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Physical Fitness and Scholastic Achievement

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PHYSICAL FITNESS

AND

SCHOLASTIC ACHIEVEMENT

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AND
SCHOLASTIC ACHIEVEMENT

A Study Presented

to

Eastern Illinois State College

In Partial Fulfillment

of the Requirements for the Degree

Master of Science in Education

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by

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CHAPTER I

INTRODUCTION

Today's formal education, being the "continuous process of adjustment, having as its aim at every stage an added capacity of growth,"[1] contains a multitude of complex subordinates. The existence of the human organism should be a continuous development and maintenance of mind and emotions, spiritual stability, and vigor of the physical to fulfill a wholesome and worthwhile life. With these components of living in mind, the writer intended to seek out the possible relationship existing between two of these factors.

The concept of total fitness, with all its interrelated areas, includes mental functions and the ability to achieve and maintain a degree of scholastic success, as set up by the formal systems of education. Furthermore, physical fitness represents a component of total fitness that is necessary to carry on the daily functions of life.

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[1]L. D. Crow, and A. Crow, Introduction to Education, (New York: American Book Company 1947). p. 55.

The men and women in educational institutions should realize that a measure of these two characteristics are necessary to fulfill the processes of living.

How much relationship is there between the physical fitness of an individual and the ability to achieve and maintain scholastic measures? What does this relationship imply? In the pages following, the writer hopes to find the degree of relationship and possible implications of these two characteristics of human fitness.

PURPOSE OF THE STUDY

The purpose of the study was to examine relationships, if any, which existed between physical fitness, as determined by Rogers' Physical Fitness Index, and scholastic achievement, as described by grade point averages, among a selected sample of college men enrolled in the service physical education classes at the Eastern Illinois State College. In addition it was proposed to examine the amount of change which took place in the physical fitness and scholastic achievement during the period of one year and to determine if a change in one of these factors was related to a corresponding change in the other.

DEFINITION OF TERMS

Physical Fitness.--The physical fitness of the subjects in this study was defined as the strength of the large muscle groups. Justification of strength as a

measure of physical fitness was found in the works of Rogers[2] where it was implied that relationships existed between physical condition and muscular strength.

Scholastic achievement.--Scholastic achievement was the status maintained by the subjects in terms of grade point averages. These averages were computed by considering the number of credits scheduled and the grades earned.[3] While many factors contribute to the earning of a grade in a course which might not be directly associated with scholastic achievement, it was felt that an average of grades earned would indicate the ability of an individual to achieve relative success in scholastic pursuits.

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[2]F. R. Rogers, Physical Capacity Tests, (New York: A. S. Barnes and Company, 1931), p. 30.

[3]Eastern Illinois State College Bulletin 1956 - 1957, (Charleston: No 214, 1956), p. 74

CHAPTER II

REVIEW OF THE LITERATURE

Finding literature concerning physical fitness and scholastic achievement as seperate topics was not difficult; but literature revealing possible relationships of these two areas to each other was not easily located. In the area of health, however, which was composed in part of mental and emotional status, there seemed to be a sufficient amount of evidence pertaining to the aptness of mental efficiency in connection with body fitness.

McCloy[4] mentioned that Rogers' primary intention was that his physical fitness test might be used to judge the health status of the body. In later studies this concept was partially supported in its tendencies that health might be estimated by this type of body measurement. Since health measurement may have been possible, through the physical fitness test, it is possible that the physical status might have some influence on mental ability.

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[4]C. McCloy, Tests and Measurements in Health and Physical Education, (New York: F. S. Crafts and Company, 1942), p. 26.

Steinhaus[5] stated that the nutritional status and toxic condition of the body had a definite relation to the rise and fall of mental function, strength and skills. Since it was possible for mental and physical functions to be similarly conditioned by one element, then the possibility existed that these two functions had a certain degree of influence upon each other.

When investigating the results of the physical fitness tests, Steinhaus[6] found that the assumption was made that only an otherwise perfectly functioning body can develop and support such power units as arm, back, and leg muscles; therefore, strength becomes a factor in determining total health. The indication was also given that strength is synonyomous with physical power, robustness, and health.

When the vital organs have a change in condition, there is a corresponding change in the condition of the voluntary muscle function. The opposite would also be true, and the mental abilities could show a corresponding change with the rise or fall of muscle function. This will occur in practically all condition changes in the vital organs.[7]

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[5]A. Steinhaus, "Health and Physical Fitness", The Journal of Health and Physical Education, (1936), p. 7.

