

THE EFFECTS OF SHORT DURATION EXERCISES ON THE
DEVELOPMENT OF PHYSICAL FITNESS

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THE EFFECTS OF SHORT DURATION EXERCISES ON THE
DEVELOPMENT OF PHYSICAL FITNESS

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CHAPTER I

THE EFFECTS OF SHORT DURATION EXERCISES ON THE DEVELOPMENT OF PHYSICAL FITNESS

Introduction

Many physical educators throughout the nation have been seeking to improve the physical fitness of children in the public schools. Emphasis upon physical fitness has become a challenge to the physical education profession, partially as a result of the famed Kraus-Weber Tests, which found that the youth of America tended to make inferior scores on the physical fitness items as compared to the scores of children of Japan, England, Wales, and other countries. Such results led to the assumption that greater stress should be placed on physical fitness.

In addition to the Kraus-Weber Tests, the establishment of a special governmental agency, The President's Council on Physical Fitness, stimulated physical educators to seek an increased level of physical fitness for students in American schools. This led to accelerated programs designed solely for narrowly conceived concepts of physical fitness development. These crash programs have often been substituted for physical education, and in many instances disregard the objectives of physical education in the physical education programs for the American youth.

It is agreed by many in the field of physical education that the desire to improve physical fitness should not result in the deterioration of a broader concept of physical education. It therefore appears that the physical educators of the nation need to reappraise the objectives to determine whether or not the great emphasis now being placed on physical fitness has not in fact weakened the total program of physical education in the public schools.

It would seem evident that physical educators should seek not only to offer a program designed to raise physical fitness to an acceptable level, but also should offer one which will allow time for the teaching of other important aspects of physical education. Consideration should, in this respect, be given to the related areas of game and skill activities, desirable attitudes and habit formation, and the introduction of activities which can be carried over into leisure or adult life.

Many short length exercise routines designed to improve physical fitness have been developed by individuals working in the area of physical education. Analysis and comparison of these programs are a necessity if the profession is to determine the most effective methods of developing physical fitness without a sacrifice of other desirable objectives.

Most activity programs will benefit physical fitness when followed purposefully. However, in many of the nation's

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schools, physical education is not a class which meets daily. Instead, physical education classes may meet but one, two, or three times per week. The situation has created a need for a study that emphasizes two conditions, time and exercise, to ascertain if the objective of physical fitness, and the additional goals of physical education can be pursued together profitably in an organized and purposeful program.

Statement of Problem

The effects of short duration exercise routines on the development of physical fitness.

Purposes of the Study

The following purposes were formulated:

1. To investigate the development of physical fitness using only a fifteen minute portion of the physical education period for an exercise routine.
2. To compare the results of the isometric, intensive, and calisthenic routines to determine if one routine was superior in meeting the goals of fitness development.
3. To determine if a combination of the three exercise routines would be advantageous for the development of all facets of physical fitness.
4. To investigate the differences in physical fitness growth as a result of exposure to exercise once a week, twice a week, and three times a week in randomly selected students in physical education classes.

5. To compare the results of groups using isometrics, intensives, and calisthenics with the control groups exposed only to the other physical education activities.

Hypotheses

Consistent with the above purposes the study was designed to test the following hypotheses:

1. The student groups subjected to isometrics, intensives, and calisthenics, will show significant improvement (at the .05 level) in seven measures of physical fitness tested during the twelve weeks period of exposure.

2. The improvement in cardio-vascular endurance, abdominal strength, leg power, speed and agility, and speed, for those students subjected to calisthenics and intensives will be significantly greater than those students using isometrics.

3. The improvement in bicep strength and arm power for those students subjected to isometrics and intensives will be significantly greater than those students using calisthenics.

4. The group exposed to three periods per week of physical education will show a significant improvement on seven components of physical fitness over those meeting twice a week when the same routine is employed.

5. The groups exposed to two periods per week of physical education will show a significant improvement on

seven components of physical fitness over those meeting once a week when the same routine is employed.

6. The control groups will show no significant improvement on the seven components of physical fitness.

Background and Significance of the Study

In seeking to offer comprehensive physical education programs, the physical educator is often restricted because of insufficient time allotted to physical education. The two major problems which commonly confront the physical educator are (1) the size of physical education classes is often quite large, frequently exceeding 100 students, or the limits of effective individualized instruction; and (2) the classes frequently meet only once, twice, or three times weekly. Such problems challenge the instructor to utilize every minute of each physical education class period to its maximum.

The initial part of the normal physical education class period is usually devoted to group exercise routines of some type. Such exercises usually have a twofold purpose. Some exercises are especially selected for their contribution to the development of strength, endurance, and other components of physical fitness. In addition, the exercises may serve as warm-up for further activities. The time spent in exercises, and exercise routines, varies according to the emphasis attached to physical fitness.

While the development of physical fitness is an integral part of the total physical education program, it is necessary to keep physical fitness in its proper perspective. It is equally important to continue a diversified activity program that will introduce each student to many activity skills that can be utilized throughout his lifetime.

The study sought to find a type of exercise that would aid in the development of a satisfactory degree of physical fitness while allowing time for skill and recreational development. The three exercise routines, isometrics, intensives, and calisthenics, that were employed have been used with good results by various physical educators. The study attempted to find which of these routines would best meet the demands of the students. It also sought to determine if there was in fact a marked difference in the degree of fitness attained according to the exposures per week.

It is suggested that the study may serve as follows:

1. To aid the physical educator in utilizing time more efficiently to develop physical fitness and present other worthwhile activities.
2. To determine which of the three exposures, one, two, or three times per week, is the most advantageous for a developmental program of physical education.
3. To encourage physical educators to test, develop,

or integrate exercise routines that are more effective than the routines currently employed.

4. To encourage those within the profession to treat all aspects of physical education, including physical fitness, equally.

5. To aid those terminating their education at the junior high level in obtaining knowledge of worthy use of leisure time.

6. To aid such groups as the President's Council on Physical Fitness in securing information that may assist them in improving the quality of physical education instruction.

Definition of Terms

In the study the following definitions were used:

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

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

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

4. Junior High School--an educational unit composed of grades seven, eight, and nine.

5. Physical Education--the program which provides for the mental, social, physical, and emotional growth of the

individual through the use of selected physical activities.

6. Physical Fitness--the quality of the status of the individual at a given time--associated with the possession of seven components of physical fitness: arm strength, abdominal strength, speed and agility, speed, leg power, arm power, and endurance.

7. Frequency of Exposure--the number of times the individual is subjected to exercise per week.

8. Wilks' lambda test--a statistical procedure for evaluating the difference between two or more groups on several measures.

The study referred to an acceptable level of physical fitness. The President's Council on Physical Fitness has suggested that a physically fit individual would be capable of participating in normal activities, enjoying recreational pursuits, and meeting unexpected emergencies.

Passing scores on the Kraus-Weber Tests would be regarded by most physical educators as only meeting the minimum requirements of physical fitness. Recognizing that an acceptable level of physical fitness is individual in nature, the study arbitrarily chose the mean performances of the Youth Fitness Tests as the acceptable level of physical fitness.

Limitations of the Study

The limitations are as follows:

1. To investigate only the effects of isometrics, intensives, and calisthenics on the growth of physical fitness.
2. To apply the results only to junior high school boys in a typical midwestern urban area.
3. To investigate the effect of one day a week, two days a week, and three days a week of exposure to physical education.
4. To investigate only those components associated with physical fitness.

Basic Assumptions

1. It was assumed that the fact that all classes were taught by the same instructor would eliminate the difficulty of separating the effects of the teacher from the effects of the method.
2. It was assumed that all aspects of the program, with the exception of the exercise period, were constant for all groups. The use of only one instructor would eliminate differences which might otherwise occur.
3. It was assumed that there would be no unique differences in groups when chosen by random selection.
4. It was assumed that the activities participated in by the student subjects outside of the physical education class would not vary appreciably to the extent that they would affect the results of the classes.

significantly affect the study, since the period immediately following lunch was eliminated from the study.

6. It was assumed that the initial orientations would be identical since they were given to all but the control groups by the same instructor.

A Survey of Previous Studies

Studies Involving Isometrics

A comparative study of Howell and others (12) examined the effects of isometric and isotonic exercise programs upon muscular endurance. In view of their findings the investigators hypothesized that increases in muscular endurance may be effected by isometric contractions. They also noted that The Commander Set of isometrics produced results similar to those attained through thirty minutes of weight lifting.

Berger (2) analyzed the results obtained by static and dynamic training programs conducted with college male students. His findings indicated that static, or isometric, exercises might actually result in a greater increase in strength than dynamic training. He hypothesized that this was partially due to the result of fatigue build-up in the dynamic workout. Hettinger and Muller (18) were also able to prove the effectiveness of isometric training. These investigators reported a 5 per cent strength increase as a result of various short time contractions.

Muller and Rohmert (18) in repeating the above study concluded that a single maximal training contraction acts as a gradually diminishing stimulus for strength increase for a period of seven days as the individual nears his maximal strength level. Reductions in girth and subcutaneous fat were observed by Mohr (15) as a result of isometric exercise in a study of women. Six-second contractions were used in this study.

Studies Involving Calisthenics

Calisthenics programs have been used in various studies. Fabricus (10) in an experiment with elementary children noted that the inclusion of six calisthenics in each physical education period made significant improvements in the students' overall physical fitness, but did not appreciably alter the basic instructional program. Similar findings were reported by Henry and Prue (11) using overweight girls as subjects. These investigators, using the Royal Canadian Air Force XBX Program, devoted only twelve minutes of class time to exercises. The results of the twenty-one girls completing the course showed a loss of weight in twelve, and an increase in physical fitness in nineteen.

Studies Involving Periods of Exposure

The element of time necessary for the development of satisfactory gains in physical fitness has been studied by

others in the field of physical education. DeVries (7) investigated the effects of minimal time programs upon selected motor fitness measures of college men. His findings indicated significant improvement in all variables, and led to the conclusion that some improvement in motor fitness can be made with as little as one hour per week of activity. A survey of Indiana high schools by Stafford (3) concluded that the type of activity and the amount of time allotted to class activities were related to the physical development of the pupils.

Summary

As a result of studies (2, 7, 8, 10, and 12) there appears to be a general agreement among the researchers that isometric contractions can provide significant gains in physical fitness. Studies (9 and 11) using short length periods of calisthenics also produced results indicating the growth of physical fitness through this medium. The importance of exposure to physical activity is noted in the reports of DeVries and Stafford.

Procedures for Collecting Data

In order to test the hypotheses established in this study, the entire male enrollment of the physical education classes was the subject of a controlled experiment using various types of exercise routines. Four hundred and

twenty boys in the seventh, eighth, and ninth grades were included.

Prior to the introduction of the present study the American Association for Health, Physical Education, and Recreation, AAHPER, Youth Fitness Tests were administered. Following the tests the boys were divided first by random selection into physical education classes. Four groups of students, meeting only one day per week, were designated Intensive I, Isometric I, Calisthenic I, and Control I.

The students meeting two days per week were likewise designated Intensive II, Isometric II, Calisthenic II, and Control II. Similarly, the four groups meeting three times weekly were designated Intensive III, Isometric III, Calisthenic III, and Control III.

The following short-time exercise routines for the twelve weeks duration of the study:

1. The Commander Set, an isometric routine developed by Arthur H. Steinhaus, dean and professor of physiology at George Williams College of Chicago. The routine consists of thirteen individual contractions, which, according to Steinhaus, will increase strength at about 4 per cent per week.

2. The intensity drills developed by Woldemar Gershler and refined by Forrest Westering at Parsons College, Fairfield, Iowa.

3. The SBX Plan of calisthenics developed by the Royal Canadian Air Force.

The three control groups received instruction in health, physical education, and recreation during the fifteen minute exercise period. Through the use of films, visiting lecturers, and short field trips, the program was designed to be interesting and different from previous exposures.

Following the twelve weeks experimentation period the AAHPER Youth Fitness Test was again administered to all groups.

Procedures for Treating Data

The hypotheses were tested by examining the data and treating them statistically in the following manner:

1. Hypothesis number one was tested by the use of Wilks' lambda test (6). When a significance of difference was found, Fisher's t test was employed to ascertain the level of significance.

2. Hypothesis number two was tested by a simple analysis of variance. When a significant difference was found, Fisher's t test was employed to determine the level of significance.

3. Hypothesis number three was tested by simple analysis of variance. When a significant level of difference was found, Fisher's t test was employed to determine the level of significance.

4. Hypothesis number four was tested by Wilks' lambda test.

When a significant level of difference was found, Fisher's t test was employed to determine the level of significance.

5. Hypothesis number five was tested by Wilks' lambda test. When a significant level of difference was found, Fisher's t test was employed to determine the level of significance.

6. Hypothesis number six was tested by Wilks' lambda test. When a significant F ratio was obtained, Fisher's t test was used to determine where the difference occurred.

Each of the above hypotheses was arbitrarily accepted or rejected at the .05 level of significance.

All computations were conducted at the IBM Computer Center at North Texas State University.

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CHAPTER II

THE HISTORICAL FOUNDATIONS OF PHYSICAL EDUCATION

Physical education has, through history, been one source of assistance to the people and their respective countries in meeting the challenges hurled at them by the problems of the times. For this reason it has been noted that "the amount and type of physical education practiced by a people reflect its philosophy and frequently serve to reveal the dominant purpose of the state" (70, p. 1).

Physical activity has by necessity been practiced by people since the primitive man used such activity to survive. Corrective physical education has also been found to have existed since early times. "Records and drawings have been found presenting the use of crude corrective gymnastics by the Chinese about 3000-2600 B. C. There is evidence of the use of exercise, massage, and baths by the early Egyptians, Hindus, Greeks, and Romans" (11, p. 2).

It has also been observed that the rulers of ancient Sparta and Persia recognized the need for a fit male populace. Primarily, the purpose of these two state rulers was conquest. Elaborate programs of skill activities and games were

developed to raise the quality of physical prowess among the soldiers of these countries.

There have also been periods in the past where the practice of physical education has been quite limited. During the medieval period in Europe only mental activity was recognized as being a worthy pursuit. One authority has noted that this was not limited to Europe. "The people of India, who believed in subjugating the body as a means of elevating the soul, discouraged enjoyable physical activity" (70, p. 10).

Physical education has existed within the confines of institutions of education for centuries. It has been recorded that in ancient Greece the gymnasia were formed, and from within this source of physical activity grew the academic subjects. Brownell has observed that an important milestone in the unfolding concept of physical education is found in Athenian education of the fifth century B. C., which "saw physical education rise to a place of honor not since achieved in the schools and colleges of the modern world" (7, p. 40).

The need for physical education in this country has not had such recognition in our schools. A need for physical activity has been recognized, but not the need for organized physical education. The early Puritans looked with distaste upon such practices within the confines of our schools.

In addition, most early physical educators sought to draw, as had their academic counterparts, from the European systems. Formalized gymnastics, as advocated by Jahn and Muth of Germany, were introduced but failed to gain widespread acceptance. Ling's corrective exercise activities, from Sweden, met with even a cooler reception.

Physical education began in the schools of this country through student initiative and desire. The students, looking for an outlet for pent-up emotions, developed games and activities which, unlike their European counterparts, were informal. It was not until our country was faced with war did physical education and physical fitness gain recognition in our schools.

The country's physical education programs have swung in a pendulum manner. During World War II the emphasis was placed on physical fitness to meet the urgent demands of the armed forces. Our playgrounds became obstacle courses and calisthenics were common. Once the threat was ended, we tended once more to swing toward only the play aspects of physical education.

Now once more the pendulum has swung and physical education is faced with the problem of meeting new challenges. Clark has observed that

Never before in the history of physical education in the United States during peacetime has this field been so positively challenged to improve the fitness of

all youth. Exercise as a way of life is becoming accepted as a basic need for adults. The necessity for improving fitness through proper physical activity is critical due to the demands of a strong and enduring populace for national survival, to the results of medical research showing the necessity for a physically active life in the reduction of the incidence of degenerative diseases, and to the demonstrated general fitness inferiority of our youth (11, p. vii).

Physical Education in Perspective

It has been previously suggested that physical education must be concerned with a diversity of purposes rather than with only physical fitness. Physical educators have sought to establish basic principles for physical education. Muse made a thorough investigation of the literature in an exhaustive attempt to find related purposes. The following six principles were drawn from Muse's research of principles considered basic by a majority of physical educators.

Six Principles of Physical Education

1. The physical education program should offer a wide variety of activities with opportunities to acquire a number of motor skills.
2. The physical education program should be considered an integral part of the total educational effort of the school.
3. The physical education program should serve all pupils, and should recognize individual differences among students.

4. The physical education program should be conceived and conducted with an awareness of the unitary nature of man.

5. There should be a course of study which is educationally sound and based upon the interests, needs, purposes, and capacities of the youth it serves.

6. The physical education program should be designed to promote physical fitness and encourage a wise use of leisure time.

Principle One: The Physical Education Program
Should Offer a Wide Variety of Activities
with Opportunities to Acquire
a Number of Motor Skills

In order to secure a balanced program of physical activity young people need to find opportunities for exercise carefully oriented toward development of body mechanisms, desirable strengths and coordinations, physiological needs, and enjoyment. Such a purposefully planned program will aid the individuals to utilize their bodies efficiently and gracefully in the daily performance of routine tasks (68).

Means has noted:

The modern physical education program cannot be narrowly restricted to one or a few activities, sports, or games. The great task of transforming spectators into participants is a challenge to the profession and to education. Width and breadth is essential to a functional school program in physical education (41, p. 111).

It is evident that people in the area of physical education are concerned with not only the physical growth of

the student, but in addition they are aware of the biological, psychological, and sociological needs of the student. Within this broad framework of the imperative needs of students, it is important to note that physical education is not just exercise or mere physical training. Participation in a broad program of physical education not only provides recreational opportunities, but aids the individual in achieving social competence and ego satisfaction (58).

Interests and needs vary with individuals. Programs at all levels of education should be varied in order to permit every student an opportunity to gain self-realization. Not every male student enjoys basketball; not every boy can play football; and swimming is not universally appealing. It must also be recognized that enjoyment through watching others is not sufficient either. It should be the obligation of all educators to individualize the program sufficiently so as to provide the opportunity for all students to realize their own strengths through success in some form of motor expression (50).

Too often we are inclined to view physical education only as play, and do not note that within the confines of this term is a physiological need. Modern physical education with its emphasis upon education through the physical is based upon the biologic unity of mind and body. According to Williams,

Those who worship at the altar of mental development too frequently neglect the implications of unity. Socrates with a headache is always preferable to a brainless Hercules, but the modern spirit in physical education seeks the education of man through physical activities as aspect of the social effort for human enlightenment . . . (24, p. 24).

Principle Two: The Physical Education Program
Should Be Considered an Integral Part
of the Total Educational
Effort of the School

Physical education is an integral part of a school's total curriculum. It gives special emphasis on physically educating the body for the same life for which the academic disciplines are educating the mind. Physical education is the sum total of athletics, physical fitness, activities and testing, tumbling and apparatus work, carry-over games and group games. It is more than any one of them or any combination of less than all of them (28).

In the past there has been a noted lack of agreement among educators, physical educators, and the general public on the place of physical activity, health, and fitness in the overall pattern of academic effectiveness and achievement. However, recent studies have led to an increased understanding of this relationship between physical and mental health.

