THE EFFECTS OF INDIVIDUALIZED PROGRAMS OF PHYSICAL EDUCATION ON NORMAL CHILDREN WHO HAVE READING DIFFICULTIES

APPROVED:

Graduate Committee:

Edward C. Bonk
Committee Chairman

John F. Curry
Committee Member

Harold C. Lindeman
Committee Member

Susan Kingery
Dean of the School of Education

Robert B Toulouse
Dean of the Graduate School

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Sebron Belton Williams, B.S., M.Ed.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF ILLUSTRATIONS

CHAPTER I

INTRODUCTION

A problem which confronts education today, and which causes many children to be unsuccessful in academic achievement, is retarded reading. The voluminous literature on the teaching of reading attests to its centrality in the on-going process of education as it is presently structured, that is, as the primary media for the communication of knowledge from one individual to another, from one culture to another, and from one generation to another. Havighurst (17) considered reading to be a developmental task, and pointed out that the level of mental skills demanded by daily living has been raised by industrialization and technological change.

A review of the literature disclosed an early and sustained effort to call attention to the urgent need for helping those children who have not attained independent reading proficiency. Even before the turn of the century scientific investigations had been initiated for the purpose of determining causes and seeking possible avenues of remediation for this difficulty. From 1896, when W. P. Morgan asserted in the British Medical Journal that the child's reading disability resulted from congenital alexia, until the present, the quest for possible means for assisting him

has ensued (40). Although the search at that time was focused upon the discovery of a single causative factor, no single source has been identified to account for all reading problems.

The child is a single individual who functions in all areas of his developmental tasks as an integrated system (17). Developmental psychologists generally support the concept of the child's expressive behavior in any one situation as a result of the complex interaction of a multiplicity of forces. The dynamism of this action system develops as a function of the formation of the contributing action patterns.

> A purely functional psychology can scarcely explain human and child nature. Functions do not operate in vacuo, and our comprehension of child behavior must begin with a factual knowledge of its conformations and patterns. Viewed as a growing complex of action patterns, the mind has a developmental anatomy. The mind has architecture. Behavior patterns challenge the same interest in structured form which the disciplines of embryology and physical anthropology demand. Maturity traits represent the achieved and the nascent anatomy of the total action system of the child (12, p. x).

The bulk of the research focuses upon the more specific approaches of investigation, seeking to identify or to describe the degree of relationship between the specific factors required for mastery of reading skills. Examination of the literature revealed numerous efforts to explicate the emergence and maturation of mental processes in terms of physical responses to a physical world. The theory that learning is an integration of sensory-motor activity has, in

recent years, generated questions concerning the nature of this relationship and the extent to which development in one area affects the development in another. Expressive behavior exhibits the inter-relationship between motor and mental activities, delineated in studies by Harter (16), showing that children engage in a greater number of trial and error problem solutions than do adults. An adult solves a maze problem implicitly with his eyes, but a child explores it tactually with his fingers (25). His experiences with his environment are muscular--a child develops a concept of emptiness by plunging his clenched hand into an empty cup (19)--and action responses constitute a large body of his learning. According to Landreth (22), some Russian psychologists suggest that early perceptions are basically motor, that a young child acquires a mirror image of the objects in his world, and that this mirror image is a motor image composed of the pattern of movements his eyes and hands make as they explore each object.

The multifactor theory of causation currently supported by Gates (11), Monroe (24), and Robinson (34) emphasizes technique and materials, initiation of interest, and social factors, indicating a full-blown specialized approach to controlling factors of perception and secondary motivation. Recent interest, stimulated primarily by neurologists, has generated new research more directly biological, in the

biological-neurological area (32, 37, 39). The increasing awareness of the multiplicity of causative factors operating to produce reading difficulties and the general acceptance of the unity of the developing child intensify the need for finding the relationship between these factors and their combined effects on the child. What factor, or constellation of factors, operates to inhibit a child's learning to read? What factor or constellation of factors can assist him to acquire this skill and to become a successful reader? What elements of his training can be implemented in such a way as to promote optimal proficiency in his reading response?

There is renewed interest in physical fitness training as contributor to a child's maximal mental functioning, and evidence from research in the field would seem to indicate that physical fitness and good general health are important variables in a child's ability to operate at his optimal level of proficiency (4). Most reading specialists would agree that good health does provide a sound substructure which forms the fulcrum upon which pivots successful performance. Terman (42) found that his gifted children were above the average in general health. Although most authorities would agree that improved physical fitness would produce a more adequately functioning individual generally, there is little evidence showing the relationship between physical fitness training and amelioration of reading difficulties.

Findings from studies concerning reading difficulties and their remediation are inconclusive and confusing. Part of the difficulty of defining the problem may be ascribed to the multitude of forces impinging on children in a nomothetic study. The complexity of the patterns associated with reading difficulties makes causal factors difficult to identify and to appear somewhat elusive.

In spite of the obstacles, the urgent needs of these children strengthen the necessity for research which will lead to a possible discovery of specific and distinctive program designs in physical fitness training which will assist him in becoming a more efficient reader. Perhaps no single factor of physical ability will ever be found to be associated with reading effectiveness, but rather a general pattern of physical and motor vitality.

Statement of the Problem

The problem of the study was to evaluate the effect of specially planned programs of individualized physical activity upon reading achievement of elementary age school children with normal intelligence who are experiencing learning difficulties in reading achievement.

Purpose of the Study

The purpose of this study was to design and evaluate a program of individualized physical fitness training which

might benefit elementary age school children, with normal intelligence, who were experiencing reading difficulties.

The study further proposed to measure the effect of the individualized physical fitness training on reading achievement, compared to the effects of group physical education activities, and sedentary recreational activities on reading improvement.

Hypotheses

To carry out the purposes of this study, the following hypotheses were formulated:

I. There will be a significantly greater gain in reading achievement of the experimental group than in either of the two control groups at that grade.