[6]Ibid., p. 7.

[7]F. R. Rogers, "The Significance of Strength Test in Revealing Physical Condition, "The Research Quarterly of the American Physical Education Association. 7 (1936), p. 302.

Research workers in health and physical education have pointed out that deeper and more fundamental relationships lie between strength and general health status. Relationships which involve virility and a more positive and buoyant mental attitude.[8]

McCloy has given his views on the importance of strength as follows:

> Each individual is required to carry or support his bodily weight from morning to night. He must do this with the muscles he has. It is known that a muscle that is too weak for its task works at a lower effeciency than does one that is adequately developed. Hence, an individual who is markedly underdeveloped is working inefficiently, so far as his muscles are concerned, and is suffering greater fatigue, both locally and generally. He has less energy with which to approach his tasks, suffers more from fatigue tozema and works under a greater nervous strain. Hence, in addition to its indication as to general medical condition, the strength tests in the form of the Physical Fitness Index tell much about the individuals general fitness for living and working.[9]

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[8]T. Cureton, Physical Fitness Appraisal and Guidance, (St. Louis: C. V. Mosby Company, 1947), p. 367.

[9]C. McCloy, "How About Some Muscle?", The Journal of Health and Physical Education, 7 (May, 1936), p. 302.

In Rudert's[10] study there was no evidence that a high Physical Fitness Index meant that the general health status of a person was also high. Other short articles concerning Physical Fitness Index gave the following views: Health and physical fitness go hand in hand;[11] low physical fitness influences health and well being.[12]

In the summaries of abstracts of unpublished thesis, many factors were brought out concerning the relationship of physical status and activities to scholarship, personality and mental attitudes.[13]

The mean grade-point average of a group high in athletic achievement was higher than the mean grade-point average in a group of students low in athletic achievement. Biddulph[14] found the higher group had a smaller standard deviation than did the lower achievement group. This difference, however, was not significant enough to indicate a difference in scholastic achievement.

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[10] T. K. Cureton, Physical Fitness Appraisal and Guidance, (St. Louis: C. V. Mosby Company, 1947), p. 378, citing John Rudert, "Nutritional Appraisal of Eighth Grade Boys" (unpublished Master's thesis, Springfield College, Springfield, Massachusetts), p. 276.

[11] L. Rowntree, "Education, Health and Physical Fitness," The Journal of Health and Physical Education, 14 (September, 1942), p. 370.

[12] H. Kraus, and R. Herschland, "Muscular Fitness and Health," Journal of the American Association for Health, Physical Education and Recreation, 24, (December 1953), p. 17-19

[13] T. K. Cureton, Summary of Abstracts of Unpublished Theses, section by J. T. Mahoney concerning the Activities on Mental Attitudes, Personality and Scholarship, (1955).

[14] Ibid, p. 4

In a study conducted by Hanson[15] on athletes and non-athletes, the athletes achieved the better grade point averages. The athletes also scored higher on the Iowa Silent Reading Test.

Paski[16] made similar findings at the University of Washington but found the athletes' grades decreased somewhat during active participation. When the team had a successful season, the grade point averages were higher than during a poorer season.

A study of the scholastic achievement of athletes of city schools and athletes of rural schools found the rural athletes with the higher grades. The city athletes had grade point averages lower than city non-athletes, and the rural athletes had higher grade point averages than the rural non-athletes.[17] In the junior colleges of southern California, the grades of athletes were low in relation to the normal curve, but their scholarship showed little variation from a season of competition to a season without competition.[18]

In a study investigating the scholastic achievement of students who participated in physical activities, the

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[15] Ibid., p. 65.

[16] Ibid., p. 66.

[17] Ibid., p. 5.

[18] Ibid., p. 117.

active group received grades higher than a group of non-participating students. Students participating in intramural athletics had higher scholastic ability than those who did not. The only group that indicated lower grades were sophomores participating in intramurals during the fall of the year.[19]

In Elmore's[20] study of acievement marks, responsibility traits, social traits, and work habits of athletes and non-athletes, the athletes excelled over the non-athletes.

In an investigation, conducted by Anderson,[21] on the army specialized training program, there was practically no relationship found between physical fitness and scholastic achievement.

Physical fitness, being a necessary trait in performing athletic feats, tends to be characteristic of the competent sport participant. Very often athletes have been categorized as "all muscle," implying, of course, that the physically dexterous person lacks a similar quality toward scholastic success. Studies have been conducted that question such reasoning.

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[19] Ibid., p. 5.

[20] Ibid., p. 4.

