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A STUDY TO DETERMINE THE EFFECT OF THREE ELEMENTARY PHYSICAL EDUCATION PROGRAMS ON PHYSICAL FITNESS

A Thesis

Presented to

the Graduate Faculty

Central Washington College of Education

In Partial Fulfillment

of the Requirements for the Degree

Master of Education

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by

Thomas Pattillo

August 1961

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APPROVED FOR THE GRADUATE FACULTY

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TABLE OF CONTENTS

CHAPTER		PAGE
I.	THE PROBLEM AND DEFINITIONS OF TERMS USED. .	1
	The Problem.	1
	Statement of the problem.	1
	Importance of the study	1
	Limitations of the study	5
	Definitions of Terms Used	6
	Control group	6
	Experimental group	6
	Partial experimental group	6
	Norms	6
	Physical fitness.	6
	Overview of remainder of the thesis	7
II.	REVIEW OF THE LITERATURE	8
	Historical Background	8
	Washington State Elementary Physical Fitness Test. .	12
III.	PROCEDURES OF INVESTIGATION	15
	Instruments of Measurement	15
	Washington State Elementary Physical Fitness Test.	15
	Standing broad jump	16

CHAPTER PAGE

Bench push-up 16

Curl-up 17

Squat-jump 17

Thirty-yard dash 17

Organization of the Experiment 17

Experimental program 18

Partial experimental program 20

Control program 20

Organization of the Test Situation 20

Health status 20

Pupil orientation 21

Equipment 21

Student helpers 21

Space requirements 21

Collection of Data 22

IV. RESULTS AND ANALYSIS OF DATA 24

Fourth Grade 24

Results of pre-test 24

Results of post-test 27

Comparison of pre-test and post-test 28

Fifth Grade 29

Results of pre-test 29

CHAPTER PAGE

Results of post-test 30

Comparison of pre-test and post-test. 31

Sixth Grade 32

Results of pre-test. 32

Results of post-test 34

Comparison of pre-test and post-test 35

V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS. 37

Summary 37

Conclusions 40

Recommendations 41

BIBLIOGRAPHY 43

APPENDIX 46

LIST OF TABLES

TABLE		PAGE
I.	Comparison of Mean Scores Between Pre-Test and Post-Test	25
II.	Standard Error of Difference and "t's" Between Two Means for Pre-test, Grade Four	26
III.	Standard Error of Difference and "t's" Between Two Means for Post-test, Grade Four	27
IV.	Standard Error of Difference and "t's" Between Two Means for Pre-test, Grade Five	30
V.	Standard Error of Difference and "t's" Between Two Means for Post-test, Grade Five	31
VI.	Standard Error of Difference and "t's" Between Two Means for Pre-test, Grade Six	33
VII.	Standard Error of Difference and "t's" Between Two Means for Post-test, Grade Six	34
VIII.	Individual Record Card	47
IX.	Individual Scores, Control Group, Grade Four	48
X.	Individual Scores, Partial Experimental Group, Grade Four	49

TABLE PAGE

XI. Individual Scores, Experimental Group, Grade Four . . 50

XII. Individual Scores, Control Group, Grade Five 51

XIII. Individual Scores, Partial Experimental Group, Grade Five 52

XIV. Individual Scores, Experimental Group, Grade Five . . 53

XV. Individual Scores, Control Group, Grade Six 54

XVI. Individual Scores, Partial Experimental Group, Grade Six. 55

XVII. Individual Scores, Experimental Group, Grade Six . . 56

XVIII. Formulas Used for Computing the Data 57

CHAPTER I

THE PROBLEM AND DEFINITIONS OF TERMS USED

For several years a difference of opinion has existed as to the degree of fitness of Seattle elementary school children. Some teachers claim that the present physical education program meets the requirements for fitness, others that it is inadequate. Most claims made about the present physical education program, however, are based upon limited observation as there is little experimental evidence to support the arguments of either side.

I. THE PROBLEM

Statement of the problem. It was the purpose of this study (1) to compare the regular physical education program at Olympic Hills Elementary School, Seattle, Washington, with an experimental physical education program; (2) to compare the physical fitness of boys and girls in the fourth, fifth, and sixth grades in the same school; and (3) to study the effect of the program on the individual's fitness level.

Importance of the study. Physical fitness has frequently been stressed as one of the most important aims in physical

education, but recent information will bear out the fact that there is a definite lack of physical fitness in today's youth. Kraus and Hirschland state:

> We have the impression that insufficient exercise may cause the dropping of muscle efficiency levels below that minimum necessary for daily living. The same lack of exercise may cause inadequate outlet for nervous tension.
>
> Lack of sufficient exercise, therefore, constitutes a serious deficiency comparable with vitamin deficiency. Prevention of this deficiency is an urgent need.
>
> Our physical education needs a very definite expansion and active participation on a wider base, not only in high school, but even more important, in elementary schools (14:17).

A study by the same authors compared the fitness level of American and European elementary school children (14:15). The percentage of failure for American children on the first test was 57.9 per cent. The European children showed an 8.7 per cent failure.

When a Kraus-Weber Physical Fitness Test was given to the boys and girls in six selected Seattle elementary schools, 965 children were unable to pass, a 49.7 per cent failure (17:1). A Rogers Physical Fitness Test was given to 200 boys at Roosevelt High School in Seattle. One hundred twelve of these boys could not achieve the average fitness requirements of the test (15:34).

In a recent study by Campbell and Pohndorf, 10,000 British boys and girls were given the AAHPER Physical Fitness Test. The

results were compared with scores taken from tests given to United States boys and girls. The British boys and girls were far superior to the United States youth in every test exclusive of the softball throw. Campbell stated:

> The unfit condition of the U. S. youth is serious as indicated in this study. The physical fitness of a nation is definitely not displayed in the showing of its Olympic team, nor by its economic stature, but by what its individuals can do, and the U. S. youth certainly does not display good physical fitness when looked at from these criteria (3:7-8).

These findings testify to the fact that our present way of life does not provide adequate physical fitness. Today many of the children cannot receive the right kind and amount of physical activity to develop organic and muscular power, stamina, vigor, and the activity skills. The reasons are given by Kiphuth:

> In daily life the mechanical aids to comfort have nearly done away with the need for people to use their muscles. As a result, what our forefathers would have regarded as a relatively short walk or light exercise has become unusual work unless it is part of a game, and many jobs they took for granted--jobs that use the "big muscle groups"--are simply beyond our physical conditions (11:VIII).

The physical education teachers in the Seattle Public Schools have been teaching skills and games. All this has, of course, been most beneficial, yet many of these same boys and girls cannot achieve the minimum physical fitness requirements. A return to exercises that develop the muscles seems to be the most effective

means of attaining the proper physical fitness according to Kiphuth (11:VII).

Clark discussed the role of the physical educator in physical fitness and suggested exercises as one means to develop strength and endurance (5:3-4). The fact that much can be accomplished by elementary school children was shown by Hutinger, who reported that exercises over a period of three months resulted in significantly greater gains in strength than that resulting from the usual program of activity (9:159-62). Adamson found that an after-school program of three ten-minute sessions per week devoted to strength building activities resulted in significant gains in strength within a period of one month (1:22-25).

Mr. William Haroldson, Director of Health, Physical Education and Recreation for Seattle Public Schools, stated in a recent interview:

> There is a need to determine the effectiveness of the normal physical education program as compared to a special physical fitness program in the physical education classes of the Seattle elementary schools.
>
> Although we had tests and measuring devices to measure the level of fitness of secondary students, those available to measure the students on the elementary grade level were, in general, too cumbersome and complex for the average, self-contained classroom elementary teacher; consequently, they would make no effort to measure the level of fitness of their students and adjust their program as a result of test information.