Tests administered by Terman (67, p. 24), Clark and Jarman (12, p. 161), Keogh and Benson (30, p. 334), and Ward (71, p. 77) have all determined a definite, positive

relationship between physical fitness and intelligence. In addition, the tests given by Ward showed sufficient gains in social efficiency which has attributed to physical competence.

Thomas Woody has noted:

Despite the fact that lip-service has been paid increasingly to the dictum "a sound mind in a sound body," ever since Western Europe began to revive the educational concepts of the Graeco-Roman world, there is still a lack of balance among those who write of education (77, p. 23).

Similarly, Dwight D. Eisenhower has suggested:

National policies will be no more than words if our people are not healthy of body, as well as of mind, putting dynamism and leadership into the carrying out of major decisions. Your young people must be physically as well as mentally and spiritually prepared for American leadership (20, p. 2).

That the whole man should have a whole education is a common adage found in educational literature. It is necessary that all areas of the school's curriculum contribute their share toward the fulfilling of such a totality if our schools are to move toward the fulfillment of this worn expression.

Physical education has been described as the phase of general education which aids the students in acquiring physiological, psychological, and social development through participation in balanced programs of selected and controlled motor activities (60, p. 154).

The role of physical education in the total picture of education can perhaps best be shown by reference to a 1946 bulletin from the Educational Policies Commission (19, p. 18). Four main objectives listed for education are

1. The objectives of self-realization, which are concerned with developing the individual to his fullest capacity in respect to such things as health, recreation, and the philosophy of life.

2. The objectives of human relationship, which refer to relationships among people on the family, group, and society levels.

3. The objectives of economic efficiency, which are interested in the individual as a producer, a consumer, and an investor.

4. The objectives of civic responsibility, which stress the individual's relationship to his local, state, national, and international forms of government.

The importance of physical education can be noted quickly in these objectives.

Principle Three: The Physical Education
Program Should Serve All Pupils and
Should Recognize Individual
Differences Among Students

For the student well equipped with motor skill abilities, the school, through a well rounded athletic program, offers many opportunities to display these talents. The physical education program and the area of athletics are branches of the same field. The purposes of each can be justified only if it contributes to the total educational endeavor. Too often those with handicaps are ignored, or subject to loosely

supervised periods in which little instruction is presented (60).

A carefully constructed physical education program should be diverse enough to serve all participants. It is no longer sufficient to offer a schedule of activities geared only to the talented or centered around group participation. It has become increasingly necessary for those in physical education, as is true in all education, to give consideration to individual differences.

It then becomes necessary for the physical educator to recognize that each student differs in qualities of fitness, skills, and interests. There is even the possibility that physical education should be taught by individual prescription to meet these various aspects. Methods, techniques, tools, and medical advice, will be required to meet the range of abilities brought to the physical education class.

Modern educators and laymen alike are increasingly aware of the necessity for providing for the education of the exceptional child. The exceptional child is one who differs so definitely in mental, physical, emotional, or behavioral characteristics that he cannot profit from the standard curriculum. Special provisions are necessary to meet the demands of such individuals if they are to realize their potential (23).

Individuals, handicapped through physical impairment, a lack of physical fitness, poor skill development, growth

immaturity, or social inadequacies, must be noted and provided for. There should be an opportunity for each to gain the values of physical education through participation in a program that recognizes both his needs and his interests (64, pp. 521-536).

Through an early identification of individuals with weaknesses or special physical problems the physical educator can assist the student in improving, accepting, and adjusting to such problems. By noting a physical impairment the instructor can provide an opportunity for the student to improve the condition, compensate for the defect, and learn skills suitable to his handicap, needs, and abilities.

The lack of physical fitness can be improved through a balanced program of physical education. Phoenix, Arizona, and La Sierra, California, have developed extensive physical fitness programs featuring ability grouping (31 and 32). Keokuk, Iowa, and Yorktown Heights, New York, have, in addition, added fitness report cards to motivate students. Lane High School in Brooklyn, New York, has developed a program to aid boys to lose weight effectively, and Omaha, Nebraska, has adopted a program of homework to aid those students who are physically unfit. Students can be assisted by conscientious efforts on the part of physical educators to overcome fitness problems.

It has also been noted by Halsey, Schifferes, and Mennigger that there exist great individual differences in

the individual's tendency toward socialization. They have suggested that the failure of many students to display an adequate level of skill ability has caused social handicaps and ostracization (26, 58, and 24). It would therefore seem apparent that physical educators must take appropriate steps to provide the opportunities for instruction in skill activities, followed by adequate opportunities for participation.

Physical education must represent more than mere game activities. The ideal program of physical education should present sport activities coupled with instruction. Intramurals, interscholastic, and informal extramurals should allow every young person who so desires an opportunity for participation (55). In addition, activities and skills should be introduced for the purpose of enjoyment and ability acquisition. Opportunities for all boys to perform can be met through the gymfest or sports night presented for parents or P. T. A. meetings.

In viewing physical education's contributions to those who need it most, it is interesting to note a comment by Williams. "No child can be considered totally educated unless he has acquired, in childhood and youth, familiarity and skill in a large number of games and sports which give satisfaction and lead to their pursuit in recreational ways out of school" (75, p. 236).

Principle Four: The Physical Education Program
Should Be Conceived and Conducted with
an Awareness of the Unitary Nature
of Man

The student should not be considered as a composite of separate parts--body, mind, and spirit--but as a unified, organic whole. Moreover, this development should be recognized as a total phenomenon. Observations of physical growth, the development of motor skills, emotional maturity, and social adjustment may be noted separately, but they must be considered as interrelated changes in an indivisible organism. The teacher must plan and watch for all outcomes possible for each individual. These plans and these outcomes go well beyond exercise and fun (26, p. 10).

Physical educators have opportunities to observe students in a broader range of activities and emotional situations, perhaps, than any other member of the school faculty. For this reason the physical educator must be as conscious of the individual differences as the coach, whose record depends upon his recognizing the talents of his athletes.

Nash has observed:

Every educational activity has within it the possibilities for integration, but no activities dominate the lives of children or the lives of adults to the extent of those in the realm of physical education . . . the supreme contribution of sports and games lies in the opportunities found in them for integrating the group. In a game, the abilities of all members are integrated for the common welfare. If each individual has a contribution to make, the disintegrating forces of race, religion, and creed

yield to the integrating ones of common objectives (48. pp. 268-269).

Stish has noted:

Physical education has two main responsibilities-- to teach the individual to know himself and to control himself in his motor response to the environment. More teaching should be done through laboratory type experiences in which students experience body responses to movement stresses (63, p. 33).

Physical education must seek to become more than mere education of the physical; rather it must be education through the physical since these experiences involve intellectual, emotional, social, and physical aspects. For best results the physical educator must consider the influence of his program upon the individual in addition to the effect on isolated segments. Education is development in the individual by a process of learning as distinguished from only physical growth. Education is not learning to do, but assisting each individual to know what to do (45, p. 30).

The instructor in physical education must consider the individual as a unit and attempt to aid him through corrective exercise, games, activities, and skills to become a functioning whole. It must also be noted that the individual must be recognized as being in a period of transition. The physical educator must concern himself with the student's tomorrows as well as mere considerations of the present.

Principle Five: There Should Be a Course
of Study Which Is Educationally Sound
and Based Upon the Interests, Needs,
Purposes, and Capacities
of the Youth It Serves

Whereas sports and other types of enjoyable physical activities serve the goals of physical education, physical conditioning exercises, especially calisthenics are not nearly so valuable (72). There is, of course, a need for calisthenics and other forms of physical conditioning exercises because there is a place for physical fitness in the physical education program. However, too great an emphasis upon only this one aspect may sacrifice many other important facets of a total program.

Weiss has suggested that "if a sacrifice is to be made I would prefer less physical fitness and more learning. We need physical education more than we need physical training" (72, p. 18).

Stefanelli concurs and adds:

I fully support the idea of good physical conditioning, but it must be remembered that physical education includes all aspects of the physical potential of a being and includes motor skills. It is evident that a well-conditioned body does not necessarily result in a well-coordinated body. Good health usually results from fine physical conditioning, but there are other means along with formal calisthenics that an individual can use to gain better physical and emotional health (61, p. 3).

The establishment of an adequate level of physical fitness is important and should be a prerequisite for the physical education program rather than the major item of emphasis.

In addition to this important aspect of physical education, the instructor must seek to introduce activities and games that will fulfill the needs of the individual and will have enough diversity to motivate and capture the interests of the student (32).

Brownell and Hagman offer:

The skillful teacher of physical education seizes upon activities of apparent interest to students and uses these activities as a basis for developing interests and satisfactions in a wider span of physical events. In the final analysis, the success of any program of physical education lies in the degree to which the individual has learned to use the activities for the best adjustment of himself to his environment of the present and his probable environment of the future. Of course, the best way to determine whether a child will properly adjust himself to the future is by his ability to adjust to his present environment (7, p. 21).

The emphasis or type of physical education offered in our schools is frequently determined by outside factors, like war. When the security of our nation is threatened and an increased level of physical fitness is a necessity, our physical education programs are enlisted to aid in meeting the challenge. This situation exists today as is evidenced in recent declarations by the Navy and Marine Corps (8). They have proclaimed the need for special programs to correct the deficiencies noted in today's youth.

It has been suggested that in time of peace the importance of physical fitness is forgotten and this virtue is squandered by neglect, and by the influence of living in

a mechanized era (65). Today, faced not only with the responsibility of providing physical fitness for meeting the challenge of armed conflict, but also of providing instruction for an adult life of individual sports and recreation, the physical educator must provide a well rounded program. Through vigorous activity the student is assisted in the raising and maintaining of an adequate level of physical fitness, but likewise through a program of sports and activities the individual is given an opportunity for desirable participation and appreciation.

Principle Six: The Physical Education Program
Should Be Designed to Promote Physical
Fitness and Encourage a Wise
Use of Leisure Time

Movement is important in man's life, but civilization and automation have removed much of the necessity for it. He is no longer forced to defend against wilderness dangers, and easily controlled machinery now performs tasks previously accomplished by muscular exertion. Man, aided by advancements in science, has tended to become a "sitting creature." Work, the basic ingredient for muscular development, has become almost obsolete due to civilization's growth. People today are losing important muscle strength and tone by adoption of the "easy" way (51).

Renfrow has stated that, "No one can estimate what the automobile has cost the American people in muscle; or the

radio, television and motion pictures in active participation in recreation" (29).

The age of automation is still in its infancy. Labor unions are speaking in terms of the four hour work day, and twenty hour work week. Modern computers and increased mechanization are constantly reducing the physical labor needed to a minimum. Woody has observed that "When all labor is done by machines, as it may sometime be, man will still need healthy muscles and vital organs as a condition of healthy life" (77, p. 8).

The modern program of physical education must, in order to meet the challenges of such a changing society, seek to provide opportunities for the individual's development of an adequate level of physical fitness, while still introducing activities that will aid in healthful, worthwhile, leisure participation.

Mand has issued a challenge to the physical educators:

More people have more opportunity for leisure activity in America today than in any other society in the history of the world. Yet, too many people seem at a loss to know what to do with their leisure. Increased mechanization creates less opportunity for vigorous activity and the necessary acquisition of sports skills. Are we to turn our programs to strictly calisthenic activities, or can we do a better job of providing recreational activity skills to promote participation in later life? (38, p. 1)

Physical educators are quite divided on the approach necessary to meet the two major issues facing them today. One source of pressure felt by the professional is the

necessity for improving the physical fitness status of our youth. British boys were found to be quite superior to American boys on the AAHPER Fitness Test. The British boys were found to rank at the seventieth per cent level when compared to American norms, and English girls were found to rank at the seventy-seventh per cent level when compared to American girls. Results just as shocking were found in comparison with Japanese youth. These tests were administered five years after the Kraus-Weber Tests had first noted a deficiency in American children (1).

The other problem confronting the physical educator is the recognized need for the development of activities which can be carried over into leisure time pursuits of the future. Teaching students how to play games and to participate in activities during their adult life is an important function of physical education. Teachers must teach the fundamentals of golf, tennis, badminton, archery, horseshoes, bowling, and dancing, and motivate young people to participate regularly after graduation. Then physical education will have aided the physical well-being of tomorrow's adult community (28).

Physical education must attempt a reconciliation among these major issues if it is to face the student needs with a unified set of purposes. Neither the concept of physical fitness nor carry-over activities can afford to be, nor need

they be, neglected if physical educators seek a program of total fitness. Most physical education personnel see the need for the inclusion of both fitness and carry-over activities, but due to time and scheduling they tend to emphasize or over-emphasize one area.

LaPrutti observes:

There's little question that sports and the theory of play constitute a valuable and integral part of any physical education program. But, as intensive investigation has proved we've placed too much emphasis on this factor. Sports activities and the pursuit of gross sports skills alone have not produced the most desirable end results (32, p. 60).

In disagreement with this view, Weiss offers:

Rather than place major emphasis on high levels of physical fitness, it is suggested that we raise fitness to moderate levels, and then proceed to the more important objectives of skill learning and activity habit formation. If a sacrifice is to be made I would prefer less physical fitness and more learning. We need physical education more than we need physical training (72, p. 19).

Such controversial views are not beyond compromise, however. Among those engaged in the field of physical education there are many who are diligently seeking the correct exposure to fitness and activities of other types.

Physical education has as a major objective the development of physical fitness. It is important that students not only attain a high level of proficiency in physical growth, but in addition learn to participate in sport skill activities and sports with confidence and pleasure. Success is found not only by student participation,

but also when the student as an adult continues to find satisfaction through the involvement in vigorous recreational pursuits (54).

What is needed is a blending of skills instruction with fitness work. It is not a question of either skills or fitness; it is a question of fusing the two to develop physically strong boys and girls who have the skill to use their strength in sports and other activities (17).

Means attempts to summarize the controversy by noting:

Physical education becomes a way of education; a medium through which health and vigor can be captivated and maintained through a wide range of selected activities, sports and games, which are taught boys and girls at proper age levels, and in which frequent opportunities are provided for participation to the end that post-school and adult living may be enriched. This concept does not eliminate many older forms of physical training such as gymnastics, apparatus, exercise, and muscle building activities. Rather it places them in proper perspective to the broad group of enjoyable activities, to the end that all people may find background for the things they will enjoy after school days are over (41, p. 1).

Application to the Study

An exercise routine capable of producing an adequate level of physical fitness, while allowing time for the development of worthwhile skills, attitudes, and activities, becomes an apparent need. Physical educators have grown increasingly aware of this necessity, and as a result, there have been developed several systems of exercise.

The three used in this experiment are representative of this quest, and will be examined.

Isometric Exercise

Although the principle involved in static, or isometric exercises has been known for many years--a change in the tension of a muscle whose extremities are fixed upon the application of a stimulus--increased interest was directed toward this method of exercise following the experiments of Hettinger and Muller in 1953.

In a study in which all training was performed by pulling and holding a certain degree of tension, they noted an average increase per week of 5 per cent maximal strength gain. One daily exercise in which the tension was held for six seconds resulted in increases comparable to longer periods of contraction and more frequent practices (44).

These studies have been supported by Lorbach, Lyne, Mathews and Kruse, Taylor, and Wolbers and Sills. If the findings of Hettinger and Muller are correct, such a method of exercise, a two-thirds maximal contraction for six seconds once a day, would be a very economical training program (44).

The advantage of static training, according to Berger, is the ability to exercise five and six days per week without a build-up of fatigue. Static training may evidence a greater increase in strength than a program using weights

because it allows a greater number of training sessions without fatigue (5).

A comparative study by Howell, Kimoto, and Morford (1) studied the effects of isometrics and isotonic exercise programs upon muscular endurance. The purpose of the 1962 study was to determine the relative effects of an isometric exercise program, The Commander Set by Steinhaus, and a regular isotonic exercise program of weight lifting upon muscular endurance as measured by 2 minute all-out work on a bicycle ergometer at 14 kilogram resistance.

Following the equivalent groups technique, thirty-three college male students at the University of British Columbia were equated, as a result of a pre-test, into three groups of eleven. The age, height, and weight of these students was also measured.

Group I, the isotonic group, and Group II, the isometric group, met once a day, two times a week for eight weeks. The control group, Group III, followed their normal activities. Group I trained with a five minimum and ten maximum repetition program of lifts, while Group II used six second maximum contractions in thirteen exercise positions. Following the eight weeks experimental period the three groups were retested on the bicycle ergometer using the same 2 minute all-out work at 14 kilogram resistance.

The statistical treatment dealt with the mean increase in each group as compared to the other groups. Results were accepted as significant at the .01 level of confidence.

There were no significant differences in the increases of weight and height among the subjects. Group I and Group II showed significant improvements in muscular endurance as measured by the bicycle test at the .01 level of confidence. However, there were no significant differences between experimental groups, and both were significantly superior to the control group.

In view of their findings the investigators hypothesized that increases in muscular endurance may be effected by isometric contractions as well as by isotonic exercises, particularly when the exercises involve the whole body. They also noted that five minutes of isometrics equalled thirty minutes of weight lifting in the building of muscular endurance.

Although the investigators indicated no recommendations, they did infer that these results may have been altered with a longer period of investigation, or by the use of subjects of a different age level. They suggested a need for further experimentation to determine the degree of involvement necessary for isometrics to cause a change in muscular endurance.

It seems reasonable to assume that the isometric contraction method of exercise, due to its speed of

presentation, ability to develop strength, and its failure to induce fatigue, suggests a possibility as a routine for physical education. Variations in techniques of presentation have also been suggested by Sills and Scheurmann.

Intensive Exercise

A German, Woldemar Gerschler, is credited with the creation of interval training. This system is now adapted for the conditioning of distance runners. Intensives involve training, using shortened distances, at a pace accelerated beyond that of normal running speeds. Through this workout the individual develops speed, endurance, strength, and power (11, p. 88).

There are four variable situations in a program of intensive training: (1) length of time devoted to the exercise, (2) number of repetitions within a given time, (3) number of repetitions, and (4) length of the rest periods between repetitions. In intensive training for exercises, work bouts are done in intervals with a near-capacity effort. Almost any standard group of exercises can be adjusted to an intensives workout (62, p. 22).

Stein has observed:

By using this approach, two years ago students in our junior high school classes surpassed students in senior high school classes in certain elements of our school physical fitness test. By the same token, last year our tenth grade students, using this system, surpassed previous tenth grade classes as well

as eleventh grade classes in these same elements of our fitness test (62, p. 23).

Thomas K. Cureton has popularized a system of rhythmic exercises as a means of overall physical fitness improvement. He has incorporated within his approach many features of intensive, interval training (11, p. 189).

Westering has concluded:

Through the use of intense intermittent type physical fitness program, the physical education instructor can develop a high degree of physical fitness in half the time consumed by the conventional program. This time saved can be utilized effectively for the additional teachings of many activity skills in the physical education program (73, p. 37).

Calisthenic Exercise

Calisthenics include a wide variety of movements. When followed with direction, a program of calisthenics can be used as a warm-up drill, to correct individual problems, and as an aid to the development of physical fitness.

Physical educators in Phoenix, Arizona, have found that a period of five to seven minutes devoted to calisthenics allows for the teaching of many other activities in the same period, but is an indispensable aid to the program (46).

In a program designed to aid the overweight boys in gaining an adequate level of physical fitness, instructors at Franklin K. Lane High School in Brooklyn, New York, added a routine of sit-ups, modified push-ups, and continuous running. The exercises provided substantial improvements (6).

