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A Comparison of Physical Fitness of Adolescent Boys after Participations in a Regular Education Program

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A Comparison Of Physical Fitness Levels Of Adolescent Boys After Participation In A Regular Physical Education Program

By

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CHAPTER I

THE PROBLEM AND ITS SCOPE

The Problem

The purpose of this study was to determine if the participation in a regular physical education class would effect the physical fitness level of the student.

Need for the Study

An essential characteristic of a dynamic democratic society such as we aspire to maintain is physical fitness. Because we live in a democracy, we as a nation are dependent upon the combined work of all its citizens. We as citizens are limited in the amount of productiveness we can possess by our physical capabilities. We, as citizens of a democracy, owe to ourselves and to our country the potentialities that can only be realized by physical fitness.

That the individual and the nation can gain benefit from physical fitness is a readily demonstrated truth. But let us look at the problem a little more closely. How do individuals become physically fit? Whose job is it to provide the vehicle for physical fitness? Are those responsible for making the nation physically fit doing a satisfactory job?

Many answer the questions by saying it is the schools' responsibility to prepare our youngsters for citizenship by giving them the opportunity to become physically fit. They say it is the school's responsibility to offer physical education classes to fulfill the job of developing fitness. Whether the reader agrees with the above answers or not it must be admitted that physical fitness, at least to some measure, is the responsibility of the school.

With the fact being established that the school is at least in part responsible for the fitness of our citizens, let us turn to the last question. Is the school doing a competent job toward making our future citizens physically fit?

The great emphasis put on physical fitness today makes it imperative that our schools have a good physical education program. Many physical educators feel that they are doing an adequate job in the area of fitness. Many others feel that even more time should be required in the physical education class.

In recent years many comparisons have been made between the European youngster and the United States youngster in the area of fitness. It was these comparisons to a large extent that spurred our educators to recognize the need for a good physical program.

It is the purpose of this study to answer, in a limited way, some questions which were stated above.

Delimitations

This study is limited to 480 students from the physical education classes in Larimore High School from the years 1960 to 1963. The students range in age from thirteen to sixteen. No attempt was made to use the same students in each of the three years for the study. No attempt was made to limit the study to non-athletes therefore, it is quite reasonable to assume that some athletes are considered in this study. No attempt was made to limit the outside activities of the students except in the case of athletes which were restricted uniformly for all three years.

The physical education classes were conducted by two different instructors over the three year period.

Definitions

Minnesota Physical Efficiency Test: The test used in this study to measure physical fitness.

Fitness level: The proficiency to which the subjects were able to perform the Minnesota Physical Efficiency Test.

CHAPTER II

REVIEW OF RELATED LITERATURE

Much has been written about physical education and physical fitness. This chapter will summarize some of the more important literature written on the subject.

"Physical fitness which is brought about by vigorous exercise will benefit not only the skeletal muscles but also the heart, lungs, and other vital organs."[1] This very enlightening statement was made by Charles Wilkenson, an advisor to President Kennedy.

Staton and Butler observed that, "Research is now available to support the belief that fitness serves as a specific preventive measure against sports injuries."[2] This statement is not surprising to those people who are involved in athletic competition.

The implications of physical fitness are many and varied. Recently, "...a study conducted in the United States Military Academy revealed that there is a direct

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[1]Charles Wilkenson, "How Does Your Child Rate in Fitness?" Parents Magazine, (October, 1961) pp. 46-47.

[2]Wesley M. Staton and L.C. Butler, "Fitness and Safety," A leaflet published by the National Education Association.

relationship between physical ability and leadership ability."[3]

For those people who argue that because of the conveniences and luxuries of modern living there is not need for a high degree of fitness. Nagle insists that everyone must be ready to meet emergencies. In any given emergency the individual may utilize the maximum potential of his body.[4] In such an emergency, whether it be physical strain or mental anxiety, the person who is fit will be more apt to prevail.

To again illustrate the diverse nature of physical fitness Carolyn and Karl Bookwalter report a research study which involves ten physically strong boys and ten weaker boys from their childhood through their adolescence. "At the end of adolescence, the stronger boys were rated superior to the weaker boys in physical strength, size, early maturity, proficiency in athletics, high popularity, social prestige, and good emotional adjustment."[5]

From the current literature and research we become aware of glaring reality that physical fitness can give us

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[3]Pattric Ruth O'Keefe and Anita Aldrich, Education Through Physical Activities, St. Louis: C.V. Mosby Co., 1959, p. 55.