A. There will be a significantly greater mean gain in reading achievement made by second grade pupils participating in the individualized physical fitness training during a twelve week period than by those second grade pupils participating in the regular physical education program.

B. There will be a significantly greater mean gain in reading achievement made by second grade pupils participating in the individualized physical fitness training during a twelve week period than by those second grade pupils participating in the sedentary recreation program.

C. There will be a significantly greater mean gain in reading achievement made by third grade pupils participating

in the individualized physical fitness training during a twelve week period than by those third grade pupils participating in the regular physical education program.

D. There will be a significantly greater mean gain in the reading achievement made by third grade pupils participating in the individualized physical fitness training during a twelve week period than by those third grade pupils participating in the sedentary recreation program.

E. There will be a significantly greater mean gain in reading achievement made by fourth grade pupils participating in the individualized physical fitness training program during a twelve week period than by those fourth grade pupils participating in the regular physical education program.

F. There will be a significantly greater mean gain in reading achievement made by fourth grade pupils participating in the individualized physical fitness training program during a twelve week period than by those fourth grade pupils participating in the sedentary recreation program.

G. There will be a significantly greater mean gain in reading achievement made by fifth grade pupils participating in the individualized physical fitness training during a twelve week period than by those fifth grade pupils participating in the regular physical education.

H. There will be a significantly greater mean gain in reading achievement made by fifth grade pupils participating in the individualized physical fitness training program during a twelve week period than by those fifth grade pupils participating in the sedentary recreation program.

II. There will be a significant correlation between gain in reading achievement at each grade and gain in proficiency in selected physical activities.

III. There will be a significantly greater mean gain in reading achievement made by the regular physical education group than by the sedentary group at each grade level.

IV. There will be a significantly greater mean gain in reading made by the 30 per cent of the pupils making the greatest gain in each physical skill than that made by the 30 per cent of the pupils making the least gain in each physical skill.

A. There will be a significantly greater mean gain in reading made by the 30 per cent of second grade pupils making the highest gain in each physical skill than that made by the 30 per cent of second grade pupils making the least gain in each physical skill, including

1. Arm Hang
2. Sit Ups
3. Shuttle Run
4. Broad Jump

5. Fifty-yard Dash

6. Ball Throw

7. Three Hundred Yard Run-walk

B. There will be a significantly greater mean gain in reading made by the 30 per cent of third grade pupils making the highest gain in each physical skill than that made by the 30 per cent of third grade pupils making the least gain in each physical skill, including

1. Arm Hang

2. Sit Ups

3. Shuttle Run

4. Broad Jump

5. Fifty-yard Dash

6. Ball Throw

7. Three Hundred Yard Run-walk

C. There will be a significantly greater mean gain in reading made by the 30 per cent of fourth grade pupils making the highest gain in each physical skill than that made by the 30 per cent of fourth grade pupils making the least gain in each physical skill, including

1. Arm Hang

2. Sit Ups

3. Shuttle Run

4. Broad Jump

5. Fifty-yard Dash

6. Ball Throw

7. Three Hundred Yard Run-walk

D. There will be a significantly greater mean gain in reading made by the 30 per cent of fifth grade pupils making the highest gain in each physical skill than that made by the 30 per cent of fifth grade pupils making the least gain in each physical skill, including

1. Arm Hang
2. Sit Ups
3. Shuttle Run
4. Broad Jump
5. Fifty-yard Dash
6. Ball Throw
7. Three Hundred Yard Run-walk

V. There will be a significantly greater mean gain in each of the physical skills made by the 30 per cent of the pupils making the greatest gain in reading than that made by the 30 per cent of the pupils making the least gain in reading at each grade level.

A. There will be a significantly greater mean gain in each physical skill (arm hang, sit ups, shuttle run, broad jump, fifty-yard dash, ball throw, and three hundred yard run-walk) made by the 30 per cent of the second grade pupils making the greatest gain in reading than that made by the 30 per cent of the second grade pupils making the least gain in reading.

B. There will be a significantly greater mean gain in each physical skill (arm hang, sit ups, shuttle run, broad jump, fifty-yard dash, ball throw, and three hundred yard run-walk) made by the 30 per cent of the third grade pupils making the greatest gain in reading than that made by the 30 per cent of the third grade pupils making the least gain in reading.

C. There will be a significantly greater mean gain in each physical skill (arm hang, sit ups, shuttle run, broad jump, fifty-yard dah, ball throw, and three hundred yard run-walk) made by the 30 per cent of the fourth grade pupils making the greatest gain in reading than that made by the 30 per cent of the fourth grade pupils making the least gain in reading.

D. There will be a significantly greater mean gain in each physical skill (arm hang, sit ups, shuttle run, broad jump, fifty-yard dash, ball throw, and three hundred yard run-walk) made by the 30 per cent of the fifth grade pupils making the greatest gain in reading than that made by the 30 per cent of the fifth grade pupils making the least gain in reading.

Background and Significance of the Study

During the decade 1925 to 1935, diagnosis and remediation of reading difficulties became a chief subject of study, with the neurologist (27) and the educator (9) both seeking means

for ameliorating the deficiency. The distinct problem of reading deficiency emerged as a stimulus to research from both disciplines in an effort to find possible solutions. The divergent direction of approaches attests to the breadth of interest in the problem. The following years brought into full bloom the multiple-causation theory of reading, consistent with the concept of the total organism, and reflecting the variety of research approaches to the question. In the past, researchers have literally gone off in all directions in the search for those aspects of the developing child most intimately related to reading difficulties: the effect of endocrine disorders (8), visual readiness (36), auditory adequacy (44), sociometric status (23), intelligence (15), speech (6), and emotions (43). Diagnosis and remediation of reading deficiency during the 1920's involved observation of such motor factors as eye-movements, vocalization, extraneous bodily movements, and breathing, and placed emphasis upon methods designed to remedy these factors (40). Gates (11) viewed reading retardation as a complex process explainable only by a group or syndrome of related causes or factors. The variety of directions in research approaches and the vigorous interest from varied disciplines reflect the vitality of the question and the importance of its solution.

