercise routine.

Consistent with the stated null hypotheses, a summary of the conclusions determines that

1. Each of the four selected exercise routines produced gains between pre-test and post-test in each of seven test events; however, each exercise group was unique in producing significant gains in each of the seven test events. These significant gains were:

a. Group I produced significant gain between pre-test and post-test in each of the seven test events, thus rejecting the portion of null hypothesis number one concerning Group I in each of the seven test events.

b. Group II produced significant gains between pre-test and post-test in three of the seven test events--shuttle run, standing broad jump, and softball throw, thus rejecting the portion of null hypothesis number one concerning Group II in these three test events.

c. Group III produced significant gains between pre-test and post-test in four of seven test events--sit-up, shuttle run, standing broad jump, and 600-yard run/walk, thus rejecting the portion of null hypothesis number one

d. Group IV produced significant gains between pre-test and post-test in six of the seven test events-- sit-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600 yard run/walk, thus rejecting the portion of null hypothesis number one concerning Group IV in these six test events.

2. Group I produced no significance of difference in mean score changes from pre-test to post-test scores over Group II on the shuttle run, standing broad jump, fifty-yard dash, and softball throw test events. Thus, null hypothesis number two is accepted on these four test events. Null hypothesis number two was rejected on the pull-up, sit-up, and 600-yard run/walk test events because Group I produced significant gains over Group II on these three events.

3. Group I produced no significance of difference in mean score changes from pre-test to post-test scores over Group III on the sit-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600-yard run/walk test events. Thus, null hypothesis number three is accepted on these six test events. Null hypothesis number three is rejected on the pull-up test event because Group I produced significant gains over Group II on this test event.

4. Group I produced no significance of difference in mean score changes from pre-test to post-test scores over Group IV on the sit-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600-yard run/walk test

events. Thus, null hypothesis number four is accepted on these six test events. Null hypothesis number four is rejected on the pull-up test event because Group I produced a significant gain over Group IV on this event.

5. Group II produced no significance of difference in mean score changes from pre-test to post-test scores over Group III on the pull-up, shuttle run, standing broad jump, fifty-yard dash, softball throw, and 600-yard run/walk test events. Thus, null hypothesis number five is accepted on these six test events. Null hypothesis number five is rejected on the sit-up test event because Group III produced a significant gain over Group II on this test event.

6. Group II produced no significance of difference in mean score changes from pre-test to post-test scores over Group IV on the pull-up, shuttle run, standing broad jump, fifty-yard dash, and softball throw test events. Thus, null hypothesis number six is accepted on these five test events. Null hypothesis number six is rejected on the sit-up and 600-yard run/walk test events because Group IV produced significant gains over Group II on these test events.

7. Group III produced no significance of difference in mean score changes from pre-test to post-test scores over Group IV in any of the seven test events. Thus, null hypothesis number seven is accepted.

Inferences

Consistent with the general hypotheses and upon review of the stated conclusions, the following inferences were formulated:

1. The intensive exercise routine, the isometric exercise routine, the calisthenic exercise routine, and the continuous exercise routine are each useful in the development of physical fitness by male junior college students, as measured by the AAHPER Youth Fitness Test.
2. The intensive exercise routine tends to be of greater value than the three alternate routines in the improvement of pull-up and softball throw in male junior college students.
3. The isometric exercise routine tends to be of greater value than the three alternate routines in the improvement of standing broad jump in male junior college students.
4. The continuous exercise routine tends to be of greater value than the three alternate routines in the improvement of sit-up, shuttle run, fifty-yard dash, and 600-yard run/walk in male junior college students.
5. The intensive exercise routine tends to be of greater value than the three alternate exercise routines in the development of total physical fitness in male junior college students.
6. The physical fitness development of students can be improved when the physical education instructor utilizes an organized and purposeful routine which is related to the needs of the student.

7. Improvement in arm and shoulder strength tends to be related to the intensive exercise routine more than to the three alternate routines.

8. Improvement in leg strength tends to be related more to the isometric exercise routine than to the three alternate routines.

9. Improvement in abdominal strength, agility and rhythm condition, speed and cardio-vascular efficiency are more related to the continuous exercise routine than to the three alternate routines.

Recommendations

The following recommendations were formulated:

1. Physical educators should analyze the specific needs of their physical education students and prescribe the appropriate short duration exercise routines that would assist in alleviating the needs.

2. A study similar to the present study should be conducted, increasing the frequency of exposure to three, four, or five times per week. This would ascertain if the results obtained from the present study would be affected by increased frequency to exposure.

3. A study similar to the present study should be conducted, using female subjects and different age-level subjects to determine if the results obtained from this study are applicable to the opposite sex and/or different age-levels.

4. A study should be conducted to determine if the seven test events of the AAHPER Youth Fitness Test are accurate measures of the physical fitness development of the student.

APPENDIX A

The AAHPER Youth Fitness Test

Name _____ Age _____

Height _____ Weight _____

Test 1

Test 2

Date _____

Date _____

Pull-up _____

Sit-up _____

Shuttle Run _____

Standing Broad Jump _____

50-Yard Dash _____

Softball Throw _____

600-Yard Run/Walk _____

PROFILE RECORD

Pull-up

Sit-up

Shuttle Run

Standing

Broad Jump

50-Yard Dash

Softball

Throw

600-Yard

Run/Walk

5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100

APPENDIX B

**CLASS COMPOSITE RECORD
for the
AAHPER Youth Fitness Test**

Location:		School:								
Name of Student	Date of Birth	Ht.	Wt.	Sit-up	Pull-up	Shuttle Run	Stand- ing Br Jump	500- Yard	Soft- ball Throws	600- Yard

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