[4]Francis J. Nagle, "How Much Fitness?" A pamphlet published by the National Education Association.

[5]Karl and Carolyn Bookwalter (ed). Fitness for Secondary School Youth, (Washington; American Association for Health, Physical Education and Recreation, 1956), pp. 42-43.

benefits at all age levels. It also follows then that the earlier we become physically fit the more we will enjoy life.

Pakas maintains that unless we constantly use out muscles our physical development will be lacking. If we fail to use our muscles, atrophy will set in and we will lose bodily fitness. To prevent such deterioration, exercise is mandatory.[6]

Several years ago, McLoy observed that the person who lacked normal fitness was handicapped by fatigue, susceptible to infections, muscular inefficiency, and improper functioning of the organic system.[7]

Several studies have been concluded which relate directly to this study. Below is a review of these selected studies.

Bergquist's Study[8]

The purpose of Bergquist's study was to determine the physical education practices in America and more specifically those practices in North Dakota. After reviewing vast amounts of current literature Bergquist concluded that the fitness level of the nation in general was quite low.

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[6]Manfred Pakas, "Muscle in on Health," American Mercury, September, 1960, p. 90.

[7]Charles H. McLoy, "How About Some Muscle?" Journal of Health and Physical Education, III (May, 1936), p. 302.

[8]Harold Bergquist, "Physical Fitness: Its Relation to The Individual and The Nation; A Projection of The Status of Fitness in North Dakota," (unpublished research paper, Dept. of Physical Education, University of North Dakota, 1961).

For North Dakota Bergquist tested two schools using two different fitness tests. In one school he used the President's Council Physical Fitness Test. In the second school he used the Minnesota Physical Efficiency Test.

Bergquist concluded that the students involved in these tests were lacking in fitness.

Bergquist recommended the use of a fitness period in the elementary grades lasting for fifteen minutes per day. He also recommended a more vigorous program of physical fitness in the high schools. He observed that for North Dakota students the Minnesota Physical Efficiency Test was superior to that of the President's Council Physical Fitness Test.

De La Barre's Study[9]

The purpose of De La Barre's study was to determine the effect that the five period physical education week had on fitness values compared to the effect the two period physical education week had upon fitness values. The test was carried out for one semester.

De La Barre concluded that the five period physical education week did produce significant changes in most measurements of physical fitness. Although the two period

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[9]Craig H. De La Barre, "A Study of the Fitness Values Derived From A Five Day Per Week Activity Compared With Like Values From A Two Day Per Week Activity," (unpublished thesis, Dept. of Physical Education, University of North Dakota, 1962).

per week class did show improvement, only the back strength and pushups showed any significan difference.

Sundre's Study[10]

Sundre's study was to determine which of two programs of physical education is most effective in:

1. The development of physical fitness.

2. The development of good attitudes toward physical education.

3. The development of knowledge of sports skills.

Sundre organized introductory physical education programs at the University of North Dakota. One program consisted of recreational sports and the other program consisted of recreational sports supplemented by conditioning exercises.

Sundre found that the conditioning exercises used in the second program increased the physical fitness of the group to a significant level. No change was shown in the attitude or the knowledge of sports skills in either group.

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[10]Orlo A. Sundre, "A Comparative Study of Two Physical Education Programs For Male Students At The University of North Dakota," (unpublished masters thesis, Dept. of Physical Education, University of North Dakota, 1960).

CHAPTER III

PROCEDURE

The purpose of this chapter is to describe the procedure used in collecting data for this study. The method for selection of the group will also be discussed.

Selection of Group

The subjects were selected from the Larimore High School physical education classes on the basis of (1) age, (2) completion of all physical fitness tests, (3) random numbers.

The subjects were equally divided between thirteen, fourteen, fifteen, and sixteen years of age. All of the members must have taken all of the physical fitness tests given for that particular year. The subjects need not have been the same in all three years tested. A systematic random sampling eliminated the number of participants to forty per class.

