

A STUDY OF THE RELATIONSHIP BETWEEN READING SKILLS
AND SELECTED COMPONENTS OF PHYSICAL FITNESS
AMONG FIRST-GRADE CHILDREN

A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR
THE DEGREE OF MASTER OF ARTS IN HEALTH, PHYSICAL
EDUCATION, AND RECREATION IN THE GRADUATE
SCHOOL OF THE TEXAS WOMAN'S UNIVERSITY

COLLEGE OF
HEALTH, PHYSICAL EDUCATION, AND RECREATION

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DENTON, TEXAS
AUGUST, 1969

Texas Woman's University

Denton, Texas

August 1969

We hereby recommend that the thesis prepared under

our supervision by Judy Kay Thompson

entitled A STUDY OF THE RELATIONSHIP BETWEEN

READING SKILLS AND SELECTED COMPONENTS OF

PHYSICAL FITNESS AMONG FIRST-GRADE CHILDREN

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ACKNOWLEDGMENTS

The writer wishes to express appreciation and gratitude to Doctor Joel Rosentswieg of the College of Health, Physical Education, and Recreation at the Texas Woman's University and director of this thesis for his patient assistance and explicit guidance during this study.

Appreciation is also given to Doctor Bert Lyle, Doctor Virginia Hicks, and Doctor Ruth Tandy of the College of Health, Physical Education and Recreation for their splendid cooperation, valuable suggestions, and services as members of the thesis committee.

Acknowledgment is made to Mr. Sammy Spratt, principal of the Woodrow Wilson Elementary School, Denton, Texas, to Barbara Roden, school counselor, and to the first-grade teachers and their student teachers at Woodrow Wilson Elementary School for their services and cooperation.

Grateful acknowledgment is given to the students who participated in the study and to Elizabeth Byford who served as an assistant.

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CHAPTER I

ORIENTATION TO THE STUDY

Introduction

Physical education can contribute to a vigorous and healthy life. There is little question that physical education can be a very important part of the educational process.

Rabin points out that:

Boys and girls with highly developed motor skills are more accepted in many play activities and frequently enhance their status positions by assuming leadership roles, whereas those inferior in motor skills oftentimes feel the sting of rejection from their peer groups.¹

It may thus be inferred that physical achievement can make a contribution in the areas of socialization and emotional behavior as well as in the more obvious area of organic vigor.

Many people feel that physical education may be related to mental achievement. Humphrey² states that children may be motivated to improve their reading skills through

¹Herbert M. Rabin, "The Relationship of Age, Intelligence, and Sex to Motor Proficiency in Mental Defectives," The American Journal of Mental Deficiency, LXII, (November, 1957), p. 507.

²James H. Humphrey, Child Learning Through Elementary School Physical Education (Dubuque, Iowa: Wm. C. Brown Company, 1965), p. 153.

physical education activities. Cratty¹ implies that motor activities may be a helpful learning modality in general, and the findings of Bibace and Hancock² indicate that low scholastic achievement is related to low perceptual-motor achievement. The literature tends to support the concept of a mind-body inter-relationship more completely with each passing year.

Physical fitness may be defined as the ability to perform a given task, or the possession of the physical qualities to the extent demanded by a task.³ In a study by Arnett which showed a positive relationship between grade-point average and physical fitness tests, the implication was made that greater health and vitality of a student may aid him in achieving his academic potential.⁴ An analysis of the dropouts from U.S. military academies revealed that a disproportionate percentage of the failures were particularly low on components of physical fitness.⁵ In view of these

¹Bryant J. Cratty, "Movement and the Intellect," Speech to Education Majors and to Faculty, School of Education, San Diego, California, (June, 1967), p. 4.

²Roger Bibace and Karen Hancock, "Relationships Between Perceptual and Conceptual Cognitive Processes," Journal of Learning Disabilities, II, (January, 1969), p. 24.

³Robert N. Singer, Motor Learning and Human Performance (New York: The MacMillan Company, 1968), p. 107.

⁴Chapelle Arnett, "Interrelationships Between Selected Physical Variables and Academic Achievement of College Women," The Research Quarterly, XXXIX (May, 1968), p. 250.

⁵Joseph B. Oxendine, Psychology of Motor Learning (New York: Appleton-Century-Crofts, 1968), p. 272.

studies it was hypothesized that if a student is physically fit, he may have more desire and/or energy to improve academically.

Reading skills may play an important part in the life of an individual. A poor reader may be perplexed by many problems in addition to the purely intellectual. A substantial number of poor readers have been found to be generally clumsy.¹ Harris noted that poor readers are below average in athletic skill, awkward in walking and running, and make poorly formed letters and numbers in writing.²

The development of an adequate reading vocabulary and basic reading skills are considered to be requisite to further education and to advancement in society. A good vocabulary will contribute greatly to a student's success in college and afterwards, whereas a weak vocabulary is believed to foreshadow failure.³ Robinson points out that, "reading readiness can be developed more rapidly through proper instruction than by merely waiting for growth."⁴ The importance of teaching and improving reading skills through all areas of the curriculum has been evidenced by the emphasis on evaluation of

¹Albert J. Harris, How to Increase Reading Ability (New York: David McKay Company, 1961), p. 243.

²Ibid.

³William Templeman, "Does Vocabulary Building Have Value?" College English, XVI (March, 1955), p. 368.

⁴Helen M. Robinson, "Factors Which Affect Success in Reading," Elementary School Journal, LV (January, 1955), 263-9.

teaching methods with respect to reading comprehension and reading vocabulary. At least one authority believes that the better a person can read the better he will communicate.¹

The discipline of physical education has long believed that it offers more than just physical activity; yet more information is needed to support this concept. Physical educators believe that they are able to provide experiences which will be of future value to all students.² One way to support the value of physical education to general education would be to offer further evidence that people who participate and become skilled in physical education activities are utilizing or developing an intelligence for skills that may be related to other skills. The present investigation is specifically interested in relating physical fitness components with reading skills. If a significant relationship exists between physical fitness, which must be considered an important aspect of physical education, and the ability to read, both of these components should be presented in educational institutions in ways that compliment one another, and the importance of this relationship in the public school curricula should be recognized.

¹Edgar Dale, "Problems of Vocabulary in Reading," Educational Research Bulletin, XXXV (May, 1956), p. 123.

²Anne Schley Duggan, A Comparative Study of Undergraduate Women Majors and Non-Majors in Physical Education With Respect to Certain Personal Traits (New York: Bureau of Publications, Teachers College, Columbia University, 1936), p. 2.

Statement of the Problem

The present investigation entailed the administration of reliable and valid tests to eighty-eight children enrolled in the first grade of the Woodrow-Wilson Elementary School in Denton, Texas, during the fall semester of the academic year of 1968-1969, in order to determine the relationship between reading skills and selected components of physical fitness.

Definitions and/or Explanations of Terms

For the purpose of clarification the investigator established the following definitions and/or explanations of terms for use in this study:

A. Reading Skill: The investigator accepted the definition of Good¹ who stated that:

A reading skill is an ability that is essential to successful performance in reading, such as word recognition, comprehension, organization or remembrance.

In the present study, reading skills refer to the total of six entities of reading as measured by the 1965 Metropolitan Readiness Tests. These entities are word meaning, listening, matching, alphabet, numbers, and copying.

B. Physical Fitness: In general, physical fitness is:

the development and maintenance of a strong physique and soundly functioning organs, to the end that the individual realizes his capacity for physical activity,

¹Carter V. Good, Dictionary of Education (New York, Toronto, London: McGraw-Hill Book Company, 1959), p. 503.

unhampered by physical drains or by a body lacking in strength and vitality.¹

Specifically for this study, strength, endurance, power, and speed were the selected components of physical fitness, and were measured by the Elementary School Physical Fitness Test.² Bench push-ups, curl-ups, and squat jumps were used to measure specific aspects of strength and endurance, the standing broad jump was used to measure specific aspects of power, and the thirty-yard dash was used to measure specific aspects of speed.