Increased impetus in research during the following fifteen years reflects an accelerating interest. The mounting number of studies of reading difficulties reflected an

intensified activity among researchers in this field; in 1934, Tinker reported that 180 studies had been conducted (40). The number of articles concerning reading problems appearing in the Educational Index between 1935 and 1950 reveals an unusual interest in that subject. Smith (40) reported that spiraling interest in this field of research produced an increased number of published articles during the following fifteen years. Specialists in related disciplines such as sociology, psychology, and physiology increased their efforts to obtain facts related to reading deficiency with respect to medical treatment and psychotherapy (40).

Concomitant with the upsurge of research was a maturing research approach manifested in the organizing process of theory construction, and in greater precision in controls and more sophisticated statistical techniques (40). These improved techniques and liberal funds made available by the government were instrumental in stimulating greater emphasis on high quality research. Financial support of reading research on the part of the national government manifests the general concern for reading improvement and widespread accord surrounding its importance to our national welfare.

> Truly, reading instruction has grown entirely new dimensions in the enlarged and important role it has to play in achieving national goals. Without a doubt, the national recognition and support given reading instruction by the government constitute the most salutory and conspicuous mark of progress in the history of American reading instruction (41, p. 9).

It is apparent from the diversity of investigators from the varied disciplines of the behavioral sciences--sociology, psychology, and education--actively engaged in research in reading problems, from the increasing number of published studies concerning this problem, and from the support afforded by the general public, that alleviation of reading difficulties is considered to be of central importance in assisting the child in maximal development of his potential, and the utilization of his resources.

In spite of these favorable situational factors, there is indication that the number of children who are experiencing reading difficulties is quite high, representing a rather large body of our school population. It has been reported that the incidence of reading difficulties is as high as 30 per cent of the school population; and according to the National Council of Teachers of English, this would mean that at least four million elementary school children in the United States are disabled (7).

The severity of the problem begins to appear as one surveys the high incidence among school children and the degree of personal loss as an effective individual suffered by each of those children. Harris (15) reported that juvenile delinquents as a group have been found to include many whose reading achievement was far below their mental ability, and that even though many poor readers avoid delinquency, the scars produced by years of repeated unsuccessful

effort are practically certain to create inferiority feelings which would impede normal, healthy personality development. Sherman (38) pointed out that reading failure frequently results in an impaired self image, with many children becoming social and emotional casualties as a result of early and repeated defeat. Gates (11) estimated that three-fourths of the children with reading disturbances develop signs of maladjustment. Similarly, Natchez (26) noted their anxiety and reaffirmed the need for prevention. Thus, reflected in the studies of reading authorities is the anguish and suffering experienced by children who are crippled in their efforts at full self development.

Remediation and possibly ultimate prevention of reading difficulties becomes imperative both as a problem of the general welfare and as an imminent problem of the individuals who comprise the group of retarded readers. Not only is it important from the perspective of the general good of mankind--that of maximal utilization of human resources available within the human community, and the fullest development of those resources; but it also undergirds the release of that precious gift of human kind, self-realization, which flows from a healthy, whole, fully functioning individual.

More recently, the publication of Kraus and Hirschland (21) that 57.9 per cent of the sample of American children failed on one or more parts of the Kraus-Weber Physical Fitness tests, compared to only 8.7 per cent of the sample

of European children precipitated concern for the physical fitness of school children, and consequently has generated numerous other similar tests. Prudden (31) reported similar results, as did successive studies (10, 20, 28, 29). In 1957, as an outgrowth of a national conference called by President Dwight D. Eisenhower, the American Association for Health, Physical Education and Recreation Research Council under the direction of Paul Hunsicker developed a fitness test battery and established national norms. A second normative study, conducted in 1964-65, disclosed improved performance on each test (1). According to the Youth Fitness Test Manual, the second survey shows "that there has been improvement, but that much remains to be done" (1, p. 5). Comparative studies in 1961 reported that British children (3) and Danish children (20) performed better than American children on almost all measures of the AAHPER Youth Fitness Test, which findings would tend to support the Council's statement evaluating the status of the physical fitness of children in this country.

Recent investigations have revealed that in those particular studies, specific factors of physical fitness were related to school achievement (18), physical fitness measurements were related to specific aspects of school achievement (5,33), and failure in school work was related to low physical fitness scores (30). Rosborough (35) studied the effects of physical fitness training upon the achievement of poor readers. Perhaps important in the educational

program for children experiencing reading difficulties is the physical training which they receive. The present study was designed to assess the effects of an individualized physical fitness training program on the reading performance of these children.

Definition of Terms

Reading difficulty refers to students whose achievement in reading was six months or more below expectancy.

Individualized physical fitness training refers to a program of physical education, involving those muscles of equilibrium known as body mechanics, wherein the pupil worked on his own, not involving partner or group activity.

Regular physical education program refers to the type of physical education that involves partner or group activities and group competition.

Sedentary recreational activities refers to those activities of a recreational nature such as story-telling, having a minimum of physical activity.

Achievement is proficiency of performance in a given skill, or body of knowledge (13)..

Reading achievement is the ability to progressively improve in the basic skill area of reading vocabulary and reading comprehension, as measured by the Gates-MacGinitie Tests.

Selected physical activities are those skills which contribute to the development of laterality, directionality, balance, and coordination. For the development of these skills selections were made from recommended activities for children in the elementary school. Emphasis was placed upon running, jumping and landing, footwork, body movements, rocking, rolling, stretching and curling, twisting and turning.

Laterality is the ability to distinguish between the left and right side and to control the two sides of the body separately and simultaneously (19).

Discrimination refers to the projection of the left and right discrimination within the body to objects outside the body.