With the production of Dr. Kirchner's elementary test, which was completed about the same time that Mr. Pattillo, a teacher at Olympic Hills Elementary School, had indicated a desire to do graduate study in the area of physical education, this provided me with the opportunity to accomplish two things:

First, was the test usable by the average classroom teacher from the administrative standpoint? Being realistic, we have to realize that a classroom teacher is faced with a great deal of clerical work and a wide range of subjects she teaches, and we wanted to be sure that this test would not unnecessarily add to this burden.

And, secondly, because the test is comparatively simple, would it reflect the changing fitness levels of children as they were exposed to varying types of activity programs?

There were other things which we wished to casually observe, such as changes in the social and emotional attitudes of the children as the fitness levels improved. However, there was no effort made to isolate and measure these changes as this in itself would require a rather complete research study (7).

Limitations of the study. The following are recognized as limitations of the study:

1. The study was limited to the Olympic Hills Elementary School in Seattle, Washington, during the spring of 1960.

2. The number of boys and girls was determined by the size of each class.

3. The amount of time boys and girls had to participate in the program was determined by the time schedule of the physical education program. For each week, the total class time that each student had for actual participation in the physical education program

was 5 twenty-five-minute sessions.

4. The only equating done was by class. There are three each of the fourth, fifth, and sixth grades at Olympic Hills School. One class from each grade level was used as a control group, the second as an experimental group, and the third class as a partial experimental group.

II. DEFINITIONS OF TERMS USED

Control group. This group had the regular physical education program offered at Olympic Hills Elementary School.

Experimental group. This group received the specialized physical education program.

Partial experimental group. This group received from ten to fifteen minutes of specialized instruction and the completion of the period in the regular physical education program.

Norms. The norms used were established by the Washington State Elementary School Physical Fitness Test.

Physical fitness. This may be defined as the development and maintenance of a sound physique and of soundly functioning organs, to the end that the individual realizes his capacity for physical strength and vitality (4:16).

III. OVERVIEW OF REMAINDER OF THESIS

A brief summary of the remaining chapters follows:

1. Chapter II will relate the historical background of the history of physical education in the elementary school. A brief history of the Washington State Physical Fitness Test will also be discussed.

2. Chapter III will contain the procedure of the investigation through the use of the Washington State Physical Fitness Test. Also included in this chapter will be description of the groups to be tested and the type of program to be followed by each group.

3. Chapter IV will be an analysis of the data and the statistical results.

4. Chapter V will contain a brief review of the problem and a statement concerning the results of the testing program. The conclusions evaluated from the testing results and recommendations from the result of the entire testing program will be stated.

CHAPTER II

REVIEW OF THE LITERATURE

The history of the physical education movement in the United States is of considerable importance to this thesis because the national pattern was reflected by the program of the Seattle Public Schools. Physical education in this area was influenced mainly by national interest. The historical background in this chapter provides data for comparison of past and present trends in physical education with respect to their importance and influence on our present program.

This chapter is organized in two parts. Part I is a resume of the historical background of physical education in the United States from colonial times to the present. Part II reviews the construction of the Washington State Elementary Physical Fitness Test.

I. HISTORICAL BACKGROUND

American Physical Education grew mainly from four sources: from gymnastic systems of Germany and Sweden, from the games-playing system of English public schools and universities, and from the particular contributions and developments of its own

people (17:159).

In the early nineteenth century, German Gymnastics were one of the first programs of physical education introduced into the United States. In spite of its slow acceptance, the history of German Gymnastics after the Civil War is one of growth and steady assimilation into the American pattern (19:169).

By contrast, the Swedish immigrants introduced a therapeutic exercise system into the Americas in the middle nineteenth century (21:393).

Both systems had considerable effect on the United States physical education programs, but by the end of the century several physical education leaders including Dr. D. A. Sargent had culled the best from the Swedish and German system and produced a more typically American system (17:165). Bennett points out that Sargent was among the first to place physical education on a scientific basis, using a combination medical and physical examination as a basis for individualizing physical education instruction (2:77-92).

It is interesting to note that during this period a type of competitive sports developing in some of the Eastern colleges was to have a definite influence on the physical education programs in the United States. The games played were English in origin. During the early years games were played with little or no organization. Then developed an intramural program that blossomed into varsity competition

between schools. In the early part of the twentieth century, English games lost their appeal as our culture developed its own "American-ized" games such as basketball, baseball, volleyball, and football.

Hutchinson and Lee sum the type of physical activities carried on during this period:

> As the twentieth century opened, gymnastics was the backbone of the physical education program. Sports were approved and desired but in most places were only a sideline--not a part of the actual program. A health-through-exercise movement began after the slump in interest in gymnastics that followed the popularity of the past era (19:281).

The emergence of the Dewey philosophy in education caused a moving away from the formal system toward individual programs and education for leisure time recreation. Consequently, school physical education programs began to follow a recreational sports program. Without question, the sports and games program which developed slowly during the nineteenth century had literally pushed the traditional physical education program into the background by the middle of the twentieth century.

At the close of World War I, there were approximately 10,000 men and women in the United States trained in physical education. By 1950 the figure had risen to 76,000 (19:367). These instructors had specialized programs in physical education in the elementary schools, high schools, and universities. Soon after World War I these schools began to change from an eight-year

elementary school and four-year high school to a six-year elementary school, three-year junior high, and three-year high school. Specialists in physical education continued in the departmentalized systems of the junior highs, but only a small percentage of physical education instructors remained in the self-contained programs of the elementary school. Consequently, there was a trend towards a "What would you like to play today?" program.

The impact of the sports and games program and the type of program carried on by the elementary schools caused many leading physical educators to analyze the role that physical education should play in the schools. It was realized that it was not enough to provide only a recreational type program; it was also a responsibility to develop those aspects of physical fitness that depend upon physical activity for accomplishment (19:356). Interest in physical fitness became pronounced when rejection figures of new draftees in World War II showed that almost three million (one third) were found to be unfit for any form of military duty due to poor physical condition (18:357). Again in 1950 the Selective Service reported that over a half million of the 18 1/2 to 26 year olds were rejected for the draft.

The impact of the Kraus-Weber Test of fitness is emphasized in a statement by Lee and Bennett:

> Interest in fitness lagged for several years and even the Korean episode did not stimulate much concern. However, the topic of fitness was dramatized by the publication of the

results of the Kraus-Weber Tests on groups of European and American children. The first published report by Hans Kraus and Ruth Hirshland was in the December, 1953 issue of the Journal under the title "Muscular Fitness and Health." This article was the source for national newspaper and magazine publicity. John B. Kelly, Sr., Director of the Division of Physical Fitness during World War II, and a friend of Dr. Kraus, brought the study to the attention of President Dwight D. Eisenhower, who called the first President's Conference on Fitness of American Youth in June, 1956, and Shane McCarthy was appointed its executive director (16:82).

President Eisenhower helped show the way through his own interest and by calling national attention to our deteriorating standards of physical fitness. In 1960 Kennedy re-emphasized the consistent decline of fitness in the United States. He suggested continued research into the field of physical fitness to provide data for improving existing programs and to provide an opportunity to encourage development of new programs (10:15-17).

II. THE WASHINGTON STATE ELEMENTARY PHYSICAL FITNESS TEST (13:1)

In 1958, Dr. Glenn Kirchner developed a test battery that could be used to measure physical fitness of boys and girls of the elementary school age. The reason for developing such a test was twofold. First, there was a need for a valid and reliable test battery that would measure strength, endurance, power, and speed among children of elementary school age. Second, it was necessary to

establish norms for boys and girls six to twelve years of age.

In selecting the individual elements composing the battery, Kirchner chose twenty-one test variables: standing broad jump, curl-up, chest raising, treadmill, four-count burpee, five-second run, bench push-up, sit-up, squat jump, bar hold--arms flexed, pull-up, right leg dip, elbow flexion, elbow extension, trunk flexion, trunk extension, knee extension, knee flexion, 550-yard run-or-walk, 30-yard dash, and jump reach.