C. Skill: The investigator accepted the definition of Good³ who stated that:

A skill is anything that the individual has learned to do with ease and precision; may be either a physical or mental performance.

D. Skilled Reader: In this study, a skilled reader was designated as a student whose standing was at or above the upper thirty percentile of the first-grade children at Woodrow Wilson Elementary School, Denton, Texas, as determined by his score on the Metropolitan Readiness Tests.⁴

¹H. Harrison Clarke and David H. Clarke, Developmental and Adapted Physical Education (Englewood Cliffs, New Jersey: Prentice-Hall, Inc., 1963), p. 24.

²Glenn Kirchner, Physical Education for Elementary School Children (Dubuque, Iowa: Wm. C. Brown Company, 1966), pp. 583-4.

³Good, Dictionary of Education, p. 503.

⁴Gertrude Hildreth, Nellie Griffith, and Mary McGauvran, Metropolitan Readiness Tests, (New York: Harcourt, Brace, and World, Inc., 1965).

E. Unskilled Reader: In this study, an unskilled reader was designated as a student whose standing was at or below the lower thirty percentile of the first-grade children at Woodrow-Wilson Elementary School, Denton, Texas, as determined by his score on the Metropolitan Readiness Tests.

Purposes of the Study

The general purpose of the study was to determine the relationship between reading skills, as measured by the Metropolitan Readiness Tests, and selected components of physical fitness, as measured by the Elementary School Physical Fitness Test, of eighty-eight children enrolled in the Woodrow Wilson Elementary School, Denton, Texas, during the fall semester of the academic year of 1968-1969.

Specifically, the investigator attempted to answer the following questions:

- A. Is there a significant relationship between reading readiness skills and selected components of physical fitness of first-grade children?
- B. Does a skilled reader have more or less ability in any of the selected aspects of fitness than does an unskilled reader?

Delimitations of the Study

The present study was subject to the following limitations:

- A. The subjects were eighty-eight children enrolled in grade one of the Woodrow-Wilson Elementary School in Denton, Texas,

during the fall semester of the academic year of 1968-1969.

B. The physical fitness tests were administered by one physical education specialist with the aid of one student teacher who had a major sequence in physical education, and two student teachers who had major sequences in elementary education.

C. The reading skills were measured by the Metropolitan Readiness Tests. With respect to validity,

the total score on the Metropolitan correlates very highly [.80] with the total score on [the] Murphy-Durrell [Reading Readiness Analysis], indicating that the two tests yield results in close agreement as to the relative readiness ranking of pupils.¹

The reliability of the total score is "above .90."² The Metropolitan Readiness Tests were administered by the school counselor.

D. The components of physical fitness were measured by the Elementary School Physical Fitness Test. With respect to validity, "the Elementary School Physical Fitness Test . . . correlates .811 with the AAHPER Youth Fitness Test."³ The reliability for each item in the test, as correlated with ages six to twelve, is as follows:

¹Hildreth, Metropolitan Readiness Tests, p. 12.

²Ibid., p. 14.

³Kirchner, Physical Education for Elementary School, p. 647.

Standing Broad Jump	.764
Bench Push-up	.889
Curl-up	.948
Squat Jump	.930
30-Yard Dash	.840 ¹

Summary

There is substantial evidence to indicate that physical education can be very important to living in today's society. Reading skill has long been recognized in our society as a vital component to an individual's personal development. If a significant relationship exists between physical fitness, which must be considered an important aspect of physical education, and the ability to read, the two should be presented in educational institutions in ways that compliment one another. The importance of this relationship in the public school curricula should be recognized.

The general purpose of this study was to determine the relationship between reading skills and selected components of physical fitness of eighty-eight children enrolled in grade one of the Woodrow Wilson Elementary School, Denton, Texas, during the fall semester of the academic year of 1968-1969. Delimitations of the terms used in the study were presented in order to facilitate understanding of the investigation. Delimitations of the study included restrictions of the sample measured, limitations in the administration of the tests

¹Ibid.

and the reading and physical fitness tests used.

In chapter two, the investigator will review literature that is related to the present study.

CHAPTER II

A SURVEY OF SELECTED RELATED LITERATURE

A thorough investigation of previous studies and related literature revealed no previous studies which duplicated the present investigation. The studies presented herein are confined primarily to research which is directly related to some aspect of physical fitness as compared to some mental and/or intellectual aspect of performance. The related literature is discussed under the following major headings: (1) Physical Fitness and Intellectual Abilities; (2) Motor Skills and Academic Achievement; and (3) Reading and Motor Skills.

Physical Fitness and Intellectual Abilities

In 1953, Weber¹ published a study that was concerned with the relationship between physical fitness, success in college, and personality. The subjects utilized in the study were 246 male freshmen students who were enrolled at the State University of Iowa.

¹Robert John Weber, "Relationship of Physical Fitness to Success in College and to Personality," Research Quarterly, XXIV (December, 1953), pp. 471-474.

The Physical Efficiency Profile, as given by the Department of Physical Education for Men, State University of Iowa, was used to determine the physical fitness of each subject. This instrument consisted of four activities: sit-ups for two minutes, pull-ups, 100-yard pick-a-back run, and 300-yard shuttle run.

The academic success of each subject was based upon his grade-point average during the freshman year and the results of written entrance examinations. The Minnesota Multiphasic Personality Inventory was used to measure personality.

The results of the study by Weber indicated that there was a significant relationship between physical fitness scores and grade-point averages for the year. There was a significant relationship also between composite scores of the entrance examinations and grade-point averages for the year. Weber found a multiple correlation of .666 between physical fitness scores and the composite test scores of the entrance examinations and the grade-point averages for the year. No significant relationship between the scores of the tests of achievement measured in the entrance examinations and the physical fitness scores were noted. There was no significant relationship between the physical fitness scores and the nine measures of personality of the Minnesota Multiphasic Personality Inventory. Weber found a negative coefficient of correlation $[-.04]$ between the physical fitness scores and the total Minnesota Multiphasic Personality Inventory.

Shaffer,¹ in 1959, completed an investigation concerning the variables affecting Kraus-Weber failures among junior high school girls. The Kraus-Weber Test, which was developed as a clinical tool to measure the minimum muscular fitness necessary to maintain normal health, is a battery of six subtests: two for the abdominal muscles, two for the back muscles, one for the psoas muscles, and one for flexibility of the back and hamstring muscles. Failure in any one of the subtests results in failure of the entire test.

Shaffer found that a positive correlation existed between the Intelligence Quotient and Kraus-Weber failures. As intelligence increased, the Kraus-Weber failures generally decreased. It was concluded that intelligence had a significant effect on success or failure of the test.

In 1963, Hart and Shay² completed a study of the relationship between physical fitness and academic success. The purpose of the study was to determine whether there was a relationship between academic achievement and the level of fitness of sophomore women at Springfield College. The study was limited to sixty sophomore women from Springfield College

¹Gertrude Krauss Shaffer, "Variables Affecting Kraus-Weber Failures Among Junior High School Girls," Research Quarterly, XXX (March, 1959), pp. 75-86.

²Marcia Hart and Clayton Shay, "Relationship Between Physical Fitness and Academic Success," Research Quarterly, XXXV (October, 1964), pp. 443-445.

who were tested at the beginning of their freshman year and retested during the spring semester of the same year. All students were enrolled in the same courses. Academic aptitude was determined by scores made on the mathematical and verbal parts of the Scholastic Aptitude Test, which was a part of the College Entrance Examination Board. Academic achievement was determined by the cumulative academic index. The personnel of the Springfield College Physical Education Tests and Measurements Laboratory collected the Physical Fitness Index scores.

Hart and Shay revealed that the correlations between the Scholastic Aptitude Test verbal scores and the Physical Fitness Index were not significant, and neither were the correlations between the Scholastic Aptitude mathematical scores and the Physical Fitness Index. When the effect of the verbal scores was removed, the correlation between academic achievement and physical fitness became significant. It was concluded that the correlation between physical fitness and academic success is "high enough to be considered as a necessary factor for the improvement of the academic index in the general education of the college student."¹

Gutin,² in 1966, conducted a study concerning the

¹Ibid., p. 445.