The conclusion that seven and a half to eleven minutes of calisthenics daily would show a significant improvement in cardio-respiratory efficiency was drawn by Walters (16). These results were similar to those found by Henry and Prue, using a twelve minute XBX drill developed by the Royal Canadian Air Force, in a study of girls (27).

Hinger has observed that "Physical fitness is achieved partly by vigorous conditioning activities, calisthenics, and other muscle building activities, but that it is also achieved by a vast program of sports, games, relays, gymnastics, rhythms, and intramurals" (28, p. 2).

Physical educators in Phoenix, Arizona, have offered a challenge to any high school physical education department in the country to compare physical fitness results. Their basic program consists of only fifteen minutes of daily calisthenics, in addition to their regular activities. The results accomplished at Cortez High School have been outstanding.

Fabricus studied the effects of calisthenics, used for three minutes and nine seconds at the beginning of each class period. The classes met four times per week. The time that was used for this additional period of calisthenics was only slightly more than 10 per cent of the total class time.

A significance of beyond the .01 level was noted in the performance of the experimental group as compared to the group not subjected to the calisthenic routine. Fabricus concluded that five or six calisthenics may be included in the lesson plan without a gross loss of instructional time and with significant benefits in fitness development.

Whether the physical educator has chosen to use intensives, isometrics, or calisthenics, the results have substantiated the idea that physical fitness can be raised and maintained with a reasonable allotment of time to such a routine. It would seem necessary, however, to find which routine will most adequately meet the student's needs. In addition, by a comparison on each of the test areas, it may be found that a combination of the three types of exercise may be the most satisfactory way to raise the level of physical fitness.

It is quite important, therefore, to find an instrument which is suitable for meeting the requirements for measuring the seven components of physical fitness mentioned previously.

In the design of this experiment, age alone was considered to be an adequate basis for grouping. Some tests have attempted to use the three factors of age, height, and weight. The AAHPER Youth Fitness Test has chosen to allow the use of either technique.

Espenschade, in a study of the relationships between age, height, and weight has concluded:

The use of age alone as a basis for the development of test norms is recommended. Although a combination of age, height, and weight has a somewhat higher predictive value than age alone in a few tests at several age levels for boys, the amount of improvement is not sufficient to justify the labor involved (22, p. 149).

It is suggested by Stein that the Youth Fitness Test is a highly reliable instrument when administered according to the instructions in the test manual. His results in all cases produced reliability coefficients which were significant far beyond the .001 level (62).

Further evidence of the validity of this test instrument was found by a study which found all seven subtests to be positively correlated (53, p. 525).

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CHAPTER III

METHOD OF THE STUDY

Description of the Subjects

The subjects who participated in this study were seventh, eighth, and ninth grade male students enrolled in a small city junior high school in the midwest. Keokuk, a community of 16,000 located in Southeastern Iowa, is composed largely of socio-economic middle class families. The school population is predominantly white, and as is true of the city, is of a non-migratory nature.

Experimental Design

Out of the male population of 420 students, the results of 343 boys' performances were utilized for this study. Although all of the boys were initially tested for their level of physical fitness, the results of seventy-seven boys were not included in the final analysis due to involvement in interscholastic athletics, physical impairments, over-age, or excessive absences. All boys who were members of the eighth or ninth grade basketball squads, or who participated in varsity swimming were disallowed. A boy was considered to have a physical impairment if restricted in physical activity by a doctor's recommendation, recuperating

from an injury, or limited by birth defects or polio. Age requirements were established for each grade level. Seventh grade boys were required to be thirteen or under; eighth grade boys were required to be fourteen or under; and ninth grade boys were required to be sixteen or under.

Excessive absences for a seventh or eighth grade boy were considered to be more than two absences from physical education during the twelve weeks experimental period. Excessive absences for a ninth grade boy were considered to be more than three absences from physical education during the twelve weeks experimental period. One additional absence was allowed ninth grade students because of their greater number of exposures to physical education during the twelve weeks experimental period.

Prior to the outset of the second semester all male students were assigned to one of twelve groups, according to their grade level. Thus, four seventh grade groups, four eighth grade groups, and four ninth grade groups were formed. Assignments to their respective grade groups were made by using random selection procedures. The students' class schedules were then arranged to allow each of the twelve groups to meet as an independent physical education class during the second semester of the school year.

The four seventh grade classes meeting one period per week were assigned to groups labeled Control I, Isometric I, Intensive I, and Calisthenic I. The four

eighth grade groups, meeting two periods per week were assigned to groups labeled Control II, Isometric II, Intensive II, and Calisthenic II. The four ninth grade groups meeting three periods per week were assigned to groups labeled Control III, Isometric III, Intensive III, and Calisthenic III.

There was a total of 127 seventh grade boys originally assigned; this was an average of thirty-two students per group. However, seven of the seventh grade boys were disallowed because of physical handicaps; two boys were found to exceed the age of thirteen; and seven students were absent three or more times from physical education class. A total of 111 seventh grade boys was included in the final study.

There was a total of 145 eighth grade boys originally assigned; this was an average of thirty-six students per group. However, twenty of the eighth grade boys were disallowed because of their participation in basketball; two other eighth grade boys were found to exceed the age of fourteen; four boys had physical impairments; and five students were absent three or more times from physical education class. A total of 114 eighth grade boys was included in the final study.

There was a total of 148 ninth grade boys originally assigned; this was an average of thirty-seven students

per group. However, twenty of the ninth grade boys were disallowed because of their participation in basketball and swimming; there were no physical impairments; eight ninth grade boys were found to exceed the age of sixteen; and two students were absent four or more times from physical education class. A total of 118 ninth grade boys was included in the final study.

Instruments Used

The AAHPER Youth Fitness Test was selected as a valid and reliable instrument to measure growth in seven areas of physical fitness; arm strength, abdominal strength, speed and agility, speed, leg power, arm power, and cardiovascular endurance. This test was administered with rigid adherence to the instructions presented in the test booklet.

The AAHPER Youth Fitness Test was administered in January, 1965, immediately prior to the commencement of the twelve weeks experimental period. The actual administration of this initial pre-test required two physical education class periods for each group tested. All tests were administered by the same instructor, with assistance from one student teacher and squad leaders who had been chosen by the instructor. The same test was re-administered in April immediately following the twelve weeks experimental period.

For the purpose of administering the AAHPER Youth Fitness Test certain equipment and facilities were essential. For the first of the seven tests, the pull-ups, it was important that a bar, one and a half inches in diameter, suspended at a height high enough to allow students to hang fully extended, be used. The sit-up test required the use of a stop watch. The third test, the shuttle run, used two blocks of wood, two inches by two inches by four inches, a stop watch, and two parallel lines thirty feet apart. A starting line and a tape measure were used in measurement of the standing jump. Stop watches were essential along with a fifty-yard course for the timing of the fifty-yard dash. The softball throw was measured on a course laid with the help of a tape measure, and a softball was used. The 600 yard run-walk required only a measured course and timing devices.

The Experimental Groups

The following short time exercise routines were used in the present study:

1. The Commander Set.--An isometric routine developed by Arthur H. Steinhaus, dean and professor of physiology at George Williams College of Chicago. The routine consisted of thirteen various positions and fifteen contractions, each six seconds in length. This routine, according to Steinhaus,

"will increase muscle strength in the average person about four per cent a week up to maximal strength" (Appendix B).

2. Intensity drill.--The intensity drills were developed by Woldemar Gershler, and refined by Forrest Westering at Parsons College. The intensity program can be flexible to fit one's needs; however, the basic muscle groups that tended to be developed by this drill were arms and shoulders, abdominal muscles, and legs. The exercises involved were modified pull-ups, push-ups, bent knee sit-ups, and the speed run (Appendix A).

3. The 5BX Plan.--A calisthenic routine designed for progressive development. There are six charts; each chart is composed of five exercises performed in the same order, and in the same maximum time limit. All exercises are to be administered in eleven minutes (Appendix C).

No special apparatus was necessary for the administering of the three exercise routines, and all three could be completed within the fifteen minute period designated for exercise.

The Control Groups

In addition, the four control groups were subjected to fifteen minutes of non-physical instruction in the areas of health, physical education, and recreation, during their physical education class period (Appendix D).

Teaching Procedures

Following the administration of the initial AAHPER Youth Fitness Test and the assignment of classes, the instructor gave identical orientations to all experimental groups (Appendix H), and also explained the health, physical education, and recreation program to the control groups (Appendix I).

The physical education class periods of fifty-four minutes were divided into four minutes for dressing; fifteen minutes of experimental activity; twenty-six minutes of class physical activity; and nine minutes for showering and dressing. These time specifications were rigidly adhered to by means of a device used for test timing.

The same instructor taught all classes and led all exercise routines. Each class was divided into four squads for their participation in the games and activities. The games and activities, shown in the appendixes, were chosen in such a manner that all classes, according to their grade level, received identical exposure. A program of competition, termed the Olympics, was used for the games between class squads. Activities such as volleyball, crab hockey, relays, and mum ball were used as Olympic events during the activity period. In addition, instruction was given in many areas including wrestling, work on the parallel bars, and on the horizontal bar.

Exercise routines were explained and demonstrated initially. After this early presentation the instructor led and timed each group. In the control groups many approaches were used. Films, tape recording, demonstrations, and speakers were among the techniques employed in teaching these classes.

At the conclusion of the twelve weeks experimental period the AAHPER Youth Fitness Test was re-administered to all students. At this time the individual cards of those students not meeting the requirements of the study were withdrawn from the experimental data.

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CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The basic purpose of this study was to ascertain if physical fitness levels could be raised by supplementing the regular physical education class activities with organized exercise routines. Achievement gains by groups using exercise routines were evaluated by comparison with control groups receiving no exercises.

Three different exercise routines were studied at three grade levels to include the seventh, eighth, and ninth grades. Each grade level was subjected to a different frequency of exposure. The three routines employed were: (1) isometrics, The Commander Set; (2) intensives, The Parsons Intense Intermittent Drills; (3) calisthenics, The 5BX Plan. The ninth grade male students received three weekly exposures to exercises and organized physical activity; the eighth grade male students received two weekly exposures to exercises and physical activity; and the seventh grade male students received one weekly exposure to exercise and physical activity. The control groups at each level received the same amount of exposure to organized physical activity, but without the period of exercise.

The seven variables in the study were as follows: pull-ups, measured in terms of the number completed; sit-ups, measured in terms of the number of full sit-ups; shuttle run, measured in terms of the time in seconds; standing jump, measured in terms of the number of inches; fifty-yard dash, measured in terms of the time in seconds; softball throw, measured in terms of the number of feet; and the 600 yard run-walk, measured in terms of the time in seconds. These measurements are in accordance with the AAHPER Youth Fitness Test. An analysis was made of the pre- and post-test data to determine the effectiveness of the three exercise routines compared to each other and to the control groups.

There was a total of 343 junior high school male students in the experiment: 111 seventh grade boys; 114 eighth grade boys; and 118 ninth grade boys. Through random selection the boys were divided into four groups at each grade level. The groups meeting physical education class once a week were designated Control I, Intensive I, Calisthenic I and Isometric I. The groups meeting physical education class twice a week were designated Control II, Intensive II, Calisthenic II, and Isometric II. The groups meeting physical education class three times a week were designated Control III, Intensive III, Calisthenic III and Isometric III.

Table I represents a composite grouping of the twelve groups on the pre-test. A comparison of the means and

TABLE I

SUBGROUP MEANS AND STANDARD DEVIATIONS FOR
SEVEN DIMENSIONS OF PHYSICAL FITNESS
AS SHOWN ON THE PRE-TEST FOR THE
TWELVE GROUPS OF THE STUDY

Group	Pull-ups (Number)		Sit-ups (Number)		Shuttle Run (Seconds)	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Control I N = 30	4.17	4.09	50.80	13.08	10.45	3.89
Intensive I N = 27	5.19	3.94	50.48	17.73	11.07	.89
Calisthenic I N = 27	3.48	3.92	47.93	11.26	11.35	.62
Isometric I N = 27	3.07	2.97	50.59	21.49	11.18	.86
Control II N = 30	4.33	3.42	54.37	13.73	10.44	.68
Intensive II N = 28	6.29	5.46	62.21	12.98	10.50	.92
Calisthenic II N = 28	5.86	5.61	57.86	9.59	10.25	.64
Isometric II N = 27	5.59	3.83	60.00	12.51	10.54	.68
Control III N = 34	6.59	4.36	61.76	16.02	10.51	.75
Intensive III N = 28	6.11	4.15	62.00	15.57	10.41	.77
Calisthenic III N = 28	6.25	4.73	56.43	12.49	10.31	.69
Isometric III N = 28	6.61	4.15	60.96	15.57	10.22	.77

TABLE 1--Continued

Standing Jump (Inches)		50-Yd. Dash (Seconds)		Softball Throw (Feet)		600-Yd. Run (Seconds)	
Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
63.40	7.11	7.86	.53	118.43	22.29	156.73	26.06
67.11	8.54	8.11	.89	118.56	27.85	150.73	29.75
60.81	7.63	8.35	.59	110.85	22.43	152.50	17.34
61.85	7.75	8.26	.54	116.22	27.45	170.33	28.44
69.17	8.23	7.44	.66	132.80	22.83	143.87	27.30
72.39	12.09	7.67	.77	133.29	30.78	137.36	17.74
73.71	9.99	7.87	.75	128.46	25.36	136.00	15.22
73.04	8.17	7.70	.63	142.67	26.84	135.11	13.87
70.38	8.14	7.32	.63	143.68	26.86	135.82	17.39
72.43	9.86	7.28	.55	142.29	34.71	132.71	16.55
73.54	10.23	7.71	.75	148.21	25.74	136.68	16.57
74.93	9.86	7.55	.55	148.21	34.71	134.04	16.55

standard deviations are shown for each of the seven physical fitness variables.

The results shown in Table I indicate only moderate deviations among the four groups assigned to physical education one day per week. The pull-up variable showed the Intensive I group to have the greater mean average of 5.19 pull-ups, and the Isometric I group to have the lesser mean average of 3.07 pull-ups. The sit-up variable showed the Isometric I group to have the greater mean average of 50.59 sit-ups, and the Calisthenic I group to have the lesser mean average of 43.93 sit-ups. The shuttle run variable, a timed event, showed the Intensive I group to have the greater mean average of 10.45 seconds, and the Calisthenic I group to have the lesser mean average of 11.35 seconds. The standing jump variable showed the Intensive I group to have the greater mean average of 67.11 inches, and the Calisthenic I group to have the lesser mean average of 60.81 inches. The fifty-yard dash variable, a timed event, showed the Control I group to have the greater mean average of 7.86 seconds, and the Calisthenic I group to have the lesser mean average of 8.35 seconds. The softball throw showed the Intensive I group to have the greater mean average of 118.56 feet, and the Calisthenic I group to have the lesser mean average of 110.85 feet. The 600 yard run-walk variable, a timed event, showed the Intensive I group to have the greater mean average of

150.78 seconds, and the Isometric I group to have the lesser mean average of 170.33 seconds.

The F Max test for homogeneity of variance was used to analyze the differences shown by the four groups on each of the seven fitness variables. Although there were moderate differences recorded, the groups were assumed to be homogeneous due to the allowances made for differences by the Wilks' lambda test of generalized analysis of variance.

The results shown on Table I indicate only moderate deviations among the four groups assigned to physical education two days per week. The pull-up variable showed the Intensive II group to have the greater mean average of 6.29 pull-ups, and the Control II group to have the lesser mean average of 4.33 pull-ups. The sit-up variable showed the Intensive II group to have the greater mean average of 62.21 sit-ups, and the Control II group to have the lesser mean average of 54.37 sit-ups. The shuttle run variable, a timed event, showed the Calisthenic II group to have the greater mean average of 10.25 seconds, and the Isometric II group to have the lesser mean average of 10.54 seconds. The standing jump variable showed the Calisthenic II group to have the greater mean average of 73.71 inches, and the Control II group to have the lesser mean average of 69.17 inches. The fifty yard dash variable, a timed event, showed the Control II group to have the greater mean average of 7.44 seconds, and

the Calisthenic II group to have the lesser mean average of 7.87 seconds. The softball throw variable showed the Isometric II group to have the greater mean average of 142.67 feet, and the Calisthenic II group to have the lesser mean average of 128.46 feet. The 600 yard run-walk variable, a timed event, showed the Isometric II group to have the greater mean average of 135.11 seconds, and the Control II group to have the lesser mean average of 143.87 seconds.

The F Max test for homogeneity of variance was used to analyze the differences shown by the four groups on each of the seven fitness variables. Although there were moderate differences recorded, the groups were assumed to be homogeneous due to the allowances made for differences by the Wilks' lambda test of generalized analysis of variance.

The results shown on Table I indicate only moderate deviations among the four groups assigned to physical education three days per week. The pull-up variable showed the Isometric III group to have the greater mean average of 6.61 pull-ups, and the Intensive III group to have the lesser mean average of 6.11 pull-ups. The sit-up variable showed the Intensive III group to have the greater mean average of 62.00 sit-ups, and the Calisthenic III group to have the lesser mean average of 56.43 sit-ups. The shuttle run, a timed event, showed the Isometric III group to have the greater mean average of 10.22 seconds, and the Control III

group to have the lesser mean average of 10.51 seconds. The standing jump variable showed the Isometric III group to have the greater mean average of 74.93 inches, and the Control III group to have the lesser mean average of 70.38 inches. The fifty yard dash variable, a timed event, showed the Intensive III group to have the greater mean average of 7.28 seconds, and the Calisthenic III group to have the lesser mean average of 7.71 seconds. The softball variable showed both the Calisthenic III and the Isometric III groups to have the greater mean average of 148.21 feet, and the Intensive III group to have the lesser mean average of 142.29 feet. The 600 yard run-walk variable, a timed event, found the Intensive III group to have the greater mean average of 132.71 seconds, and the Calisthenic III group to have the lesser mean average of 136.68 seconds.

The F Max test for homogeneity of variance was made to analyze the differences shown by the four groups on each of the seven fitness variables. Although there were moderate differences recorded, the groups were assumed to be homogeneous due to the allowances made for differences by the Wilks' lambda test of generalized analysis of variance.

Hypothesis One stated that the student groups subjected to isometrics, intensives, and calisthenics would show significant improvement (at the .05 level) in the seven measures of physical fitness being evaluated during the twelve

TABLE II

MEAN IMPROVEMENT AND STANDARD DEVIATION FOR SEVEN DIMENSIONS OF PHYSICAL FITNESS ON SUBJECTS EXPOSED TO PHYSICAL EDUCATION ONE DAY PER WEEK

Variables	Control I N = 30		Intensive I N = 27		Calisthenic I N = 27		Isometric I N = 27	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	.00	1.44	.70	.90	.11	1.03	.56	.83
Sit-ups (Number)	.90	8.23	4.85	4.52	.77	4.19	4.82	5.81
Shuttle Run (Seconds)	-.34	.48	-.03	2.76	-.21	2.06	-.20	.21
Standing Jump (Inches)	3.80	5.52	6.56	2.36	4.04	2.01	3.85	2.45
50 yd. Dash (Seconds)	.15	.40	-.51	.36	-.19	.14	-.20	.17
Softball Throw (Feet)	4.17	10.47	16.93	5.62	16.89	10.44	8.07	6.35
600 yd. Run (Seconds)	-3.93	12.14	-.89	6.38	-7.19	7.91	-9.82	16.20
$A = .28556 \quad F \frac{21}{291} = 7.514 \quad P < .001$								

weeks period of exposure. The Wilks' lambda test was employed to measure the significance of the differences in the means of score gains in the seven variables.