The final selection of each item in the test battery was determined after twenty potential test items were tested. Only seventeen of these items were within the capabilities of elementary boys. Twelve items of the seventeen were retained since they had a coefficient of reliability and objectivity of .75 and above.

The composite score of the external criterion was used as the primary means of validating the test battery. In order to validate the test, each experimental test was correlated with an external criterion. The experimental test which showed the highest correlation with the selected criterion variables were retained for further study.

The Pearson Product Method was used for establishing the reliability of the test. The objectivity of the tests in this study was measured by the degree to which they might be administered to the same group of subjects by independent testers and still register the same scores.

In the final phase of the construction of the test battery, the Wherry-Doolittle test selection method was used to determine the variables for the Washington State Elementary Physical Fitness Test. The final test battery correlated .8723 with the composite external criterion. Included in the final selection was the five-second run, standing broad-jump, curl-up, and squat jump. The bench push-up was added to the final selection in order to have a measurement of the strength and endurance of the arm and shoulder girdle muscles. The thirty-yard dash was substituted for the five-second run as a measure of speed. This was necessary because of the difficulty many elementary teachers found in the administration of the five-second run. Therefore, the final test battery was composed of the standing broad-jump, thirty-yard dash, bench push-up, curl-up, and squat jump.

CHAPTER III

PROCEDURES OF INVESTIGATION

Basically, the plan of the experiment was to test students in the fourth, fifth, and sixth grades, using the Washington State Elementary Physical Fitness Test to evaluate each child's performance. The development and completion of this plan involved several aspects which can best be discussed under separate headings.

I. INSTRUMENTS OF MEASUREMENT

The Seattle Public School Physical Education Department has been interested in finding an elementary school physical fitness test that was simple, easy to administer, and inexpensive. They were also interested in a test that was reasonably free of accidents or physical harm.

Washington State Elementary Physical Fitness Test.

The Washington State Elementary Physical Fitness Test was selected because it most nearly met the requirements of the criteria stated in the preceding paragraph. The Department of Physical Education felt that norms established by using elementary school

boys and girls from Washington State, including Seattle, were more reliable and valid than those taken elsewhere. This fitness test was developed for the Washington Association for Health, Physical Education and Recreation by Glenn Kirchner, Ed.D., Assistant Professor of Physical Education, Eastern Washington College, Cheney, Washington. The test battery was designed to measure strength, endurance, power, and speed, which Kirchner considered to be the basic elements of physical fitness (13:2). He stated:

> If a child records a high level of performance in these elements, he is considered to be physically fit. However, if his level of performance is low, we assume he is unfit not only to meet daily life activities but also any unforeseen emergencies (13:2).

In order to measure each of these basic elements, five tests were developed: (1) standing broad jump, (2) bench push-up, (3) curl-up, (4) squat jump, and (5) thirty-yard dash. These tests, described below, can be found in detail in the examiner's manual (13:10-14).

Standing broad jump. The purpose of this test was to measure power. The pupil assumed a squat position and jumped forward as far as possible. The distance to the nearest inch from the take-off line to the nearest heel position was recorded.

Bench push-up. The purpose of this test was to measure the strength and endurance of the forearm, the arm, and the shoulder

muscles. The pupil assumed regular push-up position with the hands on the side of a chair rather than on the floor. The pupil lowered and raised his body as many times as possible. The score depended on the number of complete push-ups.

Curl-up. The purpose of this test was to measure the strength and endurance of the trunk muscles. The pupil assumed a position on his back with his hands behind his head. The tester kept the pupil's knees close to the buttocks in order to insure a bent knee position. The score was the number of times the pupil sat up and touched his knees.

Squat jump. This test measured the strength and endurance of the trunk and leg muscles. The pupil would crouch and then jump to a height approximately four inches above the floor. The score was the number of times the pupil jumped off of the floor.

Thirty-yard dash. The purpose of this test was to measure speed. The pupil ran a thirty-yard distance. The score was the time required to complete the run, recorded to the nearest one tenth of a second.

II. ORGANIZATION OF THE EXPERIMENT

The first procedure in the organization of the experiment

was to determine which classes would be used as experimental groups, partial experimental groups, and control groups. At Olympic Hills Elementary School there is a system of departmentalization in physical education classes. Since the writer was the instructor for a fourth grade, a fifth grade, and three sixth grades, it seemed logical to use the fourth grade, the fifth grade, and one sixth grade as the experimental groups. The home room of the writer was used as the experimental group for the sixth grade. Assistance was given by Miss Geneva Henry and Mr. Donald Brown, who carried out the same partial experimental program used by this instructor in their respective rooms for their B groups. The regular physical education programs were conducted by the control groups and supervised by their regular classroom teachers.

Hereafter, all experimental groups will be referred to as group A, partial experimental groups as group B, and control groups as group C. There will, therefore, be nine groups--four A, B, and C; five A, B, and C; and six A, B, and C.

Experimental program (A). The experimental group received a special program designed to work the large muscle groups. The class activities were arranged in such a manner that all students in group A participated equally in each of the events. These exercises were designed to give muscle tone and to enable the joints of the body

to move through the greatest possible range. They included a great deal of bending forward to flex the trunk and to strengthen the long back muscles. Some of the exercises stretched the muscles of the front of the body, the chest, the hip joints, and the lateral muscles of the trunk; and still others dealt with posture so the body parts were properly aligned. As the experiment progressed, the exercises were done more rapidly in order to stimulate circulation and respiration and to increase general vigor. Some of the exercises used in this program were (1) arm rotation, (2) hand clap, (3) squat-bend, (4) burpee, (5) windmill, (6) running in place, (7) shuffle, (8) squat-jump, and (9) deep breathing.

Additional exercises were done in a prone and supine position on the gym floor. Newspapers were placed on the floor to keep clothing clean. Girls took their places behind the boys in order to preserve modesty. Exercises such as leg-raises, curl-ups, and push-ups were done in these positions.

Folding chairs were also used by members of the group. They were able to do bench push-ups, dips, and body raises from different positions on the chairs.

Relays were used in the program to keep the children interested. The relay formations were designed to include running, hopping, skipping, and other vigorous activities. Children also did the "Bunny Hop" from their relay positions.

Partial experimental program (B). During the twenty-five-minute class period, the partial experimental groups would spend about ten minutes on strenuous exercises. This program included the same exercises done by the experimental group with the exception of the prone and supine positions and chair exercises. The remainder of each period included the activities regularly carried on in the physical education program or the same as the control group.

Control program (C). The control group followed the regular program at Olympic Hills. This program included participation in (1) learning skills, (2) lead-up games, (3) seasonal sports such as basketball and soft ball, and (4) rhythmical activities.

III. ORGANIZATION OF THE TEST SITUATION

In order to administer the test with ease and efficiency, it was necessary to follow these procedures suggested by Kirchner (13:5-6): (1) health status, (2) pupil orientation, (3) equipment, (4) student helpers, and (5) space requirement.

Health status. The only children tested were those physically able to participate in the regular physical education program. Students that had physical defects were not allowed to participate. The boys and girls that had been absent from school were also eliminated.

Pupil orientation. Each child tested was oriented with all five tests. Kirchner stated, "Since practice does not reduce the validity of these test items, they may be given as regular exercises prior to the actual testing day" (13:5). Demonstrating and explaining each test helped to familiarize the pupils with the items and reduce the time needed to administer the test battery.

Equipment. The only pieces of equipment used in the actual testing were two mats, two folding chairs, and a stop watch. Mats were used to protect children during the testing of the curl-ups, bench push-ups, and squat jumps. The folding chairs were used while doing the bench push-ups. The stop watch was used to time the students for the thirty-yard dash.

Student helpers. In order to reduce the time of the testing, it was necessary to use student helpers. This tester used several capable sixth grade boys and girls. It seemed wiser to use a helper of the same sex as the participant in the squat-jumps and curl-ups. The student helpers counted the number of repetitions and recorded the scores.