²Bernard Gutin, "Effect of Increase in Physical Fitness on Mental Ability Following Physical and Mental Stress," Research Quarterly, XXXVII (May, 1966), pp. 211-220.

effect of an increase in physical fitness upon the ability of college men to perform complex mental tasks after a period of mental and physical exertion. The complex mental tasks consisted of four tests of the Employee Aptitude Survey: Verbal Comprehension, Visual Pursuit, Verbal Reasoning, and Symbolic Reasoning. The increase in the group level of fitness, which was developed in a college course meeting twice weekly for twelve weeks, did not affect positively the ability of that group to perform complex mental tasks following stress. Gutin concluded that there did seem to be a moderate but significant relationship between degree of improvement in fitness and degree of improvement in mental task ability following stress.

Lovelace,¹ in 1967, completed a study of the relationship between physical fitness, reading achievement, perceptual-motor skills and participation in a concentrated unit of selected physical activities of fifty children enrolled in the second and third grades. The elementary school children were equated and then divided into a control group and an experimental group upon the bases of pretest administrations of the Glover Physical Fitness Test, Kephart's Perceptual

¹Myreen Lovelace, "A Study of the Relationship Between Physical Fitness, Reading Achievement, and Perceptual-Motor Skills and Participation in a Concentrated Unit of Selected Physical Activities of Fifty Second and Third Grade Children," (Unpublished Master's thesis, the Texas Woman's University, 1967).

Motor Survey Rating Scale, the California Reading Test, and upon grade and sex. The experimental group [N=25] participated in a thirty-one day unit of selected physical activities. The control group [N=25] participated in a thirty-one day unit of free-play activities.

Lovelace concluded that there was no significant development in physical fitness, as measured by the Glover Physical Fitness test, made by one group over the other and that there was no significant development in reading achievement, as measured by the California Reading Test, of one group over the other. It was noted that a significant development was attained in perceptual-motor skills, as measured by selected items from Kephart's Perceptual Motor Survey Rating Scale, by second-grade children [N=12] who participated in a concentrated unit of selected physical activities as compared to second-grade children in the free-play activities [N=12]. A significant relationship in physical fitness and reading achievement was attained for second-grade boys, when considered independently [N=6], in the experimental group, but not for the girls [N=6]. Lovelace found that no significant relationship in reading achievement and perceptual-motor skills was attained by children who participated in a concentrated unit of selected physical activities, as compared to children who participated in a program of free-play activities. A significant correlation was obtained, however, between physical fitness and perceptual-motor skills for the

girls [N=6] in the third-grade control group and for the total third-grade control group [N=13], but not for the boys, when considered independently in the same control group [N=7].

Motor Skills and Academic Achievement

Gleason and Klausmeier,¹ in 1958, conducted a study which was concerned with the relationship between variability in physical growth and academic achievement among third and fifth-grade children. Grip strength was one measure taken. It was concluded that uneven growth in height, weight, strength of grip, and carpal development was generally accompanied by uneven and low achievement in reading, arithmetic and language among third [N=26] and fifth-grade [N=27] girls, by low achievement among third-grade boys [N=28], but not by variable or low achievement among fifth-grade boys [N=39].

In 1968, Coston² completed a study of the relationship between perceptual-motor skills and academic achievement. The subjects were sixty fourth-grade children who were enrolled

¹Gerald T. Gleason and Herbert J. Klausmeier, "The Relationship Between Variability in Physical Growth and Academic Achievement Among Third-and Fifth-Grade Children," Journal of Educational Research, LI (March, 1958), 521-27.

²Betty Coston, "A Study of the Relationship Between Perceptual-Motor Skills and Academic Achievement in Fourth-Grade Children" (Unpublished Doctoral Dissertation, the Texas Woman's University, 1968).

in the elementary schools of Denton, Texas, during the academic year of 1967-1968. The Wide Range Achievement Test and the Kuhlman-Anderson Test of intelligence were used to establish levels of academic achievement. The Purdue Perceptual-Motor Survey and the Lincoln-Oseretsky Motor Development Scale were used to measure perceptual-motor skills. Appropriate t-tests were used to determine the significance of the difference between attained coefficients of correlation.

Coston concluded that when achievers and underachievers were considered separately, the relationship between perceptual-motor skills and academic achievement was too low to be of value. When achievers and underachievers were combined, the relationships were statistically significant, but too low to be of predictive value. The performance of perceptual-motor skills by the achievers were significantly better than performance of perceptual-motor skills by the underachievers.

Reading and Motor Skills

In 1948, Rarick and McKee¹ conducted a study of twenty third-grade children who exhibited extreme levels of achievement on tests of motor proficiency. The tests utilized in

¹G. Lawrence Rarick and Robert McKee, "A Study of Twenty Third-Grade Children Exhibiting Extreme Levels of Achievement on Tests of Motor Proficiency," Research Quarterly, XX (May, 1949), pp. 142-152.

their study were: 40-yard dash, standing broad jump, throw for distance, striking (pendulum controlled), catching (hoop controlled), modified side stepping, and balance (stick-test lengthwise). The tests were given to 172 third-grade children. The subjects chosen for the study were five boys and five girls who had the highest total standard scores and the five boys and five girls who had the lowest total standard scores. One of the findings in the study by Rarick and McKee indicated that more children in the superior performance group possessed higher intelligence and received better grades in reading, writing, and comprehension than did the children in the inferior performance group.

In 1968, McCormick, et. al.,¹ completed a study that was concerned with improvement in reading achievement through perceptual-motor training. The subjects utilized in the study were forty-two underachieving first-grade children who were enrolled in the Meadows Elementary School, District 70, Lisle, Illinois. The subjects, who were divided into three groups of seven boys and seven girls to each group, were matched for age and Intelligence Quotient. The forty-two children were then administered the Lee-Clark Reading Test. The scores on this initial test yielded no significant

¹Clarence McCormick, Janice Schnobrich, S. Willard Footlik, and Betty Poetker, "Improvement in Reading Achievement Through Perceptual-Motor Training," Research Quarterly, XXXIX (October, 1968), pp. 627-633.

differences among the three groups.

Before beginning the school day one group received perceptual-motor training for forty-five minute periods twice a week for seven weeks. The exercises began with cross-lateral crawling and proceeded through walking, balancing, jumping rope, and progressively more difficult tasks. Through the selected exercises an attempt was made to increase each child's attention span. Elements were added to each exercise, thus increasing their dimensional complexity in number, space, and time.

A second group was formed to control the possible effects of extra activity and extra attention received by the experimental group. The subjects in this group received standard physical education training twice a week for a forty-five minute period prior to beginning the regular school day. Their activities consisted of: Squirrels and Trees, Hokey Pokey, simple dodgeball, Uncle Sam, soccer dodgeball, tumbling, jump rope, throwing and catching skills, locomotor skills to rhythm, and relays. The third group formed the control group. They received no extra training, activity, or attention.

After seven weeks, the Lee-Clark Reading Test was readministered. The experimental group showed statistically significant gains while the other two groups did not. The conclusion was drawn that perceptual-motor training could be a useful addition to the regular curriculum, contributing

to total education by increasing the child's capacity for academic achievement.

In 1968, Plack¹ completed a study of the relationship between achievement in reading and achievement in selected motor skills in elementary school children. The subjects consisted of 172 children from grades one, three, and five who were enrolled in two elementary schools in a selected Minnesota school system. Reading achievement was determined by the Iowa Tests of Basic Skills and achievement in selected motor skills was determined by the Johnson motor achievement battery. Relationships between reading and motor achievement variables were computed by applying the Pearson product-moment coefficient of correlation. The subjects were divided into three levels according to their reading achievement. Scheffe's method of comparing pairs of means from a two-way analysis of variance table was used to tell if the achievement differences in the motor skills tests were significant.

