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The Effect of Circuit Training on the Physical Fitness of Fourth Grade Boys and Girls Compared to Traditionally Accepted Calisthenics

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THE EFFECT OF CIRCUIT TRAINING ON THE PHYSICAL FITNESS OF FOURTH GRADE BOYS AND GIRLS COMPARED TO TRADITIONALLY ACCEPTED CALISTHENICS

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CHAPTER I

THE PROBLEM AND DEFINITION OF TERMS

In physical education there is the responsibility for the development of physical fitness among the youth of the nation. There are a variety of ways of insuring that students get the vigorous activity that they need each day. The activity program should make a significant contribution to this purpose, the remainder of the task rests with the daily conditioning program.

The writer chose to compare the circuit training method of conditioning to a traditionally accepted program of conditioning for fourth grade boys and girls at Mt. Stuart Elementary School in Ellensburg, Washington.

I. THE PROBLEM

The problem is to compare the effect of two elementary programs on physical fitness.

The study was confined to one fourth grade class which was divided into two groups in the Mt. Stuart Elementary School, Ellensburg, Washington.

Purpose of this study.

It was the purpose of this study: (1) To compare the regular physical education program of the fourth grade with an experimental physical education program of the fourth grade; and (2) to compare

physical fitness of boys and girls of the two groups before and after the study.

Importance of the study.

The importance of this study is to determine which of the two physical fitness programs would provide fourth grade students with the best development in physical fitness. The physical fitness programs for both groups were the same except in the technique of administration. Both programs presented ten minutes of physical fitness exercises each day for five months.

From the writer's experience in the field of elementary physical education, many programs of elementary physical education throughout the state are executed in an incompetent manner. It is the writer's conviction that exercise preceding play activities is very important and, thus, ought to be of a stimulating nature.

Limitations of the study.

1. The study was limited to the Mt. Stuart Elementary School, Ellensburg, Washington, from January to June, 1970.

2. The number of boys and girls was determined by the size of the class. The control group was composed of seven girls and eight boys, the experimental group consisted of seven girls and eight boys.

3. Both groups were allotted five thirty-minute sessions per week for physical education. This study was presented for ten minutes four times weekly.

II. DEFINITIONS OF TERMS

Circuit training method. The formation of six exercising stations, with each station ranging from five to twenty yards from the other. Subjects exercise at each station for a prescribed number of seconds, stop, and sprint to the next exercise station. The procedure is continued until each subject has completed the circuit. Subjects were given ten seconds between each station for sprint, recovery and obtaining the next exercise position.

Control group. This group participated in the normal physical education program at Mt. Stuart Elementary School. The physical fitness exercises were done in the traditional manner.

Traditionally accepted calisthenics. The formation of three lines of students, with one student standing in front acting as that days physical fitness leader. Each student does the prescribed number of exercises in cadence with others of the group.

Experimental group. This group participated in the normal, physical education program at Mt. Stuart Elementary School. This group's physical fitness exercises were done by the circuit training method.

Physical fitness. "A person who is physically fit possesses the strength and stamina to carry out his daily tasks without undue fatigue and still has enough energy to enjoy leisure and to meet unforeseen emergencies." (10:3)

CHAPTER II

REVIEW OF LITERATURE

Circuit training is a recently developed method for doing calisthenics. This method of exercising was introduced into the United States thirteen years ago by the English. However, many physical educators have not yet become involved with it. Circuit training is a method of exercise that can be executed in many different ways. One might use the clock as the sole factor, another may use lap times as the sole factor in determing the degree of physical fitness being gained. Whatever format used for execution of the circuit, one should consider its worth as a new trend within the field of physical education and give it some serious thought.

I. RELATED LITERATURE

Circuit training satisfies the modern demand that pupils shall be treated as individuals and not in the mass, and that they shall pursue their activity with the minimum of direction from the teacher. (3:5-6)

This is to say, that if a student is capable of doing only three push-ups, he will not be subjected to undue embarrassment by having to struggle through ten poorly executed push-ups. By using circuit training the student will be competing against only himself. Also, the teacher with only a minimum of knowledge in physical

education will be able to play a much larger role during the physical education period because of circuit trainings simplicity.

A recent experiment by Grieve compared the physical fitness level of two ninth grade classes. One ninth grade section was selected to work on a circuit training program aimed exclusively at physical fitness. Each days exercise period lasted for 15 minutes, the experiment went on for five months. The results of this program were "superlative" (15:44)

Grieve's study included both the time element factor and the specific number of repetitions factor.

Grieve went on to state, circuit training,

> Though considered "new" by many physical educators, it does not represent a radical departure from traditional training methods. It's merely an organizational change that makes more effective use of time and facilities. (15:44)

Whitlow states:

> Circuit training, adapted for use in the elementary physical education program, need not be elaborate or complex. Many of the traditional elements of circuit training, such as target times, fixed loads, fixed time limits, and red, white and blue circuits, may be eliminated. The important thing is to give the students a circuit with simple goals to begin. Then make the goals more difficult for students as you see their enthusiasm develop. (21:26-7)

Whitlow conducted an experimental circuit training program in the Edwardsville Community Unit District, Edwardsville, Illinois, in 1968, for the elementary grades. The circuit consisted of four stations with each station having two duties; one was called an activity, the other an exercise. If a piece of equipment was being used by one student, another student did his exercises first and then used the equipment. To avoid crowding, two or three students were

assigned to each station. Whenever a student reached a point where he could do all the required work at all the stations the number of repetitions was increased at the different stations. (21:26-7)

At the conclusion of Whitlow's experimental program, the enthusiastic reactions of the students was so great that circuit training took a permanent place in the elementary physical education program.