Balance refers to the ability of the individual to maintain his neuro-muscular system in a static condition for an efficient response or to control it in a specific efficient posture while it is moving.

Coordination refers to the ability of the performer to integrate types of movements into specific patterns (2).

Perceptual-motor skills refers to the smooth and efficient functioning of sensory and motor nerves and the connection between them, resulting in rapid reaction to stimuli with a minimum of effort (2).

Physical fitness is that state which characterizes the degree to which a person is able to function. Fitness is an

individual matter. It implies the ability of each person to live most effectively within his potentialities. Ability to function depends upon the physical, mental, emotional, social, and spiritual components of fitness, all of which are related to each other and are mutually inter-dependent (14).

Normal intelligence refers to subjects whose I.Q. falls within the range of 80-120.

Limitations of the Study

Specific limitations of the study were the following:

1. The subjects were students in one school system in a suburb of a large southwestern metropolitan area.

2. Only those students whose achievement in reading was six months or more below expectancy were included. Students eligible for special education were not eligible for this study.

3. Though not restricted by the structure of the study, the socio-economic level of the students who participated in the study was approximately that of middle class.

Sources and Treatment of Data

Data were collected from results of pre-tests and post-tests of reading achievement as measured by the Gates-MacGinitie Reading Tests and from pre-tests and post-tests of physical fitness as measured by scales from the Youth Fitness Test as developed by the Research Council of the American Association for Health, Physical Education and

Recreation. Data were coded and submitted to the Computer Center at North Texas State University, where all computations were made. To test the first and third hypotheses, a simple analysis of variance and a t-test were used. In analyzing the second hypothesis, a product moment correlation was employed. Hypotheses IV and V were treated by analysis of variance, and the t-test.

Summary

The adverse development of a child facing difficulties in reading, and the prevalence of these difficulties in the school population generate a pressing need for seeking methods for their remediation. Theory and research support the inter-relationship between the general well-being of the total organism and his performance in a given situation. Further research seeks to demonstrate the presence of a relationship between symbolic processes and motor activity. Recent tests of physical fitness disclosed that American children may be below the level of fitness of children in other countries.

The present study was designed in an effort to determine the relative effects of specially planned programs of individualized physical activity upon reading achievement of elementary age school children normal in intelligence, who are experiencing learning difficulties in reading.

CHAPTER BIBLIOGRAPHY

1. American Association for Health, Physical Education and Recreation Youth Fitness Test Manual, Washington, D.C., American Association for Health, Physical Education and Recreation, 1965.

2. Barrow, Harold M. and Rosemary McGee, A Practical Approach to Measurement in Physical Education, Philadelphia, Lee and Febiger, 1964.

3. Campbell, William R. and Richard H. Pohndorf, "Physical Fitness of British and United States Children," Health and Fitness in the Modern World, edited by Leonard A. Larson, Chicago, Athletic Institute, 1961, pp. 8-16.

4. Clarke, Harrison, Application of Measurement, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1967.

5. _____ and Boyd O. Jarman, "Scholastic Achievement of Boys, 9, 12, and 15 Years of Age Related to Various Strength and Growth Measures," Research Quarterly, XXXII (May, 1961), 155.

6. Crooks, T. G. and Margaret Greens, "Some Characteristics of Children with Two Types of Speech Disorders," British Journal of Educational Psychology, XXXIII (February, 1963), IV, 31-40.

7. DeHirsh, Katrina and others, Predicting Reading Failure, New York, Harper and Row, 1966.

8. Eames, Thomas H., "Physical Factors in Reading," The Reading Teacher, XV (May, 1962), 427-432.

9. Fernald, Grace, Remedial Techniques in Basic School Subjects, New York, McGraw-Hill Book Company, Inc., 1943.

10. Fox, Margaret and Janet Atwood, "Results of Testing Iowa School Children for Health and Fitness," Journal of Health, Physical Education and Recreation, XXVI, No. 6 (September, 1955), 20-21.

11. Gates, Arthur, "The Role of Personality Maladjustments in Reading Disability," Journal of Genetic Psychology, LIX (September, 1941), 77-83.

12. Gesell, Arnold and Frances L. Ilg, Child Development, New York, Harper and Brothers, 1949.

13. Good, Carter V., editor, Dictionary of Education, 2nd. ed. rev., New York, McGraw-Hill Book Company, Inc., 1959.

14. Hall, Sue M., editor, Children and Fitness: A Program for Elementary Schools, A Report of the National Conference on Fitness of Children of Elementary School Age, Washington, D.C., American Association for Health, Physical Education and Recreation, 1960.

15. Harris, Albert J., How to Increase Reading Ability, New York, Longmans, Green and Company, 1950.

16. Harter, G. L., "Overt Trial and Error in Problem Solving of Pre-school Children," Journal of Genetic Psychology, XXXVIII (Spring, 1930), 361-372.

17. Havinghurst, Robert J., Developmental Tasks and Education, New York, Longmans, Green and Company, 1952.

18. Kagerer, Rudolph Lucas, "The Relationship of the Kraus-Weber Test for Minimum Muscular Fitness to School Achievement," unpublished master's thesis, Department of Psychology, Purdue University, 1958.

19. Kephart, Newell C., "Perceptual-Motor Aspects of Learning Disabilities," Exceptional Children, XXXI (1964), 23.

20. Kirchner, G. and D. Glines, "Comparative Analysis of Eugene, Oregon Elementary School Children Using the Kraus-Weber Test of Minimum Muscular Fitness," Research Quarterly, XXVIII, No. 1 (March, 1957), 16-25.

21. Kraus, H. and Ruth P. Hirschland, "Minimum Muscular Fitness Tests in School Children," Research Quarterly, XXV (1954), 178-188.

22. Landreth, Catherine, Early Childhood, New York, Alfred A. Knopf, 1967.

23. Miles, Matthew B., Innovation in Education, New York, Bureau of Publications, Teachers College, Columbia University, 1964.