Plack concluded that there were highly significant correlations between achievement in reading and the throw and catch test and achievement in reading and the zig-zag run test, but that there was little or no consistent relationship between achievement in reading and the kicking test or the

¹Jeralyn J. Plack, "Relationship Between Achievement in Reading and Achievement in Selected Motor Skills in Elementary School Children," Research Quarterly, XXXIX (December, 1968), pp. 1063-1068.

jump and reach test. Plack noted that there were significant differences between the mean motor skills scores among high, middle, and low reading achievement groups.

Summary

Chapter two surveyed a number of studies that were related to the present investigation. These studies were categorized into three groups: those concerned with physical fitness and intellectual abilities, those concerned with motor skills and academic achievement, and those concerned with reading and motor skills.

The studies by Weber, Shaffer, Hart and Shay, Gutin, and Lovelace all were concerned with the relationship of physical fitness to some intellectual aspect. Weber disclosed that a significant relationship existed between physical fitness and grade-point averages of 246 male freshman students. Shaffer found a positive relationship between the Intelligence Quotient and failure on the Kraus-Weber Test among junior high school girls. The study by Hart and Shay indicated that there was a significant relationship between academic achievement and physical fitness of sixty college women. Gutin reported a significant relationship between the degree of improvement in physical fitness and the degree of improvement in a specific mental task following stress in college men. Lovelace found conflicting relationships between physical fitness and reading achievement.

Gleason and Klausmeier, and Coston conducted studies that were concerned with motor skills and academic achievement. Gleason and Klausmeier found that uneven growth in height, weight, strength of grip, and carpal development was generally accompanied by uneven and low achievement in reading, arithmetic, and language of third and fifth-grade girls, and by low achievement among third-grade boys, but not by variable or low achievement among fifth-grade boys. Coston concluded that performances in perceptual-motor skills by academic achievers were significantly better than performances in perceptual-motor skills by academic under-achievers among sixty fourth-grade children.

Studies by Rarick and McKee, McCormick, and Plack were concerned with relationships between reading and motor skills other than physical fitness. Rarick and McKee indicated that third-grade children with superior motor proficiency possessed higher intelligence and received better grades in reading, writing, and comprehension than did children of inferior motor proficiency. McCormick, in a study of 142 underachieving first-grade children, concluded that perceptual-motor training could improve academic achievement. Plack revealed that highly significant correlations existed between achievement in reading and specific motor skills.

In chapter three, the investigator will discuss procedures followed in the development of the study.

CHAPTER III

PROCEDURES FOR THE DEVELOPMENT OF THE STUDY

The present study was developed as a result of the investigator's interest in the relationship between physical fitness and reading achievement. Eighty-eight children enrolled in grade one of the Woodrow Wilson Elementary School, in Denton, Texas, were the subjects involved in the study that was conducted during the fall semester of the academic year of 1968-1969. The procedures followed in the development of the study are presented in this chapter. These procedures are described in detail under the following major headings: (1) sources of data; (2) procedures; and (3) treatment of data.

Sources of Data

The investigator collected data from both documentary and human sources. The documentary sources included: books, periodicals, pamphlets, bulletins, theses, dissertations, and other published and unpublished reports of research pertaining to various aspects of this study. The human sources were selected authorities in the areas encompassed by the study, faculty members in the College of Health, Physical

Education and Recreation of the Texas Woman's University, Denton, Texas, public school administrators, teachers, counselors, and first-grade students enrolled in the Woodrow-Wilson Elementary School, Denton, Texas.

Procedures

Before undertaking the present investigation, certain preliminary procedures were adhered to. Information from the available documentary and human sources of data directly related to the present investigation was surveyed, studied, and assimilated. Permission to conduct the present study was secured from the principal of Woodrow Wilson Elementary School, Denton, Texas. The tentative outline for the study was presented at a graduate seminar at the Texas Woman's University, Denton, Texas.

Criteria were established for the selection of subjects and the subjects were then selected upon the basis of the criteria established. One criterion was that the subjects must be students who were enrolled in grade one. This grade was selected rather than a higher grade because of the probability that younger children feel fewer social and cultural influences than older children and, thus, their abilities in reading and in physical fitness would not be as greatly affected by external circumstances. The Woodrow-Wilson Elementary School, Denton, Texas, was selected because of the interest and cooperation of the principal in the present

investigation. The Metropolitan Readiness Test was selected because of its adequate validity and reliability, and because the Denton Independent School District administered this test to the children who were enrolled in grade one at the selected elementary school.

The subjects were available for physical fitness testing during their regular physical education period each afternoon. The students participated in the testing program and their normal physical education activities in their regular school clothing. They were not divided according to sex, but were tested in alphabetical order. They were encouraged to do their best, but no extrinsic awards were offered for outstanding performances.

Criteria were established for the selection of the testing instruments. The criteria established for the selection of the testing instruments were:

A. Validity: A test is said to be valid when it measures what it is supposed to measure.¹

B. Reliability: A test is said to be reliable if it is dependable and if similar results will occur when the test is repeated by the same group under the same conditions.²

¹M. Gladys Scott and Esther French, Measurement and Evaluation in Physical Education (Dubuque, Iowa: Wm. C. Brown Company, 1959), p. 19.

²Harold M. Barrow and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1964), p. 42.

C. Objectivity: A test is said to be objective if the instructor does not influence the test results.¹

D. Administrative considerations: A test is said to be administratively feasible if inexpensive equipment can be made available, if preliminary arrangements before each administration of the tests do not become too time-consuming, and when appropriate norms are available.²

Upon the bases of these criteria, The Elementary School Physical Fitness Test was selected for this study. The Elementary School Physical Fitness Test had the highest validity, reliability, and objectivity, and the most convenient administrative considerations of all the possible tests of physical fitness that could have been used for grade one of the elementary school.

Qualified persons were selected to assist the investigator in the administration of the testing instruments. Those persons included one student teacher who had a major sequence in physical education and two student teachers who had major sequences in elementary education. Those persons who aided in the administration of the physical fitness tests received instruction and practice prior to the actual testing.

¹Ibid., p. 45.

²Ibid., pp. 49-50.

Before administering the Elementary School Physical Fitness Test, each test was demonstrated to the subjects by the investigator and each test was practiced by the subjects during one physical education period. The complete physical fitness test was administered twice to each subject, all scores were recorded, and the better score of each subject for each item was retained for use in the study.

Treatment of Data

Forms were developed for recording the data. After collecting the data they were tabulated and treated statistically. The mean, standard deviation, and mean difference for each group, upon each of the variables to be analyzed was computed. The analysis of variance technique was used to differentiate between skilled and unskilled readers in their performance on each of the physical fitness tests. The Pearson Product-Moment Coefficient of Correlation was used to determine the relationship between reading ability and the selected components of physical fitness.

The data were organized and presented in appropriate tables. In the preparation of the final report, the findings were summarized, the data were interpreted, a conclusion to the study was drawn, and implications of the findings were formulated. A written report of the study, including an appendix and a classified bibliography was prepared and recommendations for further studies were made. The findings

and interpretations of this investigation are presented in chapter four.

Summary

Chapter three presented sources of data, procedures, and treatment of data. The procedures used in the development of the present study included the securing of permission for the study, the presentation of the tentative outline at a graduate seminar, the establishment of criteria for the selection of the subjects and the testing instruments to be used in the study, and the selection of qualified persons to help administer the physical fitness tests.

Organized procedures were followed in the selection of subjects. The scores made on both the reading and physical fitness tests were examined and a percentile ranking for each subject was determined. The complete physical fitness test was administered twice to each subject and the better scores were utilized for the study.

The data were treated statistically. The mean, standard deviation, and mean difference were calculated. Analysis of variance and the Pearson Product-Moment Coefficient of Correlation techniques were utilized for the study. The data were organized and presented in appropriate tables along with the narrative in the final report.