[21] Ibid., p. 6.

Ray,[22] investigating relationships of the physical and mental accomplishments of high school boys, uncovered facts that tend to refute the impression of athletes' scholastic inadequacies. The findings of this study gave implications that were merely corroborations of various other investigations. The areas examined were intelligence quotient and growth rate. The growth rate was more generally related to intelligence quotient than to any factor except age. The athletes were not low in mental ability, though individuals possessing very high intelligence quotients frequently forego athletics.

> Within the limits of any I. Q. group, this study finds physical ability a more reliable predictor of academic standing than is relative I. Q. At the low I. Q. levels, some unmeasured quality seems to influence achievement of all sorts in the individuals who persist in school attendance - - the athlete is not only superior in mental ability as measured by I. Q., but more superior as measured by academic averages, and still more superior as measured by the number of academic failures.[23]

McCloy[24] related that physical fitness was not identical with total fitness, and did not embody complete organism fitness. A person with high intellectual abilities might maintain the same degree of fitness as someone mentally poor, but the mentally low person and the person of high

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[22] H. C. Ray, "Inter-relationships of Physical and Mental Abilities and Achievements of High School Boys," The Research Quarterly, 11 (March, 1940), p. 138-141.

[23] Ibid., p. 140.

[24] C. H. McCloy, "What Is Physical Fitness?" Journal of Health - Physical Education - Recreation, 27 (September 1956), p. 14.

intelligence "might be affected, as to physical fitness, by emotional disturbances via psychosomatic routes."[25] The implication of this opinion seems that in specific cases the mind-body relationship has its only route through emotional stability. The possibility of an overall judgement of the physical fitness of groups and their aptness in scholastical achievement would not hold significant relationship. The more probable indication would be that a higher degree of relationship might exist between emotional status and physical fitness than in a relationship of physical fitness to any other factor.

Rogers[26] implied that the physical fitness test results could indicate the rise and decline of a pupil's progress and efficiency in an educational program. The specific rise or fall could not be denoted. This was due to a multitude of altering factors (e.g., emotional disposition, possible illness, nutritional status, etc.). An examiner could not assume that changes in a student's physical fitness indices were due to a physical education program. When changes such as mentioned occur, there were the possibilities of some predisposition caused by

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[25] Ibid., p. 14.

[26] Rogers, Op. Cit., p. 34.

problematical conditions. At any rate ". . . . when the averages are compared, administrators have fairly reliable measures by which to estimate the relative values of contrasted programs, methods of treatment and even of teacher efficiency."[27]

Morris,[28] while explaining physical education and the philosophy of education, mentioned the concept of splitting the mind and body into two separate parts and the fallacy of this reasoning. Man is an organic whole which is not to be severed into parts, but instead the body and mind are considered "extensions" of each other. The human should be viewed as an organism which needs life experiences through psychosomatic routes.

HYPOTHESIS

The literature reviewed for this study indicated that a person who had maintained fitness of the body would have a higher degree of scholastic success than a person who had not. After consideration of these factors, however, any relationship existing between physical fitness and scholastic achievement would tend to be minute. Changes between physical fitness and scholastic achievement ratings, taken approximately one year apart, should tend to show a strong relationship.

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[27] Ibid., p. 35.

[28] V. C. Morris, "Physical Education and the Philosophy of Education," Journal of Health, Physical Education and Recreation, 27 (March 1956), p. 21

CHAPTER III

SUBJECTS, MEASURES, AND PROCEDURES

Subjects

The subjects for this study were freshmen, sophomore, and junior male students who were enrolled in the service classes of the physical education program at the Eastern Illinois State College. These students were administered the Rogers'[29] Physical Fitness Test during the winter quarter, ending March 1956. The two-hundred men were selected at random for the purpose of conducting an investigation of scholastic achievement and physical fitness. From the original sampling of two-hundred, an experimental group was formed. The experimental group included the freshmen who would remain in the service physical education program for a period of one year following the physical fitness testing of 1956. In March of 1957, the freshmen of the original sampling, now sophomores, were invited to submit themselves for retesting. Of the men who represented this experimental

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[29] Rogers, op. cit.

group, thirty-eight responded, were tested, and their scores utilized for this investigation.

The purpose of establishing an experimental group was to further study any relationship, which might have existed. If the group was similar in physical fitness and scholastic success to the original sampling of two-hundred, their scores might be used for reliable relationships of the two measures concerned in this study.

Measures

The measures selected for this study were scholastic achievement, as determined by grade point average and physical fitness, as measured by the Rogers' [30] Physical Fitness Index.