The results of the Wilks' lambda test for groups participating in physical education one day per week are shown in Table II.

The lambda criterion shown in Table II was significant at the .001 level, indicating that the four programs produced significant differences on the seven experimental variables. As a result of the illustrated significance of difference the Fisher t test was used to ascertain where the differences occurred. The results of the Fisher t test for these four groups are shown in Tables III, IV, V, VI, VII and VIII.

A comparison of the Control I and Intensive I groups on the seven physical fitness variables is shown in Table III.

A study of the data in Table III indicated that the improvement shown by the Intensive I group was significantly greater than the improvement shown by the Control I group on five of the seven physical fitness variables tested. The Intensive I group produced a mean gain of .70 pull-ups and when compared to no gain by the Control I group, this difference was significant at the .05 level. The Intensive I group produced a mean gain of 4.85 sit-ups and when compared to a gain of .90 by the Control I group, this difference was

TABLE III

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL I AND INTENSIVE I ON THE SEVEN FITNESS VARIABLES

Variables	Control I N = 30		Intensive I N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.00	1.44	.70	.90	-2.40	.05
Sit-ups (Number)	.90	8.23	4.85	4.52	-2.45	.05
Shuttle Run (Seconds)	- .34	.48	-.03	.28	-3.59	.001
Standing Jump (Inches)	3.80	5.52	6.56	2.36	-2.94	.01
50 yd. Dash (Seconds)	.15	.40	-.51	.36	8.42	.001
Softball Throw (Feet)	4.17	10.47	16.93	5.62	-5.50	.001
600 yd. Run (Seconds)	-3.93	12.14	-.89	6.38	- .99	NSD

significant at the .05 level. The Intensive I group produced a mean gain of 6.56 inches on the standing jump and when compared to a gain of 3.80 inches by the Control I group, this difference was significant at the .01 level. The Intensive I group produced a mean gain of .51 seconds in the fifty-yard dash and when compared to a loss of .15 seconds by the Control I group, this difference was significant at the .001 level. The Intensive I group produced a mean gain

of 16.93 feet in the softball throw and when compared to a gain of 4.17 feet by the Control I group, this difference was significant at the .001 level.

It was also noted that the Control I group produced a mean gain of .34 seconds in the shuttle run and when compared to a gain of .03 seconds by the Intensive I group, this difference was significant at the .001 level. The Control I group produced a mean gain of 3.93 seconds in the 600 yard run-walk compared to a mean gain of .89 seconds; however, this difference was not significant at the .05 level.

A comparison of the Control I and Calisthenic I groups on the seven physical fitness variables is shown in Table IV.

A study of the data in Table IV indicated that the improvement shown by the Calisthenic I group was significantly greater than the improvement shown by the Control I group on two of the seven physical fitness variables tested. The Intensive I group produced a mean gain of .19 seconds in the fifty-yard dash and when compared to a loss of .15 seconds by the Control I group, this difference was significant at the .001 level. The Intensive I group produced a mean gain of 16.89 feet on the softball throw and when compared to a mean gain of 4.17 feet by the Control I group, this difference was significant at the .001 level. The Intensive I group produced greater mean gains on the pull-ups, standing jump, and the 600 yard run-walk compared to the Control I group;

TABLE IV

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL I AND CALISTHENIC I ON THE SEVEN FITNESS VARIABLES

Variables	Control I N = 30		Calisthenic I N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.00	1.44	.11	1.03	-.38	NSD
Sit-ups (Number)	.90	8.23	.78	4.19	.08	NSD
Shuttle Run (Seconds)	-.34	.48	-.21	.21	-1.45	NSD
Standing Jump (Inches)	3.80	5.52	4.04	2.01	-.25	NSD
50 yd. Dash (Seconds)	.15	.40	-.19	.14	4.25	.001
Softball Throw (Feet)	4.17	10.47	16.89	10.44	-5.49	.001
600 yd. Run (Seconds)	-3.93	12.14	-7.19	7.91	1.06	NSD

however, these differences were not significant at the .05 level.

It was also noted that the Control I group produced greater mean gains on the sit-ups and the shuttle run compared to the Calisthenic I group; however, these differences were not significant at the .05 level.

A comparison of the Control I and Isometric I groups on the seven physical fitness variables is shown in Table V.

TABLE V

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL I AND ISOMETRIC I ON THE SEVEN FITNESS VARIABLES

Variables	Control I N = 30		Isometric I N = 27		Fisher \underline{t}	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.00	1.44	.56	.83	-1.89	NSD
Sit-ups (Number)	.90	8.23	4.81	5.81	-2.42	.05
Shuttle Run (Seconds)	- .34	.48	- .20	.21	-1.58	NSD
Standing Jump (Inches)	3.80	5.52	3.85	2.45	- .06	NSD
50 yd. Dash (Seconds)	.15	.40	- .20	.17	4.39	.001
Softball Throw (Feet)	4.17	10.47	8.07	6.35	-1.69	NSD
600 yd. Run (Seconds)	-3.93	12.14	-9.81	16.20	1.91	NSD

A study of the data in Table V indicated that the improvement shown by the Isometric I group was significantly greater than the improvement shown by the Control I group on two of the seven physical fitness variables tested. The Isometric I group produced a mean gain of 4.81 sit-ups compared to a mean gain of .90 sit-ups by the Control I group; this difference was significant at the .05 level. The Isometric I group produced a mean gain of .20 seconds in the fifty-yard

dash and when compared to a loss of .15 seconds by the Control I group, this difference was significant at the .001 level. The Isometric I group produced greater mean gains on the pull-ups, standing jump, softball throw, and 600 yard run-walk and when compared to the Control I group, these differences were not significant at the .05 level.

It was also noted that the Control I group produced greater mean gains on the shuttle run compared to the Isometric I group; however, these differences were not significant at the .05 level.

A comparison of the Intensive I and Calisthenic I groups on the seven physical fitness variables is shown in Table VI.

A study of the data in Table VI indicated that the improvement shown by the Intensive I group was significantly greater than the improvement shown by the Calisthenic I group on three of the seven physical fitness variables tested. The Intensive I group produced a mean gain of 4.85 sit-ups and when compared to a mean gain of .78 sit-ups by the Calisthenic I group, this difference was significant at the .05 level. The Intensive I group produced a mean gain of 6.56 inches on the standing jump and when compared to a mean gain of 4.04 inches by the Calisthenic I group, this difference was significant at the .05 level. The Intensive I group produced a mean gain of .51 seconds on the fifty-yard dash

TABLE VI

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS INTENSIVE I AND CALISTHENIC I ON THE SEVEN FITNESS VARIABLES

Variables	Intensive I N = 27		Calisthenic I N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.70	.90	.11	1.03	1.97	NSD
Sit-ups (Number)	4.85	4.52	.78	4.19	2.46	.05
Shuttle Run (Seconds)	-.03	.28	-.21	.21	2.08	.05
Standing Jump (Inches)	6.56	2.36	4.04	2.01	2.62	.05
50 yd. Dash (Seconds)	-.51	.36	-.19	.14	-4.07	.001
Softball Throw (Feet)	16.93	5.62	16.89	10.44	.02	NSD
600 yd. Run (Seconds)	-.89	6.38	-7.19	2.00	2.00	NSD

and when compared to a mean gain of .19 seconds by the Calisthenic I group, this difference was significant at the .001 level. The Intensive I group produced greater mean gains on the pull-ups and softball throw compared to the Calisthenic I group; however, these differences were not significant at the .05 level.

It was also noted that the Calisthenic I group produced a mean gain of .21 seconds on the shuttle run and when compared

to a mean gain of .03 seconds by the Intensive I group, this difference was significant at the .05 level. The Calisthenic I group produced a greater mean gain on the 600 yard run-walk compared to the Intensive I group; however, this difference was not significant at the .05 level.

A comparison of the Intensive I and Isometric I groups on the seven physical fitness variables is shown in Table VII.

TABLE VII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS INTENSIVE I AND ISOMETRIC I ON THE SEVEN FITNESS VARIABLES

Variables	Intensive I N = 27		Isometric I N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.70	.90	.56	.83	.49	NSD
Sit-ups (Number)	4.85	4.52	4.81	5.81	.02	NSD
Shuttle Run (Seconds)	-.03	.28	-.20	.21	1.96	.05
Standing Jump (Inches)	6.56	2.36	3.85	2.45	2.81	.01
50 yd. Dash (Seconds)	-.51	.36	-.20	.17	-3.93	.01
Softball Throw (Feet)	16.93	5.62	8.07	6.35	3.72	.01
600 yd. Run (Seconds)	-.89	6.38	-9.81	16.20	2.84	.01

A study of the data in Table VII indicated that the improvement shown by the Intensive I group was significantly greater than the improvement shown by the Isometric I group on three of the seven physical fitness variables tested. The Intensive I group produced a mean gain of 6.56 inches on the standing jump compared to a mean gain of 3.85 inches by the Isometric I group; this difference was significant at the .01 level. The Intensive I group produced a mean gain of .51 seconds on the fifty-yard dash and when compared to a mean gain of .20 seconds by the Isometric I group, this difference was significant at the .01 level. The Intensive I group produced a mean gain of 16.93 feet on the softball throw and when compared to a mean gain of 8.07 feet by the Isometric I group, this difference was significant at the .01 level. The Intensive I group produced greater mean gains on the pull-ups and sit-ups compared to the Isometric I group; however, these differences were not significant at the .05 level.

It was also noted that the Isometric I group produced a mean gain of .20 seconds on the shuttle run and when compared to a mean gain of .03 seconds by the Intensive I group, this difference was significant at the .05 level. The Isometric I group produced a mean gain of 9.81 seconds on the 600 yard run-walk and when compared to a mean gain of .89 seconds by the Intensive I group, this difference was significant at the .01 level.

A comparison of the Calisthenic I and Isometric I groups on the seven physical fitness variables is shown in Table VIII.

TABLE VIII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CALISTHENIC I AND ISOMETRIC I ON THE SEVEN FITNESS VARIABLES

Variables	Calisthenic I N = 27		Isometric I N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.11	1.03	.56	.83	-1.48	NSD
Sit-ups (Number)	.78	4.19	4.81	5.81	-2.44	.05
Shuttle Run (Seconds)	- .21	.21	- .20	.21	- .12	NSD
Standing Jump (Inches)	4.04	2.01	3.85	2.45	.19	NSD
50 yd. Dash (Seconds)	- .19	.14	- .20	.17	.14	NSD
Softball Throw (Feet)	16.89	10.44	8.07	6.35	3.71	.01
600 yd. Run (Seconds)	-7.19	7.91	-9.81	16.20	.84	NSD

A study of the data in Table VIII indicated that the improvement shown by the Calisthenic I group was significantly greater than the improvement shown by the Isometric I group on one of the seven physical fitness variables tested. The Calisthenic I group produced a mean gain of 16.89 feet on the

softball throw compared to a mean gain of 8.07 feet by the Isometric I group; this difference was significant at the .01 level. The Calisthenic I group produced greater mean gains on the shuttle run and standing jump compared to the Isometric I group; however, these differences were not significant at the .05 level.

It was also noted that the Isometric I group produced a mean gain of 4.81 sit-ups and when compared to a mean gain of .78 sit-ups by the Calisthenic I group, this difference was significant at the .05 level. The Isometric I group produced greater mean gains on the pull-ups, fifty-yard dash, and 600 yard run-walk compared to the Calisthenic I group; however, these differences were not significant at the .05 level.

The results of the Wilks' lambda test for groups participating in physical education two days per week are shown in Table IX.

The lambda criterion shown in Table IX was significant at the .001 level indicating that the four programs produced significant differences on the seven experimental variables. As a result of the illustrated significance of difference the Fisher \underline{t} test was used to ascertain where the differences occurred. The results of the Fisher \underline{t} test for these four groups are shown in Tables X, XI, XII, XIII, XIV and XV.

TABLE IX

MEAN IMPROVEMENT AND STANDARD DEVIATION FOR SEVEN DIMENSIONS
OF PHYSICAL FITNESS ON SUBJECTS EXPOSED TO
PHYSICAL EDUCATION TWO DAYS PER WEEK

Variables	Control II N = 30		Intensive II N = 28		Callisthenic II N = 28		Isometric II N = 27		
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
Pull-ups (Number)	1.07	2.10	1.54	1.55	1.25	1.74	.59	.99	
Sit-ups (Number)	2.20	9.50	5.04	5.65	2.18	4.21	1.78	6.44	
Shuttle Run (Seconds)	-.04	.31	-.36	.39	-.29	.13	-.29	.14	
Standing Jump (Inches)	4.40	4.35	5.57	2.11	1.75	2.63	4.41	2.10	
50 yd. Dash (Seconds)	-.15	.41	-.25	.17	-.61	.28	-.34	.21	
Softball Throw (Feet)	8.67	9.84	28.03	8.30	20.18	4.87	12.81	7.68	
600 yd. Run (Seconds)	-8.47	14.68	-10.39	4.20	-5.14	3.63	-8.93	3.70	
A		=	.23035	F	$\frac{21}{296}$	=	9.41748	P	$\ll .001$

A comparison of the Control II and Intensive II groups on the seven physical fitness variables is shown in Table X.

TABLE X

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL II AND INTENSIVE II ON THE SEVEN FITNESS VARIABLES

Variables	Control II N = 30		Intensive II N = 28		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.07	2.10	1.54	1.55	-1.06	NSD
Sit-ups (Number)	2.20	9.50	5.04	5.65	-1.56	NSD
Shuttle Run (Seconds)	- .04	.31	- .36	.39	4.44	.001
Standing Jump (Inches)	4.40	4.35	5.57	2.11	-1.47	NSD
50 yd. Dash (Seconds)	- .15	.41	- .25	.17	1.32	NSD
Softball Throw (Feet)	8.67	9.84	28.04	8.31	-9.14	.001
600 yd. Run (Seconds)	-8.47	14.68	-10.39	4.20	.87	NSD

A study of the data in Table X indicated that the improvement shown by the Intensive II group was significantly greater than the improvement shown by the Control II group on two of the seven physical fitness variables tested. The Intensive II group produced a mean gain of .36 seconds on the shuttle run

and when compared to a mean gain of .04 seconds by the Control II group, this difference was significant at the .001 level. The Intensive II group produced a mean gain of 28.04 feet on the softball throw and when compared to a mean gain of 8.67 feet by the Control II group, this difference was significant at the .001 level. The Intensive II group produced greater mean gains on the pull-ups, sit-ups, standing jump, fifty-yard dash, and 600 yard run-walk when compared to the Control II group; however, these differences were not significant at the .05 level.

A comparison of the Control II and Calisthenic II groups on the seven physical fitness variables is shown in Table XI.

A study of the data in Table XI indicated that the improvement shown by the Calisthenic II group was significantly greater than the improvement shown by the Control II group on three of the seven physical fitness variables tested. The Calisthenic II group produced a mean gain of .29 seconds on the shuttle run and when compared to a mean gain of .04 seconds by the Control II group, this difference was significant at the .01 level. The Calisthenic II group produced a mean gain of .61 seconds on the fifty-yard dash and when compared to a mean gain of .15 seconds by the Control II group, this difference was significant at the .001 level. The Calisthenic II group produced a mean gain of

TABLE XI

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL II AND CALISTHENIC II ON THE SEVEN FITNESS VARIABLES

Variables	Control II N = 30		Calisthenic II N = 28		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.07	2.10	1.25	1.74	- .41	NSD
Sit-ups (Number)	2.20	9.50	2.18	4.21	.01	NSD
Shuttle Run (Seconds)	- .04	.31	- .29	.13	3.45	.01
Standing Jump (Inches)	4.40	4.35	1.75	2.63	3.32	.01
50 yd. Dash (Seconds)	- .15	.41	- .61	.28	5.97	.001
Softball Throw (Feet)	8.67	9.84	20.18	4.87	-5.43	.001
600 yd. Run (Seconds)	-8.47	14.68	-5.14	3.63	-1.51	NSD

20.18 feet on the softball throw and when compared to a mean gain of 8.67 feet by the Control II group, this difference was significant at the .001 level. The Calisthenic II group produced a greater mean gain on the pull-up compared to the Control II group; however, this difference was not significant at the .05 level.

It was also noted that the Control II group produced a greater mean gain of 4.40 inches on the standing jump and when

compared to a mean gain of 1.75 inches by the Calisthenic II group, this difference was significant at the .01 level. The Control II group produced greater mean gains on the sit-ups and 600 yard run-walk when compared to the Calisthenic II group; however, these differences were not significant at the .05 level.

A comparison of the Control II and Isometric II groups on the seven physical fitness variables is shown in Table XII.

TABLE XII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL II AND ISOMETRIC II ON THE SEVEN FITNESS VARIABLES

Variables	Control II N = 30		Isometric II N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.07	2.10	.59	.99	1.06	NSD
Sit-ups (Number)	2.20	9.50	1.78	6.44	.23	NSD
Shuttle Run (Seconds)	- .04	.31	- .29	.14	3.51	.01
Standing Jump (Inches)	4.40	4.35	4.41	2.10	- .01	NSD
50 yd. Dash (Seconds)	- .15	.41	- .34	.21	2.44	.05
Softball Throw (Feet)	8.67	9.84	12.81	7.68	-1.94	NSD
600 yd. Run (Seconds)	-8.47	14.68	-8.93	3.70	.21	NSD

A study of the data in Table XII indicated that the improvement shown by the Isometric II group was significantly greater than the improvement shown by the Control II group on two of the seven physical fitness variables tested. The Isometric II group produced a mean gain of .29 seconds on the shuttle run and when compared to a mean gain of .04 seconds by the Control II group, this difference was significant at the .01 level. The Isometric II group produced a mean gain of .34 seconds on the fifty-yard dash compared to a mean gain of .15 seconds by the Control II group; this difference was significant at the .05 level. The Isometric II group produced greater mean gains on the standing jump, softball throw, and the 600 yard run-walk when compared to the control II group; however, these differences were not significant at the .05 level.

It was also noted that the Control II group produced greater mean gains on the pull-ups and the sit-ups when compared to the Isometric II group; however, these differences were not significant at the .05 level.

A comparison of the Intensive II and Calisthenic II groups on the seven physical fitness variables is shown in Table XIII.