The findings and interpretations of this investigation are presented in chapter four.

CHAPTER IV

PRESENTATION, ANALYSIS, AND INTERPRETATION OF THE DATA

The present investigation entailed the administration of reliable and valid tests in order to determine the relationship between reading skills and selected components of physical fitness for eighty-eight children enrolled in the first grade of the Woodrow Wilson Elementary School in Denton, Texas, during the fall semester of the academic year of 1968-1969.

The data obtained through the administration of the physical fitness test and the reading achievement test were subjected to specific statistical treatment. The mean, standard deviation, and mean difference for the upper and lower thirty percentile of each reading and physical fitness group were computed. An analysis of variance was used to differentiate between skilled and unskilled readers in their performances on each of the five physical fitness tests. Finally, the Pearson Product-Moment Coefficient of Correlation technique was used to determine the relationship between reading ability and the selected components of physical fitness.

Table one, page 31, provides the range, mean, and standard deviation for the total scores made by boys and girls upon the Metropolitan Readiness Tests.

TABLE 1.--Comparison of Scores made by Boys and Girls upon the Metropolitan Readiness Tests^a

Subjects	N	R	$\bar{X}$	S
Boys	47	L-27 H-89	60.66	30.75
Girls	41	L-26 H-87	65.25	41.90
Total	88	L-26 H-89	63.00	38.25

^aAll statistics are recorded in standard units.

A study of table one reveals that the mean score of the boys' group was 60.66, the mean score of the girls' group was 65.25, and the mean score for the combined groups was 63.00. The results are typical for the first grade in that the girls scored higher than the boys in reading readiness. The standard deviations of 30.75 (boys) and 41.90 (girls) indicate that both sex groups were variable, but that the boys were more closely clustered around the mean than were the girls.

Norms for the Elementary School Physical Fitness Test,¹ which was utilized in the present investigation, were completed in 1964. These norms were established with the aid

¹Kirchner, Physical Education for Elementary School, pp. 596-623.

of approximately thirty thousand children representing rural and urban populations from several states. Each actual test score was converted into standard units in order to give an over-all estimate of each child's level of fitness. For example, a six-year-old boy who completed twelve curl-ups received fifty-three points for curl-ups. The total points for each of the five physical fitness tests represents the child's level of fitness. For this study all the boys and girls, who were used as the subjects, ranged in age from six to seven years, and their individual points were figured according to age. However, in computing the statistics, all the boys were grouped together, and all the girls were grouped together, without regards to age.

Table two, page 33, provides the range, mean, standard deviation, and mean difference for the high and low reading readiness groups upon each of the physical fitness variables measured for the boys who were subjects of the study.

Table two reveals that the means, given in standard units, of the high reading ability groups were above the means of the low reading ability groups with respect to all of the selected tests of fitness for the boys, with the exception of the thirty-yard dash. The greatest difference between the means for the high and low reading groups was upon the performance of the standing broad jump. The high reading ability group had a mean difference which is 8.00

TABLE 2.--Range, Mean, Standard Deviation, and Mean Difference for each Physical Fitness Component for the Boys^a

Fitness Component	High Reading Ability Group				Low Reading Ability Group				$\bar{X}_D^b$
	N	R	$\bar{X}$	S	N	R	$\bar{X}$	S	
SBJ ^c	18	L-40 H-61	53.50	9.42	8	L-35 H-66	45.50	14.62	8.00
BPU ^d	18	L-41 H-74	52.72	12.43	8	L-43 H-56	49.00	4.49	3.72
CU ^e	18	L-34 H-75	51.17	15.11	8	L-40 H-58	48.13	8.49	3.04
SJ ^f	18	L-30 H-66	49.61	13.31	8	L-33 H-59	46.63	11.98	2.98
DASH ^g	18	L-37 H-63	47.44	12.43	8	L-33 H-65	48.38	8.72	.94

^aAll numbers are in standard units.^bMean Difference^cStanding broad jump^dBench push-ups^eCurl-ups^fSquat jumps^g30-yard dash

points above the mean score of the low reading ability group with respect to the standing broad jump. The smallest difference between the means of the high and low reading groups was upon the performance of the thirty-yard dash. The low reading ability group shows a mean difference which is only .94 points above the mean score of the high reading ability group with

respect to the thirty-yard dash. The standard deviation of 15.11 for the curl-up test indicates that the scores for this test were more scattered than were the scores for any of the other selected tests of fitness.

Table three, page 35, provides the range, mean, standard deviation, and mean difference for the high and low reading readiness groups upon each of the physical fitness variables measured for the girls who were subjects of the study. The large difference in the numbers between the two groups should be noted. The relatively few students who scored in the lower thirty centile of the standardized norms on the Metropolitan Readiness Test is believed due to the conducive family environment of the students attending the Woodrow Wilson School.

Table three indicates that there was a greater mean difference for the girls' high and low reading ability groups in the push-ups and the curl-ups than for the standing broad jump, the squat jump, and the thirty-yard dash. The high reading ability group scored higher in the bench push-ups and the curl-ups than the low reading ability group. The low reading ability group scored higher on the other three tests, although the differences between the means were not as great as those favoring the high reading ability group. The squat jumps showed the greatest difference between the means in which the low group excelled. The difference was 2.41 points. The high standard deviation, with respect to

TABLE 3.--Range, Mean, Standard Deviation, and Mean Difference for each Physical Fitness Component for the Girls^a

Fitness Component	High Reading Ability Group				Low Reading Ability Group				$\bar{X}D^b$
	N	R	$\bar{X}$	S	N	R	$\bar{X}$	S	
SBJ ^c	22	L-27 H-60	48.32	11.14	4	L-37 H-56	49.75	8.08	1.43
BFU ^d	22	L-38 H-61	52.05	10.06	4	L-39 H-54	48.25	6.50	3.80
CU ^e	22	L-0 H-68	47.18	23.50	4	L-0 H-62	42.25	23.72	4.93
SJ ^f	22	L-27 H-62	52.09	10.52	4	L-50 H-57	54.50	4.03	2.41
DASH ^g	22	L-33 H-54	43.77	12.08	4	L-36 H-52	45.50	9.00	1.73

^aAll numbers are in standard units.^bMean difference^cStanding broad jump^dBench push-ups^eCurl-ups^fSquat jumps^g30-yard dash

performances upon the curl-ups, may be due to the fact that some of the subjects were unable to perform any curl-ups, and, thus, did not receive any points. This result is similar to that of the boys.

The analysis of variance technique was used to determine whether the performance differences for subjects who are in the upper and lower thirty percentiles in reading skill, as measured by the Metropolitan Readiness Test, were significant for each of the five selected physical fitness tests. An F ratio of 7.82 was necessary to be significant at the .01 level of significance for all of the boys' physical fitness tests.

Table four presents a summary for the analysis of variance with respect to scores upon the boys' standing broad jump.

TABLE 4.--Summary Table for the Analysis of Variance of the Boys' Standing Broad Jump Scores

Source	df	SS	ms	F	p
Between reading levels	1	179.59	179.59	3.08	n.s.
Within reading levels	24	1400.44	58.35		
Total	25	1580.04			

Table four illustrates an F ratio of 3.08. It can be stated, therefore, that there is no significant difference between boys who are in the upper thirty percentile of reading skill and boys who are in the lower thirty percentile of reading skill with respect to the standing broad jump.

Table five presents a summary for the analysis of

variance with respect to scores upon the boys' bench push-ups.

TABLE 5.--Summary Table for the Analysis of Variance of the Boys' Bench Push-up Scores

Source	df	SS	ms	F	p
Between reading levels	1	81.98	81.98	1.31	n.s.
Within reading levels	24	1502.49	62.60		
Total	25	1584.46			

Table five depicts an F ratio of 1.31 that indicates that there is no significant difference between boys who are in the upper thirty percentile of reading skill and boys who are in the lower thirty percentile of reading skill with respect to the bench push-ups.