Physical Education Program

All subjects followed the regular physical education program. This program consisted of units on (1) fieldball, soccer, and touch football, (2) relays, (3) games, (4) stunts and tumbling, (5) apparatus, (6) basketball,

(7) volleyball, (8) wrestling, (9) track and field, (10) softball, (11) social dancing. These activities were supplemented by conditioning exercises, recreational sports, and physical fitness tests.

The physical education classes were held for one hour, twice a week. This routine was interrupted on some occassions because of lyceum and assembly programs etc. Class was not held the first week of school nor the last week of school. Many vacations also interrupted the physical education program. For further information concerning the program see Appendix B.

Motivation of Subjects

The purpose of the test given at the beginning of the school year was to motivate and encourage the subjects to improve their individual achievement. In both tests the subjects were given verbal encouragement by the other class members. The subjects were conscious of the fact that their test results influenced their physical education grade. The subjects were also motivated in the second test by the knowledge of the results of the first test. The subjects were given a letter grade of A,B,C,D, or F depending upon the numerical value of the tests.

Test Used for the Study

The Minnesota Physical Fitness Test was used as the instrument for measuring physical fitness. The test con-

sists of six separate items: (1) burpee, (2) sit-ups, (3) pushups, (4) pull-ups, (5) vertical jump, (6) broad jump. This test was given to all subjects twice, once at the beginning of the school year in September before any physical educations had been held and once near the end of the school year in April.

Administration of the Test

In administering the test, the various test items were divided into two groups.

Group I included those items which could be tested in mass. They consisted of sit-ups, push-ups, and the Burpee Test. The subjects were lined up in two equal lines and assigned subjects opposite each other to work as partners. While the subjects of one line were doing the test, the partners in the opposite line were counting and recording results. The procedure was then reversed, and the pupils of the second line took the test. Individual record cards were supplied to the subjects and the proper entries were made upon a suitable card (see Appendix B).

Group II consisted of the broad jump, vertical jump, and the pull-ups. Squads were used for this testing. Competent squad leaders were chosen by the instructor to administer these tests. In both Group I and Group II the squad leaders and the subjects in general were instructed on the correct form to use in the performance of these tests.

Three testing stations were established in the gymnas-

ium for Group II. The squads then rotated from station to station. The squad leaders also recorded the test results.

Subjects were not allowed to take additional trials in order to better their record. No trials were given to better individual records after the subjects had completed the test until the next regular testing period. Three to four tests were given per year but only the first and last test results were used in the study. Two days were allowed for the completion of the entire test. As mentioned previously the test was administered once in September and once in April for the purpose of the study.

Below is a description of the tests and their administration.

Burpee Test

The Burpee Test consisted of four distinct counts. On the first count, the subject bent to the squatting position placing his hands on the floor with the arms between the legs. On the count of two, the subject extended his legs straight backwards, feet together, and assumed the same position as though he was ready to start dipping for the push-up exercise. The feet could not be extended backward until the position for count one had been definitely taken. On the count of three, he resumed the same position as he was in at the count of one and on the count of four, he resumed the starting position, coming to a definite upright position with knees straight. Each position was taken definitely and deliberately. The test was to determine the

number of times a pupil could go through the complete cycle in thirty seconds. The completion of each cycle correctly executed was recorded.

Sit-ups

The sit-up exercise was done from a supine position, fingers of both hands interlocked behind the neck, and feet held together and down by another member of the class who served as a tester. The first part of the test called for the trunk to be raised forward and moved downward, rotated so that the right elbow touched the left knee. The second part of the test called for a return of the body to the starting position. On the next sit-up the left elbow touched the right knee. Each time the pupil sits up and touches a knee, it counts as one sit-up. The tester counted the completed sit-up aloud. Two minutes were allowed for completion of the test.

Push-ups

The push-ups were done on the floor. They were completed from a front-leaning rest position in which the body was supported on the hands and toes with the arms and body straight. This was the starting position. The first part of the exercise called for the bending of the arms, allowing the body to come down so that the chest barely touched the floor. The second phase of the exercise called for the arms to be extended so that the body was brought to the starting

position. This complete procedure counts as one push-up. The head, trunk, and legs remained in a straight line. The push-ups were done without rest between parts of the exercise or during the completed exercise. The number of successful completions of the complete exercise indicated the number of push-ups. Correct form was emphasized throughout the test.