24. Monroe, Ruth M. and B. Backus, Remedial Reading, Boston, Houghton Mifflin Company, 1937.

25. Munn, Norman, Psychology, New York, Houghton Mifflin Company, 1961.

26. Natchez, Gladys, Personality Patterns and Oral Reading, New York, New York University Press, 1959.

27. Orton, Samuel T., "Specific Reading Disability-Strephosymbolia," Journal of American Medical Association, XC (April 7, 1928), 1095-1099.

28. Phillips, Marjorie, "How Fit are Our American School Children?" Journal of Health, Physical Education and Recreation, XXVI (September, 1955), 14-15.

29. _____ and others, "Analysis of Results from the Kraus-Weber Test for Minimum Muscular Fitness in Children," Research Quarterly, XXVI, No. 3 (November, 1955), 314-322.

30. Page, C. Getty, "Case Studies of College Men with Low Physical Fitness Indicates," unpublished master's thesis, Syracuse University, Syracuse, New York, 1940.

31. Prudden, Bonnie, Is Your Child Really Fit?, New York, Harper and Brothers, 1956.

32. Rabinovitch, Ralph D. and Winifred Ingram, "Neuro-psychiatric Considerations in Reading Retardation," The Reading Teacher, XV (May, 1962), 433-438.

33. Rarick, Lawrence and Robert McKee, "A Study of Twenty Third Grade Children Exhibiting Extreme Levels of Achievement on Tests of Motor Efficiency," Research Quarterly, XX (May, 1949), 142.

34. Robinson, H. M., Why Pupils Fail in Reading, Chicago, University of Chicago Press, 1946.

35. Rosborough, Pearl M., Physical Fitness and the Child's Reading Problem, New York, Exposition Press, Inc., 1963.

36. Rosenbloom, Alfred A., Jr., O.D., "Promoting Visual Readiness for Reading," Changing Concepts of Reading Instruction, International Reading Association Conference Proceedings, New York, Scholastic Magazines, 1961, pp. 89-93.

37. Schiffman, Gilbert, "Early Identification of Reading Disabilities, The Responsibility of the Public School," Bulletin of the Orton Society, XIV (1964), 42-44.

38. Sherman, Mandel, "Emotional Disturbances and Reading Disability," Recent Trends in Reading, Supplementary Educational Monographs, No. 49, Chicago, University of Chicago Press, 1939, pp. 126-134.

39. Silver, Archie A. and Rosa A. Hagin, "Specific Reading Disability: Follow-up Studies," American Journal of Orthopsychiatry, XXXIV (January, 1964), 95-102.

40. Smith, Nila Blanton, American Reading Instruction, Newark, Delaware, International Reading Association, 1965.

41. _____, "Reading: Seventy-Five Years of Progress," Reading: Seventy-Five Years of Progress, Proceedings of the Annual Conference on Reading Held at the University of Chicago, 1966, XXVIII, Chicago, University of Chicago Press, 1966, 3-12.

42. Terman, L. M., editor, The Gifted Group at Mid-Life, Follow-up of the Superior Child, Vol. V of Genetic Studies of Genius, Stanford, Stanford University Press, 1959.

43. Tulchin, S., "Emotional Factors in Reading Disabilities in School Children," Journal of Educational Psychology, XXVI (1935), 443-454.

44. Witty, Paul and D. Kopel, Reading and the Educative Process, Boston, Ginn and Company, 1939.

CHAPTER II

REVIEW OF THE LITERATURE

Awareness of the centrality of reading skills in acquiring information gave support to increased concern from the standpoint of implementing an individual's available resources. Recognition of its importance cast an aura of urgency which rose from the poignant needs of children who suffer the humiliation and deprivation engendered by retarded reading.

Description of the Child with Reading Difficulties

Who is the child with reading difficulties? Reading difficulty has been defined by specialists in terms of incongruity between reading performance and age, between reading performance and grade placement, between reading performance and some estimation of capacity. The common thread interwoven into each of these approaches, however, seems to be that reading difficulty exists within the child who, in other modes of behavior, appears to be functioning quite normally. That is to say, that the child's reading performance seems to be out of harmony with his other observed behavior.

The complex nature of reading difficulty reveals itself in the multifarious descriptions of those children who would

be classified as retarded readers. Researchers have directed their efforts toward examining the many sides of these children, illuminating their reading lag with respect to their chronological age, their grade level in school, their estimated capacity, their physical condition, their general mental ability, and their emotional well being.

To say that a child experiences reading difficulties means that his reading performance is below the average for his age and grade placement. Harris (32) found that in typical elementary schools, approximately one-third of the children read at their grade level, about one-third read one or more years below their grade level. It is this last group which he would designate as having reading difficulties.

The retarded reader is differentiated from that group of children who manifest general mental retardation. Sol Garden (28), in an address to the Texas Association for Children with Learning Disabilities, pointed out that children with learning difficulties are basically normal, even above average in intelligence, but may have problems of perception, conception, or physical coordination. Bateman defined learning difficulty as a discrepancy between estimated capacity and performance:

> . . . those who manifest an educationally significant discrepancy between their estimated intellectual potential and actual level of performance . . . (4, p. 219).

Kirk (45) pointed out that in education a child possessing the intellectual capacity to read but who does not learn to do so after an adequate period of time is classified as having a reading difficulty.

Spache (67) defined the child who may be thought of as having a reading difficulty more specifically in terms of the scope of the deficiency, the degree of retardation, and the duration of the difficulty. The individual is retarded in a number of reading skills: an isolated deficiency such as reading rate can be easily overcome by developmental or corrective training which fosters maturation, flexibility, and the improvement of the weak skill. The individual is retarded by one year or more if in the primary grades, or by two years or more if older: the degree of discrepancy may vary with the numbers of children who can be served by special reading instruction. The individual manifests persistent retardation; that is, he has continued to show this degree of retardation below his estimated capacity: special training is not required for the pupil who lags behind only for a short period from temporary developmental causes.