Table six presents a summary for the analysis of variance with respect to scores upon the boys' curl-ups.

TABLE 6.--Summary Table for the Analysis of Variance of the Boys' Curl-up Scores

Source	df	SS	ms	F	p
Between reading levels	1	5.09	5.09	0.05	n.s.
Within reading levels	24	2287.88	95.33		
Total	25	2292.96			

Table six indicates that there is no significant

difference between boys who are in the upper thirty percentile of reading skill and boys who are in the lower thirty percentile of reading skill with respect to the curl-ups. The F ratio was 0.05.

Table seven presents a summary for the analysis of variance with respect to scores upon the boys' squat jumps.

TABLE 7.--Summary Table for the Analysis of Variance of the Boys' Squat Jump Scores

Source	df	SS	ms	F	p
Between reading levels	1	3.00	3.00	0.03	n.s.
Within reading levels	24	2585.15	107.71		
Total	25	2588.15			

Table seven, which illustrates an F ratio of 0.03, reveals that there is no significant difference between boys who are in the upper thirty percentile of reading skill and boys who are in the lower thirty percentile of reading skill with respect to the squat jumps.

Table eight presents a summary for the analysis of variance with respect to scores upon the boys' thirty-yard dash.

Table eight depicts an F ratio of 0.19. This ratio indicates that there is no significant difference between boys who are in the upper thirty percentile of reading skill

TABLE 8.--Summary Table for the Analysis of Variance of the Boys' 30-Yard Dash Scores

Source	df	SS	ms	F	p
Between reading levels	1	10.26	10.26	0.19	n.s.
Within reading levels	24	1287.28	53.64		
Total	25	1297.54			

and boys who are in the lower thirty percentile of reading skill with respect to the thirty-yard dash.

Tables nine through thirteen are summary tables for the analysis of variance of physical fitness scores for the girls' group. Table nine presents a summary for the analysis of variance with respect to scores upon the girls' standing broad jump. An F ratio of 7.72 for significance to be found at the .01 level of confidence was necessary because of the difference in the number of female subjects as compared to the number of male subjects.

TABLE 9.--Summary Table for the Analysis of Variance of the Girls' Standing Broad Jump Scores

Source	df	SS	ms	F	p
Between reading levels	1	9.08	9.08	0.17	n.s.
Within reading levels	26	1355.03	52.12		
Total	27	1364.11			

Table nine illustrates an F ratio of 0.17. That fact that there is no significant difference between girls who are in the upper thirty percentile of reading skill and girls who are in the lower thirty percentile of reading skill with respect to the standing broad jump is presented.

Table ten presents a summary for the analysis of variance with respect to scores upon the girls' bench push-ups.

TABLE 10.--Summary Table for the Analysis of Variance of the Girls' Bench Push-up Scores

Source	df	SS	ms	F	p
Between reading levels	1	58.50	58.50	1.61	n.s.
Within reading levels	26	944.50	36.33		
Total	27	1003.00			

Table ten indicates an F ratio of 1.61. No significant difference between girls who are in the upper thirty percentile of reading skill and girls who are in the lower thirty percentile of reading skill with respect to the bench push-ups are found.

Table eleven presents a summary for the analysis of variance with respect to scores upon the girls' curl-ups. An F ratio of 8.02 was necessary due to the smaller number of participants on this test.

TABLE 11.--Summary Table for the Analysis of Variance of the Girls' Curl-up Scores

Source	df	SS	ms	F	p
Between reading levels	1	51.27	51.27	0.94	n.s.
Within reading levels	21	1148.47	54.69		
Total	22	1199.74			

Table eleven depicts an F ratio of 0.94. This ratio reveals that there is no significant difference between girls who are in the upper thirty percentile of reading skill and girls who are in the lower thirty percentile of reading skill with respect to the curl-ups.

Table twelve presents a summary for the analysis of variance with respect to scores upon the girls' squat jumps.

TABLE 12.--Summary Table for the Analysis of Variance of the Girls' Squat Jump Scores

Source	df	SS	ms	F	p
Between reading levels	1	41.15	41.15	0.81	n.s.
Within reading levels	26	1320.85	50.80		
Total	27	1362.00			

An F ratio of 7.72 was necessary in order to be significant at the .01 level of significance for this test.

Table twelve indicates an F ratio of 0.81 that may be interpreted as revealing that there is no significant difference between girls who are in the upper thirty percentile of reading skill and girls who are in the lower thirty percentile of reading skill with respect to the squat jumps.

Table thirteen presents a summary for the analysis of variance with respect to scores upon the girls' thirty-yard dash. An F ratio of 7.77 was necessary because of the difference in the number of subjects who participated in the thirty-yard dash.

TABLE 13.--Summary Table for the Analysis of Variance of the Girls' 30-Yard Dash Scores

Source	df	SS	ms	F	p
Between reading levels	1	19.13	19.13	0.39	n.s.
Within reading levels	25	1229.61	49.18		
Total	26	1248.74			

Table thirteen, which illustrates an F ratio of 0.39, reveals that there is no significant difference between girls who are in the upper thirty percentile of reading skill and girls who are in the lower thirty percentile of reading skill

with respect to the thirty-yard dash.

Observation of tables four through thirteen indicates that there was no significant differences at the .01 level of confidence for either boys or girls with respect to any of the selected components of physical fitness. Thus, it may be inferred that a person's readiness to read is not reflected in any measurable way by any of the selected components of physical fitness as measured in this study.

The Pearson Product-Moment coefficient of correlation technique was used to determine the degree of relationship between reading and the selected physical fitness scores. Table fourteen indicates the relationship of reading achievement, as measured by the Metropolitan Readiness Test, to each of the five selected tests of physical fitness. The coefficient

TABLE 14.--Pearson Product-Moment Coefficient of Correlation for Achievement in Reading with Selected Physical Fitness Tests

Source	Boys (N=47)	Girls (N=41)
Standing Broad Jump	.32	-.16
Bench Push-ups	.04	.18
Curl-ups	.15	.13
Squat Jumps	.24	-.07
30-Yard Dash	-.06	-.12
Total	.21	.03

of correlation for the total test was determined by summing the score values for each test, and relating it with the reading test for each individual. No coefficient of correlation was found to be significant.

Table fourteen reveals a positive, but small relationship between the total reading and physical fitness scores for the boys, and a positive, but even smaller, relationship between the total reading and physical fitness scores for the girls. The standing broad jumps, bench push-ups, curl-ups, and squat jumps for boys showed a positive relationship to reading, whereas the thirty-yard dash revealed a negative relationship to reading. The standing broad jumps, squat jumps, and thirty-yard dash for the girls indicated a small negative relationship to reading, whereas the push-ups and curl-ups revealed a positive relationship to reading. None of the relationships were high enough to be considered for predictive purposes.

On the basis of the data presented, it may be assumed that there is almost no relationship between a person's ability to read and the selected components of physical fitness as found in this study of first-grade children. It may, therefore, be stated that any relationship which exists between the ability to read and the selected components of physical fitness as measured in this study, is slight.

Summary

Chapter four presented the findings and interpretations of the data that were obtained. The range, mean, standard deviation, and mean difference for each subject upon each of the variables analyzed were presented in tables and in narrative form. The results of the analysis of variance that were computed for each test were shown in tables, and indicated that there was no significant difference at the .01 level of confidence for either the boys or girls with respect to any of the selected components of physical fitness. Thus, it was inferred that a person's readiness to read is not reflected in any measurable way by any of the selected components of physical fitness.

In addition, the correlation coefficients for achievement in reading with respect to the scores made upon the Elementary School Physical Fitness Test, were presented in tabular form. The results indicated a positive, but small, relationship between the total reading and physical fitness scores for the boys, and an even smaller relationship between the total reading and physical fitness scores for the girls.

Chapter five will present the summary, conclusion to the study, findings, and recommendations for further studies.