Space requirements. The standing broad jump, bench push-ups, curl-ups, and squat jumps were conducted in the school gymnasium. Because of the limited space in the gymnasium, it

was necessary to conduct the thirty-yard dash in the covered play court adjacent to the gymnasium.

IV. COLLECTION OF DATA

February 3, 1960, 268 fourth, fifth, and sixth grade boys and girls were tested in the gymnasium of Olympic Hills Elementary School by the writer and student helpers. The testing schedule began with complete explanation of the skills and requirements of each of the Fitness Test events. Following detailed orientation, student help was used at some of the testing stations and to record individual scores. Each student's test score was kept on an individual mimeographed card as shown in Table VIII.

Scores were recorded by the examiners on score cards which pupils carried to each testing station. The grade and room number were used only as a means of classifying the cards. The pupil's age and sex were necessary to convert the raw score to equivalent points in the norms. Hunsicker emphasized "that a raw score only becomes meaningful when compared to a norm" (8:26). The McCall T-scale was used to transfer a child's raw score on each test item into equivalent points in a normal distribution (13:308). Kirchner continues:

> This common scale permits the performance on any test item to be compared with the performance on any of the other four tests of the battery. The points can also be

> added to give a total physical fitness score. In addition, the scoring tables are of further value in that approximately fifteen per cent of any group tested will rank superior, thirty-five per cent will rank average, thirty-five per cent will rank poor and fifteen per cent will rank very poor. A teacher simply has to look at the rating which corresponds to the points a child receives to estimate his level of physical fitness. Also, by comparing a pupil's performance from one trial to another we can estimate whether he is decreasing, maintaining or increasing his level of physical fitness (13:15).

The final retest after the completion of the nine weeks program took place during the last of April. The total number of students starting the program was 273. The scores from 239 cards were used in the analysis of the data.

Of the 29 students that dropped out of the experiment, 15 were absent on the final testing day, 6 were excused for physical reasons, 2 didn't finish the final test, 2 moved from one room to another, and 4 left school before the test was completed.

CHAPTER IV

RESULTS AND ANALYSIS OF DATA

Analysis of data will be discussed in three areas: (1) fourth grade, (2) fifth grade, and (3) sixth grade.

I. FOURTH GRADE

Results of pre-test. The Washington State Elementary School Physical Fitness Test was administered to 3 fourth grade groups with the following results. Group A, known as the control group, had a mean for the total test of 243.96. Group B, the partial experimental group, had a mean of 235.93. Group C, the experimental group, had a mean of 232.14. (See Table I).

It can be readily seen that before the study was begun the control group had the best physical fitness rating as measured by the criteria. The mean of the control group was 8.03 higher than that of the partial experimental group and 11.82 higher than the experimental group's. (See Table I). It was determined that the standard error of the mean of the control group was 5.61, of the partial experimental 4.61, and of the experimental 5.22 (Tables IX, X, XI).

The standard error of the difference gave a mean difference of 7.26 between the control group and the partial experimental group,

TABLE I

COMPARISON OF MEAN SCORES

BETWEEN PRE-TEST AND POST-TEST

GROUP	No.	Pre-Test	Post-Test	Difference	Std. Err. of Mean Diff.	"t"	Level of Signif.
			FOURTH GRADE				
A	25	243.96	259.52	15.56	7.19	2.16	.05
B	30	235.93	263.67	27.74	5.99	4.63	.01
C	28	232.14	265.92	33.78	7.11	4.75	.01
			FIFTH GRADE				
A	25	247.45	255.87	8.42	6.86	1.23	N.S.
B	30	232.83	246.33	13.50	6.81	1.98	N.S.
C	28	237.33	266.87	29.84	6.04	4.89	.01
			SIXTH GRADE				
A	26	249.12	261.92	12.81	7.61	1.68	N.S.
B	21	238.62	258.24	19.62	9.52	2.06	N.S.
C	26	251.38	285.38	34.00	8.50	4.00	.01

and a "t" of 1.11 was obtained as shown in Table II. This is not a significant difference, as a "t" of 2.04 is needed to be significant at the .05 level of confidence for 30 cases (Garrett: 308). Therefore, the null hypothesis that there is no significance between these two groups was accepted.

TABLE II

STANDARD ERROR OF DIFFERENCE AND "t's"

BETWEEN TWO MEANS FOR PRE-TEST, GRADE FOUR

Groups	Standard error of mean difference	t
M_1 V_s M_2	7.26	1.11
M_1 V_s M_3	7.66	2.24
M_2 V_s M_3	6.96	1.85

Using the same procedure for the control and experimental groups, a difference of 7.66 between two means was obtained and a "t" of 2.24. This shows a significant difference at the .05 level of confidence in favor of the control group.

The difference between two means of the partial experimental group and the experimental group was 6.96, giving a "t" of 1.85, not significant at the .05 level.

Results of post test. Table I shows that the experimental group had the best physical fitness rating after the second test. The experimental group had a mean of 265.92, 2.00 higher than the partial experimental, and 6.40 higher than the control group.

An analysis of the difference between two means was calculated. The results showed that the difference between the means of the control group and the partial experimental group was 5.91 with a "t" of .70. The difference between two means of the control group and the experimental group was 6.61 with a "t" of .96. Between the partial experimental and experimental groups the difference was 6.17 and a "t" of .36. Table III shows that all of the "t's" were well below the .05 level of confidence. Therefore, no significant difference between any two groups occurred in the post-test.

TABLE III

STANDARD ERROR OF DIFFERENCE AND "t's"

BETWEEN TWO MEANS FOR POST-TEST, GRADE FOUR

Groups	Standard Error of Mean Difference	t
M_1 V_s M_2	5.91	.70
M_1 V_s M_3	6.61	.96
M_2 V_s M_3	6.17	.36

Comparison of pre-test and post-test. Table I shows that there was an increase of mean by each group in the second test. The control group had a mean of 259.52, an increase of 15.56 over the first test. The partial experimental group had a mean of 263.67, an increase of 27.74. The experimental group had a mean of 265.92, an increase of 33.78 over the results of the first test. The total increase in mean for the experimental group was 33.78. This was 6.04 higher than the 27.74 recorded for the partial experimental group. The control group had a mean increase of 15.56, but this was 8.22 less than that of the experimental group. This is particularly important as in the first test the experimental group was the lowest and therefore made the greatest increase as shown in Table I.

In order to determine whether there was significant difference between the results of the first test and second test, an analysis of the difference between means was applied to the data. The results of this analysis appear in Table I.

The difference between means in the first and second test of the control group was 7.19. The "t" was 2.16, above the necessary 2.06 for a .05 level of confidence.

The difference between means for the partial experimental group was 5.99. This resulted in a "t" of 4.63. A "t" of 2.75 was required to be statistically significant at the .01 level of confidence; this difference is significant well beyond the .01 level.

The experimental group had a difference between means of 7.11. A "t" of 4.75 was obtained. This was significant well beyond the .01 level of confidence.

II. FIFTH GRADE

Results of pre-test. Table I shows that the control group had the best total physical fitness rating as measured by the criteria. The control group was 14.62 higher than the partial experimental group. The experimental group had a 5.50 higher mean than the partial experimental group.

The standard error of the difference and "t's" were computed. Table IV shows that the difference between means of the control group and the partial experimental group was 6.48. It was determined that a significant difference existed in favor of the control group. A "t" of 2.26 is above the necessary 2.04 at the .05 level of confidence.

The standard error of a difference between the control group and the experimental group was 6.27. A "t" of 1.61 was nonsignificant at the .05 level of confidence.

The standard error of a difference between the partial experimental and experimental groups was 6.05. A "t" of .74 was nonsignificant and well below the .05 level of confidence.