Although the child experiencing reading difficulties may be defined operationally in terms of the measured discrepancy between his reading performance and his age, grade placement, or estimated capacity, he may also be described in terms of characteristics such as physical condition, mental capacity, and emotional factors. Monroe (56) designated

learning capacity, congenital or acquired neurological defects, conflicting cerebral tendencies, poor perceptual habits, and ill health as contributors to reading disabilities.

Learning capacity defined by a composite score on an intelligence test does not predict reading achievement with certainty. DeHirsh (19) reported that among predictor tests administered to kindergarten pupils, intelligence quotient ranked twelfth in predicting reading achievement at the end of the second grade. It is this very discrepancy between these two measures which partially defines reading deficiency. It has been reported that 90 per cent of poor readers ranged between 80 and 110 on intelligence measures and were evenly distributed throughout the range (76). Harris (32) found that among the children who had been referred as non-readers there were several with intelligence scores of 115 to 125. He does qualify this remark by saying that most children with several reading deficiencies have average or low average general intelligence. Strang (70) believes that the majority of the pupils who are reading a year or more below grade placement have the potential mental ability to read at, or even above, the level appropriate to their age or grade, whereas only a smaller percentage of those pupils reading a year or more below their grade level are mentally retarded. Monroe (56) reported that among special reading cases, I.Q.'s ranged from 60 to 150. In general, the range of intelligence

in the groups of children having reading deficiencies appears to correspond to that of the general population.

Unlike the intelligence range which indicates normalcy among retarded readers, emotional patterns reveal no such healthy picture. While emotional difficulties may cause reading difficulties, emotional problems have also been said to result from reading difficulty. Fernald (26) reported the histories of all but four of seventy-six children treated for reading disability revealed that they evidenced no emotional instability prior to entering school, that they entered school joyfully and eagerly, experiencing emotional upset when their desire to learn met defeat. She traced negativism toward this failure as it generalized to books, the school room, the members of the group, and their subsequent withdrawal from the group or their compensation expressed in bullying or showing--the "solitary child" or the "bombastic child" (26, p. 9). Austin (2) wrote in a similar vein, observing that these children frequently exhibited low self-esteem or self-concept and an excessive desire to please others, as well as aggression, expressed in fighting, verbal attacks, teasing, and clowning, and withdrawal expressed in daydreaming, a defeated attitude toward reading, defensiveness, and nervous tension. Supporting these views, Wilking (75) found that from thirty cases exhibiting emotional disturbances, only one preceded the reading disability. Jameson (38) described the young child who comes to school, anxious about

this new competitive group and his status within it, as being unable to learn the complicated task of reading. He feels hiw own failure, recognizes his lowered esteem as a member of his group, and frequently suffers shame which is intensified by parents and teachers. Spache (67) found that five patterns appeared among retarded readers in elementary school: hostile, adjustive, defensive, solution-seeking, and autistic. Observations of children with reading difficulties yield a very high incidence of emotional difficulties, and a preponderance of research and opinion points toward the appearance of the reading difficulties prior to the emergence of emotional maladjustment.

The general physical condition of the child has been considered to be a factor which contributes indirectly to reading problems. School absences resulting from ill health characterized some retarded readers (56, 77, 19); however, authorities gave more support to the theory of lowered vitality, depletion of energy, and inadequate stamina to function at optimum levels of performance. Chronic conditions such as rheumatic fever, asthma, heart trouble, and sinus infection tend to lower the child's output (32). Austin (2) included among these factors the childhood diseases, and emphasized that a lowered vitality could predispose a child to susceptibility. Witty and Kopel (77) listed allergies as a contributing factor to reading problems. Dechant (18) emphasized that any physical inadequacy makes it difficult

to become enthusiastic about learning: not only are the child's responses impeded, but also his attention is distracted from orientation in his work to focus upon his physical problem. Eames (22) cited pituitary dysfunction as a contributor to reduced eye span and increased number of fixations. Previously, both Harris (32) and Mateer (54) had noted the high number of glandular imbalance problems among poor readers. Toxic conditions caused by infections could produce visual and hearing deficiencies (8). The child's lowered vitality is sometimes closely related to the process of learning to read: he tires rapidly and cannot continue a sustained sequence of responses (32); he cannot compete successfully with healthier classmates (3); he fatigues quickly and becomes irritable and inattentive (19). As the tension mounts, the pupil becomes uninterested, disgusted, and may even turn from reading completely (19). As Dechant succinctly expressed it, "In general, good health is conducive to good reading, and poor health is often associated with reading deficiency" (18, p. 42).

Rationale for Study

Total Organism

The theory that physical fitness may be a factor affecting a child's successful reading performance has its roots in both organismic psychology, which emphasizes the interaction between mental and physical factors, as well as in

behavioral psychology, which underscores the function of sensory-motor processes in learning. Some theories embody the concept that teaching methods are not the solution to reading difficulties, that reading is a part of the total growth and intimately related to it, that reading development is rooted in biology, psychology and education. Support for the biological or maturational theory may be found in studies of the differences between boys and girls in reading achievement, the relationship between reading achievement and the physiology of the mother, the achievement of siblings and the mother, the achievement of siblings, and the relationship to secondary sex characteristics (1). Growth curves of individual children reflect that physical, emotional, and intellectual modification is generally unified: the child's readiness for reading depends upon his general development (1). From such multifarious investigations has emerged the multiple causation theory of reading difficulty. Because of the complexity of the interactions which exist between the many factors in a child's development, the dynamic quality of this relationship is an important consideration. To study the child, one must conceptualize him organismically, as a total person; but also, to understand the total child, one must delineate the components. Harmon (31) supported the concept of the synthetic approach, since advancing research, the use of more precise measuring instruments, and the applications of dynamics to the problems of human behavior have

repeatedly shown that no single function of the living organism can be considered without taking into account the interactions which that function has with others with which it is connected.