CHAPTER V

SUMMARY, CONCLUSION, DISCUSSION OF THE FINDINGS, AND RECOMMENDATIONS FOR FURTHER STUDIES

Summary of the Investigation

The present investigation entailed the administration of reliable and valid tests in order to determine the relationship between reading skills and selected components of physical fitness. The reading skills were measured by the Metropolitan Readiness Tests. The selected components of physical fitness were measured by the Elementary School Physical Fitness Test, which included tests of the standing broad jump, bench push-ups, curl-ups, squat jumps, and the thirty-yard dash.

The present study was undertaken because of an interest in the topic and a belief that if a significant relationship exists between physical fitness, which must be considered an important aspect of physical education and the ability to read, the two should be presented in educational institutions in ways that compliment one another. The importance of such a relationship to the public school curricula should be recognized.

A number of studies that were related to the present investigation were reviewed. Most of the studies reported

either a positive or a significant relationship between some aspect of physical fitness or motor performance and some aspect of reading or academic achievement.

After the administration of the reading and the physical fitness tests, the scores made on both tests were examined. The subjects were classified into two groups: those whose scores were in the upper thirty percentile and those whose scores were in the lower thirty percentile of the Metropolitan Readiness Tests. The data were then treated statistically. The mean, standard deviation, and mean difference were calculated. The analysis of variance technique was used to differentiate between skilled and unskilled readers in their performance on each of the physical fitness tests. In addition, the Pearson Product-Moment Coefficient of Correlation technique was computed in order to determine the relationship between reading ability and the selected components of physical fitness.

Findings of the Study

The general purpose of the study was to determine the relationship between reading skills, as measured by the Metropolitan Readiness Tests, and selected components of physical fitness, as measured by the Elementary School Physical Fitness Test, of eighty-eight children enrolled in the Woodrow Wilson Elementary School, Denton, Texas, during the fall semester of the academic year of 1968-1969.

Specifically, the investigator attempted to answer the following questions:

- A. Is there a significant relationship between reading readiness skills and selected components of physical fitness of first grade children?
- B. Does a skilled reader have more or less skill in any of the selected aspects of fitness than does an unskilled reader?

The findings of this investigation indicate that there was no significant relationship between reading readiness skills and selected components of physical fitness of first grade children. Furthermore, for the subjects who participated in the study, a skilled reader had neither more nor less skill in any of the selected aspects of fitness than did an unskilled reader.

The findings of this study suggest that there is little relationship between a person's ability to read and the selected components of physical fitness. However, this study should not be taken as conclusive evidence that no such relationship exists, since a number of related studies produced results which disclosed considerably greater positive relationships between similar mental and physical factors. This investigation seems to reveal the fact that any relationship which exists between the ability to read and the selected components of physical fitness is probably small.

Conclusion of the Study

As a result of the findings of this investigation, it may be concluded that for first-grade boys and girls, a positive but small relationship exists between the ability to read and the selected components of physical fitness. None of the relationships between reading and the five components of physical fitness measured were significant and, therefore, could not be utilized for predictive purposes.

Limitations of the Study

The present investigation was delimited with respect to the subjects and to the selected components of physical fitness. Most of the eighty-eight subjects who were enrolled in grade one of the Woodrow Wilson Elementary School, Denton, Texas, were children of college professors and other highly educated professional people. Thus, it may be inferred that most of the subjects come from environments that provide exceptional educational advantages and stress educational accomplishments. This would seem to account for the fact that there were considerably more good readers than would be expected in a typical first grade sample; thus, more students were grouped into the upper thirty percentile in reading than were grouped into the lower thirty percentile in reading. It would have been preferable to have the same number of subjects in each group. The administra-

tion of the Elementary School Physical Fitness Test may be considered a limitation because there was little choice in physical fitness tests that were standardized for first-grade children. Specifically, the curl-ups test, which measured the strength and endurance of the trunk flexor muscles, was found to be a limitation because some of the children were unable to perform any of this type of exercise at this stage of their growth and development.

Recommendations for Further Studies

The following suggestions are recommended for further investigation:

- A. The relationship between reading ability and selected components of physical fitness using a larger sample, especially one that more truly represents a normal population.
- B. The relationship between reading and specific sports skills at the elementary school level.
- C. The relationship of specific academic subjects, such as English and Math, to specific components of physical fitness or motor performance..

APPENDIX

THE ELEMENTARY SCHOOL PHYSICAL FITNESS TEST¹

Test No. 1: Standing broad jump

Purpose: to measure power

Directions: "We are going to see how far you can jump. Stand with the toes of both your feet almost touching the line. Jump as far as you can and land on both feet. You will get one practice jump. Then go to the end of the line and wait for your turn."

Scoring: record to the nearest inch, from take-off line to the heel of the foot closest to the line.

Test No. 2: Bench push-ups

Purpose: to measure the strength and endurance of the forearm, the arm, and the shoulder girdle muscles.

Directions: "Place both hands on the edge of the bench. Your hands should be under your shoulders. Keep your hands on the bench and your body straight. Bend your arms and touch your chest to the bench, then push-up until your arms are straight. Do this as many times as you can without stopping."

Scoring: the score is the number of push-ups performed. Stop the pupil at the end of the fiftieth push-up.

Test No. 3: Curl-ups

Purpose: to measure the strength and endurance of the trunk flexor muscles.

Directions: "Lie down on your back and bend your knees. Put

¹Kirchner, Physical Education for Elementary School, pp. 588-592.

your feet flat on the mat and lace your fingers behind your head." (tester will place right hand across pupil's feet, holding them down, with the left hand across the pupil's knees). "Sit up and touch (the tester's) hand," (with head, chin, or chest), "then, lie down again. Keep your hands behind your head. Do this as many times as you can." (stop at fifty)

Scoring: the score is the number of curl-ups performed.

Test No. 4: Squat jumps

Purpose: to measure the strength and endurance of the trunk and leg extensor muscles

Directions: "Squat down with your arms at your sides and put your hands on the mat. Jump into the air with your arms at your sides. Straighten your legs when you jump. Land on your feet in squat position. Do this as many times as you can without stopping."

Scoring: the score is the number of squat jumps performed.

Test No. 5: Thirty-yard dash

Purpose: to measure speed

Directions: "You will be given the starting signal like this. 'Ready, go!' On 'go!' run as fast as you can. Do not slow down until you are past the finish line."

Scoring: record to the nearest tenth of a second.

BOYS' RANK ORDER OF SCORES MADE ON METROPOLITAN READINESS TESTS, SCORES MADE ON ELEMENTARY SCHOOL PHYSICAL FITNESS TEST, AND POINTS ALLOTTED FOR EACH TEST

Subject	Reading Score	Total P-F ^a Points	SBJ ^b		BPU ^c		CU ^d		SJ ^e		DASH ^f	
			S ^g	P ^h	S	P	S	P	S	P	S	P
B ₁	89	269	3'10"	57	19	55	20	60	17	51	6.8	46
B ₂	88	226	3'2"	49	20	56	1	34	16	50	7.5	37
B ₃	85	235	3'5"	53	12	47	7	47	11	43	6.9	45
B ₄	84	271	4'2"	59	11	44	31	63	32	60	6.5	45
B ₅	83	250	4'1"	57	18	54	3	36	25	55	6.1	48
B ₆	81	249	3'3"	44	12	46	16	52	30	59	6.1	48
B ₇	78	222	3'10"	53	9	41	7	43	10	38	6.3	47
B ₈	78	284	3'9"	59	22	58	25	63	30	65	7.2	39
B ₉	78	243	3'0"	46	23	59	3	40	19	53	6.9	45
B ₁₀	77	261	3'9"	59	16	52	9	50	19	53	6.7	47
B ₁₁	76	235	3'6"	48	12	46	16	52	9	36	6.0	48
B ₁₂	76	226	3'8"	51	10	43	25	39	5	30	6.6	43
B ₁₃	74	276	3'8"	57	23	59	6	46	33	66	6.5	48