TABLE IV

STANDARD ERROR OF DIFFERENCE AND "t's"

BETWEEN TWO MEANS FOR PRE-TEST, GRADE FIVE

Groups	Standard Error of Mean Difference	t
M_1 V_s M_2	6.48	2.26
M_1 V_s M_3	6.27	1.61
M_2 V_s M_3	6.05	.74

Result of post-test. Table I shows that there was an increase in mean by each fifth grade group in the second test. The results showed that the experimental group had the best total mean, 266.87. This was 11.00 higher than the control group and 20.54 higher than the partial experimental group. The partial experimental group had the lowest mean in the second test; however, their increase was higher than that of the control group in the fifth grade.

Table V shows that the standard error of the difference between the control group and the partial experimental was 7.18 with a "t" of 1.33, nonsignificant at the .05 level of confidence. The standard error of the difference between the control group and the experimental was 6.66. The "t" of 1.65 was nonsignificant.

TABLE V

STANDARD ERROR OF DIFFERENCE AND "t's"

BETWEEN TWO MEANS FOR POST-TEST, GRADE FIVE

Groups	Standard Error of Mean Difference	t
M_1 V_s M_2	7.18	1.33
M_1 V_s M_3	6.66	1.65
M_2 V_s M_3	7.17	2.86

There was a significant difference between the partial experimental and the experimental groups at the .01 level of confidence. The standard error of the difference was 7.17 in favor of the experimental group. The "t" of 2.86 was slightly above the necessary 2.76 for .01 level of confidence for 28 cases.

Comparison of pre-test with post test. Table I shows that there was an increase in total mean by each fifth grade group in the retest. The experimental group made the largest gain, recording a difference of 29.84, over twice the 13.50 increase made by the partial experimental group, and over three times the increase of 8.42 made by the control group. The partial experimental group had a lower total mean than the control group in both tests. Nevertheless, the

13.50 increase by the partial experimental group was 5.08 greater than the increase of the control group.

A statistical analysis of the difference between the first test and the second test showed that a significant difference at the .01 level of confidence was recorded by the experimental group. The "t" of 4.84 was well beyond the necessary 2.76 for 28 cases.

The standard error of the difference for the partial experimental group was 6.81. The "t" of 1.98 was only slightly less than the necessary 2.04 at the .05 level of confidence.

The control group had a standard error of a difference of 6.86 and a "t" of 1.23. This was nonsignificant at the .05 level of confidence.

III. SIXTH GRADE

The Washington State Elementary Physical Fitness Test was administered to the sixth grade groups with the following results.

Results of pre-test. Group A, known as the control group, had a mean for the total test of 249.12. Group B, known as the partial experimental group, had the lowest mean for the sixth grade groups, 238.62. Group C, known as the experimental group, had the highest mean, 251.38 (Table I).

Table I shows that the experimental group had the highest physical fitness rating before the test was begun. It was important to

note that the 251.38 average for this group was the highest mean recorded by any of the nine groups tested. According to the norms for the Washington State Elementary Physical Fitness Test, this was a poor rating for boys and girls at the 11 or 12 age level. The control group had 2.26 points less than the experimental group, and according to Table I the control group is 10.50 points higher than the partial experimental group.

Table VI shows the standard error of the difference between the control and partial experimental group was 8.25. The "t" of 1.27 was nonsignificant at the .05 level of confidence.

TABLE VI

STANDARD ERROR OF DIFFERENCE AND "t's"

BETWEEN TWO MEANS FOR PRE-TEST, GRADE SIX

Groups	Standard Error of Mean Difference	t
M_1 V_s M_2	8.25	1.27
M_1 V_s M_3	7.56	1.40
M_2 V_s M_3	8.37	.27

The standard error of the difference between the control and experimental was 7.56. A "t" of 1.40 in favor of the experimental group was nonsignificant.

The "t" between the partial experimental and the experimental was well below significance at the .05 level of confidence.

Results of post-test. Table I shows that the experimental group had a mean of 285.38, 27.14 higher than the partial experimental group and 23.46 higher than the control group. The control group maintained a higher score than the partial experimental group in the second test.

Table VII showed that the standard error of the mean difference between the control group and the partial experimental group was 8.98. A "t" of .41 showed no significance at the .05 level of confidence.

TABLE VII

STANDARD ERROR OF DIFFERENCE AND "t's"

BETWEEN TWO MEANS FOR POST-TEST, GRADE SIX

Groups	Standard Error of Mean Difference	t
M_1 Vs M_2	8.98	.41
M_1 Vs M_3	8.54	2.75
M_2 Vs M_3	9.64	2.43

The standard error of the mean difference between the control and experimental group was 8.54. The "t" of 2.75 in favor of the experimental group was significant at the .05 level of confidence. 2.78 was needed for significance at the .01 level of confidence.

The standard error of the mean difference between the partial control and experimental group was 8.54. A "t" of 2.43 was above the necessary 2.06 for .05 level of confidence.

Comparison of pre-test with post-test. Table I showed that each group made a gain on the second test over the first test. The experimental group made the largest gain, 34.00. This was a 14.38 greater gain than the partial experimental group and 21.19 greater than the control group. The partial experimental group had a lower mean on the second test than the control group, but the partial experimental group showed a 6.81 larger gain.

Table I showed that the standard error of mean difference between the first and second test of control group was 7.61. The "t" of 1.68 was nonsignificant at the .05 level of confidence.

The partial experimental group had a standard error of mean difference of 9.52. The "t" of 2.06 was considered nonsignificant at the .05 level. A "t" of 2.08 is necessary for significance with 21 cases.

The experimental group showed the only significant difference by a sixth grade group in comparison. The "t" of 4.00 was well above the necessary 2.75 at the .01 level of confidence.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The purpose of this study was to determine the effect of three physical education programs on physical fitness. The research technique utilized three control classes, three partial experimental classes, and three experimental classes.

The experiment was carried on at the fourth, fifth, and sixth grade level at Olympic Hills Elementary School, Seattle, Washington. Nine heterogeneously grouped classes containing a total of 285 pupils were employed. The 9 classes contained 3 fourth, 3 fifth, and 3 sixth grade classes. Each of these classes represented either a control, partial experimental, or an experimental group. The Washington State Elementary Physical Fitness Test was administered to the nine classes in February, 1960.

Immediately after the pre-test, the experimental group received a special program designed to work the large muscles of the body. The program lasted twenty-five minutes daily and included exercises and relays. The partial experimental group started their daily program doing vigorous exercises for ten minutes. The last

fifteen minutes was spent in the regular physical education program. The control group followed the regular physical education program.

The experiment concluded after nine weeks. The control, partial experimental, and experimental groups were retested using the previously mentioned fitness test. The results of the pre-test and post-test scores for those pupils present for both tests, 241, were submitted to a comprehensive statistical analysis.

Small samples were employed in the study and the comparison between two groups at a time was the experimental design. Therefore, the "t" test of significance was used in all cases. The first and second tests were performed to determine whether there was a statistical difference between (1) the control group and partial experimental group, (2) the control group and experimental group, and (3) the partial experimental group and experimental group. Additional statistics were computed to determine if a statistical difference existed between the pre- and post-test of each group.

Results of the fourth grade tests revealed that there was a significant difference in favor of the control group over the experimental group in the pre-test. There was no significant difference between the other two groups. In the post-test there was no significant difference between groups. When the pre- and post-tests were compared, the control group showed a significant difference at the .05 level of confidence. The partial experimental group and the

experimental group showed a significant difference well above the .01 level of confidence.

The fifth grade results showed that in the pre-test a significant difference occurred at the .05 level in favor of the control group over the partial experimental group. There was no significant difference between the other two groups. The post-test revealed a significant difference in favor of the experimental group over the partial experimental group at the .01 level of confidence. In comparison of pre- and post-tests the experimental group showed a significant difference at the .01 level of confidence.