Scholastic Achievement.-- The scholastic ahievement was determined in terms of the grade point averages. The letter grade A, B, C, D, and F were represented by the numbers 4, 3, 2, 1, and 0 respectively. The numbers were the grade points. For each course completed, a number of quarter hours was given. The grade points for each course

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[30] Ibid.

was multiplied by the number of quarter hours representing the course completed. The answer received was the quality point total for that course. The quality points for these courses were then added. The total received was then divided by the total number of quarter hours. The result was the grade point average. The grade point average might be calculated as follows:[31]

Grade	-	Grade points	-	Quarter hours	-	Quality points
B	-	3	X	4	=	12
B	-	3	X	4	=	12
C	-	2	X	4	=	8
C	-	2	X	4	=	8

Quarter Hour Total = 16) Quality point total = 40.00 = Grade Point Average

32
80
80

The grade point averages were acquired from the Registrar's office of the Eastern Illinois State College. Some of the averages were received by Professor E. C. Haight of the Women's Physical Education Department; others calculated by the writer; and the remainder by the staff of the registrar's office. Averages were taken for the periods ending March, 1956, and March, 1957.

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[31]Eastern Illinois State College Bulletin 1956-1957, op. cit., p. 74

Physical Fitness Index.-- The Physical Fitness Index was used to determine the physical status of the subjects of this investigation. The physical fitness was determined in terms of strength of the large muscles groups of the body, with consideration for age, height, weight, and lung capacity. Clarke[32] pointed out the factor of reliability of the Physical Fitness Index as established by Rogers in 1925. The following test unit self-correlations were found in the original study:

Lung capacity	.97
Right grip	.92
Left grip	.90
Back strength	.88
Leg strength	.86
Pull-ups	.91
Push-ups	.90
Strength index	.94

The classifications of Physical Fitness Indices were distributed into three areas. The score of 100 was classed as average, and significant deviation from this score indicated physical deficiency or superiority. The person well above 100 would have a high degree of physical capacity. The evident lowness of a test score indicated a need for developmental guidance. The varying elements which entered into these factors should be kept in mind when classifying individuals.

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[32] H. H. Clarke, Application of Measurement to Health and Physical Education, (New York: Prentice-Hall, Inc., 1950), p. 172.

Scoring the Physical Fitness Index was accomplished using the following methods:

Arm strength.-- Arm strength was scored according to the following formula:

$$(\text{pull-ups} + \text{push-ups}) \times \left(\frac{W}{10} + H - 60\right)$$

in which W represented the weight in pounds and H the height in inches. Fractions were corrected to whole numbers.

The Strength Index, or SI, was the total score determined by adding together the scores made on each test item: Lung capacity, right and left grip, back strength, leg strength, and arm strength.

The Normal Strength Index was found by the use of norm charts. The norm charts were based upon sex, weight, and age, the normal score being changed for each two-pound increase in weight and for each half-year increase in age. Instead of interpolating to determine the norm for those individuals between points on the norm chart, the weight above and the age below should be taken. For example, if an individual weighs 151 pounds, the norm at 152 should be taken; if he is 19 years and 5 months of age, the norm at 19 years should be taken.

Physical Fitness Index.-- The Physical Fitness Index is computed from the following formula:

$$PFI = \frac{\text{Achieved SI}}{\text{Normal SI}} \times 100.^{33}$$

Each subject carried a score card from one testing unit to the next. The score received was marked on the subject's card by a recorder. Each card was received and inspected by the recorder at the last testing station.

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[33] Ibid., p. 168

Procedures

The Physical Fitness Test was given to the college men enrolled in the service physical education program at the Eastern Illinois State College. From this group, a sampling was taken for the purpose of correlating their indices with their grade point average. It was decided to establish an experimental group composed of freshmen, during 1955-1956, who were tested with the original sampling. The experimental sampling was tested in March, 1957, approximately one year after the testing of 1956. The group was enrolled in the service physical education classes during the period between the March, 1956, and the March, 1957, testings.

A staff member of the Eastern Illinois State College's Department of Physical Education (Men) administered a separate unit of the test. Each staff member was given written directions, explaining in detail, the methods to be used for administering the test unit to which they were assigned. Major students of the aforementioned department aided in the testing by serving as recorders.

The Subjects were encouraged to put forth the very best of their strength and capacities on the various units.