Pull-ups

The subject hung by his hands from a horizontal bar, arms stretched overhead, and legs fully extended. This was the starting position. The subject pulled his body up so that the chin was above the bar. This counted as one pull-up. The subject was not allowed to swing or kick in order to help lift his body. He then lowered his body to the starting position. The hands were placed on the bar in a palms forward position. The exercise was repeated as many times as the subject could pull up so that his chin was over the bar.

Vertical Jump

The subject took a position facing the wall, feet together, toes touching the wall, and heels touching the floor. With one hand he reached as high as possible, keeping the heels on the floor and the hand and forearm against the wall, and made a mark on the chalkboard with a short piece of chalk. After marking the wall, the pupil then turned so that the arm used to mark the chalkboard was next

to the wall. He then swung both arms vigorously and made a jump vertically into the air, reaching up and touching the wall as high as it was possible for him to touch, thus marking the chalkboard with a second mark. The distance between the two chalk marks was the individuals record. The better of two trials is recorded.

Broad Jump

The subject stood with toes even with the edge of the take-off mark and then jumped forward as far as possible. The two-foot take-off was used. The subject was instructed to swing arms and hands to help in jumping. The better of the two jumps was recorded by the squad leader.

CHAPTER IV

ANALYSIS OF DATA

The purpose of this study was to determine if any significant change in the level of physical fitness as measured by the Minnesota Physical Efficiency Test took place in the period of one school year. At this point in the study it has become necessary to choose a statistical instrument to approve or disprove the hypothesis. The instrument which was chosen would test the significance of difference between the initial test and the final test.

The data will be analyzed for a comparison between the initial test and the final test for the physical fitness level of each age group.

Statistical Procedure

The author assumed the null hypothesis in this study. In its simplest form, this hypothesis asserts that there is no true difference between two population means, and that the difference found between sample means is, therefore, accidental and unimportant.[1]

The "t" technique was used in this study to test the

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[1] Henry E. Garret, Statistics in Psychology and Education. New York: Longmans, Green and Co., 1955, p. 213.

null hypothesis. This test determined the ratio between the mean difference and the estimate of sampling error of the mean difference. This ratio is expressed as "t" and is checked for significance in a "t" table. The value of "t" is proportional to the degree of freedom allowed in determining the relationship between the mean difference and the estimate of sampling error of the mean difference.[2]

For this study it was decided to retain the null hypothesis up to the .05 level of significance.

Results of Comparison

Burpee Test - Age 13

The subjects had a mean score of 18.05 completions on the initial test and a mean score of 20.425 completions on the final test. This was a mean difference of 2.375 completions increase between the initial and final test. The estimate of the sampling error of the mean difference was .507. The "t" value of 4.684 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Burpee Test - Age 14

The subjects had a mean score of 18.75 completions on the initial test and a mean score of 20.375 completions on the final test. This was a mean difference of 1.625

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[2]Ibid.

completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was .476. The "t" value of 2.574 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Burpee Test - Age 15

The subjects had a mean score of 20.475 completions on the initial test and a mean score of 21.1575 completions on the final test. This was a mean difference of 1.100 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was .363. The "t" value of 3.030 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Burpee Test - Age 16

The subjects had a mean score of 18.225 completions on the initial test and a mean score of 20.75 completions on the final test. This was a mean difference of 2.525 completions increase between the initial and final test. The estimate of the sampling error of the mean difference was .441. The "t" value of 5.726 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Sit-ups - Age 13

The subjects had a mean score of 52.625 completions

on the initial test and a mean score of 57.95 completions on the final test. This was a mean difference of 5.325 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.929. The "t" value of 3.002 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Sit-ups - Age 14

The subjects had a mean score of 55.95 completions on the initial test and a mean score of 63.00 completions on the final test. This was a mean difference of 7.05 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.840. The "t" value of 3.832 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Sit-ups - Age 15

The subjects had a mean score of 57.525 completions on the initial test and a mean score of 61.021 completions on the final test. This was a mean difference of 3.685 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.355. The "t" value of 2.719 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Sit-ups - Age 16

The subjects had a mean score of 56.925 completions on the initial test and a mean score of 62.25 completions on the final test. This was a mean difference of 5.325 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.444. The "t" value of 3.771 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Push-ups - Age 13

The subjects had a mean score of 29.55 completions on the initial test and a mean score of 32.8 completions on the final test. This was a mean difference of 4.15 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.788. The "t" value of 2.321 with 39 degrees of freedom indicate a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Push-ups - Age 14

The subjects had a mean score of 31.275 completions on the initial test and a mean score of 34.675 completions on the final score. This was a mean difference of 3.400 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.452. The "t" value of 2.204 with 39 degrees of freedom indicated a significant difference beyond the .05 level

of confidence and rejection of the null hypothesis.