Such a theory of the interrelationship of human functions gives rise to a "flesh and blood" hypothesis concerning learning efficacy: it is indicated that the higher thought processes can be no more efficient than the motor abilities which cradle the mind and give expression to all behavior. John Watson attempted to seek methods for describing all human behavior in terms of muscular responses, defining thought as sub-vocal speech (74). A more moderate view does assert, however, that higher forms of behavior emerge from their roots, implanted in motor learning, and depend upon the basic structure of the muscular activity from which they develop. That muscular activity is involved in symbolic processes of the intellect has not been empirically established; however, there is evidence that thinking is at least accompanied by a general increase in muscular tension (42). Electrodes placed on fingers have indicated tension in these muscles when the subject was thinking of some manipulatory task (59). As early as 1932, studies by Jacobsen (37) showed that when one thinks, his muscles are also active. Subjects having been instructed to imagine counting, while the neural and muscular activities of their tongue were recorded, gave evidence of talking sub-vocally. Max (55), also in the

1930's, instructed deaf mutes to multiply and divide numbers "in their heads." Eighty per cent of them exhibited muscular activity in their hands, with some of the movements sufficiently large to be seen by the naked eye. Thirty per cent of the subjects with normal hearing, given the same study, indicated sign of hand movement but with less magnitude. More recently other studies (37, 34) have indicated a relationship between thinking and motor activity, and specifically between reading and motor activity (23). The importance of these studies seems to be that problem-solving behavior seems to be accompanied by muscular movements. It seems reasonable to assume that there is a relationship between learning the symbolic processes like reading and the ability of the organism to respond muscularly.

The educator who works with the child cannot ignore the interactions or interrelations among what McCandless (50) names the three major classes of behavior, for which he designed a schema to represent the facets of child development upon which workers from various disciplines tend to focus their inquiries (Fig. 1). The apex, or angle of greatest emphasis in the school setting is labeled school achievement and academic aptitude, and represents the focus of concentrated effort by parents and teachers. The lines intersecting at B enclose the personal-social-emotional aspects of the child's behavior, and reflect the greatest area of interests by school counselors, clinical and school psychologists,

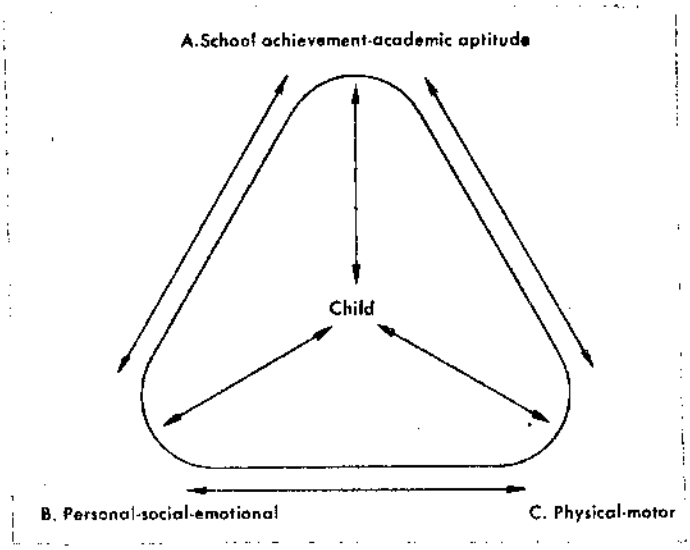

Fig. 1--A sketch of how the child and his behavior and characteristics may be usefully viewed. The double-headed arrows indicate interactions (50, p. 4).

psychiatrists, sociologists, social workers, and law enforcement officers. The area enclosed at C represents the child's physical attributes, including body type, strength, and motor coordination. McCandless observed that teachers and welfare workers are likely to ignore physical behavior, while medical personnel and physical education teachers may focus on it to the neglect of its interrelation with the other two facets.

Such a view of integrated processes underlies Carmichael's (13) theory of behavioral development. According to Coghill, the pattern of behavior expands as an integrated, unified whole; within the total patterns, partial patterns appear, and by the process of individuation acquire varying gradations of independence. Such a theory is contrary to the

concept of the progressive integration of increasing numbers of discrete units. However, Carmichael pointed out that this theory of the organization of behavior does not fully explain development. Activities become differentiated in varying rates, some responses being finely differentiated, while specificity has not become apparent in other responses (13).

Total Organism and Physical Skills

Modern physical education, reflecting this view of life as totality, and emphasizing education through the physical, has its foundations in the biologic unity of mind and body (76). As early as 1907, J. M. Tyler in Growth in Education, demonstrated that exercise of the large muscles of the trunk, arms, and legs is essential for stimulating growth and development of the maintenance organs and of the brain and mind (51). Physical skills permit the child to explore the environment, thus lending concreteness to mental process (68).

Upon this relationship rests Kephart's theory that motor flexibility promotes greater capacity for adaptability, which underlies the elaboration of behavior required of the complex human organism (44). Behavioral adaptability enables the child to respond to new situations with a wider repertoire. The capacity to shift from one configuration of behavioral responses to another is a function of muscle flexibility in conjunction with the process of generalization and discrimination and is basic to the modification of behavior. Such

plasticity of response originates in the interplay of nerve and muscle. The process of reciprocal interweaving, explained by Gesell, sharpens the focus on a multiplicity of simultaneous processes operating in the performance of a simple motor task such as clapping (29). Some muscles are flexed while others are extended; one hand proceeds in one direction, while the other travels in the opposite plane; they meet in the center at the same time--thus we see involved reciprocal inervation muscle strength, directionality, laterality, and time, all coordinated to emerge as a single constellation. The repertoire of constellations available to a child and the fluidity with which he shifts from one set to another underlies his capacity to respond appropriately to new situations and his adaptability in learning new responses.