^aphysical fitness
^bstanding broad jump
^cbench push-ups
^dcurl-ups
^esquat jumps
^f30-yard dash
^gScore
^hpoints

BOYS' SCORES--Continued

Subject	Reading Score	Total P-F Points	SBJ		BPU		CU		SJ		DASH	
			S	P	S	P	S	P	S	P	S	P
B ₁₄	73	245	3'7"	56	12	47	1	34	14	47	5.9	61
B ₁₅	71	2858	3'10"	57	35	67	10	51	22	57	6.3	53
B ₁₆	71	266	3'8"	57	22	58	15	56	10	41	6.1	54
B ₁₇	69	214	2'8"	40	9	43	20	60	6	34	7.5	37
B ₁₈	66	328	3'11"	61	50	74	50	75	20	55	5.7	63
B ₁₉	64	281	3'7"	56	12	47	20	60	31	66	6.4	52
B ₂₀	63	303	4'0"	63	19	55	21	61	28	62	5.8	62
B ₂₁	61	263	3'10"	57	20	56	14	55	16	50	6.9	45
B ₂₂	61	248	3'2"	38	20	56	15	56	12	44	6.1	54
B ₂₃	60	254	3'9"	52	9	41	28	60	24	54	6.3	47
B ₂₄	59	243	3'6"	55	13	48	8	48	13	44	6.5	48
B ₂₅	58	205	3'0"	40	9	41	5	40	15	45	6.9	39
B ₂₆	58	252	3'7"	56	16	52	7	47	15	49	6.5	48
B ₂₇	58	264	3'8"	57	21	57	13	54	11	43	6.3	53
B ₂₈	56	278	4'3"	60	50	72	32	63	10	38	6.5	45
B ₂₉	55	237	3'1"	47	12	47	8	48	15	49	6.8	46
B ₃₀	54	171	3'2"	43	10	43	0	0	11	40	6.5	45
B ₃₁	54	264	3'9"	52	19	53	33	63	19	49	6.3	47
B ₃₂	53	234	3'5"	53	10	45	4	42	10	41	6.2	53
B ₃₃	50	212	2'11"	44	9	43	3	40	14	47	7.4	38

BOYS' SCORES--Continued

Subject	Reading Score	Total P-F Points	SBJ		BPU		CU		SJ		DASH	
			S	P	S	P	S	P	S	P	S	P
B ₃₄	50	256	3'2"	49	26	61	7	47	15	49	6.6	48
B ₃₅	49	259	4'5"	63	17	51	9	45	23	53	6.3	47
B ₃₆	48	267	4'2"	66	19	55	12	33	9	39	6.1	54
B ₃₇	47	285	2'10"	43	19	55	28	65	22	57	7.4	38
B ₃₈	46	185	2'3"	33	30	64	0	0	19	53	7.7	35
B ₃₉	46	198	3'1"	42	20	56	1	31	10	38	7.5	31
B ₄₀	43	238	2'8"	40	9	43	9	50	24	59	6.8	46
B ₄₁	43	244	3'7"	49	16	52	8	44	12	41	5.5	58
B ₄₂	42	243	3'5"	53	12	47	9	50	20	55	7.4	38
B ₄₃	40	256	3'3"	50	20	56	10	51	17	51	6.5	48
B ₄₄	37	207	2'5"	36	11	46	3	40	9	39	6.7	46
B ₄₅	34	214	2'9"	35	19	53	15	52	7	33	6.8	41
B ₄₆	33	207	2'5"	36	12	47	3	40	9	39	6.9	45
B ₄₇	27	293	4'2"	66	13	48	19	58	21	56	5.4	65

GIRLS' RANK ORDER OF SCORES MADE ON METROPOLITAN READINESS TESTS, SCORES MADE ON ELEMENTARY SCHOOL PHYSICAL FITNESS TEST, AND POINTS ALLOTTED FOR EACH TEST

Subject	Reading Score	Total P-F ^a Points	SBJ ^b		BPU ^c		CU ^d		SJ ^e		DASH ^f	
			S ^g	P ^h	S	P	S	P	S	P	S	P
G ₁	87	233	3'6"	52	11	48	6	41	20	50	6.7	42
G ₂	87	246	3'4"	49	13	51	17	54	23	53	6.9	39
G ₃	87	245	3'3"	47	11	48	40	68	19	49	7.6	33
G ₄	86	227	2'5"	39	13	52	10	51	10	41	7.1	44
G ₅	83	255	2'4"	38	17	56	15	56	21	55	6.8	50
G ₆	82	262	3'0"	50	22	61	16	57	16	50	7.1	44
G ₇	81	258	2'7"	45	14	53	15	56	25	59	7.0	45
G ₈	79	269	3'6"	58	14	53	20	60	20	54	7.1	44
G ₉	79	214	3'9"	55	10	46	0	0	30	60	6.1	53
G ₁₀	77	263	3'0"	50	17	56	11	52	21	55	6.8	50
G ₁₁	76	230	3'2"	53	15	54	2	33	13	45	7.0	45
G ₁₂	75	264	2'10"	47	20	60	8	48	26	60	6.9	49
G ₁₃	75	231	2'5"	33	18	55	10	47	33	62	7.4	34
G ₁₄	74	225	2'10"	40	17	55	12	50	16	45	7.3	35
G ₁₅	74	266	3'3"	54	15	54	8	48	25	59	6.7	51
G ₁₆	73	209	3'7"	53	4	38	10	47	9	37	7.4	34

^aPhysical fitness

^bStanding broad jump

^cBench push-ups

^dCurl-ups

^eSquat jumps

^f30-Yard dash

^gScore

^hPoints

GIRLS' SCORES--Continued

Subject	Reading Score	Total P-F Points	SBJ		BPU		CU		SJ		DASH	
			S	P	S	P	S	P	S	P	S	P
G ₁₇	72	252	2'9"	48	18	57	9	49	15	48	6.8	50
G ₁₈	69	229	2'10"	47	11	49	11	52	12	44	7.7	37
G ₁₉	69	277	3'6"	58	20	60	10	51	20	54	6.4	54
G ₂₀	67	256	2'7"	42	10	47	20	60	23	57	6.8	50
G ₂₁	67	256	4'0"	60	16	54	22	58	19	49	7.3	35
G ₂₂	66	161	3'1"	45	4	38	0	0	11	40	6.5	45
G ₂₃	64	223	2'10"	40	12	50	9	46	22	52	7.2	35
G ₂₄	64	290	3'8"	61	19	58	16	57	24	58	6.2	56
G ₂₅	63	324	4'2"	70	33	70	35	69	24	58	6.0	37
G ₂₆	62	287	3'11"	66	18	57	14	55	21	55	6.4	54
G ₂₇	61	228	3'5"	50	13	31	17	54	15	44	6.4	49
G ₂₈	60	245	2'4"	38	17	56	15	56	11	43	6.5	52
G ₂₉	58	238	3'6"	58	8	44	6	45	17	51	7.4	40
G ₃₀	57	255	3'5"	56	12	50	16	57	14	47	7.0	45
G ₃₁	57	229	3'6"	52	12	50	6	41	12	40	6.5	46
G ₃₂	56	275	4'4"	74	3	35	13	54	27	61	6.6	51
G ₃₃	54	255	2'11"	48	20	60	5	43	27	61	7.2	43
G ₃₄	53	251	3'0"	50	11	49	13	54	15	48	6.8	50
G ₃₅	51	237	2'10"	47	13	52	9	49	14	47	7.3	42
G ₃₆	50	257	3'4"	49	25	62	9	46	31	60	6.8	40
G ₃₇	48	251	3'6"	58	7	42	13	54	14	47	6.8	50
G ₃₈	43	270	3'5"	56	10	47	23	62	20	54	6.6	51
G ₃₉	39	253	3'0"	50	15	54	9	49	14	57	7.2	43
G ₄₀	31	269	3'5"	56	14	53	17	58	16	50	6.5	52
G ₄₁	26	159	2'3"	37	5	39	0	0	14	57	7.8	36

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