Adamson and Morgan go on to say: Conservative physical educators are finding as much, if not more, fitness can be developed with such a method as circuit training. During the winter months, one may still continue a well constructed fitness program, even with very limited amount of space, and not have the fear that boredom will take the upper hand. (3:5-94)

If one's facilities are extremely poor, the possibility for circuit training is still available. Once the objective has been set, adapt the circuit to it. The composition of the circuit depends upon the apparatus available and the specific aims in mind. (13:61)

Efforts to improve the physical fitness of our youth are being made often, circuit training is another of these efforts being made. Circuit training came to the United States from a very physically orientated country and has been adapted to a variety of situations. (3:1-5)

> In 1957 a method of developing physical fitness was introduced to this country from England. This method commonly called circuit training, involves rigorous activity on a number of selected exercises performed at a series of stations. (16:576-84)

Through this practice and teaching of circuit training at Leeds University in England, many physical educators and coaches have profited.

The circuit training method has definite appeal to students. The facts that follow account for the popularity of circuit training:

1. Every student receives a vigorous workout in a short period of time.

2. Each student works at a rate that is well-suited for him. He progresses at the rate he is capable of if he has the desire to progress.

3. Each student knows exactly what he is going to be required to do. He is in competition with no one except himself.

4. Students enjoy the freedom of the circuit and not being restrained by having to conform to standards set for an entire class.

5. Students find the circuit layout attractive. The movement of the circuit adds variety which would be missing in other means of doing exercises. The apparatus involved in some circuits provides extra appeal.

6. A student can observe and easily assess his own improvement in physical fitness as evidence by the improved lap times, more repetitions in the work time interval on fitness tests given periodically. (3:37)

II. HISTORICAL

A decline in physical fitness can be traced back to the industrial revolution. During this age of automation, with technological advances, the American people were given a new form of life. Modern machines were now supplying the muscle power for the vast majority of jobs. Only half a century before the tasks of doing these same jobs had contributed significantly to cardio-respiratory fitness.

It is this reduction of muscular effort and shortened working hours that has necessitated the present emphasis we place on physical

fitness. Because the industrial revolution has so increased man's leisure time, we are confronted with a new challenge of providing worthwhile and vigorous activities for him to enjoy during this leisure time. (5:88)

In 1953, an article was published by Kraus and Hirschland entitled "Muscular Fitness and Health." This article informed the American people about the poor physical condition of our youth in contrast to European children. The American public were very surprised by these results.

President Eisenhower was alerted to these facts at which time immediate arrangements were made for a meeting of the President's Conference on Fitness of American Youth. The fitness program was discussed in detail by about 150 leaders in sports education, youth programs, recreation, health and other related fields. In September of that same year the President's Council on Youth Fitness was established by Executive Order. Dr. Shane MacCarthy was appointed Executive Director of the Council. (5:249-50)

In January, 1959, the AAHPER announced a new program called Operation Fitness-U.S.A., headed by Louis E. Means. It was designed to better leadership to the fitness effort, through teamwork among business, industry, and education. The AAHPER Youth Fitness Test project became the first program to be sponsored nationwide, through Operation Fitness-U.S.A. (4:3)

As a special incentive to those participating in the AAHPER Youth Fitness Testing program, special motivational materials were prepared for distribution to boys and girls who attained high fitness levels. (2:10)

The President's Council on Youth Fitness has changed its title to The President's Council on Physical Fitness. The work of the Council was expanding under President John F. Kennedy and was continued under President Lyndon B. Johnson. With each new president there has also been a new Executive Director of the Council. Bud Wilkinson served in that capacity for President Kennedy, Stan Musial directed the Council for President Johnson. (2:9)

The President's Council on Physical Fitness recommended that:

> All students spend at least 15 minutes per day participating in sustained conditioning exercises and developmental activities designed to build vigor, strength, flexibility, endurance, and balance. In the remaining available time, a variety of activities should be analyzed for their contributions to physical fitness. Special emphasis should be placed on the improvement of the individual child. (22:8)

For the physical educator to demand improvement within individuals, he must first rid the individual of embarrassment when doing physical exercise. Circuit training accomplished this by having individuals compete against only the stop watch and the individual himself. Too many times, a student will become uninterested in physical exercise because others in class did more push-ups than they.

The Council's goals are to urge all schools and related groups to strive for quality health and physical education programs emphasizing physical fitness. Workshops and clinics conducted by members of the Council educated school personnel and acquaint them with various practices advocated by the Council.

III. THE AAHPER YOUTH FITNESS TEST

The AAHPER Youth Fitness Test was developed in Chicago in February of 1957 by selected members of the AAHPER Research Council. Council members present at that meeting were Ruth Abernathy, Carolyn W. Bookwalter, Anna S. Espenschade, Esther French, Margorie P. Phillips, C. Etta Walters, Karl W. Bookwalter, David K. Brace, Charles C. Cowell, Thomas K. Cureton, Arthur A. Esslinger, Paul A. Hunsicker, and Carl A. Troester. (1:1)

The committee chose the following seven test-items: Pull-ups (modified for girls), sit-ups, shuttle run, standing broad jump, 50-yard dash, softball throw for distance, and 600-yard run-walk. (9:144-50)

The writer chose two items from this battery. They were the 50-yard dash and the shuttle run. (17)

The test and national norms were published by the AAHPER in September of 1958. These norms were developed under the supervision of Dr. Hunsicker. (9:8-9)

In 1965, new norms were established once again under the supervision of Dr. Hunsicker. (9:210)

IV. THE OREGON SIMPLIFICATION TEST

In 1925 Frederick Rank Rogers developed norm tables that showed the relationships among physical condition, athletic performance, and muscular strength. These norm tables were based on sex, age, and weight; from which two scores are possible - the strength index and the physical fitness index. (9:145)

> The physical fitness index is a score derived from comparing an achieved strength index with

> a norm based upon the individual's sex, weight, and age. It is a measure of basic physical fitness elements, including both muscular strength and muscular endurance. (9:145)

Roger's composite test of seven elements is a reduction from ten tests given by Sargent and includes the following large muscle groups: forearms, upper arms, shoulder girdles, back, and legs.