In the pre-test of the sixth grade there was no significant difference between groups. The post-test revealed a difference existed at the .05 level of confidence in favor of the experimental group over the partial experimental group and the control group. In the comparison of pre-test with post-test the partial experimental had a difference at the .05 level of confidence. The experimental group recorded a difference well above the .01 level of confidence.

In comparing the pre-test and the post-test means, the experimental groups showed the greatest difference of the three groups. The partial experimental groups had the second greatest difference and the control groups recorded the smallest difference.

In each grade level the experimental group made the largest gains in physical fitness, regardless of their standing in the pre-test. It is interesting to note that at the fourth grade level they were the lowest in the pre-test, at the fifth grade level they were second, and at the third grade level they were the highest group tested. In the post-test they were the best group tested at each grade level regardless of their starting point. Also, at each grade level they made the most increase on test scores.

At each grade level their increase was significant at the .01 level of confidence. In only one other group was this increase significant at the .01 level, this being the partial experimental group in the fourth grade.

II. CONCLUSIONS

The statistical data indicated a definite increase in physical fitness for the experimental group, as shown by this test. There was some gain made by each group in the study, but only the experimental group in all three grades showed a significant gain between pre-test and post-test. The partial experimental groups showed the next largest gain. The control groups showed a gain at each grade level, but it was less than the experimental or partial experimental group in each case.

This study has shown that the groups following the special physical education program made greater gains in test scores than did the group following a regular physical education program at Olympic Hills Elementary School.

It is the opinion of this writer that the Washington State Elementary Physical Fitness Test was relatively easy to administer by one teacher, provided student helpers were available.

There are no statistics to show social adjustment, but it was observed by the writer that the boys and girls in the experimental group of the sixth grade seemed more adjusted socially and personally than did the sixth graders of previous years. In general, the sixth grade experimental group showed better adjustment in relation to other pupils, to social competency, and to social participation.

III. RECOMMENDATIONS

Following are some of the recommendations to be considered:

1. The inclusion of a similar type of program used by the experimental group in the course of study may be expected to produce an amount of physical fitness significantly beyond that produced by the present program.
2. A physical fitness program designed to achieve

maximum results should be conducted daily.

3. Similar types of studies should be conducted in other areas of the city.
4. The Washington State Physical Fitness Test should be given to primary grade children as well as to the intermediate grade children.

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APPENDIX

TABLE VIII

INDIVIDUAL RECORD CARD

NAME _____

Grade _____ Room _____ Age _____

	Score	Points
Standing broad jump	_____	_____
Bench push-ups	_____	_____
Curl-ups	_____	_____
Squat-jumps	_____	_____
Thirty-yard dash	_____	_____
Totals	_____	_____

TABLE IX

INDIVIDUAL SCORES, CONTROL GROUP, GRADE FOUR

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	53	58	47	43	56	53	34	42	38	46	228	242
2.	56	53	40	49	39	47	49	53	46	46	230	248
3.	56	56	53	63	53	52	48	73	38	46	248	290
4.	38	39	35	45	49	46	40	58	39	36	201	224
5.	60	56	50	48	52	52	58	62	46	46	266	264
6.	39	38	43	46	41	40	32	45	36	36	191	205
7.	47	45	43	45	45	51	57	62	39	45	231	248
8.	65	61	55	52	52	48	52	57	52	52	276	270
9.	42	55	47	49	53	58	58	65	41	45	241	272
10.	37	54	46	51	41	41	47	53	45	46	216	245
11.	48	48	34	40	56	60	50	77	38	46	226	271
12.	53	57	61	59	52	47	44	54	39	52	249	269
13.	41	44	57	48	41	49	73	73	50	41	262	255
14.	57	59	47	57	59	57	70	70	46	46	279	289
15.	51	46	49	48	59	61	67	73	41	41	267	269
16.	45	48	52	39	41	48	49	63	31	41	218	239
17.	55	55	43	43	68	75	73	73	50	50	289	296
18.	51	58	58	50	51	43	65	70	52	46	277	267
19.	48	43	43	55	43	56	39	60	41	41	214	255
20.	48	46	47	56	51	60	73	60	50	41	269	263
21.	40	39	52	65	43	48	45	56	31	31	211	239
22.	45	39	50	43	52	57	61	70	46	46	254	255
23.	37	45	48	47	42	47	47	56	41	41	215	236
24.	41	48	52	56	60	75	65	60	50	41	268	280
25.	59	64	51	60	60	59	65	68	38	46	273	297
Total	1212	1254	1203	1257	1259	1330	1361	1553	1064	1094	6099	6488
Mean	48.48	50.16	48.12	50.28	50.36	53.28	54.48	62.12	42.56	43.76	243.96	259.52
σ											27.41	21.99
σ_M											5.61	4.50

TABLE X

INDIVIDUAL SCORES, PARTIAL EXPERIMENTAL GROUP, GRADE FOUR

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	47	55	54	59	47	53	50	59	39	60	237	286
2.	37	52	50	49	42	47	59	40	46	55	234	243
3.	45	48	53	46	37	51	62	72	55	52	252	269
4.	62	62	57	60	47	50	41	49	55	55	262	276
5.	16	39	35	48	37	32	43	49	39	45	170	213
6.	34	36	40	49	49	52	49	53	38	46	210	236
7.	53	28	51	49	50	53	40	58	55	55	249	243
8.	42	63	53	66	57	59	52	66	39	39	243	293
9.	35	42	35	51	43	42	50	45	39	45	202	225
10.	55	50	47	48	37	32	41	54	45	45	225	229
11.	45	53	56	59	43	45	43	62	53	45	239	264
12.	32	28	45	49	46	54	49	49	38	46	210	226
13.	48	61	53	51	56	56	39	77	55	55	251	300
14.	42	56	54	59	60	58	52	63	38	46	246	282
15.	34	53	45	45	51	57	39	52	38	45	207	252
16.	36	53	37	47	52	48	48	50	38	38	211	236
17.	46	47	46	38	50	56	60	51	50	50	252	242
18.	48	51	49	46	43	56	59	61	50	50	249	264
19.	42	48	44	53	54	62	51	73	31	50	222	286
20.	38	46	60	59	46	66	62	68	31	50	237	289
21.	54	58	59	44	48	52	55	42	50	50	266	246
22.	42	50	57	59	46	56	60	61	50	52	255	268
23.	32	37	50	61	37	66	54	62	31	51	204	276
24.	40	53	58	54	41	46	58	73	31	50	228	276
25.	45	50	57	62	39	48	73	73	50	50	264	283
26.	42	45	40	48	39	46	44	73	41	41	206	253
27.	48	50	76	76	63	69	58	70	41	46	286	311
28.	41	51	58	59	46	57	62	63	50	50	257	280
29.	45	57	57	51	57	51	56	70	50	55	265	284
30.	46	57	52	50	48	53	43	63	50	46	239	269
Total	1272	1479	1528	1595	1411	1573	1552	1801	1315	1462	7078	7900
Mean	42.40	49.30	50.93	53.16	47.03	52.43	51.73	60.03	43.83	48.73	235.93	263.67
σ											24.78	20.62
σ_M											4.61	3.83