A study of the data in Table XIII indicated that the improvement shown by the Intensive II group was significantly greater than the improvement shown by the Calisthenic II group

TABLE XIII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS INTENSIVE II AND CALISTHENIC II ON THE SEVEN FITNESS VARIABLES

Variables	Intensive II N = 28		Calisthenic II N = 28		Fisher t	LC
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.54	1.55	1.25	1.74	.63	NSD
Sit-ups (Number)	5.04	5.65	2.18	4.21	1.55	NSD
Shuttle Run (Seconds)	- .36	.39	- .29	.13	- .97	NSD
Standing Jump (Inches)	5.57	2.11	1.75	2.63	4.71	.001
50 yd. Dash (Seconds)	- .25	.17	- .61	.28	4.58	.001
Softball Throw (Feet)	28.04	8.31	20.18	4.87	3.64	.01
600 yd. Run (Seconds)	-10.39	4.20	-5.14	3.63	-2.34	.05

on three of the seven physical fitness variables tested. The Intensive II group produced a mean gain of 5.57 inches on the standing jump and when compared to a mean gain of 1.75 inches by the Calisthenic II group, this difference was significant at the .001 level. The Intensive II group produced a mean gain of 28.04 feet on the softball throw and when compared to a mean gain of 20.18 feet by the Calisthenic II group, this difference was significant at the .01 level. The Intensive II

group produced a mean gain of 10.39 seconds on the 600 yard run-walk and when compared to a mean gain of 5.14 seconds by the Calisthenic II group, this difference was significant at the .05 level. The Intensive II group produced greater mean gains on the pull-ups, sit-ups and shuttle run when compared to the Calisthenic II group; however, these differences were not significant at the .05 level.

It was also noted that the Calisthenic II group produced a mean gain of .61 seconds in the fifty-yard dash and when compared to a mean gain of .25 seconds by the Intensive II group, this difference was significant at the .001 level.

A comparison of the Intensive II and Isometric II groups on the seven physical fitness variables is shown in Table XIV.

A study of the data in Table XIV indicated that the improvement shown by the Intensive II group was significantly greater than the improvement shown by the Isometric II group on two of the seven physical fitness variables tested. The Intensive II group produced a mean gain of 1.54 pull-ups and when compared to a mean gain of .59 pull-ups by the Isometric II group, this difference was significant at the .05 level. The Intensive II group produced a mean gain of 28.04 feet on the softball throw and when compared to a mean gain of 12.81 feet by the Isometric II group, this difference was significant at the .001 level. The Intensive II group produced greater mean gains on the sit-ups, shuttle run,

TABLE XIV

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS INTENSIVE II AND ISOMETRIC II ON THE SEVEN FITNESS VARIABLES

Variables	Intensive II N = 28		Isometric II N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.54	1.55	.59	.99	2.07	.05
Sit-ups (Number)	5.04	5.65	1.78	6.44	1.75	NSD
Shuttle Run (Seconds)	- .36	.39	- .29	.14	-.87	NSD
Standing Jump (Inches)	5.57	2.11	4.41	2.10	1.42	NSD
50 yd. Dash (Seconds)	- .25	.17	- .34	.21	1.12	NSD
Softball Throw (Feet)	28.04	8.31	12.81	7.68	6.99	.001
600 yd. Run (Seconds)	-10.39	4.20	-8.93	3.70	-.65	NSD

standing jump, and 600 yard run-walk when compared to the Isometric II group; however, these differences were not significant at the .05 level.

It was also noted that the Isometric II group produced a greater mean gain on the fifty-yard dash but when compared to the Intensive II group, this difference was not significant at the .05 level.

A comparison of the Calisthenic II and Isometric II groups on the seven physical fitness variables is shown in Table XV.

TABLE XV

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CALISTHENIC II AND ISOMETRIC II ON THE SEVEN FITNESS VARIABLES

Variables	Calisthenic II N = 28		Isometric II N = 27		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.25	1.74	.59	.99	1.44	NSD
Sit-ups (Number)	2.18	4.21	1.78	6.44	.21	NSD
Shuttle Run (Seconds)	-.29	.13	-.29	.14	.09	NSD
Standing Jump (Inches)	1.75	2.63	4.01	2.10	-3.25	.01
50 yd. Dash (Seconds)	-.61	.28	-.34	.21	-3.42	.01
Softball Throw (Feet)	20.18	4.87	12.81	7.68	3.38	.01
600 yd. Run (Seconds)	5.14	3.63	-8.93	3.70	1.67	NSD

A study of the data in Table XV indicated that the improvement shown by the Calisthenic II group was significantly greater than the improvement shown by the Isometric II group on two of the seven physical fitness variables tested.

The Calisthenic II group produced a mean gain of .61 seconds on the fifty-yard dash and when compared to a mean gain of .34 seconds by the Isometric II group, this difference was significant at the .01 level. The Calisthenic II group produced a mean gain of 20.18 feet on the softball throw and when compared to a mean gain of 12.81 feet by the Isometric II group, this difference was significant at the .01 level. The Calisthenic II group produced greater mean gains on the pull-ups and sit-ups when compared to the Isometric II group; however, these differences were not significant at the .05 level.

It was also noted that the Isometric II group produced a mean gain of 4.01 inches on the standing jump and when compared to a mean gain of 1.75 inches by the Calisthenic II group, this difference was significant at the .01 level. The Isometric II group also produced a greater mean gain on the 600 yard run-walk than the Calisthenic II group; however, this difference was not significant at the .05 level.

It was further noted that both the Calisthenic II and the Isometric II groups showed an improvement of .29 seconds on the shuttle run.

The results of the Wilks' lambda test for groups participating in physical education three days per week are shown in Table XVI.

TABLE XVI

MEAN IMPROVEMENT AND STANDARD DEVIATION FOR SEVEN DIMENSIONS
OF PHYSICAL FITNESS ON SUBJECTS EXPOSED TO
PHYSICAL EDUCATION THREE DAYS PER WEEK

Variables	Control III N = 34		Intensive III N = 28		Callisthenic III N = 28		Isometric III N = 28	
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	1.74	1.61	2.57	1.70	.04	.98	2.14	3.10
Sit-ups (Number)	7.65	12.03	14.50	11.38	7.07	2.70	4.32	5.56
Shuttle Run (Seconds)	-.38	.63	-.29	.42	-.05	.15	-.17	.30
Standing Jump (Inches)	3.71	3.97	6.89	4.46	2.93	2.58	4.43	2.58
50 yd. Dash (Seconds)	-.09	.35	-.28	.34	-.31	.29	.57	.13
Softball Throw (Feet)	14.85	12.43	17.82	11.30	23.89	5.93	25.07	9.32
600 yd. Run (Seconds)	-2.68	13.32	-11.36	14.61	-10.57	3.64	8.25	6.07
		$\lambda = .33492$	F = $\frac{21}{311}$	=	6.85928	P	$\frac{21}{311}$.001

The lambda criterion shown in Table XVI was significant at the .001 level, indicating that the four programs produced significant differences on the seven experimental variables. As a result of the illustrated significance of difference the Fisher t test was used to ascertain where the differences occurred. The results of the Fisher t test for these four groups are shown in Tables XVII, XVIII, XIX, XX, XXI, and XXII.

A comparison of the Control III and Intensive III groups on the seven physical fitness variables is shown in Table XVII.

A study of the data in Table XVII indicated that the improvement shown by the Intensive III group was significantly greater than the improvement shown by the Control III group on four of the seven physical fitness variables tested. The Intensive III group produced a mean gain of 14.50 sit-ups and when compared to a mean gain of 7.65 sit-ups by the Control III group, this difference was significant at the .01 level. The Intensive III group produced a mean gain of 6.89 inches on the standing jump and when compared to a mean gain of 3.71 inches by the Control III group, this difference was significant at the .01 level. The Intensive III group produced a mean gain of .28 seconds on the fifty-yard dash and when compared to a mean gain of .09 seconds by the Control III group, this difference was significant at the .05 level. The Intensive III

TABLE XVII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL III AND INTENSIVE III ON THE SEVEN FITNESS VARIABLES

Variables	Control. III N = 34		Intensive III N = 28		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.74	1.61	2.57	1.70	-1.62	NSD
Sit-ups (Number)	7.65	12.03	14.50	11.38	-2.92	.01
Shuttle Run (Seconds)	- .38	.63	- .29	.42	- .82	NSD
Standing Jump (Inches)	3.71	3.97	6.89	4.46	-3.48	.01
50 yd. Dash (Seconds)	- .09	.35	- .28	.34	2.48	.05
Softball Throw (Feet)	14.85	12.43	17.82	11.30	-1.12	NSD
600 yd. Run (Seconds)	-2.68	13.32	-11.36	14.61	3.14	.01

group produced a mean gain of 11.36 seconds on the 600 yard run-walk and when compared to a mean gain of 2.68 seconds by the Control III group, this difference was significant at the .01 level. The Intensive III group produced greater mean gains on the pull-ups and softball throw when compared to the Control III group; however, these differences were not significant at the .05 level.

It was also noted that the Control III group produced a greater mean gain on the shuttle run when compared to the Intensive III group; however, this difference was not significant at the .05 level.

A comparison of the Control III and Calisthenic III groups on the seven physical fitness variables is shown in Table XVIII.

TABLE XVIII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL III AND CALISTHENIC III ON THE SEVEN FITNESS VARIABLES

Variables	Control III N = 34		Calisthenic III N = 28		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.74	1.61	.04	.98	3.29	.01
Sit-ups (Number)	7.65	12.03	7.07	2.70	.25	NSD
Shuttle Run (Seconds)	- .38	.63	- .05	.15	-2.94	.01
Standing Jump (Inches)	3.71	3.97	2.93	2.58	.85	NSD
50 yd. Dash (Seconds)	- .09	.35	- .31	.29	2.99	.01
Softball Throw (Feet)	14.85	12.43	23.89	5.93	-3.42	.01
600 yd. Run (Seconds)	-2.68	13.32	-10.57	3.64	2.85	.01

A study of the data in Table XVIII indicated that the improvement shown by the Calisthenic III group was significantly greater than the improvement shown by the Control III group on three of the seven physical fitness variables tested. The Calisthenic III group produced a mean gain of .31 seconds on the fifty-yard dash and when compared to a mean gain of .09 seconds by the Control III group, this difference was significant at the .01 level. The Calisthenic III group produced a mean gain of 23.89 feet on the softball throw and when compared to a mean gain of 14.85 feet by the Control III group, this difference was significant at the .01 level. The Calisthenic III group produced a mean gain of 10.57 seconds on the 600 yard run-walk and when compared to a mean gain of 2.68 seconds by the Control III group, this difference was significant at the .01 level.

It was also noted that the Control III group produced a mean gain of 1.74 pull-ups and when compared to a mean gain of .04 pull-ups by the Calisthenic III group, this difference was significant at the .01 level. The Control III group produced a mean gain of .38 seconds on the shuttle run and when compared to a mean gain of .05 seconds by the Calisthenic III group, this difference was significant at the .01 level. The Control III group produced greater mean gains on the sit-ups and standing jump when compared to the Calisthenic III group; however, these differences were not significant at the .05 level.

A comparison of the Control III and Isometric III groups on the seven physical fitness variables is shown in Table XIX.

TABLE XIX

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CONTROL III AND ISOMETRIC III ON THE SEVEN FITNESS VARIABLES

Variables	Control III N = 34		Isometric III N = 28		Fisher <u>t</u>	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	1.74	1.61	2.14	3.10	- .79	NSD
Sit-ups (Number)	7.65	12.03	4.32	5.56	1.42	NSD
Shuttle Run (Seconds)	- .38	.63	- .17	.30	-1.85	NSD
Standing Jump (Inches)	3.71	3.97	4.43	2.58	- .79	NSD
50 yd. Dash (Seconds)	- .09	.35	- .57	.13	6.30	.001
Softball Throw (Feet)	14.85	12.43	25.07	9.32	-3.86	.001
600 yd. Run (Seconds)	-2.68	13.32	-8.25	6.07	2.01	NSD

A study of the data in Table XIX indicated that the improvement shown by the Isometric III group was significantly greater than the improvement shown by the Control III group on two of the seven physical fitness variables tested. The Isometric III group produced a mean gain of .57 seconds on

the fifty-yard dash and when compared to a mean gain of .09 seconds by the Control III group, this difference was significant at the .001 level. The Isometric III group produced a mean gain of 25.07 feet on the softball throw and when compared to a mean gain of 14.85 feet by the Control III group, this difference was significant at the .001 level. The Isometric III group produced greater mean gains on the pull-ups, standing jump, and 600 yard run-walk when compared to the Control III group; however, these differences were not significant at the .05 level.

It was also noted that the Control III group produced greater mean gains on sit-ups and shuttle run when compared to the Isometric III group; however, these differences were not significant at the .05 level.

A comparison of the Intensive III and Calisthenic III groups on the seven physical fitness variables is shown in Table XX.

A study of the data in Table XX indicated that the improvement shown by the Intensive III group was significantly greater than the improvement shown by the Calisthenic III group on three of the seven physical fitness variables tested. The Intensive III group produced a mean gain of 2.57 pull-ups and when compared to a mean gain of .04 pull-ups by the Calisthenic III group, this difference was significant at the .001 level. The Intensive III group produced a mean gain of

TABLE XX

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS INTENSIVE III AND CALISTHENIC III ON THE SEVEN FITNESS VARIABLES

Variables	Intensive III N = 28		Calisthenic III N = 28		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	2.57	1.70	.04	.98	4.69	.001
Sit-ups (Number)	14.50	11.38	7.07	2.70	3.03	.01
Shuttle Run (Seconds)	-.29	.42	-.05	.15	-2.03	NSD
Standing Jump (Inches)	6.89	4.46	2.93	2.58	4.14	.001
50 yd. Dash (Seconds)	-.28	.34	-.31	.29	.49	NSD
Softball Throw (Feet)	17.82	11.30	23.89	5.93	-2.19	.05
600 yd. Run (Seconds)	11.36	14.61	10.57	3.64	-.27	NSD

14.50 sit-ups and when compared to a mean gain of 7.07 sit-ups by the Calisthenic III group, this difference was significant at the .01 level. The Intensive III group produced a mean gain of 6.89 inches on the standing jump and when compared to a mean gain of 2.93 inches by the Calisthenic III group, this difference was significant at the .001 level. The Intensive III group produced greater mean gains on the shuttle run and 600 yard run-walk when compared

to the Calisthenic III group; however, these differences were not significant at the .05 level.

It was also noted that the Calisthenic III group produced a mean gain of 23.89 feet on the softball throw and when compared to a gain of 17.82 feet by the Intensive III group, this difference was significant at the .05 level. The Calisthenic III group produced a greater mean gain on the fifty-yard dash when compared to the Intensive III group; however, this difference was not significant at the .05 level.

A comparison of the Intensive III and Isometric III groups on the seven physical fitness variables is shown in Table XXI.

A study of the data in Table XXI indicated that the improvement shown by the Intensive III group was significantly greater than the improvement shown by the Isometric III group on two of the seven physical fitness variables tested. The Intensive III group produced a mean gain of 14.50 sit-ups and when compared to a mean gain of 4.32 sit-ups by the Isometric III group, this difference was significant at the .001 level. The Intensive III group produced a mean gain of 6.89 inches on the standing jump and when compared to a mean gain of 4.43 inches by the Isometric III group, this difference was significant at the .05 level. The Intensive III group produced greater mean gains on the pull-ups, shuttle run, and 600 yard run-walk when compared to the Isometric III group; however, these differences were not significant at the .05 level.

TABLE XXI

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS INTENSIVE III AND ISOMETRIC III ON THE SEVEN FITNESS VARIABLES

Variables	Intensive III N = 28		Isometric III N = 28		Fisher \underline{t}	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	2.57	1.70	2.14	3.10	.79	NSD
Sit-ups (Number)	14.50	11.38	4.32	5.56	4.15	.001
Shuttle Run (Seconds)	- .29	.42	- .17	.30	- .98	NSD
Standing Jump (Inches)	6.89	4.46	4.43	2.58	2.57	.05
50 yd. Dash (Seconds)	- .28	.34	- .57	.13	3.65	.01
Softball Throw (Feet)	17.82	11.30	25.07	9.32	-2.62	.05
600 yd. Run (Seconds)	-11.36	14.61	-8.25	6.07	-1.07	NSD

It was also noted that the Isometric III group produced a mean gain of .57 seconds on the fifty-yard dash and when compared to a mean gain of .28 seconds by the Intensive III group, this difference was significant at the .01 level. The Isometric III group produced a mean gain of 25.07 feet on the softball throw and when compared to a mean gain of 17.82 feet by the Intensive III group, this difference was significant at the .05 level.

A comparison of the Calisthenic III and Isometric III groups on the seven physical fitness variables is shown in Table XXII.

TABLE XXII

A COMPARISON OF MEAN IMPROVEMENT AND STANDARD DEVIATIONS FOR GROUPS CALISTHENIC III AND ISOMETRIC III ON THE SEVEN FITNESS VARIABLES

Variables	Calisthenic III N = 28		Isometric III N = 28		Fisher t	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	.04	.98	2.14	3.10	3.90	.001
Sit-ups (Number)	7.07	2.70	4.32	5.56	1.12	NSD
Shuttle Run (Seconds)	- .05	.15	- .17	.30	1.04	NSD
Standing Jump (Inches)	2.93	2.58	4.43	2.58	-1.56	NSD
50 yd. Dash (Seconds)	- .31	.29	- .57	.13	3.16	.01
Softball Throw (Feet)	23.89	5.93	25.07	9.32	- .43	NSD
600 yd. Run (Seconds)	-10.57	3.64	-8.25	6.07	- .80	NSD

A study of the data in Table XXII indicated that the improvement shown by the Isometric III group was significantly greater than the improvement shown by the Calisthenic III group on two of the seven physical fitness variables tested.

The Isometric III group produced a mean gain of 2.14 pull-ups and when compared to a mean gain of .04 pull-ups by the Calisthenic III group, this difference was significant at the .001 level. The Isometric III group produced a mean gain of .57 seconds on the fifty-yard dash and when compared to a mean gain of .31 seconds by the Calisthenic III group, this difference was significant at the .01 level. The Isometric III group produced greater mean gains on the shuttle run, standing jump, and softball throw when compared to the Calisthenic III group; however, these differences were not significant at the .05 level.

It was also noted that the Calisthenic III group produced greater mean gains on the sit-ups and 600 yard run-walk when compared to the Isometric III group; however, these differences were not significant at the .05 level.

Hypothesis Two stated that the improvement in cardiovascular endurance, abdominal strength, speed and agility, speed, and leg power for those students subjected to calisthenics and intensives would be significantly greater than those students using isometrics. Cardio-vascular endurance was measured by the 600 yard run-walk; abdominal strength was measured by the sit-ups; speed and agility was measured by the shuttle run; speed was measured by the fifty-yard dash; and leg power was measured by the standing jump.

The comparison of the Calisthenic I and Isometric I groups was shown in Table VIII. On none of the five variables did the results correspond with the stated hypothesis. The Calisthenic I group produced greater mean gains on the shuttle run and standing jump compared to the Isometric I group; however, these differences were not significant at the .05 level. It was also noted that the Isometric I group produced a mean gain of 4.81 sit-ups compared to a mean gain of .78 sit-ups by the Calisthenic I group, this difference was significant at the .05 level. The Isometric I group produced greater mean gains on the fifty-yard dash and 600 yard run-walk when compared to the Calisthenic I group; however, these differences were not significant at the .05 level.

The comparison of the Calisthenic II and Isometric II groups was shown in Table XV. On only one of the five variables did the results correspond with the stated hypothesis. The Calisthenic II group produced a mean gain of .61 seconds on the fifty-yard dash and when compared to a mean gain of .34 seconds by the Isometric II group, this difference was significant at the .01 level. The Calisthenic II group also produced a greater mean gain on the sit-ups when compared to the Isometric II group; however, this difference was not significant at the .05 level. It was also noted that the Isometric II group produced a mean gain of 4.01 inches on the

standing jump and when compared to a mean gain of 1.75 inches by the Calisthenic II group, this difference was significant at the .01 level. The Isometric II group also produced a greater mean gain on the 600 yard run-walk when compared to the Calisthenic II group; however, this difference was not significant at the .05 level. It was further noted that on the shuttle run the Calisthenic II and Isometric II groups produced an identical mean gain of .29 seconds.