The idea of combining strength test into a formal battery for the purpose of measuring athletic ability or the idea of using strength test as a measure of physical condition are not new ones. Dudley A. Sargent, M.D., proposed a battery in which the individual elements were measured by calibrated mechanical instruments in 1880. (9:144-45)

The Oregon Simplification Test is a modification of the Rogers PFI. A team of investigators at the University of Oregon undertook the simplification of the PFI's battery for both boys and girls from the fourth grade through college. The investigators developed the following battery: back lift (boys), leg lift, pull-up test for girls, and push-ups. (9:166-67)

The regression equations for the Oregon Simplification Test of the PFI for upper elementary boys were established in 1959 by Harrison Clarke and Gavin Carter. Regression equations were established for upper elementary girls by Marilyn Parrish in 1965. (9:167)

Members of the Ellensburg Elementary Physical Education program use the Oregon Simplification of the PFI because it saves time, staff and equipment. Many small school districts cannot afford all the equipment necessary to administer the PFI but can afford enough to be able to administer the Oregon Simplification.

The Rogers PFI is often too expensive to administer, takes too long a time to administer, and requires too many well trained testers. This could be the reason for so many smaller schools using one of the modifications taken from the original PFI. (9:143-45)

CHAPTER III

PROCEDURES OF INVESTIGATION

This study was sanctioned by Ellensburg's Broadfront program prior to its starting. Next, it was presented to Ned Croshaw, Principal of Mt. Stuart Elementary School, who also gave approval. The final step for approval was given by Mrs. Evelyn Pollock, classroom teacher of the class in which the experiment was to be conducted.

I. SECURING THE DATA

The pre-test and post-testing agendas were organized by Ellensburg's Broadfront program. The pre-test was given in the early fall and post-test was given in late spring. Both tests were administered by Broadfront under the supervision of Mr. Clyde Buehler. The Broadfront program used the Oregon Simplification Test of the PFI and the Revised AAHPER Youth Fitness Test as their basis for evaluation. The writer chose to use five of these test items for his measurement of this study.

II. ORGANIZATION OF THE EXPERIMENT

One fourth grade class of thirty-two students was selected. This class was divided into two equal groups by the classroom teacher. The writer then labeled each group. Group No. 1 was to be the control group and group No. 2 was to be the experimental group. The writer labeled the two groups prior to any association with the students, doing

this to eliminate bias feelings that one might develop. This experiment began during the first teaching week in January, 1970, and continued until the close of the third teaching week in May, 1970. The experiment was conducted four days a week while on the fifth day Broadfront staff introduced the coming week's physical education activities.

The writer was allotted ten minutes of each 30-minute physical education period to conduct this experiment. The classroom teacher and the writer provided all supervision. During this 5-month period the writer and the classroom teacher would frequently change leadership from group to group.

Control group. The control group members were put in three straight lines with one member in front acting as that day's leader. They would then do each exercise for a prescribed number of repetitions, maintaining a close cadence as executed by that day's leader. Preceding each day's exercise, the control group would jog for one minute. Following each day's exercise period, control group members would sprint fifty yards.

Experimental group. The experimental group was divided into six exercise groups each day, with each group going to an exercise station. The supervisor would stand in the center of the prescribed circuit with a stop watch and a whistle. At the sound of the whistle, the members would begin exercising for a prescribed number of seconds; at the next sound of the whistle, the members would discontinue exercise at that station and sprint to the next exercise station where position for that exercise would be obtained immediately. After a prescribed number of seconds allotted for the sprint between

stations and recovery, the members would once again start exercising at the sound of the whistle. This procedure would be carried out until all six exercise stations were completed. Members would complete the circuit once daily. When the group showed less physical fatigue, the prescribed number of seconds alloted for exercise would be increased. Each group member would do as many of each exercise as possible during each exercise period. This group was given only a prescribed number of seconds in which to do an exercise, not a prescribed number of each exercise to complete.

Preceding execution of the circuit by group No. 2, a one-minute jog was required and, at the close of the circuit, a sprint of thirty yards was also required.

Exercises for the control and experimental groups. The exercises for each group were the same. The one main difference was the format used in execution. The control group used the traditionally accepted method and the experimental group used the method of circuit training.

To help prevent boredom of group members, each exercise was supplied an alternate by the writer, the alternate being used at least once a week. The alternate exercises were chosen upon their ability to accomplish a similar type of development as did the original exercises.

The following table show each exercise used:

TABLE NO. I

ORIGINAL EXERCISES	ALTERNATE EXERCISES
Imaginary Run	Tread Mill
Push-ups	Bear Walk
Bench Jump	Wheel Barrow Relay
Toe Touch	4-Count Stretcher
Curl-ups	Standing Curl-ups
Pull-ups	Rope Climb

Exercises and their alternates were listed on cards and placed in exercising areas in order that group members would know what to do at each exercise station within the circuit. The control group members were told what exercise, and how many to do preceding execution, each time.

A distance of ten yards was maintained between exercise stations within the circuit throughout the duration of this experiment.

III. INSTRUMENTS OF MEASUREMENT

Instructions for administering the Oregon Simplification Tests:

BACK LIFT

The purpose of this test is to measure back strength. The use of the back dynomometer is needed for proper measurement. The pupil's legs must be straight with the back, (bent slightly at the hips), one palm should face forward and one palm backward, the head

should be up, with eyes looking straight ahead. The score is measured to the nearest pound.