TABLE XI

INDIVIDUAL SCORES, EXPERIMENTAL GROUP, GRADE FOUR

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	56	57	49	52	42	58	49	66	55	51	251	283
2.	56	57	52	50	46	50	41	52	38	53	233	262
3.	59	63	59	51	56	60	46	64	38	52	258	290
4.	57	63	51	54	51	59	58	72	52	52	269	300
5.	53	60	52	51	42	49	50	62	52	50	249	272
6.	34	37	51	59	45	47	47	53	33	37	210	233
7.	53	57	51	51	59	64	50	53	55	46	268	271
8.	59	59	47	57	46	59	52	77	46	46	250	298
9.	67	78	56	59	46	59	60	59	52	60	281	315
10.	43	56	53	53	45	49	46	61	45	48	232	267
11.	41	38	47	45	40	40	38	72	39	39	205	234
12.	40	64	34	37	44	53	49	58	46	55	213	267
13.	32	35	33	50	43	55	50	59	31	40	189	239
14.	37	37	55	49	39	59	55	61	41	41	227	247
15.	36	38	50	46	49	50	51	70	41	46	218	250
16.	55	53	50	49	50	57	53	61	50	50	258	270
17.	38	37	39	47	37	37	49	63	16	35	179	219
18.	39	39	36	48	43	43	62	73	31	43	211	246
19.	48	53	49	58	54	53	43	70	55	58	249	292
20.	37	41	54	53	46	64	60	62	41	41	238	261
21.	31	52	49	50	58	78	52	56	41	46	231	282
22.	46	51	40	55	61	62	60	73	31	46	238	287
23.	44	43	55	77	58	57	73	73	31	41	261	291
24.	38	59	33	49	37	34	41	67	41	53	190	262
25.	31	57	50	60	33	37	50	61	41	46	205	255
26.	36	41	30	36	41	50	64	63	41	41	212	231
27.	55	61	54	62	45	53	70	70	46	50	270	296
28.	15	45	55	48	45	39	49	48	41	46	205	226
Total	1227	1431	1334	1456	1301	1475	1468	1778	1170	1306	6500	7446
Mean	43.82	51.11	47.64	52.00	46.46	52.68	52.43	63.50	41.78	46.64	232.14	265.92
σ											27.11	25.08
σ_M											5.22	4.83

TABLE XII

INDIVIDUAL SCORES, CONTROL GROUP, GRADE FIVE

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	39	53	52	60	56	60	58	60	39	52	244	275
2.	57	59	59	61	66	70	54	75	48	48	284	313
3.	63	46	39	54	61	70	37	75	62	48	252	293
4.	64	68	52	45	51	49	66	50	60	52	293	264
5.	42	42	57	53	33	33	39	41	57	48	228	217
6.	54	55	57	54	49	60	64	69	41	48	265	286
7.	34	46	45	43	51	46	47	51	39	41	206	227
8.	42	51	57	45	49	49	75	59	41	48	264	252
9.	61	52	61	58	61	53	57	59	52	52	292	274
10.	40	42	46	46	33	33	44	44	37	37	200	202
11.	49	57	53	53	55	55	39	54	48	41	244	260
12.	43	42	39	45	45	56	40	59	45	48	212	240
13.	55	51	59	53	45	61	61	59	48	57	268	281
14.	40	42	48	54	33	33	40	55	37	37	204	215
15.	43	43	58	41	37	46	39	37	45	52	227	219
16.	45	43	46	50	37	44	43	64	45	52	216	253
17.	35	52	50	58	38	40	52	54	45	45	220	249
18.	61	57	49	54	58	52	52	63	46	45	266	271
19.	50	50	48	48	40	40	60	60	50	50	248	248
20.	45	55	63	64	58	60	50	56	46	55	262	290
21.	49	52	47	46	48	46	52	64	45	37	241	245
22.	52	50	54	50	53	52	54	62	45	54	258	268
23.	42	39	53	43	48	51	60	69	37	45	240	247
24.	60	56	53	45	56	58	56	48	45	45	270	252
25.	44	52	53	54	53	59	54	65	41	41	245	271
26.	38	48	54	47	56	58	50	60	41	41	239	254
27.	48	48	58	48	38	39	55	46	41	46	240	227
28.	57	59	60	64	59	65	69	69	45	45	290	302
29.	52	45	48	46	49	45	50	56	41	28	240	220
30.	44	48	53	51	52	49	53	47	46	45	238	240
31.	48	42	64	56	60	63	62	70	46	46	280	277
Total	1496	1545	1641	1583	1518	1575	1622	1800	1394	1429	7671	7932
Mean	48.25	49.83	52.93	51.06	48.96	50.80	52.32	58.06	44.96	46.09	247.45	255.87
σ											25.88	27.16
σ_M											4.73	4.97

TABLE XIII

INDIVIDUAL SCORES, PARTIAL EXPERIMENTAL GROUP, GRADE FIVE

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	38	53	54	51	37	44	43	50	49	39	211	237
2.	29	38	48	52	38	45	39	47	39	52	193	234
3.	43	39	35	43	46	40	45	37	39	37	208	196
4.	43	51	63	59	53	47	38	52	45	52	242	271
5.	45	55	65	61	61	56	61	54	57	52	289	278
6.	39	43	51	60	48	51	37	47	39	52	214	253
7.	37	39	47	53	50	59	48	35	31	49	213	235
8.	50	49	53	59	53	48	47	56	48	48	250	260
9.	60	67	51	55	51	56	39	48	52	52	253	278
10.	48	45	35	46	51	43	50	43	37	41	221	218
11.	38	44	50	39	43	48	56	56	41	46	228	233
12.	57	71	63	68	49	49	66	63	55	46	290	297
13.	31	41	52	56	36	39	59	69	46	45	224	250
14.	39	44	40	41	48	48	55	57	41	46	223	236
15.	45	42	52	65	42	39	69	62	45	45	253	253
16.	35	42	36	36	39	35	40	46	46	41	196	200
17.	41	38	33	41	35	35	61	56	41	41	211	211
18.	47	43	42	46	40	40	55	57	45	45	229	231
19.	37	51	39	42	38	35	42	51	46	46	202	225
20.	56	50	56	71	58	46	43	69	45	45	258	281
21.	37	38	41	41	33	38	52	61	41	41	204	219
22.	41	52	47	62	49	55	62	70	41	46	237	285
23.	41	53	43	62	50	51	49	70	46	46	229	282
24.	38	46	36	32	49	45	50	49	28	37	201	209
25.	42	41	51	40	54	50	57	55	54	41	258	227
26.	52	50	59	70	46	49	52	70	46	55	255	294
27.	46	40	56	52	53	43	66	69	45	45	266	259
28.	47	47	51	68	45	43	66	62	41	46	250	266
29.	37	50	48	43	49	41	66	70	46	41	246	245
30.	35	39	56	48	43	38	51	56	41	46	226	227
Total	1274	1411	1450	1572	1386	1356	1569	1687	1306	1364	6985	7390
Mean	42.46	47.03	48.33	52.40	46.20	45.20	52.30	56.23	43.53	45.46	232.83	246.33
σ											23.90	27.85
σ_M											4.44	5.17

TABLE XIV

INDIVIDUAL SCORES, EXPERIMENTAL GROUP, GRADE FIVE

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	42	43	53	50	48	50	60	53	52	45	255	241
2.	55	52	41	48	52	56	50	55	52	60	250	271
3.	48	66	58	58	38	51	64	60	45	60	253	295
4.	59	59	56	53	48	59	54	61	60	53	277	285
5.	50	53	35	41	38	55	39	57	39	52	201	258
6.	42	57	48	55	59	72	47	72	60	60	256	316
7.	51	64	49	43	46	61	39	61	57	57	242	286
8.	47	48	50	43	42	54	38	62	41	48	218	255
9.	51	58	49	59	54	70	54	75	48	57	256	319
10.	40	51	38	38	39	54	49	59	37	41	203	243
11.	49	47	54	43	46	61	58	60	37	48	244	259
12.	46	47	38	50	38	57	51	55	48	48	221	257
13.	38	53	48	50	40	60	37	43	52	52	215	258
14.	36	40	38	41	35	48	37	56	48	41	194	226
15.	51	51	51	49	44	54	48	52	48	48	242	254
16.	29	42	47	41	52	70	38	54	39	45	205	252
17.	56	60	66	59	48	59	51	64	41	52	262	294
18.	52	40	50	53	49	58	60	65	45	54	256	270
19.	46	55	51	56	43	53	57	69	45	45	242	278
20.	37	45	48	59	47	58	52	70	46	45	230	277
21.	36	49	49	53	51	57	60	64	45	54	241	277
22.	39	49	56	43	45	41	51	59	45	54	236	246
23.	46	61	55	56	55	50	66	65	55	54	277	286
24.	46	55	54	54	48	49	56	54	46	41	250	253
25.	41	57	55	44	54	65	48	70	45	55	243	291
26.	37	46	47	41	43	53	56	70	41	46	224	256
27.	47	55	51	56	50	53	55	70	55	55	258	289
28.	44	50	57	47	45	56	61	56	41	41	249	250
29.	33	45	43	46	38	46	59	69	37	45	210	251
30.	33	35	50	48	35	30	48	55	45	45	211	213
Total	1327	1532	1485	1477	1370	1660	1543	1845	1395	1501	7120	8006
Mean	44.23	51.06	49.50	49.23	45.66	55.33	51.43	61.50	46.50	50.03	237.33	266.87
σ											22.10	23.83
σ_M											4.11	4.43