The comparison of the Calisthenic III and Isometric III groups was shown in Table XXII. On none of the five variables did the results correspond with the stated hypothesis. The Calisthenic II group produced greater mean gains on the sit-ups and the 600 yard run-walk when compared to the Isometric III group; however, these differences were not significant at the .05 level. It was also noted that the Isometric III group produced a mean gain of .57 seconds on the fifty-yard dash and when compared to a mean gain of .31 seconds by the Calisthenic III group, this difference was significant at the .01 level. The Isometric III group also produced greater mean gains on the shuttle run and standing jump when compared to the Calisthenic III group; however, these differences were not significant at the .05 level.

The comparison of the Intensive I and Isometric I groups was shown in Table VII. On only two of the five variables did the results correspond with the stated hypothesis.

The Intensive I group produced a mean gain of 6.56 inches on the standing jump and when compared to a mean gain of 3.85 inches by the Isometric I group, this difference was significant at the .01 level. The Intensive I group produced a mean gain of .51 seconds on the fifty-yard dash and when compared to a mean gain of .20 seconds by the Isometric I group, this difference was significant at the .01 level. The Intensive I group also produced a greater mean gain on the sit-ups when compared to the Isometric I group; however, this difference was not significant at the .05 level. It was also noted that the Isometric I group produced a mean gain of .20 seconds on the shuttle run and when compared to a mean gain of .03 seconds by the Intensive I group, this difference was significant at the .05 level. The Isometric I group produced a mean gain of 9.81 seconds on the 600 yard run-walk and when compared to a mean gain of .89 seconds by the Intensive I group, this difference was significant at the .01 level.

The comparison of the Intensive II and Isometric II groups was shown in Table XIV. On none of the five variables did the results correspond with the stated hypothesis. The Intensive II group produced greater mean gains on the sit-ups, shuttle run, standing jump, and 600 yard run-walk when compared to the Isometric II group; however, these differences were not significant at the .05 level. It was also noted that

the Isometric II group produced a greater mean gain on the fifty-yard dash compared to the Intensive II group; however, this difference was not significant at the .05 level.

The comparison of the Intensive III and Isometric III groups was shown in Table XXI. On only two of the five variables did the results correspond with the stated hypothesis. The Intensive III group produced a mean gain of 14.50 sit-ups and when compared to a mean gain of 4.32 sit-ups by the Isometric III group, this difference was significant at the .001 level. The Intensive III group produced a mean gain of 6.89 inches on the standing jump and when compared to a mean gain of 4.43 inches by the Isometric III group, this difference was significant at the .05 level. The Intensive III group also produced a greater mean gain on the shuttle run and the 600 yard run-walk when compared to the Isometric III group; however, these differences were not significant at the .05 level. It was also noted that the Isometric III group produced a mean gain of .57 seconds on the fifty-yard dash and when compared to a mean gain of .28 seconds by the Intensive III group, this difference was significant at the .01 level.

Hypothesis Three stated that the improvement in bicep strength and arm power for those students subjected to isometrics and intensives would be significantly greater than those students using calisthenics. Bicep strength was

measured by the pull-ups and arm strength was measured by the softball throw.

The comparison of the Isometric I and Calisthenic I groups was shown in Table VIII. On neither of the two variables did the results correspond with the stated hypothesis. The Isometric I group did produce a greater mean gain on the pull-ups compared to the Calisthenic I group, but this difference was not significant at the .05 level. It was also noted that the Calisthenic I group produced a mean gain of 16.89 feet on the softball throw and when compared to a mean gain of 8.07 feet by the Isometric I group, this difference was significant at the .01 level.

The comparison of the Isometric II and Calisthenic II groups was shown in Table XV. On neither of the two variables did the results correspond with the stated hypothesis. It was noted that the Calisthenic II group produced a mean gain of 20.18 feet on the softball throw and when compared to a mean gain of 12.81 feet by the Isometric II group, this difference was significant at the .01 level. The Calisthenic II group also produced a greater mean gain on the pull-ups when compared to the Isometric II group; however, this difference was not significant at the .05 level.

The comparison of the Isometric III and Calisthenic III groups was shown in Table XXII. However, on only one of the variables did the results correspond with the stated hypothesis.

The Isometric III group produced a mean gain of 2.14 pull-ups and when compared to a mean gain of .04 pull-ups by the Calisthenic III group, this difference was significant at the .001 level. The Isometric III group also produced a greater mean gain on the softball throw when compared to the Calisthenic III group; however, this difference was not significant at the .05 level.

The comparison of the Intensive I and Calisthenic I groups was shown in Table VI. On neither of the two variables did the results correspond with the stated hypothesis. The Intensive I group produced greater mean gains on the pull-ups and softball throw when compared to the Calisthenic I group; however, these differences were not significant at the .05 level.

The comparison of the Intensive II and Calisthenic II groups was shown in Table XIII. However, on only one of the variables did the results correspond with the stated hypothesis. The Intensive II group produced a mean gain of 28.04 feet on the softball throw and when compared to the mean gain of 20.18 feet by the Calisthenic I group, this difference was significant at the .01 level. The Intensive II group also produced a greater mean gain on the pull-ups when compared to the Calisthenic II group; however, this difference was not significant at the .05 level.

The comparison of the Intensive III and Calisthenic III groups was shown in Table XX. However, on only one of the variables did the results correspond with the stated hypothesis. The Intensive III group produced a mean gain of 2.57 pull-ups and when compared to a mean gain of .04 pull-ups by the Calisthenic III group, this difference was significant at the .001 level. It was also noted that the Calisthenic III group produced a mean gain of 23.89 feet on the softball throw and when compared to a mean gain of 17.82 feet by the Intensive III group, this difference was significant at the .05 level.

Hypothesis Four stated that the groups exposed to three periods per week of physical education will show a significant improvement on the seven components of physical fitness over those meeting twice a week when the same routine is employed. Tables XXIII, XXIV, and XXV show the mean improvement, standard deviations, and the Wilks' lambda scores for groups meeting three periods per week and for groups using the same routine but meeting only two days per week.

A comparison of the Intensive III and Intensive II groups on the seven physical fitness variables is shown in Table XXIII.

The lambda criterion in Table XXIII indicated that the Intensive III group produced a mean improvement significant at the .001 level, compared to the Intensive II group, on

TABLE XXIII

A COMPARISON OF MEANS AND STANDARD
DEVIATIONS FOR TWO GROUPS EXPOSED
TO VARIED FREQUENCIES OF
INTENSIVE EXERCISE

Variables	Intensive II N = 28		Intensive III N = 28	
	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	1.54	1.55	2.57	1.70
Sit-ups (Number)	5.04	5.65	14.50	11.38
Shuttle Run (Seconds)	- .36	.39	- .29	.42
Standing Jump (Inches)	5.57	2.11	6.89	4.46
50 yd. Dash (Seconds)	- .25	.17	- .28	.34
Softball Throw (Feet)	28.04	8.31	17.82	11.30
600 yd. Run (Seconds)	-10.39	4.20	-11.36	14.61
$\lambda = .58668$ $F \frac{7}{48} = 4.83086$ $p \leq .001$				

the seven physical fitness variables. These results, while supporting the stated hypothesis, show that the Intensive III group produced greater mean gains on only five of the seven variables compared to the Intensive II group. Greater mean gains were produced by the Intensive III group on the pull-ups, sit-ups, standing jump, fifty-yard dash, and the 600 yard run-walk.

It was also noted that the Intensive II group produced greater mean gains on the shuttle run and the softball throw.

A comparison of the Calisthenic III and Calisthenic II groups on the seven physical fitness variables is shown in Table XXIV.

TABLE XXIV

A COMPARISON OF MEANS AND STANDARD DEVIATIONS FOR TWO GROUPS EXPOSED TO VARIED FREQUENCIES OF CALISTHENIC EXERCISE

Variables	Calisthenic II N = 28		Calisthenic III N = 28	
	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	1.25	1.74	.04	.98
Sit-ups (Number)	2.18	4.21	7.07	2.70
Shuttle Run (Seconds)	- .29	.13	- .05	.15
Standing Jump (Inches)	1.75	2.63	2.93	2.58
50 yd. Dash (Seconds)	- .61	.28	- .31	.29
Softball Throw (Feet)	20.18	4.87	23.89	5.93
600 yd. Run (Seconds)	-5.14	3.63	-10.57	3.64
$\Lambda = .26335$ $F \frac{7}{48} = 19.18030$ $p < .001$				

The lambda criterion in Table XXIV indicated that the Calisthenic III group produced a mean improvement significant at the .001 level when compared to the Calisthenic II group on the seven physical fitness variables. These results, while supporting the stated hypothesis, show that the Calisthenic III group produced greater mean gains on only four of the seven variables when compared to the Calisthenic II group. Greater mean gains were produced by the Calisthenic III group on the sit-ups, standing jump, softball throw, and 600 yard run-walk. It was also noted that the Calisthenic II group produced greater mean gains on the pull-ups, shuttle run, and fifty-yard dash.

A comparison of the Isometric III and Isometric II groups on the seven physical fitness variables is shown in Table XXV.

The lambda criterion in Table XXV indicated that the Isometric III group produced a mean improvement significant at the .001 level when compared to the Isometric II group on the seven physical fitness variables. These results, while supporting the stated hypothesis, show that the Isometric III group produced greater mean gains on only five of the seven variables when compared to the Isometric II group. Greater mean gains were produced by the Isometric III group on the pull-ups, sit-ups, standing jump, fifty-yard dash, and the softball throw. It was also noted that the Isometric II

TABLE XXV

A COMPARISON OF MEANS AND STANDARD DEVIATIONS FOR TWO GROUPS EXPOSED TO VARIED FREQUENCIES OF ISOMETRIC EXERCISE

Variables	Isometric II N = 27		Isometric III N = 28	
	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	.59	.99	2.14	3.10
Sit-ups (Number)	1.78	6.44	4.32	5.56
Shuttle Run (Seconds)	- .29	.14	- .17	.30
Standing Jump (Inches)	4.41	2.10	4.43	2.58
50 yd. Dash (Seconds)	- .34	.21	- .57	.13
Softball Throw (Feet)	12.81	7.68	25.07	9.32
600 yd. Run (Seconds)	-8.93	3.70	-8.25	6.07
$\Lambda = .43975 \quad F \frac{2}{47} = 8.55379 \quad p < .001$				

group produced greater mean gains on the shuttle run and the 600 yard run-walk.

Hypothesis Five stated that the groups exposed to two periods per week of physical education would show a significant improvement on the seven components of physical fitness over those meeting once a week when the same routine is employed.

Tables XXVI, XXVII, and XXVIII show the mean improvement, standard deviations, and the Wilks' lambda scores for groups meeting two periods per week, and groups, using the same routine but meeting only one day per week.

A comparison of the Intensive II and Intensive I groups on the seven physical fitness variables is shown in Table XXVI.

TABLE XXVI

A COMPARISON OF MEANS AND STANDARD DEVIATIONS FOR TWO GROUPS EXPOSED TO VARIED FREQUENCIES OF INTENSIVE EXERCISE

Variables	Intensive I N = 27		Intensive II N = 28	
	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	.70	.90	1.54	1.55
Sit-ups (Number)	4.85	4.52	5.04	5.65
Shuttle Run (Seconds)	-.03	.28	-.36	.39
Standing Jump (Inches)	6.56	2.36	5.57	2.11
50 yd. Dash (Seconds)	-.51	.36	-.25	.17
Softball Throw (Feet)	16.93	5.62	28.04	8.31
600 yd. Run (Seconds)	-.89	6.38	-10.39	4.20
$\Lambda = .18918$ $F \frac{7}{47} = 28.77563$ $p < .001$				

The lambda criterion in Table XXVI indicated that the Intensive II group produced a mean improvement significant at the .001 level when compared to the Intensive I group on the seven physical fitness variables. These results, while supporting the stated hypothesis, show that the Intensive II group produced greater mean gains on only five of the seven variables when compared to the Intensive I group. Greater mean gains were produced by the Intensive II group on the pull-ups, sit-ups, shuttle run, softball throw, and the 600 yard run-walk. It was also noted that the Intensive I group produced greater mean gains on the standing jump and the fifty-yard dash.

A comparison of the Calisthenic II and Calisthenic I groups on the seven physical fitness variables is shown in Table XXVII.

The lambda criterion in Table XXVII indicated that the Calisthenic II group produced a mean improvement significant at the .001 level when compared to the Calisthenic I group on the seven physical fitness variables. These results, while supporting the stated hypothesis, show that the Calisthenic II group produced greater mean gains on only five of the seven variables when compared to the Calisthenic I group. Greater mean gains were produced by the Calisthenic II group on the pull-ups, sit-ups, shuttle run, fifty-yard dash, and the softball throw. It was also noted that the

TABLE XXVII

A COMPARISON OF MEANS AND STANDARD
DEVIATIONS FOR TWO GROUPS EXPOSED
TO VARIED FREQUENCIES OF
CALISTHENIC EXERCISE

Variables	Calisthenic I N = 27		Calisthenic II N = 28	
	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	.11	1.03	1.25	1.74
Sit-ups (Number)	.78	4.19	2.18	4.21
Shuttle Run (Seconds)	- .21	.21	- .29	.13
Standing Jump (Inches)	4.04	2.00	1.75	2.63
50 yd. Dash (Seconds)	- .19	.14	- .61	.28
Softball Throw (Feet)	16.89	10.44	20.18	4.87
600 yd. Run (Seconds)	-7.19	7.91	-5.14	3.63
$\Lambda = .19882 \quad F \frac{7}{47} = 27.05608 \quad p < .001$				

Calisthenic I group produced greater mean gains on the standing jump and the 600 yard run-walk.

A comparison of the Isometric II and Isometric I groups on the seven physical fitness variables is shown in Table XXVIII.

TABLE XXVIII

A COMPARISON OF MEANS AND STANDARD
DEVIATIONS FOR TWO GROUPS EXPOSED
TO VARIED FREQUENCIES OF
ISOMETRIC EXERCISE

Variables	Isometric I N = 27		Isometric II N = 28	
	Mean	S.D.	Mean	S.D.
Pull-ups (Number)	.56	.83	.59	.99
Sit-ups (Number)	4.81	5.81	1.78	6.44
Shuttle Run (Seconds)	- .20	.21	- .29	.14
Standing Jump (Inches)	3.85	2.45	4.41	2.10
50 yd. Dash (Seconds)	- .20	.17	- .34	.21
Softball Throw (Feet)	8.07	6.35	12.81	7.68
600 yd. Run (Seconds)	-9.81	16.20	-8.93	3.70

$\Lambda = .71326 \quad F \frac{7}{46} = 2.64168 \quad p < .10$

The lambda criterion in Table XXVIII indicated that the Isometric II group produced an over-all mean improvement significant at the .10 level when compared to the Isometric I group on the seven physical fitness variables. These results, while supporting the stated hypothesis, were not significant at the required .05 level. Greater mean gains were produced

by the Isometric II group on five of the seven physical fitness variables when compared to the Isometric I group. Greater mean gains were produced by the Isometric II group on the pull-ups, shuttle run, standing jump, fifty-yard dash, and the softball throw. It was also noted that the Isometric I group produced greater mean gains on the sit-ups and the 600 yard run-walk.

Hypothesis Six stated that the control groups would show no significant improvement on the seven components of physical fitness. Tables XXIX, XXX, and XXXI show the comparison of the pre- and post-test means and standard deviations, and the results of the Fisher t test for these groups.

A comparison of the pre- and post-tests for the Control I group is shown in Table XXIX.

A comparison of the pre-test and post-test for the Control I group supported the stated hypothesis of no significant improvement. However, the results shown in Table XXIX indicated that the Control I group, though exposed to physical education only one day per week and to no exercise routine, showed improvement on four of the seven physical fitness variables. Gains, though not significant, were recorded in the sit-ups, standing jump, softball throw, and the 600 yard run-walk. No mean change was noted in the pull-ups and negative results were incurred on the fifty-yard dash and the shuttle run.

TABLE XXIX

A COMPARISON OF THE PRE-TEST AND
THE POST-TEST FOR THE
CONTROL I GROUP

Variables	Pre-Test		Post-Test		Fisher <u>t</u>	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	4.17	4.09	4.17	4.23	.00	NSD
Sit-ups (Number)	50.80	13.08	51.60	13.26	- .23	NSD
Shuttle Run (Seconds)	10.45	3.85	10.78	.75	- .45	NSD
Standing Jump (Inches)	63.40	7.11	66.00	8.54	-1.26	NSD
50 yd. Dash (Seconds)	7.86	.53	8.01	.52	-1.09	NSD
Softball Throw (Feet)	118.43	22.29	121.43	25.58	- .48	NSD
600 yd. Run (Seconds)	156.23	26.66	152.70	27.56	.50	NSD

A comparison of the pre- and post-tests for the Control II group is shown in Table XXX.

A comparison of the pre-test and post-test for the Control II group supported the stated hypothesis of no significant improvement. However, the results shown in Table XXX indicated that the Control II group, though exposed to physical education only two days per week and to no exercise routine, showed improvement on all seven physical

fitness variables. These gains were not significant at the .05 level, however.

TABLE XXX

A COMPARISON OF THE PRE-TEST AND
THE POST-TEST FOR THE
CONTROL II GROUP

Variables	Pre-Test		Post-Test		Fisher <u>t</u>	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	4.33	3.42	5.40	3.83	-1.12	NSD
Sit-ups (Number)	54.37	13.73	56.77	11.66	- .72	NSD
Shuttle Run (Seconds)	10.44	.68	10.41	.75	.20	NSD
Standing Jump (Inches)	69.17	8.23	73.57	8.81	-1.97	NSD
50 yd. Dash (Seconds)	7.44	.66	7.29	.77	.81	NSD
Softball Throw (Feet)	132.80	22.83	138.10	25.78	- .83	NSD
600 yd. Run (Seconds)	143.87	27.30	135.40	23.11	1.27	NSD

A comparison of the pre- and post-tests for the Control III group is shown in Table XXXI.

A comparison of the pre-test and post-test for the Control III group supported the stated hypothesis of no significant improvement on five of the seven physical fitness variables. However, the results shown in Table XXXI indicated

TABLE XXXI
A COMPARISON OF THE PRE-TEST AND
THE POST-TEST FOR THE
CONTROL III GROUP

Variables	Pre-Test		Post-Test		Fisher <u>t</u>	LS
	Mean	S.D.	Mean	S.D.		
Pull-ups (Number)	6.59	4.36	8.32	4.68	-1.56	NSD
Sit-ups (Number)	61.76	16.02	69.41	18.05	-1.82	NSD
Shuttle Run (Seconds)	10.51	.75	10.13	.77	2.01	.05
Standing Jump (Inches)	70.38	8.14	74.09	7.01	-1.98	NSD
50 yd. Dash (Seconds)	7.32	.63	7.23	.60	.56	NSD
Softball Throw (Feet)	143.68	26.86	158.53	23.95	-2.37	.05
600 yd. Run (Seconds)	135.82	17.39	133.15	19.05	.60	NSD

that the Control III group, though exposed to physical education three days per week and to no exercise routine, did produce significant gains on the shuttle run and the softball throw. The Control III group produced a mean gain of .38 seconds on the shuttle run; this gain was significant at the .05 level. The Control III group produced a mean gain of 14.85 feet on the softball throw; this gain was significant at the .05 level.