LEG LIFT

The purpose of this test is to measure leg strength. The pupil holds bar with hands together, both palms down, knees slightly bent, arms and back must be straight and the head must be errect, with eyes looking forward. The score is measured to the nearest pound.

PULL-UPS (BOYS)

The purpose of this test is to measure upper arm and shoulder girdle strength. The pupil assumes a hanging positioin, palms forward, body straight, and pulls himself up until his chin is even with his hands, lowers his body until arms are extended and repeats this procedure as many times as possible. The pupil's score is based upon the number of completed or nearly completed repetitions.

PULL-UPS (GIRLS)

The purpose of this test is to measure upper arm and shoulder girdle strength. The pupil assumes a position approximately the height of the apex of the sternum to the bar. The palms should be forward and the body ought to slide far enough under the bar so that the hips are directly under the bar. The pupil's score is based upon the number of completed repetitions or nearly completed repetitions.

PUSH-UPS (BOYS)

The purpose of this test is to measure the strength and endurance of the forearm, the arm, and the shoulder girdle muscle. The pupil assumes an upright position on the parallel bars. When lowering the body, one's upper arms ought to be slightly less than a right angle to the forearm. The pupil's score is based upon the number of push-ups performed.

PUSH-UPS (GIRLS)

The purpose of this test is to measure the strength and endurance of the forearm, the arm, and the shoulder girdle muscles. The pupil should grasp the outsides of the bench and assume a front-leaning position. When lowering the body, the chest must touch the near edge of the bench and then raise the body back to a straight arm position. The pupil's score is based upon the number of push-ups performed.

Instructions for Administering the Revised AAHPER Youth Fitness Test.

FIFTY-YARD DASH

The purpose of this test is to measure speed. The pupil takes a sprinter's starting position behind the starting line. At the starting signal, the pupil runs as fast as possible across the finish line. The score is recorded to the nearest tenth of a second.

SHUTTLE RUN

The purpose of this test is to measure agility. The pupil assumes a running position at the starting line. One must be sure to watch that, when the blocks are being picked up, one foot extends beyond the line before returning block to starting line. The pupil's score is recorded to the nearest tenth of a second, using the best time of two trials.

IV. COLLECTION OF DATA

In early January, the students of each group were told the role they were to play in the writer's experiment. They were told that, for any given ten minutes, (four times weekly), they would participate in this program. They were told that, by having participated in such a program, students in years to come as well as themselves would profit physically.

The post-test was given during the third week of May, 1970. At this time, the data were compiled for further study and analysis. This data was recorded through the Broadfront testing program, Ellensburg Public Schools, on individual mimeographed 5" x 8" score cards.

After all scores were compiled the Fisher t was used to determine if there were statistical differences between groups.

CHAPTER IV

RESULTS AND ANALYSIS OF DATA

The data in this chapter will be discussed in the following order: (1) results of the pre-test, (2) results of the post-test, (3) results of the pre-control group as compared to those of the post-control group, (4) results of the pre-control group as compared to those of the post experimental group, and then the results of the pre-control group as compared to the pre-experimental group and the post-control group as compared to the post experimental group.

Results of pre-test. For the push-ups, the mean of the girls' control group was 9.37; the mean of the experimental group was 7,43. The difference between means was 1.94. The standard deviation of the two groups were 5.88 and 3.48 respectively. It was determined that the standard error of the mean of the control group was 2.21, of the experimental group 1.31. The standard error of the difference between means was 2.57. When the t was computed, a t of .75 was obtained. A t of 2.14 is needed to be significant at the .05 level of confidence. Therefore, there is no significant difference between the pre-tests of the two groups.

For the boys' push-ups, the mean of the control group was 2.87; the mean of the experimental group was 4.25. The difference between means was 1.38. The standard deviation of the two groups were 1.63 and 6.25. The standard error of the mean of the control group was .61,

of the experimental group 2.36. The standard error of the difference between means was 2.44. When the t was computed, a t of .56 was obtained which is not significant.

Table II explains these computations.

TABLE II

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

PRE-TEST FOR PUSH-UPS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	2.87		1.63	.61			
Boys Exp.	4.25	1.38	6.25	2.36	2.44	.56	NS
Girls Control	9.37		5.88	2.21			
Girls Exp.	7.43	1.94	3.48	1.31	2.57	.75	NS

Results of post-test. When the push-ups were administered in the post-test, the mean of the girls' control group was 12.71 and of the experimental group 12.28. The difference between means was .43. The standard deviations were 7.88 and 2.58. The standard error of the mean of the control group was 3.21, of the experimental group 1.05. The standard error of the difference was 3.38. The t obtained between the two post-tests was .13 which is not significant.

For the boys' push-ups, the mean of the control group was 5.25; the mean of the experimental group was 7.31. A difference of 2.06 was

found between the two means. The standard deviations were 4.2 and 9.0. The standard error of the means were 1.58 and 3.39. The standard error of the difference was found to be 3.61 between the two groups. A t of .57 was obtained from the two post-tests which is not significant.

Table III explains these computations.

TABLE III

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

POST-TEST FOR PUSH-UPS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANT
Boys Control	5.25		4.2	1.58			
Boys Exp.	7.31	2.06	9.0	3.39	3.61	.57	NS
Girls Control	12.71		7.88	3.21			
Girls Exp.	12.28	.43	2.58	1.05	3.38	.13	NS

Results of pre- and post-control tests. In determining the t between the pre- and post-tests of the control group, the mean of the girls' pre-test was 9.37 and of the post-test 12.71. The difference between means was 3.34. The standard deviation for the two tests were 5.88 and 3.21. The standard error of the means were 2.21 and 3.21. The standard error of the difference was 3.90. A t of .85 was obtained which is not significant.