TABLE XV

INDIVIDUAL SCORES, CONTROL GROUP, GRADE SIX

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	45	52	49	51	39	45	46	61	48	48	227	257
2.	42	45	43	43	53	53	46	59	41	41	225	241
3.	40	45	41	41	55	61	48	75	41	41	225	263
4.	49	54	59	60	59	70	75	75	48	57	290	316
5.	38	39	49	47	50	58	51	67	40	53	228	264
6.	45	41	57	45	34	36	52	75	41	48	229	245
7.	41	42	59	58	45	47	53	76	31	56	229	279
8.	40	42	49	48	55	70	38	75	41	37	223	272
9.	47	55	57	54	55	52	64	75	48	68	271	304
10.	52	52	52	40	48	51	69	57	45	54	266	249
11.	53	51	55	63	46	54	49	60	30	53	233	281
12.	38	34	45	37	55	55	59	62	45	45	242	233
13.	45	43	56	56	51	55	66	66	47	47	265	267
14.	38	38	40	37	38	32	49	52	30	30	195	186
15.	61	53	52	35	49	49	66	61	57	53	285	251
16.	47	50	36	46	40	45	66	57	53	53	242	251
17.	61	57	56	59	44	51	66	66	47	53	274	286
18.	50	51	76	76	54	54	66	66	47	47	293	294
19.	53	56	43	50	54	49	49	48	47	53	246	256
20.	60	52	57	63	39	50	62	57	47	54	265	276
21.	43	49	52	42	45	32	49	48	47	47	236	224
22.	39	39	29	35	43	49	46	49	47	53	204	225
23.	52	64	55	53	52	58	69	69	47	54	275	298
24.	51	51	57	50	42	34	66	66	47	47	263	248
25.	60	55	49	37	49	54	66	66	47	53	271	265
26.	60	66	55	46	47	54	66	66	47	47	275	279
Total	1250	1276	1328	1269	1241	1324	1502	1654	1156	1292	6477	6810
Mean	48.08	49.07	45.08	48.81	47.73	50.92	57.78	63.61	44.46	49.69	249.12	261.92
σ											26.27	27.54
σ_M											5.25	5.51

TABLE XVI

INDIVIDUAL SCORES, PARTIAL EXPERIMENTAL GROUP, GRADE SIX

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	58	58	59	61	42	57	48	58	48	57	255	291
2.	48	50	38	41	46	49	39	41	48	48	219	229
3.	34	35	42	48	46	50	38	48	49	49	209	230
4.	20	20	34	42	33	33	45	54	31	30	163	179
5.	41	45	45	51	57	42	49	57	48	46	240	241
6.	50	60	54	59	55	56	46	52	48	52	253	279
7.	45	50	41	49	46	49	38	58	41	46	211	252
8.	46	61	54	53	40	49	59	60	45	48	244	271
9.	56	60	62	68	49	57	40	69	54	50	261	304
10.	41	56	49	38	46	57	51	59	54	50	241	260
11.	45	52	50	39	32	45	59	66	47	47	233	249
12.	59	57	55	56	59	56	34	59	54	51	261	279
13.	40	41	54	48	35	37	48	69	37	35	214	230
14.	49	51	37	42	44	46	58	66	51	53	239	258
15.	66	67	53	56	55	66	65	66	64	57	303	312
16.	46	55	56	37	47	62	49	49	45	43	243	246
17.	45	43	46	45	53	55	48	57	39	37	231	237
18.	57	70	63	62	49	50	62	66	49	53	280	301
19.	45	41	46	50	55	57	47	51	37	37	230	236
20.	42	47	62	67	61	65	52	69	47	50	264	298
21.	45	50	47	45	42	46	38	58	45	42	217	241
Total	978	1069	1047	1057	992	1084	1013	1232	981	981	5011	5423
Mean	46.57	50.90	49.86	50.33	47.24	51.62	48.62	58.67	47.71	46.71	238.62	258.24
σ											28.45	31.63
σ_M											6.36	7.09

TABLE XVII

INDIVIDUAL SCORES, EXPERIMENTAL GROUP, GRADE SIX

	Standing Broad Jump		Bench Push Up		Curl Up		Squat Jump		Thirty Yard Dash		Total	
	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test	Pre-Test	Post-Test
1.	55	51	53	55	46	74	61	76	48	54	263	310
2.	69	62	61	77	55	70	61	75	48	59	294	343
3.	60	66	58	77	63	70	58	75	58	57	297	345
4.	45	42	59	63	45	70	39	61	41	40	229	276
5.	50	45	61	70	52	70	53	75	48	47	264	307
6.	51	43	50	51	45	59	48	49	48	55	242	257
7.	53	54	58	66	52	50	61	76	49	45	273	291
8.	40	60	51	63	38	70	40	70	57	59	226	322
9.	41	40	49	46	52	70	56	59	48	42	246	257
10.	54	56	59	77	59	70	46	75	48	48	266	326
11.	42	37	49	51	36	46	45	61	48	55	220	250
12.	52	60	48	50	51	54	55	66	54	51	260	281
13.	59	63	52	59	49	55	66	66	45	55	271	298
14.	57	57	60	56	55	65	69	69	45	52	286	299
15.	39	45	43	40	43	49	51	56	28	35	204	225
16.	61	60	55	53	48	54	60	66	45	51	269	284
17.	48	48	38	40	49	54	51	66	45	47	231	255
18.	53	59	45	51	51	65	69	69	45	47	263	291
19.	56	56	52	52	49	46	63	66	53	53	273	284
20.	36	45	32	37	39	48	45	66	37	38	189	234
21.	52	59	45	71	48	65	54	69	45	50	244	314
22.	66	70	46	56	39	57	55	69	54	50	260	302
23.	49	51	64	76	54	66	66	66	47	50	280	309
24.	47	53	55	60	49	68	49	69	45	42	245	282
25.	50	43	39	40	40	35	49	66	47	47	225	231
26.	49	50	46	49	36	51	48	56	37	41	216	247
Total	1334	1386	1328	1486	1243	1541	1418	1737	1213	1270	6536	7420
Mean	51.31	53.31	51.08	57.15	47.81	59.27	54.54	66.81	46.65	48.85	251.38	285.38
σ											27.21	32.64
σ_M											5.44	6.53

TABLE XVIII

FORMULAS USED FOR COMPUTING THE DATA

Mean (18:50)

$$M = \frac{\Sigma X}{N}$$

Standard Deviation (18:74)

$$SD = \sqrt{\frac{X^2}{N} - M^2}$$

Standard Error of Mean (18:127)

$$\sigma M = \frac{SD}{\sqrt{N - 1}}$$

Standard Error of Difference between the Means (4:449

$$\sigma D = \sqrt{\sigma^2 M_1 + \sigma^2 M_2}$$

Student "t" (18:166)

$$t = \frac{M_1 - M_2}{\sigma \text{ diff.}}$$