Further comparisons were made between the twelve groups used in this study and the national norms for the Youth Fitness Test. Comparisons were made according to the age levels of the groups. Tables XXXII, XXXIII, and XXXIV show these comparisons.

A comparison of the seventh grade boys who were exposed to physical education one day per week and the national norms for thirteen year old boys is shown in Table XXXII.

A study of the data in Table XXXII indicated that all study groups exposed to only one period of physical education per week approached or exceeded the national norms on all physical fitness variables. The pull-up variable showed the Intensive I group to have the greater mean average of 5.89 pull-ups, and the lesser mean average of 3.59 pull-ups was recorded by the Calisthenic I group when compared to the national norm of 3 pull-ups. The sit-up variable showed the Isometric I group to have the greater mean average of 55.41 sit-ups, and the lesser mean average of 48.70 sit-ups was recorded by the Calisthenic I group which may be compared to the national norm of 40 sit-ups. The shuttle run variable showed the Control I group to have the greater mean average of 10.78 seconds, and the lesser mean average of 11.22 seconds was recorded by the Intensive I group while the national norm is 11.3 seconds. The standing jump variable showed the Intensive I group to have the greater mean average of 73.63

TABLE XXXII

A COMPARISON OF SEVENTH GRADE BOYS' MEAN
SCORES AND THE 1957-1958 NATIONAL
YOUTH FITNESS TEST NORMS

Variables	Nat'l Norms	Control	Intensive	Calisthenic	Isometric
Pull-ups (Number)	3.	4.17	5.89	3.59	3.63
Sit-ups (Number)	40.	51.60	55.33	48.70	55.41
Shuttle Run (Seconds)	11.3	10.78	11.22	11.14	10.99
Standing Jump (Inches)	65.	67.00	73.63	64.85	65.70
50 yd. Dash (Seconds)	7.8	8.01	7.60	8.16	8.06
Softball Throw (Feet)	123.	123.37	135.48	122.37	124.30
600 yd. Run (Seconds)	157.	152.70	152.70	145.37	160.52

inches, and the lesser mean average of 64.85 inches was recorded by the Calisthenic I group while the national norm is 65 inches. The fifty-yard dash variable showed the Intensive I group to have the greater mean average of 7.60 seconds, and the lesser mean average of 8.16 seconds was recorded by the Calisthenic I group while the national norm is 7.8 seconds. The softball throw variable showed the Intensive I group to have the greater mean average of 135.48 feet, and the lesser mean average of 122.37 feet was recorded by the Calisthenic I group which may be compared to the national norm of 123 feet. The 600 yard run-walk variable showed the Calisthenic I group to have the greater mean average of 145.37 seconds, and the lesser mean average of 160.52 seconds was recorded by the Isometric I group which may be compared to the national norm of 157 seconds.

A comparison of the eighth grade boys who were exposed to physical education two days per week and the national norms for fourteen year old boys is shown in Table XXXIII.

A study of the data in Table XXXIII indicated that all study groups exposed to two periods of physical education per week approached or exceeded the national norms on all physical fitness variables. The pull-up variable showed the Intensive II group to have the greater mean average of 7.82 pull-ups, and the least mean average of 5.40 pull-ups was recorded by the Control II group. The national norm is

TABLE XXXIII

A COMPARISON OF EIGHTH GRADE BOYS' MEAN
SCORES AND THE 1957-1958 NATIONAL
YOUTH FITNESS TEST NORMS

Variables	Nat'l Norms	Control	Intensive	Callisthenic	Isometric
Pull-ups (Number)	4.	5.40	7.82	7.11	6.19
Sit-ups (Number)	44.	56.77	67.25	60.04	61.78
Shuttle Run (Seconds)	10.8	10.41	10.14	9.97	10.24
Standing Jump (Inches)	70.	73.57	77.96	75.46	77.44
50 yd. Dash (Seconds)	7.6	7.29	7.41	7.26	7.36
Softball Throw (Feet)	139.	138.10	161.54	150.43	155.48
600 yd. Run (Seconds)	150.	135.40	126.96	130.86	126.19

4 pull-ups. The sit-up variable showed the Intensive II group to have the greater mean average of 67.25 sit-ups, and the least mean average of 56.77 sit-ups was recorded by the Control II group. The national norm is 44 sit-ups. The shuttle run variable showed the Calisthenic II group to have the greater mean average of 9.97 seconds, and the lesser mean average of 10.41 seconds was recorded by the Control II group while the national norm is 10.8 seconds. The standing jump variable showed the Intensive II group to have the greater mean average of 77.96 inches, and the lesser mean average of 73.57 inches was recorded by the Control II group while the national norm is 70 inches. The fifty-yard dash variable showed the Calisthenic II group to have the greater mean average of 7.26 seconds, and the lesser mean average of 7.41 seconds was recorded by the Intensive II group while the national norm is 7.6 seconds. The softball throw variable showed the Intensive II group to have the greater mean average of 161.50 feet, and the lesser mean average of 138.10 feet was recorded by the Control II group while the national norm is 139 feet. The 600 yard run-walk variable showed the Isometric II group to have the greater mean average of 126.19 seconds, and the lesser mean average of 135.40 seconds was recorded by the Control II group which may be compared to the national norm of 150 seconds.

A comparison of the ninth grade boys who were exposed to physical education three days per week and the national norms for fifteen year old boys is shown in Table XXXIV.

A study of the data in Table XXXIV indicated that all study groups exposed to three periods of physical education per week approached or exceeded the national norms on all physical fitness variables. The pull-up variable showed the Isometric III group to have the greater mean average of 8.75 pull-ups and the lesser mean average of 6.29 pull-ups was recorded by the Calisthenic III group which may be compared to the national norm of 4 pull-ups. The sit-up variable showed the Intensive III group to have the greater mean average of 76.50 sit-ups, and the lesser mean average of 63.50 sit-ups was recorded by the Calisthenic III group. The national norm is 45 sit-ups. The shuttle run variable showed the Isometric III group to have the greater mean average of 10.05 seconds, and the lesser mean average of 10.26 seconds was recorded by the Calisthenic III group while the national norm is 10.8 seconds. The standing jump variable showed the Isometric III group to have the greater mean average of 79.36 inches, and the lesser mean average of 74.09 inches was recorded by the Control III group. The national norm is 74 inches. The fifty-yard dash variable showed the Isometric III group to have the greater mean average of 6.98 seconds, and the lesser mean average of 7.67

TABLE XXXIV

A COMPARISON OF NINTH GRADE BOYS' MEAN
SCORES AND THE 1957-1958 NATIONAL
YOUTH FITNESS TEST NORMS

Variables	Nat'l Norms	Control	Intensive	Calisthenic	Isometric
Pull-ups (Number)	4.	8.32	8.68	6.29	8.75
Sit-ups (Number)	45.	70.29	76.50	63.50	65.29
Shuttle Run (Seconds)	10.8	10.13	10.13	10.26	10.05
Standing Jump (Inches)	74.	74.09	79.32	76.46	79.36
50 yd. Dash (Seconds)	7.2	7.23	7.07	7.67	6.98
Softball Throw (Feet)	155.	158.53	160.11	186.39	173.29
600 yd. Run (Seconds)	139.	133.15	121.36	126.11	125.71

seconds was recorded by the Calisthenic III group. The national norm is 7.2 seconds. The softball throw variable showed the Calisthenic III group to have the greater mean average of 186.39 feet, and the lesser mean average of 158.53 feet was recorded by the Control III group. The national norm is 155 feet. The 600 yard run-walk variable showed the Intensive III group to have the greater mean average of 121.36 seconds, and the lesser mean average of 133.15 seconds was recorded by the Control III group. In the 600 yard run-walk the national norm is 139 seconds.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

The purpose of this study was to determine the effects of short duration exercise routines on the development of physical fitness. The study was designed to investigate the development of physical fitness using only a fifteen minute portion of the physical education period for an exercise routine; to compare the results of the isometric, intensive, and calisthenic routines to determine if one routine was superior in meeting the goals of physical fitness development; or to determine if a combination of the three exercise routines would be advantageous for the development of all facets of physical fitness.

The study also sought to investigate the differences in physical fitness growth as a result of exposure to exercise once a week, twice a week, and three times a week in randomly selected students in physical education classes, and to compare the results of groups using exercise routines with the control groups exposed to non-physical instruction during the exercise period. The results of these comparisons are listed below with the hypothesis which was stated and tested for each.

1. The first hypothesis was stated as follows: The student groups subjected to isometrics, intensives, and calisthenics will show significant improvement (at the .05 level) in the seven measures of physical fitness being tested during the twelve weeks period of exposure.

The Wilks' lambda test, a generalized analysis of variance, found all groups to have improved significantly. An F ratio of 7.514 was achieved by the groups exposed to physical education one day per week. An F ratio of 9.4175 was achieved by the groups exposed to physical education two days per week. An F ratio of 6.8593 was achieved by the groups exposed to physical education three days per week. All F ratios were significant at beyond the .001 level of confidence.

2. The second hypothesis was stated as follows: The improvement in cardio-vascular endurance, abdominal strength, speed and agility, speed, and leg power for those students subjected to calisthenics and intensives would be significantly greater than for those students exposed to the isometric routine.

Cardio-vascular endurance was measured by the results of the 600 yard run-walk variable; abdominal strength was determined by the results of the sit-up variable; speed and agility was determined by the shuttle run variable; speed was measured by the fifty-yard dash; and leg power was determined by the results of the standing jump variable.

Contrary to the stated hypothesis, the gains shown by the calisthenic groups, when compared to the isometric groups, were not significantly greater on all five variables. Only the Calisthenic II group's improvement on the fifty-yard dash was significant at beyond the .05 level. Non-significant gains were recorded by the Calisthenic I group on the shuttle run and standing jump variables, by the Calisthenic II group on the sit-up variable, and by the Calisthenic III group on the sit-up and 600 yard run-walk variables. The comparison of calisthenic and isometric routines also revealed the isometric groups to have made greater gains, some of which reached the significant level, on some of the variables. The Isometric I group recorded an improvement significantly greater, at the .05 level, than the Calisthenic I group on the sit-up variable, and non-significantly greater gains on the fifty-yard dash and 600 yard run-walk. The Isometric III group recorded an improvement significantly greater, at the .01 level, than the Calisthenic II group on the standing jump variable, and non-significantly greater gains on the shuttle run and 600 yard run-walk. The Isometric III group recorded an improvement significantly greater, at the .01 level, than the Calisthenic III group on the standing jump variable, and non-significantly greater gains on the shuttle run and fifty-yard dash.

Contrary to the stated hypothesis, the gains shown by the intensive groups, when compared to the isometric groups, were not significantly greater on all five variables. The Intensive I group produced gains, significant at the .01 level, on both the fifty-yard dash and standing jump variables. The improvement shown by the Intensive I group was also greater than the Isometric I group in the sit-up variable, but this gain was not significant at the .05 level. The Intensive II group showed greater mean gains on standing jump, 600 yard run-walk, sit-up, and shuttle run variables, but none approached the .05 level of significance. The Intensive III group showed significantly greater mean gains on the sit-up variable, at the .001 level, and the standing jump variable, at the .02 level. Non-significant gains were also recorded on the shuttle run and 600 yard run-walk. The comparison of intensive and isometric routines also revealed the isometric groups to have made greater gains, some of which reached the significant level, on some of the variables. The Isometric I group recorded an improvement significantly greater, at the .01 level, than the Intensive I group on the 600 yard run-walk variable, and at the .05 level on the shuttle run. The Isometric II group recorded a non-significantly greater gain on the fifty-yard dash variable. The Isometric III group recorded an improvement significantly greater, at the .01 level, than the Intensive III group on the fifty-yard dash variable.

3. The third hypothesis was stated as follows: The improvement in bicep strength and arm power for those students subjected to isometrics and intensives would be significantly greater than for those students using calisthenics. Bicep strength was measured by the results of the pull-up variable, and arm strength was determined by the results of the softball throw.

Contrary to the stated hypothesis, the gains shown by the isometric groups, when compared to the calisthenic groups, were not significantly greater on the two variables. The Isometric I group recorded a non-significantly greater gain on the pull-up variable than the Calisthenic I group. However, on the softball throw the Calisthenic I group showed a gain, significant at the .01 level, greater than the Isometric I group. The Isometric II group recorded a gain greater, at the .01 level on the softball throw, than the Calisthenic II group, and an improvement, not significant at the .05 level, on the pull-up variable. The Isometric III group recorded a gain greater, at the .05 level, on the pull-up variable, and an improvement, not significant at the .05 level, on the softball throw variable.

The intensive groups, when compared to the calisthenic groups, showed a greater mean improvement on both variables. However, neither gain recorded by the Intensive I group approached the .05 level of significance. The gains shown by the Intensive II group on the softball throw were

significant at the .01 level, but were not significant on the pull-up variable. The gains recorded by the Intensive III group were significant at beyond the .05 level on both the pull-up and softball throw variables.

4. The fourth hypothesis was stated as follows: The groups exposed to three periods per week of physical education will show a significant improvement on the seven components of physical fitness over those meeting twice a week when the same routine is employed.

The results of the study supported the stated hypothesis. All groups exposed to three periods of physical education per week recorded results significant at beyond the .05 level when compared to the group utilizing the same routine but meeting only two times per week. The groups exposed to the three exercise routines, isometrics, intensives, and calisthenics, all produced gains significant at the .001 level, when compared to those groups using the exercise routines two times per week. The Control III group produced gains which were significant at the .01 level when compared to the Control II group.

5. The fifth hypothesis was stated as follows: The groups exposed to two periods per week of physical education would show a significant improvement on the seven components of physical fitness over those meeting once a week when the same routine was employed.

The results of the study supported the stated hypothesis. All groups exposed to two periods of physical education per week recorded improvements when compared to the group utilizing the same routine but meeting only one time per week. However, while the gains recorded by the Control II, Intensive II, and Calisthenic II groups produced gains significant at the .001 level, the Isometric II group produced gains which did not reach the .05 level as compared to the Isometric I group.

6. The final hypothesis was stated as follows: The control groups would show no significant improvement when re-tested on the seven components of physical fitness.

The results tended to support the stated hypothesis. Although the Control III group, meeting three times a week, did reach the .05 level on two variables, the shuttle run and the softball throw, the Control I and the Control II groups failed to reach the significant level in their results. However, it was observed that the Control I group did show improvement on all but the shuttle run variable.

The Control II groups were found to have improved on all variables, though not at the .05 level of significance. The Control III group also improved on all variables.

Conclusions

An analysis of the results of this study led to several conclusions. As evidenced by the overall improvement shown

by the twelve groups, it may be concluded that any well planned, purposeful program of physical education will produce positive gains in the students' level of physical fitness.

It was also observed during the analysis that the frequency of exposure was instrumental in producing significant differences in physical fitness among the students. If such differences are in evidence as a result of only a twelve weeks period, it would appear quite evident that the time factor is very important in the attainment of adequate levels of physical fitness. This would appear to be in keeping with the suggestions of physical educators, who have sought daily exposure for all students.

The gains shown by all three control groups, in comparison to those students using organized exercise routines, were greater than expected. Because of this strong showing it seems possible to conclude that physical educators should explore the possibility of devoting more time to the teaching of skills, games, and activities, as well as attitudes, than is currently being done in many of our schools. It would appear likely that if students have multiple exposures to physical education each week, physical educators might devote more time to the teaching of the basic objectives of physical education while still making significant improvement in the students' physical fitness stature.

Since no one exercise routine proved superior in the development of all physical fitness components, it would seem likely that some combination, employing the strengths of the various routines, might be sought. For example, the calisthenics routine was found inferior in the production of bicep strength when compared to the isometric or intensive routine. Perhaps it would then be plausible to conclude that some combination might be possible in this area.

As previously stated, no group was superior in all variables. However, it should be noted that when all groups were analyzed the gains shown by the intensive routine were markedly greater in five variables, for students meeting one day per week, on six variables, for students meeting two days per week, and on four variables, for students meeting three days per week. As a result it is possible to conclude that the intensive routine produced, on this study, greater improvements in physical fitness than any other one routine. It was observed that the areas of strength appeared to be the variables on which the intensive routine tended to be the most dominant.

A final conclusion that was drawn as a result of analyzing the post-test data was that all groups appeared to reach an adequate level of physical fitness when compared to the national norms. On all variables, at all grade levels, at least three of the four groups exceeded the national norm scores. There were no apparent weaknesses although the

pre-test had indicated some deficiencies, particularly in the standing jump, softball throw, and fifty-yard dash variables.

A summary of the conclusions:

1. Any well planned physical education program will produce positive physical fitness development.
2. The frequency of exposure to physical education is an important aspect of physical fitness development.
3. Physical educators can budget time for teaching skills, activities, and concepts without sacrificing the physical fitness objective.
4. A combination of the exercise routines is necessary for production of the most desirable development of physical fitness.
5. The intensive exercise routine produced greater total improvement than the other treatments.
6. The means for the twelve groups in this study were superior to the fiftieth percentile of the national norms, with only a few exceptions.

Recommendations

The following recommendations were prompted by the experience of conducting the present study and through critical analysis of the data collected.

1. A replication of this study should be conducted. A combination of the three exercise routines should be included,

using the strengths of each routine as shown by this study. Such a study would possibly verify the results of this study, and lend new information for further research.

2. A study of other possible components of physical fitness should be undertaken to determine if the seven variables used by the AAHPER Youth Fitness Test are the most representative of true physical fitness.

3. A study should be conducted which would include daily physical education. It is important to physical educators and curriculum designers to know if there is sufficient improvement in the meeting of physical education objectives, including physical fitness, to warrant the additional time allotment.

4. Physical educators should study the possibility of including periods of non-physical instruction, such as that employed by the control groups in this study. It is possible that such a program might greatly benefit the total objectives sought in physical education.

5. Studies employing other exercise routines, such as the Cureton continuous exercise drill, should be undertaken by physical educators to determine if there are better routines that might be employed. However, it is possible that physical educators should not seek to adhere to a particular exercise routine. It may be that a fifteen minute series of relays, employing the rope climb, crab walk, and similar

activities may produce more significant results if carefully planned.

6. Studies, similar to this, should be conducted at other age levels. Due to the changes of puberty, junior high school boys are undergoing rapid physical and mental changes, and the results shown by this study may not be applicable to students of different ages. The shoulder strength of the more rapidly developing boy may be lessened, and the sudden lengthening of the limbs may cause some loss of leg strength and leg power. For this reason studies with elementary, high school, and college level students may produce varying results.

7. A study should be undertaken to ascertain if the softball throw does in reality measure arm strength. It would appear, on the basis of subjective observation, that distance in the softball throw can best be gained through the teaching of improved skills in throwing. If it were found that skill is the basis for improvement, then perhaps it is necessary to find a new measure for the evaluation of arm power.

APPENDIX A

INTENSITY EXERCISES



1. Modified pull-ups (Palms away from subject) 30 seconds.



2. Modified push-ups (Touch fist of partner) 30 seconds.



3. Bent knee sit-ups (Alternate elbows to knees) 30 seconds.



4. Speed run (5 innings--one inning consists of running in place as fast as possible for 10 seconds and resting 10 seconds).