The mean of the boys' pre-test was 2.87 and of the boys' post-test was 5.25. The difference between means was 2.38. The standard deviations for the two tests were 1.63 and 4.2. The standard error of the means were .61 and 1.58. The standard error of the difference was 1.69. A t of 1.40 was obtained which is not significant.

Table IV explains these computations.

TABLE IV

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL

PRE- AND POST-CONTROL TEST FOR PUSH-UPS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-control	9.37		5.88	2.21			
Girls post-control	12.71	3.34	7.88	3.21	3.90	.85	NS
Boys pre-control	2.87		1.63	.61			
Boys post-control	5.25	2.38	4.2	1.58	1.69	1.40	NS

Results of pre- and post-experimental tests. In determining the t between the pre- and post-test of the experimental group, the mean of the girls pre-test was 7.43 and of the post-test 12.28. The difference between means was 4.85. The standard deviations were 3.48 and 2.58. The standard error of the means were 1.31 and 1.05. The

standard error of the difference was 1.68. A t of 2.88 was obtained which is significant at the .05 level of confidence.

The mean of the boys pre-test was 4.25 and of the boys post-test was 7.31. The difference between means was 3.06. The standard deviations were 6.25 and 9.0. The standard error of the means were 2.36 and 3.39. The standard error of the difference was 4.13. A t of .74 was obtained which is not significant.

Table V shows these computations.

TABLE V

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE EXPERIMENTAL GROUPS

PRE- AND POST-EXPERIMENTAL TESTS FOR PUSH-UPS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-experimental	7.43		3.48	1.31			
Girls post-experimental	12.28	4.85	2.58	1.05	1.68	2.88	.05
Boys pre-experimental	4.25		6.25	2.36			
Boys post-experimental	7.31	3.06	0.0	3.39	4.13	.74	NS

Results of pre-test. For the shuttle run, the mean of the girls' control group was 12.50; the mean of the experimental group was 12.46. The difference between means was .04. The standard deviation of the

two groups were .387 and .63. It was determined that the standard error of the mean of the control group was .14, of the experimental group .24. When the t was computed, a t of .15 was obtained. A t of 2.14 is needed to be significant at the .05 level of confidence. Therefore, there is no significant difference between the pre-tests of the two groups.

For the boys' shuttle run, the mean of the control group was 12.30; the mean of the experimental group was 12.20. The difference between means was .10. The standard deviation of the two groups were 1.1 and .84. The standard error of the mean of the control group was .41, and of the experimental group .31. The standard error of the difference between means was .51. When the t was computed, a t of .19 was obtained which is not significant.

Table VI explains these computations.

TABLE VI

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

PRE-TEST FOR 40 YD. SHUTTLE RUN

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	12.30		1.1	.41			
Boys Exp.	12.20	.10	.84	.31	.51	.19	NS
Girls Control	12.50		.387	.14			
Girls Exp.	12.46	.04	.63	.24	.26	.15	NS

Results of post-test. When the shuttle run was administered in the post-test, the mean of the girls' control group was 12.02 and of the experimental group 11.31. The difference between means was .71. The standard deviations were 1.51 and .65. The standard error of the mean of the control group was .61, of the experimental group .26. The standard error of the difference was 6.6. The t obtained between the two post-test were 1.07 which is not significant.

For the boys' shuttle run, the mean of the control group was 11.48, the mean of the experimental group was 11.40. A difference of 3.08 was found between the two means. The standard deviations were .84 and .48. The standard error of the means were .31 and .18. The standard error of the difference was found to be .35 between the two groups. A t of .22 was obtained which is not significant.

Table VII explains these computations.

TABLE VII

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

POST-TEST FOR 40-YD. SHUTTLE RUN

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	11.48		.84	.31			
Boys Exp.	11.40	.08	.48	.18	.35	.22	NS
Girls Control	12.02		1.5	.61			
Girls Exp.	11.31	.71	.65	.26	6.6	1.07	NS

Results of pre- and post-control tests. In determining the t between the pre- and post-tests of the control group, the mean of the girls' pre-test was 12.50 and of the post-test 12.02. The difference between means was .48. The standard deviation for the two tests were .387 and 1.5. The standard error of the means were .14 and .61. The standard error of the difference was .63. A t of .76 was obtained which is not significant.

The mean of the boys' pre-test was 12.30 and of the boys' post-test was 5.25. The difference between means was 7.05. The standard deviations for the two tests were 1.1 and 4.2. The standard error of the means were .41 and 1.58. The standard error of the difference was 1.60. A t of 1.60 was obtained which is not significant.

Table VIII explains these computations.

TABLE VIII

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL

PRE- AND POST-CONTROL TESTS FOR SHUTTLE RUN

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-control	12.50		.387	.14			
Girls post-control	12.02	.48	1.5	.61	.63	.76	NS
Boys pre-control	12.30		1.1	.41			
Boys post-control	5.25	7.05	4.2	1.58	.51	1.60	NS

Results of pre- and post-experimental tests. In determining the t between the pre- and post-tests of the experimental group, the mean of the girls pre-test was 12.46 and of the post-test 11.31. The difference between means was 1.15. The standard deviations were .63 and .26. The standard error of the means were .24 and 6.6. The standard error of difference between the two means was .63. A t of 3.19 was obtained which is significant at the .01 level of confidence. A t of 2.98 is needed at the .01 level.

The mean of the boys pre-test was 12.20 and of the boys post-experimental test was 5.25. The difference between means was 6.95.

The standard deviations of the two groups were .84 and 4.2. The standard error of the means were .31 and 1.58. The standard error of the difference was .36. A t of 2.22 was obtained which is significant at the .05 level of confidence. A t of 2.14 is needed at the .05 level.

The experimental group was significant in performance in the pre-test and post-test. The control group did not make a significant change between pre-and post-test, while the experimental group did make a significant increase.