The units of the Physical Fitness Test were as follows:

Age, Height, Weight.-- Age was recorded as number of years and months rounded out the nearest year (e.g., 20 years 5 months was recorded as 20 years; 20 years 8 months was recorded as 21 years). The height was recorded to the nearest full inch, with the subjects in gym suits. The weight was recorded to the nearest whole pound with a balance-type scale.[34]

Lung Capacity.-- The Lung capacity was measured with a wet spirometer to the nearest cubic inch. The tester gave each subject a wooden mouthpiece which was placed into the end of a rubber hose connected to the spirometer. The subject was instructed to inhale as deeply as possible and then exhale into the tube until all the air within his control was gone. The tester was careful to read the indicator when it reached the highest point and relay the score to the recorder.[35]

Grip Strength.-- The grip strength was measured by a rectangular type hand dynamometer. Measurements were made on both right and left hands and were recorded to the nearest pound. The tester placed the dynamometer in the palm of the subject's hand and he was instructed to squeeze the instrument without touching his hand to the body or any other object. In the event the dynamometer slipped in the grip of the subject, or if there were an error in procedure, the subject was

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[34] Ibid., p. 156

[35] Ibid., p. 156-157

permitted a second trial. The right hand was tested first in all cases.[36]

Back Lift.-- The back lift was measured by a back and leg dynamometer. The tester instructed each subject to rub chalk on his hands to insure a firm grasp on the bar. The subject was told to stand on the small platform, to which the dynamometer was attached, with the feet placed evenly, the head erect, and to bend from the hips with the legs straight. The subject was given the bar with one palm outward and the other backward. As the testee lifted evenly, the tester encouraged the subject to do his best.[37]

Leg Lift.-- The leg lift was measured with a leg and back dynamometer, to the nearest full pound. The subject held the bar in a palms-down position and placed it in the junction where the trunk and thighs meet. A heavy canvas belt was attached to each end of the bar encircling the hips. The chain was fastened to the bar and the subject was told to lift until his legs were almost straight. The tester instructed the subject to keep his head erect, trunk and arms straight while performing the lift. The subjects thought that this unit caused the greatest amount of fatigue of any other test in the battery; therefor, it was the last test given.[38]

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[36] Ibid., p. 158

[37] Ibid., p. 160-161

[38] Ibid., p. 161-162

Push-ups.-- The push-up test was administered on regular gymnasium parallel bars. The bars were adjusted to shoulder height. The subject was instructed to grasp the ends of the bars and jump to the front support position. From this position, the subject lowered his body until the angle at the bend of his arm was less than ninety degrees. The subject then returned to the front support position without kicking or jerking. Any subject who did not go all the way down or all the way up receieved half-credits and was not given more than four.[39]

Pull-ups.-- The pull-up test was given on the gymnasium high bar. The subject was instructed to grasp the bar with the palms-forward grip, and pull himself up to a position where his chin could touch the top of the bar. From this position, the subject was to lower his body until his arms were at full extension. Only half-credits were given if the subjects pulled up with a jerking or kicking motion.[40]

Correlations.-- The coefficients of correlation were claculated by the product-moment method.[41]

Critical Ratio.-- The degrees of difference of the means were calculated by critical ratio.[42]

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[39] Ibid., p. 166-167

[40] Ibid., p. 163-164

[41] Ibid., p. 424-430

[42] Ibid., p. 431

CHAPTER IV

THE DATA

Four-hundred forty-five men enrolled in the physical education service classes of the Eastern Illinois State College were given the Rogers'[43] Physical Fitness Test during the winter quarter of 1956. From the four-hundred forty-five men, two hundred were selected at random, and their grade point averages and Physical Fitness scores calculated to determine the relationship between these components of total fitness.

The product-moment method of correlation was used to find the amount of relationship that existed between the physical fitness index scores and the grade point averages. This calculation resulted in a correlation coefficient of $r = .29$ with a probable error of .04. The mean Physical Fitness Index score for this group was 88.38 and the mean score for the grade point averages was 2.22. Tables I and II have indicated standard deviations of 18.06 and .62 for Physical Fitness Indices and grade point averages repectively.

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[43] Rogers, op. cit.