Push-ups - Age 15

The subjects had a mean score of 31.825 completions on the initial test and a mean score of 35.30 completions on the final test. This was a mean difference of 3.475 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was .825. The "t" value of 4.212 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Push-ups - Age 16

The subjects had a mean score of 34.675 completions on the initial test and a mean score of 41.450 completions on the final test. This was a mean difference of 6.775 completions increase between the initial and final test. The estimate of the sampling error of the mean difference was 1.249. The "t" value of 5.424 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Pull-ups - Age 13

The subjects had a mean score of 5.025 completions on the initial test and a mean score of 4.7 completions on the final test. This was a mean difference of .325 completions decrease between the initial and final test. The estimate of the sampling error of the mean difference

was .741. The "t" value of .439 with 39 degrees of freedom indicated no significance and acceptance of the null hypothesis.

Pull-ups - Age 14

The subjects had a mean score of 5.975 completions on the initial test and a mean score of 7.000 completions on the final test. This was the mean difference of 1.025 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was .324. The "t" value of 3. 163 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Pull-ups - Age 15

The subjects had a mean score of 7.775 completions on the initial test and a mean score of 8.400 completions on the final test. This was a mean difference of .625 completions increase between the initial and the final test. The estimate of the sampling error of the mean difference was .608. The "t" value of 1.188 with 39 degrees of freedom indicated no significance difference and acceptance of the null hypothesis.

Pull-ups - Age 16

The subjects had a mean score of 8.9 completions on the initial test and a mean score of 9.825 completions on the final test. This was a mean difference of .925 comp-

letions increase between the initial and the final test. The estimate of the sampling error of the mean difference was .637. The "t" value of 1.452 with 39 degrees of freedom indicated no significant difference and acceptance of the null hypothesis.

Vertical Jump - Age 13

The subjects had a mean score of 15.6 inches on the initial test and a mean score of 18.6 inches on the final test. This was a mean difference of 3.000 inches increase between the initial and final test. The estimate of the sampling error of the mean difference was .395. The "t" value of 7.595 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Vertical Jump - Age 14

The subjects had a mean score of 16.75 inches on the initial test and a mean score of 18.25 inches on the final test. This was a mean difference of 1.500 inches increase between the initial and the final test. The estimate of the sampling error of the mean difference was .365. The "t" value of 4.110 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Vertical Jump - Age 15

The subjects had a mean score of 20.35 inches on the

initial test and a mean score of 20.475 inches on the final test. This was a mean difference of .125 inches increase between the initial and the final test. The estimate of the sampling error of the mean difference was .490. The "t" value of .255 with 39 degrees of freedom indicated no significant difference and acceptance of the null hypothesis.

Vertical Jump - Age 16

The subjects had a mean score of 19.9 inches on the initial test and a mean score of 20.8 inches on the final test. This was a mean difference of .900 inches increase between the initial and the final test. The estimate of the sampling error of the mean difference was .402. The "t" value of 2.239 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Broad Jump - Age 13

The subjects had a mean score of 68.75 inches on the initial test and a mean score of 71.075 inches on the final test. This was a mean difference of 2.325 inches increase between the initial and the final test. The estimate of the sampling error of the mean difference was .848. The "t" value of 2.742 with 39 degrees of freedom indicated a significant difference beyond the .05 level of confidence and rejection of the null hypothesis.

Broad Jump - Age 14

The subjects had a mean score of 74.325 inches on the initial test and a mean score of 72.975 inches on the final test. This was a mean difference of 1.350 inches decrease between the initial and the final test. The estimate of the sampling error of the mean difference was 1.203. The "t" value of 1.122 with 39 degrees of freedom indicated no significant difference and acceptance of the null hypothesis.