Table IX shows these computations.

TABLE IX

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE EXPERIMENTAL GROUPS

PRE- AND POST-EXPERIMENTAL TESTS FOR SHUTTLE RUN

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-experimental	12.46		.63	.24			
Girls post-experimental	11.31	1.15	.26	6.6	.63	3.19	.01
Boys pre-experimental	12.20		.84	.31			
Boys post-experimental	5.25	6.95	4.2	1.58	.36	2.22	.05

The experimental group was significant in performance to the control group in the shuttle run when comparing the pre-experimental groups to the post-experimental group.

Results of pre-test. For the 50-yard dash, the mean of the girls' control group was 9.37; the mean of the experimental group was 9.45. The difference between means was .08. The standard deviation of the two groups were .60 and .608. The standard error of the means was .23 and .26. The standard error of the difference between means was .33. A t of .24 was obtained which is of no significance.

For the boys' 50-yard dash, the mean of the control group was 9.4; the mean of the experimental group was 9.26. The difference between means was .14. The standard deviation of the two groups were .96 and 1.01. The standard error of the mean of the control group was .36 and of the experimental group .38. The standard error of the difference between the two means was .52. A t of .27 was obtained which is not significant.

Table X explains these computations.

TABLE X

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

PRE-TEST FOR 50 YD. DASH

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	9.4		.96	.36			
Boys Exp.	9.26	.14	1.01	.38	.52	.27	NS
Girls Control	9.37		.60	.23			
Girls Exp.	9.45	.08	.608	.26	.33	.24	NS

Results of post-test. When the 50-yard dash test was administered in the post-test, the mean of the girls' control group was 9.17 and of the experimental group 8.68. The difference between means was .49. The standard deviations of the two groups were 1.48 and .75. The standard error of the means were .60 and .30. The standard error of the difference was .67. A t of .73 was obtained which is not significant.

For the boys' 50-yard dash, the mean of the control group was 8.82 and of the experimental group 8.87. The difference between means was .05. The standard deviations for the two groups were .89 and .81. The standard error of the means were .34 and .31. The

standard error of the difference was .45. A t of .11 was obtained which is not significant.

Table XI explains these computations.

TABLE XI

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

POST-TEST FOR 50 YD. DASH

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	8.82		.89	.34			
Boys Exp.	8.87	.05	.81	.31	.45	.11	NS
Girls Control	9.17		1.48	.60			
Girls Exp.	8.68	.49	.75	.30	.67	.73	NS

Results of pre- and post-control tests. In determining the t between the pre- and post-tests of the control group, the mean of the girls' pre-test was 9.37 and of the post-test 9.17. The difference between these two means was .20. The standard deviations of the two groups were .60 and 1.48. The standard error of the means was .23 and .60. The standard error of the difference between the two means was .64. A t of .31 was obtained which is not significant.

The mean of the boys' pre-test was 9.4 and of the post-test 8.82. The difference between means was .58. The standard deviations for the two tests were 9.6 and .89. The standard error of the means

were .36 and .34. The standard error of the difference was .48. A t of 1.21 was obtained which is not significant.

Table XII explains these computations.

TABLE XII

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL GROUP

PRE- AND POST-CONTROL TESTS FOR 50-YARD DASH

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-control	9.37		.60	.23			
Girls post-control	9.17	.20	1.48	.60	.64	.31	NS
Boys pre-control	9.4		9.6	.36			
Boys post-control	8.82	.58	.89	.34	.48	1.21	NS

Results of pre- and post-experimental tests. In determining the t between the pre- and post-tests of the experimental group, the mean of the girls pre-test was 12.46 and of the post-test 11.31. The difference between means was 1.15. The standard deviations were .63 and .65. The standard error of the means were .24 and .26. The Standard error of the difference was .77. A t of 1.92 was obtained which is not significant.

The mean of the boys pre-test was 9.26 and of the post-test 8.87. The difference between the means was .39. The standard deviations were 1.01 and .81. The standard error of the means were .38 and .31. The standard error of the difference was .49. A t of .78 was obtained which is not significant.

Table XIII explains these computations.

TABLE XIII

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE EXPERIMENTAL GROUP

PRE- AND POST-EXPERIMENTAL TESTS FOR 50-YARD DASH

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-experimental	12.46		.63	.24			
Girls post-experimental	11.31	1.15	.65	.26	.77	1.92	NS
Boys pre-experimental	9.26		1.01	.38			
Boys post-experimental	8.87	.39	.81	.31	.49	.78	NS

Results of pre-test. For the back lift the girls substitute pull-ups. For the girls pull-ups, the mean of the girls' control group was 7.5; the mean of the experimental group was 10.43. The difference between means was 2.93. The standard deviation of the two groups were 3.16 and 4.26. It was determined that the standard error

of the mean of the control group was 1.19 and of the experimental group 1.60. The standard error of the difference between means was 1.99. A t of 1.47 was obtained which is not significant.

For the boys, who did use the back lift, the mean of the control group was 146.87 and of the experimental group 150.62. The difference between these two means was 3.75. The standard deviations for the two groups were 24 and 44.4. The standard error of the means were 9.05 and 16.75. The standard error of the difference was 19.04. A t of .19 was obtained which is not significant.

Table XIV shows these computations.

TABLE XIV

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

PRE-TEST FOR BACK LIFT (GIRLS SUBSTITUTE PULL-UPS)

GROUP	M	diff.	6	6M	6 diff.	"t"	Level SIGNIFICANCE
Boys Control	146.87		24.0	9.05			
Boys Exp.	150.62	3.75	44.4	16.75	19.04	.19	NS
Girls Control	7.5		3.16	1.19			
Girls Exp.	10.43	2.93	4.26	1.60	1.99	1.47	NS

Results of post-test. One must keep in mind that the girls substituted pull-ups for the back lift in the post-test also. When the pull-ups were administered in the post-test, the mean of the girls'

control group was 24 and for the experimental group 21.85. The difference between these two means was 2.15. The standard deviations were 8.49 and 9.22. The standard error of the mean for the control group was 3.46 and for the experimental group 3.76. The standard error of the difference between the means was 5.11. A t of .42 was obtained which is not significant.