TABLE I

The Difference Between the
Grade Point Averages of
The Original Sample and the
Second Sample in 1956

	Original Sample	Second Sample
N	200	38
M	2.22	2.43
σ	.62	.52
R	.29 - 3.83	1.52 - 3.83
σ_m	.10	.04

Difference = .21

σ_d = .11

CR = 1.00

TABLE II

The Difference Between
the Physical Fitness Indices of the
Original Sample and
the Second Sample in 1956

	Original Sample	Second Sample
N	200	38
M	88.38	93.85
σ	18.06	18.80
R	34 - 138	55 - 138
σ_m	1.28	3.05

Difference = 5.47

σ_d = 3.31

CR = 1.65

A second sampling was taken from the original sample of two hundred. This sampling represented the freshmen of the original sampling (200) who were enrolled in the service physical education classes (100) series during the winter quarter of 1957 and in the physical education service classes during the period between the winter quarter of 1956 and the winter quarter of 1957. There were forty-nine men who qualified to be members of the second sampling. Of this group, thirty-eight reported and were tested. The 1956 Physical Fitness Index scores and grade point averages of the second sampling (38) were correlated to find if they were similar to the original sample, their scores could be used for further study.

Table I illustrated the difference of the means for grade point averages, of the original sampling of two-hundred and the second sampling of thirty-eight, in terms of critical ratio. The difference was 1.10. This indicated that the two groups were not significantly different. In Table II, the amount of difference calculated for the Physical Fitness Index means, illustrated a critical ratio of 1.74. Since the second sampling (38) did not show a critical ratio high enough to indicate a significant difference from the original sampling, it appeared that their Physical Fitness Index scores and grade point averages were similar to those of the original sampling. The second smaple (38) was similar to the original

sampling (200). Data which substantiate the statement were: Correlation coefficients of r = .12 and r = .29 were found for the thirty-eight and the two hundred subjects respectively; a mean Physical Fitness Index score of 93.85 as compared to 88.38 for the two-hundred; a mean grade point average of 2.43 as compared to 2.22 for the original sampling; a Physical Fitness Index standard deviation of 18.80 as compared to 18.06 for the original sampling; and a grade point average standard deviation of .52 as compared to .62 for the two-hundred. This evidence tends to justify use of the second saompling (38) of 1956 in studying the Physical Fitness Index scores and grade point averages they achieved approximately one year later.

The second sampling, of thirty-eight, was given the Physical Fitness Test and had accumulative grade point averages calculated in March of 1957. This was the second time this group received the Physical Fitness Test, and it was administered approximately one year after the testing of 1956. The meam physical fitness score for the 1957 testing was 88.20 as compared with the 93.85 they accomplished for the previous year. The standard deviation for the Physical Fitness Indices was 18.80 in 1956 and 15.00 in 1957. The means of the grade point averages for the second group (38) were 2.43 in 1956 and 2.45 in 1957 with standard deviations of .52 and .54 respectively. The 1957 physical fitness scores and grade point averages were correlated. The correlation coefficient was .19.

The measure of physical fitness which was mainly composed of height, weight, pull-ups, push-ups, arm strength, leg lift, back lift, right and left grip, represented the basic ingredients for finding the final Indices. Table III illustrated the means that were calculated for scores made in 1956 and then for 1957. The scores were those of the second sample of thirty-eight subjects. The only measure that indicated a significant change was the height, which had a critical ratio of the means of 4.00. The critical ratios of the means for the Physical Fitness Indices and the grade point averages were 1.45 and .18 respectively.

The grade point averages, of the second sampling (38), for 1956 were subtracted from the 1957 grade point averages to determine the amount of change that had taken place during the period of approximately one year. The same procedure was followed to find the changes in the subjects' Physical Fitness Indices.

The score changes were correlated to find the amount of relationship between the physical fitness score changes and those of the grade point averages. If the correlation coefficient was high, it would have indicated that a rise or fall in physical fitness would be accompanied by a corresponding rise or fall in scholastic success. The reverse could have been true in this particular situation. The correlation coefficient $r = .41$ was received by relating the changes of grade point average to the changes of the physical fitness scores. The result of this correlation

TABLE III

Mean Scores of Subjects for Tests Composing The Physical Fitness Index Differences and Significance

Area Tested	1956 Mean Score	1957 Mean Score	Difference in Means	Significance of Difference*
Weight	153.95	158.29	+ 4.34	1.24
Height	68.76	68.94	+ .18	4.00
Pull-ups	6.65	7.03	+ .38	.56
Push-ups	7.82	9.08	+ 1.26	1.59
Arm Strength	342.00	393.50	+51.50	.05
Leg Lift	1260.75	1106.25	-54.50	.92
Back Lift	401.50	439.10	-37.60	1.81
Left Grip	115.62	116.06	+ .44	.12
Right Grip	127.65	126.45	- 1.20	.01
Lung Capacity	277.55	276.30	- 1.25	.14
P. F. I.	93.85	88.20	- 5.65	1.45
G.P.A.	2.43	2.45	+ .02	.18

*A significant difference equals 3.00 or more

was not significantly high enough to substantiate any definite statement that a change in one of these factors would be accompanied by a change in the other; however, it may have indicated the possibility of a relationship between these two factors.