Broad Jump - Age 15

The subjects had a mean score of 78.825 inches on the initial test and a mean score of 79.225 inches on the final test. This was a mean difference of .400 inches increase between the initial and the final test. The estimate of the sampling error of the mean difference was .816. The "t" value of .490 with 39 degrees of freedom indicated no significant difference and acceptance of the null hypothesis.

Broad Jump - Age 16

The subjects had a mean score of 82.9 inches on the initial test and a mean score of 83.375 inches on the final test. This was a mean difference of .475 inches increase between the initial and the final test. The estimate of the sampling error of the mean difference was 1.142. The "t" value of .415 with 39 degrees of freedom indicated no significant difference and acceptance of the null hypothesis.

TABLE I

Rank Order of "t" For Age 13

Area of comparison	"t" Value
Vertical Jump	7.595 *
Burpee	4.684 *
Sit-ups	3.002 *
Broad Jump	2.742 *
Push-ups	2.321 *
Pull-ups	-.439

* Significant beyond the .05 level of confidence.

TABLE II

Rank Order of "t" For Age 14

Area of Comparison	"t" Value
Vertical Jump	4.110 *
Sit-ups	3.832 *
Pull-ups	3.163 *
Burpee	2.574 *
Push-ups	2.204 *
Broad Jump	-1.122 *

*Significant beyond the .05 level of confidence.

TABLE III

Rank Order of "t" For Age 15

Area of Comparison	"t" Value
Push-ups	4.212 *
Burpee	3.030 *
Sit-ups	2.719 *
Pull-ups	1.188
Broad Jump	.490
Vertical Jump	.255

* Significant beyond the .05 level of confidence

TABLE IV

Rank Order of "t" For Age 16

Area of Comparison	"t" Value
Burpee	5.726 *
Push-ups	5.424 *
Sit-ups	3.771 *
Vertical Jump	2.239 *
Pull-ups	1.452
Broad Jump	.415

*Significant beyond the .05 level of confidence

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

A group of male students from Larimore High School physical education classes were tested to see if any change had taken place in their physical fitness level. The study spanned a period of three years and included thirteen, fourteen, firteen, and sixteen year old boys. The Minnesota Physical Efficiency Test was used to measure the physical fitness level. This test included the following items: (1) Burpee Test, (2) sit-ups, (3) push-ups, (4) pull-ups, (5) vertical jump, (6) broad jump.

Each group was tested at the beginning of the school year and at the end of the school year. The significance of difference between the initial test and the final test within each group was tested by use of the "t" technique for correlated scores for small samples. The following results were obtained:

1. The thirteen year old subjects scored significantly higher on the final test in the vertical jump, Burpee Test, sit-ups, broad jump, and push-ups. This significance was beyond the .05 level.

2. The fourteen year old subjects scored significantly higher on the final test on the vertical jump, sit-ups, pull-ups, Burpee Test, and push-ups. This significance was beyond the .05 level.

3. The fifteen year old subjects scored significantly higher on the final test in push-ups, sit-ups, and the Burpee Test. This significance was beyond the .05 level for all items. Gains were made in pull-ups, broad jump, and the vertical jump also, but these gains were not statistically significant.

4. The sixteen year old subjects scored significantly higher on the final test in the Burpee Test, push-ups, sit-ups, and the vertical jump. This significance was beyond the .05 level. Gains were made in the pull-ups, and the broad jump also, but these gains were not statistically significant.

Conclusions

The following conclusions were indicated by this study:

1. The regular physical education did produce significant changes in the Burpee Test for three out of the four age groups tested.

2. The regular physical education class did produce significant changes in the sit-ups in all four age groups tested.

3. The regular physical education class did produce

significant changes in the push-ups in all four age groups tested.

4. The regular physical education class produced only a significant change in one of the four age groups tested for pull-ups.

5. The regular physical education did produce significant changes in the vertical jump in three out of the four age groups tested.

6. The regular physical education class produced only a significant change in one of the four age groups tested for the broad jump.

Recommendations

The following recommendations are made relative to this study:

1. A study should be made with a physical education program which emphasized arm and shoulder strength.

2. A different form of evaluating physical fitness should be used.

3. The physical fitness tests should be given more frequently to evaluate the effect of physical fitness levels of these shorter intervals.

4. Control groups should be used at all age levels so that better control of the factors contributing to fitness would be possible. The greatest changes were evidenced in the thirteen year old group and it is not unlikely that maturation was a contributing factor.

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