For the boys, who use the back lift, the mean of the control group was 193.75 and for the experimental group 192.50. The difference between the two means was 1.25. The standard deviation of the control group was 38.5 and for the experimental group 45.7. The standard error of the means were 14.52 and 17.24. The standard error of the difference between the two means was 22.54. A t of .05 was obtained which is not significant.

Table XV shows these computations.

TABLE XV

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

POST-TEST FOR BACK LIFT (GIRLS SUBSTITUTE PULL-UPS)

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	193.75		38.5	14.52			
Boys Exp.	192.50	1.25	45.7	17.24	22.54	.05	NS
Girls Control	24		8.49	3.46			
Girls Exp.	21.85	2.15	9.22	3.76	5.11	.42	NS

Results of pre- and post-control tests. In determining the t between the pre- and post-tests of the control group, the mean of the girls' pre-test was 7.5 and of the post-test 24. The difference between means was 16.5. The standard deviation for the two tests were 3.16 and 8.49. The standard error of the means were 1.19 and 3.46. The standard error of the difference was 3.66. A t of 4.51 was obtained which is significant at the .01 level of confidence. A t of 2.98 is needed at this level.

The mean of the boys' pre-test was 146.87 and of the boys' post-test 193.75 for the back lift. The difference between these two means was 46.88. The standard deviation for the pre-test was 24 and for the post-test 38.5. The standard error of the means were 9.05 and 14.52. The standard error of the difference was 17.11. A t of

2.74 was obtained which is significant at the .05 level of confidence.

Table XVI explains these computations

TABLE XVI

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL GROUP

PRE- AND POST-CONTROL TEST FOR BACK LIFT
(GIRLS SUBSTITUTED PULL-UPS)

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-control	7.5		3.16	1.19			
Girls post-control	24	16.5	8.49	3.46	3.66	4.51	.01
Boys pre-control	146.87		24	9.05			
Boys post-control	193.75	46.88	38.5	14.52	17.11	2.74	.05

Results of pre- and post-experimental tests. In determining the t between the pre- and post-tests of the experimental group, the mean of the girls' pre-test for pull-ups was 10.43; the mean for the girls' post-test for pull-ups was 21.85. The difference between these two means was 11.42. The standard deviations were 4.26 and 9.22. The standard error of the means were 1.60 and 3.76. The standard difference between the two means for the girls' pull-ups was 4.09. A

t of 2.79 was obtained which is significant at the .05 level of confidence. A t of 2.14 is needed at this level.

The mean of the boys' pre-test for the back lift was 150.62 and for the post-test 192.50. The difference between these two mean was 41.88. The standard deviation for the pre-test was 44.4 and for the post-test 45.7. The standard error of the means were 16.75 and 17.24. The standard error of the difference was 24. A t of 1.75 was obtained which is not significant.

Table XVII explains these computations.

TABLE XVII

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE EXPERIMENTAL GROUP

PRE- AND POST-EXPERIMENTAL TESTS FOR BACK LIFT
(GIRLS SUBSTITUTE PULL-UPS)

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANT
Girls pre-exp.	10.43		4.26	1.60			
Girls post-exp.	21.85	11.42	9.22	3.76	4.09	2.79	.05
Boys pre-exp.	150.62		44.4	16.75			
Boys post-exp.	192.50	41.88	45.7	17.24	24	1.75	NS

The control group was significant in performance in the back lift. The experimental did show significant change with the girls but the boys did not make a significant level of confidence.

Results of pre-test. For the leg lifts, the mean of the girls' control group was 287.50; the mean of the experimental group was 359.37. The difference between means was 71.87. The standard deviation of the two groups were 67.22 and 84.08. It was determined that the standard error of the mean of the control group was 25.36, of the experimental group 31.72. The standard error of the difference between means was 40.61. When the t was computed, a t of 1.77 was obtained which is not significant.

For the boys' leg lifts, the mean of the control group was 467.50; the mean of the experimental group was 376.87. The difference between means was 90.63. The standard deviation of the two groups was 78.31, of the experimental group 88. The standard error of the mean of the control group was 29.55, of the experimental group 33.20. The standard error of the difference was 44.45. A t of 2.04 was obtained which is not significant.

Table XVIII explains these computations.

TABLE XVIII

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

PRE-TEST FOR LEG LIFTS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	467.50		78.31	29.55			
Boys Exp.	376.87	90.63	88	33.20	44.45	2.04	NS
Girls Control	287.50		67.22	25.36			
Girls Exp.	359.37	71.87	84.08	31.72	40.61	1.77	NS

Results of post-test. When the leg lift test was administered in the post-test, the mean of the girls' control group was 428.33 and of the experimental group 555.71. The difference between means was 127.38. The standard deviations were 67.2 and 128.62. The standard error of the mean of the control group was 30, of the experimental group 52.49. The standard error of the difference was 60.46. A t of 2.10 was obtained which is not significant. A t of 2.14 is needed at the .05 level of confidence.

For the boys' leg lift test, the mean of the control group was 476.87; the mean of the experimental group was 501.87. The difference between these two means is 25. The standard deviation of the control group was 127.05; the standard deviation of the experimental group was 177. The standard error of the means were 47.94 and 66.79. The

standard error of the difference was 74.58. A t of 1.68 was obtained which is of no significance.