Using the exercises in the above group, the intensity drills are administered as follows:

1. Each student attempts to do as many of each exercise as possible within the prescribed time.
2. All students work in pairs as partners to execute all exercises.

3. The partner not doing the exercise holds the hands or feet of the subject when a particular exercise calls for support.
4. The subject performs the exercise while his partner counts the number of repetitions.
5. Upon completion of the exercise, the subject and his partner exchange positions immediately.
6. After each exercise is completed by the two subjects, they resume their original positions and begin the next exercise without delay.
7. Exercises are performed on each day of physical education during the twelve weeks period.

APPENDIX B

ISOMETRIC EXERCISES



1. The reach--Stand with left arm extended high over head. Reach up as high as possible. Keep heels on floor. Repeat with right arm.



2. The elbow push--Stand back to wall, elbows shoulder high and touching wall, hands at collarbone level with palms down. Press elbows and back of neck hard against wall.



3. The hand push--With palms touching, elbows at shoulder height, press palms together hard.



4. The muscle maker--With both elbows bent, hands relaxed, contract the biceps as hard as you can.



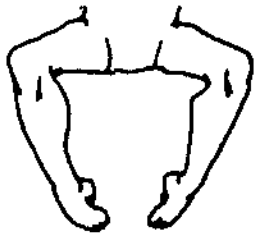
5. The finger stretch--With arms held in front, extend the fingers as hard as possible.



6. The front flattener--Lie on back with hands on hips (elbows off floor). Raise head, shoulders, and feet off floor.



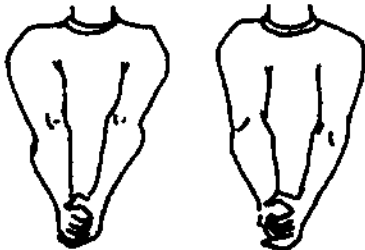
7. The curver--Lie face down with hands on hips. Raise head, shoulders, and feet off floor (keep knees straight).



8. The arch raiser--Sit with soles of feet turned in toward each other, curl toes under.



9. The grip--Grip both hands as hard as possible.



10. The twist--With arms extended forward, fingers tightly interlocked, try to twist arms inward. Repeat outward.



11. The spread--Stand with your left side toward wall. Press left foot hard against wall, keep leg straight. Repeat with right.



12. The half squat--Stand with hands on hips, kneel half bent, heels off floor. Do not toe out.



13. The heel stand--Stand on heels, use wall for balance.

Each exercise is done for six seconds at maximum strength of contraction.

APPENDIX C

CALISTHENIC EXERCISES



1. Feet astride, arms upward--Touch floor 6" outside left foot, again between feet and press once then 6" outside right foot, bend backward as far as possible (legs straight). 2 minutes.



2. Back lying--Feet 6" apart, arms clasped behind head. Sit up to vertical position, keep feet on floor. 1 minute.



3. Front lying--Hands interlocked behind the back. Lift head, shoulders, chest, and both legs as high as possible. Keep legs straight, and raise chest and both thighs completely off floor. 1 minute.



4. Front lying--Hands under the shoulders, palms flat on floor. Touch chin to floor, touch forehead to floor behind hands before returning to up position. Three definite movements, chin, forehead, arms straightened. 1 minute.



5. Stationary run--Count a step each time left foot touches floor. Lift feet approximately 4 inches off floor. After every 75 steps do 10 bobbing jumps. Bobbing jumps--feet together, hands on hips, knees bent to sit on heels. Straighten to upright position.

raising heel off floor, return to starting position each time. Keep feet in contact with floor, keep the back straight. 6 minutes.

The SBX Plan of calisthenics is a progressive routine. There are six charts, each chart is composed of five exercises, performed in the same order, and in the same maximum time limit.

APPENDIX D

A listing of the health, physical education, and recreational material employed in the instruction of the Control I, or seventh grade, group:

1. Taping--Methods employed in taping the ankle were demonstrated by the instructor.
2. Bowling--The first series of film strips, accompanied by a record, were used to introduce correct bowling procedures.
3. Bowling--The second series of film strips, accompanied by a record, were used to continue instruction in bowling techniques.
4. X-Ray--A trip to a hospital adjacent to the school was made. The X-Ray facilities were examined with the aid of a technician. The boys were allowed to leave their prior class five minutes early.
5. Audiometer--The school nurse demonstrated the audiometer, using class members as subjects.
6. Smoking--A nicotine test was presented by the cooperation of the science department.
7. Gymnastics--A gymnastics demonstration was presented with the assistance of the junior high gymnastics team. A different boy was used in each class period.
8. Rope Jumping--Intricate rope jumping was demonstrated by members of the elementary rope jumping squad.
9. Safety Education--The device used to test reflexes and reaction time was made available by the senior high driver's training teacher.
10. Physical Therapist--The physical therapist from the adjacent hospital discussed hospital therapy.

APPENDIX D Cont'd.

11. Wrestling Film--A film on elementary wrestling was shown.
12. Athlete's foot and prevention--A discussion of the problem of athlete's foot was held.

APPENDIX E

A listing of the health, physical education, and recreational material employed in the instruction of the Control II, or eighth grade, group.

Week 1--Taping--Methods employed in taping the ankle were demonstrated by the instructor.

Methods employed in taping the knee were demonstrated and discussed by the instructor.

Week 2--Bowling--The first series of film strips, accompanied by a record, were used to introduce correct bowling procedures.

The second series of film strips, accompanied by a record, were used to continue instruction in bowling techniques.

Week 3--A trip to a hospital adjacent to the school was made. The X-Ray facilities were examined with the aid of a technician. The boys were allowed to leave their prior class five minutes early. An X-Ray of one student's chest was taken.

The X-Ray of the boy's chest, complete with reading, was returned by the hospital. It was then discussed in class.

Week 4--Bowling--The students were introduced to the scoring of bowling, and given the opportunity to score through the use of an overhead projector.

Week 5--Audiometer--The school nurse demonstrated the audiometer using student subjects for demonstration.

Smoking--Discussion of smoking using the book by Joseph Dolan.

Week 6--Smoking--Demonstration and discussion of a smoking test presented by the cooperation of the science department.

APPENDIX E Cont'd.

Discussion by one of the two science fair contestants experimenting on white rats and the effects of nicotine.

Week 7--Gymnastics--Demonstration by a girl member of the junior high gymnastics club. The horizontal bar was employed.

Gymnastics--A film was shown demonstrating the competitive aspects of gymnastics.

Week 8--Rope Jumping--Intricate rope jumping techniques were demonstrated by members of the elementary rope jumping squad.

Posture--A film demonstrating postural deviations and causes was presented.

Week 9--Safety Education--Through the use of equipment, a reflex and reaction device loaned by the driver's training instructor, the students were given a practicable demonstration.

A tape recording of a traffic case was presented. The case was discussing the aspects of speed and braking distances.

Week 10--Physical Therapy--A tape recording was presented of a talk made by the physical therapist during one of the seventh grade classes.

A film showing a physical therapist at work was presented.

Week 11--Wrestling Film--The students were shown a film on elementary wrestling.

Members of the wrestling team demonstrated elementary escapes and break downs.

Week 12--Athlete's Foot and Prevention--A discussion of the problem and prevention of "Athlete's foot" was held by the instructor.

APPENDIX F

A listing of the health, physical education, and recreational materials employed in the instruction of the Control III, or ninth grade, group.

Week 1--Taping--Methods employed in taping the ankle were demonstrated by the instructor.

Methods employed in taping the knee were demonstrated and discussed by the instructor.

Methods employed in taping the shoulder were demonstrated and discussed by the instructor.

Week 2--Bowling--The first series of film strips, accompanied by a record, were used to introduce correct bowling procedures.

The second series of film strips, accompanied by a record, were used to continue instruction in bowling techniques.

The students were introduced to the scoring of bowling, and given the opportunity to score through the use of an overhead projector.

Week 3--X-Ray--A trip to a hospital adjacent to the school was made. The X-Ray facilities were examined with the aid of a technician. The technician took a picture of one boy's chest. The boys were allowed to leave their prior classes five minutes early.

Discussion of the X-Ray equipment and the film of the boy's chest took two days.

Week 4--Senior High--Physical education at the senior high level was discussed by a high school physical educator.

Swimming team participation was discussed by the high school swimming coach.

APPENDIX F Cont'd.

Blood typing was demonstrated by the school nurse. The significance of blood types was discussed.

Week 5--Alcohol--Drugs--A film on narcotic addiction of teen-agers was shown.

The effects of alcohol and drugs were discussed by the instructor.

A discussion concerning the care and prevention of athlete's foot and shower practices was held.

Week 6--Smoking--A demonstration and discussion of a smoking test were presented with the cooperation of the science department.

A discussion was conducted by one of the two science fair contestants experimenting on white rats and the effects of nicotine.

A discussion of smoking, using a book by Joseph Dolan, was presented by the instructor.

Week 7--Gymnastics--Demonstration by a girl member of the junior high gymnastics club was made with the use of the horizontal bar.

A film was shown demonstrating the competitive aspects of gymnastics.

A discussion on gymnastics and the use of the body as basic machinery was presented by the instructor.

Week 8--Rope Jumping--A demonstration of intricate rope jumping techniques was made by members of the elementary rope jumping squad.

Posture--A film demonstrating postural deviations and causes was presented.

A discussion of posture was presented by the instructor.

Week 9--Safety Education--Through the use of equipment, a reflex and reaction device loaned by the

APPENDIX F Cont'd.

driver's training instructor, the students were given a practicable demonstration.

The high school safety education director presented a short discussion of high school driver's education.

A tape recording of a traffic case was presented. The case was discussing the aspects of speed and braking distances.

Week 10--Physical Therapy--A tape recording was presented of a talk made by the physical therapist during one of the seventh grade classes.

A film showing a physical therapist at work was presented.

A demonstration of our school corrective program was presented by the instructor with the assistance of some of the handicapped students.

Week 11--Wrestling--The students were shown a film on elementary wrestling techniques.

Members of the wrestling team demonstrated elementary escapes and break downs.

An Olympic film showing contrasts in wrestling procedures was shown.

Week 12--Golf Film--A film on the healthful aspects of golf was shown.

Isometrics--A demonstration of isometrics and a discussion of their value was presented by the instructor.

Exercise--A discussion of the need for exercise--Today and Tomorrow--was presented by the instructor.

APPENDIX G

Seventh Grade

- Week 1--Squads 1 and 2--Volleyball
Squads 3 and 4--Horizontal Bar
- Week 2--Squads 3 and 4--Volleyball
Squads 1 and 2--Horizontal Bar
- Week 3--Squads 1 and 3--Volleyball
Squads 2 and 4--Parallel Bars
- Week 4--Squads 2 and 4--Volleyball
Squads 1 and 3--Parallel Bars
- Week 5--Squads 1 and 4--Volleyball
Squads 2 and 3--Side Horse
- Week 6--Squads 2 and 3--Volleyball
Squads 1 and 4--Side Horse
- Week 7--Entire Class--Relays
- Week 8--Squads 1 and 2--Crab Hockey
Squads 3 and 4--Mini Tramp
Squads 1 and 2--Mini Tramp
Squads 3 and 4--Crab Hockey
- Week 9--Squads 2 and 4--Crab Hockey
Squads 1 and 3--Mum Ball and Steal-The-Bomb
Squads 2 and 4--Mum Ball and Steal-The-Bomb
Squads 1 and 3--Crab Hockey
- Week 10--Squads 1 and 4--Crab Hockey
Squads 2 and 3--Mum Ball and Steal-The-Bomb
Squads 1 and 4--Mum Ball and Steal-The-Bomb
Squads 2 and 3--Crab Hockey
- Week 11--Squads 1 and 2--Mum Ball and Steal-The-Bomb
Squads 3 and 4--Volley Tip-in
Squads 1 and 2--Volley Tip-in
Squads 3 and 4--Mum Ball and Steal-The-Bomb
- Week 12--Squads 2 and 3 vs.
Squads 1 and 4--Indoor Softball

APPENDIX H

Eighth Grade

Week 1--Day 1--Squads 1 and 2--Basketball
Squads 3 and 4--Wrestling

Day 2--Squads 3 and 4--Basketball
Squads 1 and 2--Wrestling

Week 2--Day 1--Squads 1 and 3--Basketball
Squads 2 and 4--Horizontal Bar

Day 2--Squads 2 and 4--Basketball
Squads 1 and 3--Horizontal Bar

Week 3--Day 1--Squads 1 and 4--Basketball
Squads 2 and 3--Parallel Bars

Day 2--Squads 2 and 3--Basketball
Squads 1 and 4--Parallel Bars

Week 4--Day 1--Squads 1 and 2--Volleyball
Squads 3 and 4--Volleyball

Day 2--Squads 1 and 3--Volleyball
Squads 2 and 4--Volleyball

Week 5--Day 1--Squads 1 and 4--Volleyball
Squads 2 and 3--Volleyball

Day 2--Entire Class--Relays

Week 6--Day 1--Squads 1 and 2 vs.
Squads 3 and 4--Indoor Softball

Day 2--Squads 1 and 4 vs.
Squads 2 and 3--Volley Tip-in and Mum Ball

Week 7--Day 1--Squads 1 and 2--Crab Hockey
Squads 3 and 4--Crab Hockey

Day 2--Squads 1 and 3--Crab Hockey
Squads 2 and 4--Crab Hockey

APPENDIX H Cont'd.

Week 8--Day 1--Squads 1 and 4--Crab Hockey
 Squads 2 and 3--Crab Hockey

Day 2--Entire Class--4 Square

Week 9--Day 1--Squads 1 and 2--Indoor Softball
 Squads 3 and 4--Volley Tip-in and Steal-
 The-Bomb

Day 2--Squads 2 and 3--Indoor Softball
 Squads 1 and 4--Volley Tip-in and Steal-
 The-Bomb

Week 10--Day 1--Squads 1 and 3--Indoor Softball
 Squads 2 and 4--Volley Tip-in and Steal-
 The-Bomb

Day 2--Squads 1 and 4--Indoor Softball
 Squads 2 and 3--Volley Tip-in and Steal-
 The-Bomb

Week 11--Day 1--Entire Class--Relays

Day 1--Entire Class--Mum Ball and End-line Soccer

Week 12--Day 1--Squads 2 and 4--Softball
 Squads 1 and 3--Kickball

Day 2--Squads 1 and 3--Softball
 Squads 2 and 4--Kickball

APPENDIX I

Ninth Grade

Week 1--Day 1--Squads 1 and 2--Basketball
Squads 3 and 4--Wrestling

Day 2--Squads 3 and 4--Basketball
Squads 1 and 2--Wrestling

Day 3--Squads 1 and 3--Basketball
Squads 2 and 4--Horizontal Bar

Week 2--Day 1--Squads 2 and 4--Basketball
Squads 1 and 3--Horizontal Bar

Day 2--Squads 1 and 4--Basketball
Squads 2 and 3--Parallel Bars

Day 3--Squads 2 and 3--Basketball
Squads 1 and 4--Parallel Bars

Week 3--Day 1--Squads 1 and 2--Volleyball
Squads 3 and 4--Volleyball

Day 2--Squads 1 and 3--Volleyball
Squads 2 and 4--Volleyball

Day 3--Squads 1 and 4--Volleyball
Squads 2 and 3--Volleyball

Week 4--Day 1--Entire Class--Relays

Day 2--Squads 1 and 2--Indoor Softball
Squads 3 and 4--Indoor Softball

Day 3--Squads 1 and 3--Indoor Softball
Squads 2 and 4--Indoor Softball

Week 5--Day 1--Squads 1 and 4--Indoor Softball
Squads 2 and 3--Indoor Softball

Day 2--Squads 1 and 2--Volley Tip-in
Squads 3 and 4--Volley Tip-in

Day 3--Squads 1 and 3--Volley Tip-in
Squads 2 and 4--Volley Tip-in

APPENDIX I Cont'd.

- Week 6--Day 1--Squads 1 and 4--Volley Tip-in
Squads 2 and 3--Volley Tip-in
- Day 2--Squads 1 and 2--Mum Ball and Steal-The-Bomb
Squads 3 and 4--Mum Ball and Steal-The-Bomb
- Day 3--Squads 1 and 3--Mum Ball and Steal-The-Bomb
Squads 2 and 4--Mum Ball and Steal-The-Bomb
- Week 7--Day 1--Squads 1 and 4--Mum Ball and Steal-The-Bomb
Squads 2 and 3--Mum Ball and Steal-The-Bomb
- Day 2--Squads 1 and 2--Crab Hockey
Squads 3 and 4--Crab Hockey
- Day 3--Squads 1 and 3--Crab Hockey
Squads 2 and 4--Crab Hockey
- Week 8--Day 1--Squads 1 and 4--Crab Hockey
Squads 2 and 3--Crab Hockey
- Day 2--Entire Class--Relays
- Day 3--Entire Class--Individual Gymnastics
- Week 9--Day 1--Entire Class--Individual Gymnastics and
Mini Tramp
- Day 2--Entire Class--Introduction to the Side
Horse
- Day 3--Entire Class--4 Square
- Week 10--Day 1--Squads 1 and 2--Badminton
Squads 3 and 4--Shuffleboard
- Day 2--Squads 1 and 3--Badminton
Squads 2 and 4--Shuffleboard
- Day 3--Squads 1 and 4--Badminton
Squads 2 and 3--Shuffleboard
- Week 11--Day 1--Squads 1 and 2--Kickball
Squads 3 and 4--Softball
- Day 2--Squads 1 and 2--Softball
Squads 3 and 4--Kickball

APPENDIX I Cont'd.

Day 3--Squads 1 and 3--Kickball
Squads 2 and 4--Softball

Week 12--Day 1--Squads 1 and 3--Softball
Squads 2 and 4--Kickball

Day 2--Squads 1 and 4--Kickball
Squads 2 and 3--Softball

Day 3--Squads 1 and 4--Softball
Squads 2 and 3--Kickball

APPENDIX J

The initial orientation given by the instructor to all but the control groups:

During the next twelve weeks we are going to devote the first fifteen minutes of your class periods to _____ exercises. The purpose of this routine is to help you achieve a greater degree of physical fitness. This group of exercises was chosen because it has been found to do the job and, in addition, because it will take only fifteen minutes. This will enable us to continue our regular activities. There is one thing to remember though; what you receive from these exercises will be determined by what you put into them.

Other classes are participating in different types of physical education programs. Two other groups are using other exercise routines, and a third group is being given a series of health, physical education, and recreational demonstrations and discussions. We are always trying to find new and better ways of teaching physical education, and through the use of four different approaches we hope to find whether our regular program helps you gain adequate levels of physical fitness, or if some type of exercise is needed in addition.

APPENDIX K

The control groups were also given an orientation prior to the study period:

During the next twelve weeks we are going to devote the first fifteen minutes of your class periods to instruction in health, physical education, or recreational subjects. This will not be a continuation of your elementary health programs, but rather we'll try to find a variety of new or interesting topics to present. Among the topics to be covered are taping, bowling, physical therapy, gymnastics, and wrestling.

Other classes are participating in three kinds of exercise routines during this fifteen minute period. We are always trying to find new or better ways of teaching physical education, and through the use of four different approaches we hope to find whether our regular program helps you gain adequate levels of physical fitness, or if some type of exercise is needed.

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