CHAPTER V

SUMMARY AND CONCLUSIONS

Summary

Four-hundred and forty five college men enrolled in the physical education service classes at the Eastern Illinois State College during the winter quarter 1955-1956 were tested for physical fitness. Two hundred of these subjects were selected at random for the purpose of investigating any relationships that might have existed between physical fitness and scholastic achievement. The Rogers'[44] Physical Fitness Test was used to measure physical fitness and the scholastic achievement was judged by the grade point average.

It was then decided that a second sampling be taken. This group was to consist of the freshmen who receieved the physical fitness test with the original sampling. Further requirements were that these subjects must have been enrolled in the service physical education program for approximately one year following the testing of 1956, and that they were in the srvice classes (100 series) during the winter quarter ending in 1957. Forty-nine subjects qualified under

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[44] Ibid.

these stipulations. All of these men were invited to take the physical fitness test. Of this group thirty-eight attended, were tested and became the second sampling.

The grade point averages and Physical Fitness Indices achieved by the second sampling in the testing of 1957 were then correlated. A correlation coefficient .19 was found for this testing as compared to .12 found for this sampling in 1956.

The physical fitness score achieved in 1956 for each subject of the second sampling (38) was subtracted from the physical fitness score that the subject achieved in 1957. This indicated the degree of change that had taken place during the period of one year. The same procedure was followed to find the amount of change in the subjects' grade point averages.

The changes in physical fitness scores were correlated with the changes in grade point averages. This was done to find if a change in physical fitness would be accompanied by a corresponding change in scholastic achievement. The correlation coefficient .41 indicated that a corresponding change could take place, but on observation it appeared to be more evident in individual cases than in lagre groups.

The Rogers'[45] Physical Fitness Index was composed

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[45] Ibid.

of tests measuring the large muscles of the body with consideration for age, height, weight, and lung capacity. The critical ratio was calculated for each of these measures to find the significance of difference between the mean scores of 1956 and the mean scores of 1957. The means were those of the second sampling of thirty-eight subjects. The only measure that showed a significant difference of mean scores was height.

Conclusions

The findings of this study based upon the data compiled seemed to indicate the following:

1. The coefficients of correlation that resulted in relating physical fitness and scholastic achievement ondicated that any relationship existing between these two measures probably would be low.

2. According to the standards of the Eastern Illinois State College, the men enrolled in the service physical education program were average in scholastic achievement.[46]

3. The calculation of the critical ratio to find the significance of difference between the mean physical fitness score in 1956 and the mean physical fitness score in 1957 indicated no significant change had taken place.

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[46]Eastern Illinois State College Bulletin, 1956-1957, op. cit., p. 74

4. The correlation coefficient r = .41 was calculated by relating the changes in Physical Fitness Indices and grade point average of the subjects of this study. It was concluded that the result of this correlation was not significantly high enough to substantiate any definite statement that a change in one of these factors would be accompanied by a change in the other; however, it may have indicated the possibility of a relationship between these two factors.

B I B L I O G R A P H Y

BIBLIOGRAPHY

Clarke, H. H., Application of Measurement to Health and Physical Education, (New York: Prentice-Hall, Inc., 1950).

Crow, L. D., and Crow, A., Introduction to Education, (New York: American Book Company 1947).

Cureton, T., Physical Fitness Appraisal and Guidance, (St. Louis: C. V. Mosby Company, 1947).

Cureton, T., Physical Fitness Appraisal and Guidance, (St. Louis: C. V. Mosby Company, 1947), citing John Rudert, "Nutritional Appraisal of Eighth Grade Boys" (Unpublished Master's thesis, Springfield College, Springfield, Massachusetts).

Eastern Illinois State College Bulletin 1956 - 1957, (Charleston: No. 214, 1956).

Kraus, H., and Herschland, R., "Muscular Fitness and Health," Journal of the American Association for Health, Physical Education, and Recreation, 24, (December, 1953).

McCloy, C., Tests and Measurements in Health and Physical Education, (New York: F. S. Crafts and Company, 1942).

McCloy, C., "How About Some Muscle?", The Journal of Health-Physical Education - Recreation, 7, (May, 1936).

McCloy, C., "What Is Physical Fitness?", Journal of Health-Physical Education-Recreation, 27, (September 1956).