Table XIX explains these computations.

TABLE XIX

MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND, "t" OF THE CONTROL AND EXPERIMENTAL GROUPS

POST-TEST FOR LEG LIFTS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Boys Control	476.87		127.05	47.94			
Boys Exp.	501.87	25.00	177.0	66.79	74.58	1.68	NS
Girls Control	428.33		67.2	30			
Girls Exp.	555.71	127.38	128.62	52.49	60.46	2.10	NS

Results of pre- and post-control tests. In determining the t between the pre- and post-tests of the control group, the mean of the girls' pre-test was 287.50 and of the post-test 428.33. The difference between means was 140.83. The standard deviation for the two tests were 67.22 and 67.20. The standard error of the means were 25.36 and 30. The standard error of the difference was 39.28. A t of 3.58 was obtained which is significant at the .01 level of confidence. A t of 2.98 is needed at this level.

The mean of the boys' pre-test was 467.50 and of the boys' post-test was 476.87. The difference between means was 9.37. The

standard deviations for the two tests were 78.31 and 127.05. The standard error of the mean for the pre-test was 29.55 and of the post-test 47.94. The standard error of the difference was 56.32. A t of .16 was obtained which is not significant.

Table XXX shows these computations.

TABLE XX

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE CONTROL

PRE- AND POST-CONTROL TEST FOR LEG LIFTS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-control	287.50		67.22	25.36			
Girls post-control	428.33	140.83	67.20	30	39.28	3.58	.01
Boys pre-control	467.50		78.31	29.55			
Boys post-control	476.87	9.37	127.05	47.94	56.32	.16	NS

Results of pre- and post-experimental tests. In determining the t between the pre- and post-tests of the experimental group, the mean of the girls pre-test was 359.37 and of the post-test 555.71. The difference between the means was 196.34. The standard deviations were 84.08 and 128.62. The standard error of the mean for the pre-test was 31.72 and of the post-test 52.49. The standard error of the

difference was 61.33. A t of 3.20 was obtained which is significant at the .01 level of confidence. A t of 2.98 is needed at this level.

For the boys pre-test, the mean was 376.87 and for the post-test 501.87. The difference between the means was 125. The standard deviation for the pre-test was 88 and for the post-test 177. The standard error of the means were 33.20 and 66.79. The standard error of the difference was 74.59. A t of 1.67 was obtained which is not significant.

Table XXI shows these computations.

TABLE XXI

COMPARISON OF MEAN, DIFFERENCE BETWEEN MEANS, STANDARD DEVIATION, STANDARD ERROR OF THE MEAN, STANDARD DIFFERENCE, AND "t" OF THE EXPERIMENTAL GROUP

PRE- AND POST-EXPERIMENTAL TEST FOR LEG LIFTS

GROUP	M	diff.	6	6M	6 diff.	"t"	Level of SIGNIFICANCE
Girls pre-exp.	359.37		84.08	31.72			
Girls post-exp.	555.71	196.34	128.62	52.49	61.33	3.20	.01
Boys pre-exp.	376.87		88	33.20			
Boys post-exp.	501.87	125	177	66.79	74.59	1.67	NS

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

I. SUMMARY

The purpose of this study was: (1) To compare the regular physical education program of the fourth grade with an experimental physical education program of the fourth grade; (2) to compare physical fitness of boys and girls of the two groups before and after the study; and (3) to study the effect of the programs on fourth grade fitness levels with the established norms of the AAHPER Youth Fitness Test and the Oregon Simplification of the PFI Test.

The study was administered to a fourth grade class at Mt. Stuart Elementary School, Ellensburg, Washington. The control group had 8 boys and 7 girls, and the experimental group had 8 boys and 7 girls who completed the experiment. The mean, difference between means, standard deviation, standard error of the means, standard error of the difference, and t's were computed for each test item in the test batteries used. The data was analyzed to determine if there were a significant gain by either of the two groups or both.

The control and experimental groups started their program during the first school week in January, 1970. The program lasted for ten minutes, four times a week.

The experiment lasted from January, 1970, to May, 1970, at which time the post-test was administered to both groups. The results

of the pre-test, post-test, pre- and post-test control group, and pre- and post-test experimental group were statistically analyzed.

The Fisher t test of significance was used in each case. The pre-test and post-test were given to determine whether there was a marked difference between (1) pre-test control group and pre-test experimental group, (2) post-test control group and post-test experimental group, (3) pre- and post-test control group, and (4) pre- and post-test experimental group.

The girls experimental group showed a significant difference at the .01 level in the shuttle run and leg lift exercises when comparing the pre- and post-experimental groups, and at the .05 level of confidence in the push-ups and pull-ups. Pull-ups were substituted for the back lift for girls.

The boys experimental group showed a significant difference at the .05 level in only the shuttle run pre- and post-test.

There was a significant difference in the control group at the .01 level for the girls in the leg lifts and pull-ups pre- and post-test.

The boys control group showed a signficant difference at the .05 level in the back lift.

II. CONCLUSIONS

The statistical data indicated a definite increase for the experimental group, but not always a significant gain, upon the physical fitness of fourth grade boys and girls as measured by the Oregon Simplification of the PFI test and the AAHPER Youth Fitness test. There were gains in the experimental and control group in all

tests except the 50-Yard Dash and Shuttle Run, all tests compared.

A significant factor having some effect upon this study was the size on the control and experimental groups. In the opinion of the writer, the students from all outward appearances were physically fit.

III. RECOMMENDATIONS

Following are some recommendations to be considered:

1. A physical fitness program designed to achieve maximum results should be conducted daily for a minimum of 10 minutes each day.
2. There is a definite need for a planned elementary physical education program throughout the school community.
3. A larger sampling of subjects might bring a higher degree of validity to a study of this nature.

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