Morris, V. C., "Physical Education and the Philosophy of Education," Journal of Health, Physical Education, and Recreation, 27, (March 1956).

Ray, H. C., "Inter-relationships of Physical and Mental Abilities and Achievements of High School Boys", The Research Quarterly, 11, (March, 1940).

Rogers, F. R., Physical Capacity Tests, (New York: A. S. Barnes and Company, 1931).

Rogers, F. R., "The Significance of Strength Tests in Revealing Physical Condition", The Research Quarterly of the American Physical Education Association, 7, (1936).

Rowntree, L., "Education, Health and Physical Fitness," The Journal of Health and Physical Education, 14 (September 1942).

Steinhaus, A., "Health and Physical Fitness", The Journal of Health and Physical Education, (1936).

A P P E N D I X

RECORD CARD FOR PHYSICAL FITNESS INDEX SCORES

EASTERN ILLINOIS STATE COLLEGE
Department of Physical Education

Date												
Age	Y	M	Y	M	Y	M	Y	M	Y	M	Y	M
Weight												
Height												
Multiplier												
Pull Ups												
Push Ups												
Arm Strength												
Leg Lift												
Back Lift												
Left Grip												
Right Grip												
Lung Capacity												
Strength Index												
Normal S. I.												
P.F.I.												

NAME _____ YEAR _____

SECOND SAMPLING

Name	PFI Freshman 1956	GPA Freshman 1956	PFI Sophomores 1957	GPA Sophomores 1957	PFI Difference	GPA Difference
1. Ashworth,, Jerry	98	2.94	90	2.77	-8	-.17
2. Blary,, Raymond	81	2.64	69	2.67	-12	+.03
3. Brown, Milford	76	2.25	71	2.25	-5	.00
4. Burnside,, W.C.	83	2.00	71	2.05	-12	+.05
5. Campbell, Harold	89	2.17	95	2.25	+6	+.08
6. Cearlock,, Larry	97	2.50	87	1.80	-10	+.30
7. Courtney, Ronald	106	2.25	97	2.25	-9	.00
8. Cooprider, M.	96	2.08	99	1.77	+3	-.31
9. Daniels, Bob	93	2.00	74	2.05	-19	+.05
10. Dye,, Jerry	123	2.33	104	2.40	-19	+.07
11. Fleming,, Robert	82	2.69	99	2.75	+17	+.06
12. Gunderson,, Gayne	106	3.83	107	3.90	+1	+.13
13. Gurnea, Ralph L.	93	3.42	99	2.70	+6	-.72
14. Haddock, Tom. E.	81	1.92	75	1.95	-6	+.03
15. Harder, Bob	138	1.64	112	3.05	-26	-.41
16. Hardy, Jerry	93	2.67	94	2.65	+1	-.02
17. Harrington, William	97	2.00	95	2.35	-2	+.35
18. Hawkey, Lynn	95	3.58	92	3.60	-3	+.02
19. Hill, William	55	2.33	49	2.45	-6	+.12
20. Hinterscher, Ray	61	1.67	57	1.77	-4	+.10
21. Hockman, Dan	91	2.17	84	2.40	-7	+.23
22. Jeffris, Ronald	79	3.25	69	3.04	-10	-.21

23.	Johnston, Jerry	107	2.25	99	2.4	-8	+.15
24.	Knop, James	86	1.5	74	1.56	-12	+.06
25.	Lash, Bill	105	1.83	89	1.75	-16	-.08
26.	Manuel, Max	101	2.17	104	2.25	+3	+.08
27.	Maxwell, Jerry	68	2.88	64	2.80	-4	-.08
28.	Mitchell, James	99	2.10	103	2.55	+4	+.45
29.	Olmstead, Ray	78	2.84	87	2.74	+9	-.10
30.	Poole, Roger	96	2.54	95	2.05	-1	-.49
31.	Pullen, Andy	100	2.09	100	2.27	0	+.18
32.	Sebright, Dave	100	2.25	99	3.28	-1	+1.03
33.	Strader, Michael	97	1.75	86	1.52	-11	-.23
34.	Stumpf, Jim	94	1.92	103	1.89	+9	-.03
35.	Tayler, Robert	117	2.67	109	2.60	-8	-.07
36.	Tracy, Norman	114	2.73	104	2.85	-10	+.12
37.	Van Dyke, Scott	103	2.67	80	2.40	-23	-.27
38.	Vaughon, Richard	87	2.36	83	2.59	-4	+.23