Hunt (35) emphasized the role of fluidity in that the more variation in reality which a child has encountered the better equipped he is to cope with new situations. In their search for the nature of this integrative process, researchers have attempted to isolate the components contributing to this relationship. More recently there has emerged a renewed impetus to the search for the dynamism of that relationship; there have evolved questions pertaining to the interaction of these components within the developing individual.

Total Organism and General Physical Condition

One process, specifically reading, has been associated by most authorities with a multiplicity of factors, both native and environmental. While authorities agree that the general physical condition of the child is related to his reading achievement (18), the dynamics of the interaction are not clearly established; however, a variety of studies reflect the role of the general physical condition in contributing to the functioning of the total organism.

One may think of skills, the ability to think, and emotional status as contributing to the total well being of the child, with illness and handicaps subtracting from it. Skillful performance in strenuous exercise conserves energy, thus contributing to the energy product (68). Kraus and Raab (46) pointed up the syndrome of lack of physical exercise and emotional difficulties, inferring that physical activity promotes adaptability to stress, lowered neuromuscular tension and fatigue. Endurance, the antithesis of fatigue, has been directly correlated with strength relative to weight. The individual who has underdeveloped muscles is susceptible not only to occasional fatigue, but also cumulative fatigue which precipitates illness. The ratio of work load functions to produce muscular efficiency; thus an underdeveloped network of muscles is operating always at a lowered level of efficiency (51). In addition to increased fatigue, there is a greater susceptibility to infections. Karpovich (43)

proposed that physical fitness research seek the relationship between the functions of various organs at different levels of exertion. Accelerated exercise strengthens organic systems, including the heart; active individuals have lower blood pressure, have greater breathing capacity and lower pulse rate (57, 71). Slater-Hammel (66) found balance among groups of athletes to be superior to that of non-athletes. The inference from this study would support the efficacy of physical training in establishing kinesthetic skills contributing to the equilibrium of balance.

Rogers (62) described the processes of body mechanics founded upon basic operational principles, the stabilization forces of being off balance and the diagonal and reciprocal arm-leg coordination. When an individual walks, he literally falls forward, then modifies his foot position to maintain his balance, by adjusting his base to correspond to his new center of gravity. The leg muscles provide the propulsion, while the abdominal muscles provide a foundation for the swinging motion of the pelvis.

The act of throwing similarly calls into operation the force of gravity and the equilibrium of balance. When the individual moves his foot forward or off the ground, the front corner is unsupported and the center of gravity moves just in front of the foot which remains on the ground. Gravity causes the body to fall forward, the rear foot thrusts, and the arm swings--a summation of forces called into play to maintain the balance of the organism.

Throwing a ball requires the interplay of forces present in reciprocal coordination. The foot opposite to the throwing arm moves forward, the trunk leans forward, moving the center of gravity ahead of the base. The throwing arm moves forward with the foot. Adequate proficiency in these skills contributes to a well developed, well integrated body.

Definition and Classification of Motor Skills

Developmental trends in addition to demonstrating an interrelation between the specific factors of human maturation, also indicate increasing specificity and progressive differentiation (36, 58, 65). Bayley (5) noted that during the first fifteen months there is a strong relationship between motor and mental abilities, in the sense that achievement in one area was accompanied by achievement in the other area. However, after this time the relations were low, but positive. Jones (40) reported little relationship between intelligence and motor performance in a group of adolescents. Such findings point toward differential development of various factors, although they do not support autonomy of these factors nor their independent development. It should be noted that Kagerer (42) found that strength of upper back muscles and lower back muscles was correlated with all parts of the Metropolitan Readiness Test performances in a group of 409 children. Rosborough (63) found that all 20 of her

retarded readers failed the sit-up test, which requires strength in the abdominal muscles. There was no indication as in the Kagerer study, that these children displayed inadequacy in those parts of the test which require strength in the low back and upper back.

Therefore, it seems useful to examine the interrelationships between the various factors of specific physical abilities. Will a boy who lacks proficiency in ball throwing also be poor in foot races? It appears that these relationships are strong in infancy, but diminish later in childhood (5). Early tests of motor ability are exemplified by that designed by Cowan and Pratt (17), who attempted to predict this ability in three- to twelve-year-olds by their performance on the hurdle jump. Their theory rested upon the observation of the multiplicity of components required in this aspect of motor achievement (72). However, Hartman (33) administered to fifty-six children between forty-nine and seventy-eight months of age the following motor tests: hurdle jump, jump-and-reach, standing broad jump, baseball throw, and the thirty-five-yard dash. Thompson concluded:

> 'The low inter-correlations between the five motor tests (.36 to .56) suggest that while the tests have something in common, different motor abilities have been sampled to a large degree.' The hurdle test was not found to be a superior measure of motor development (72, p. 261).

He offered three possible explanations for the low inter-correlations typically found among different motor abilities:

differential opportunities for motor practice, no general factor of motor achievement, inadequate research to design tests for a general factor of motor achievement (72).

Clark diagrammed basic components of physical fitness to show their relationships (Fig. 2). Underlying the entire physical structure, organic soundness and proper nutrition form the basis upon which physical fitness rests. Clark defined the various elements in the motor fitness hierarchy graphically represented in terms of the nature of the skill and the type of activity in which it is employed. Muscular strength is that which is applied in a singular muscular contraction and is evident in grip strength. Muscular endurance is the ability to continue muscular exertions of less than maximal magnitude, and is basic to such activities as chinning. Circulatory endurance is the moderate contractions of large muscle groups for relatively long periods of time, which require an adjustment of the circulatory-respiratory systems to the activity, required in the fifty-yard dash. Muscular explosive power is the ability to release maximum muscular force in the briefest period of time, a component in performing the standing broad jump. Agility is speed in changing body positions or in changing direction and is necessary to successful performance of the shuttle run. Speed is the rapidity with which successive movements of the same kind can be performed, as in the fifty-yard dash.

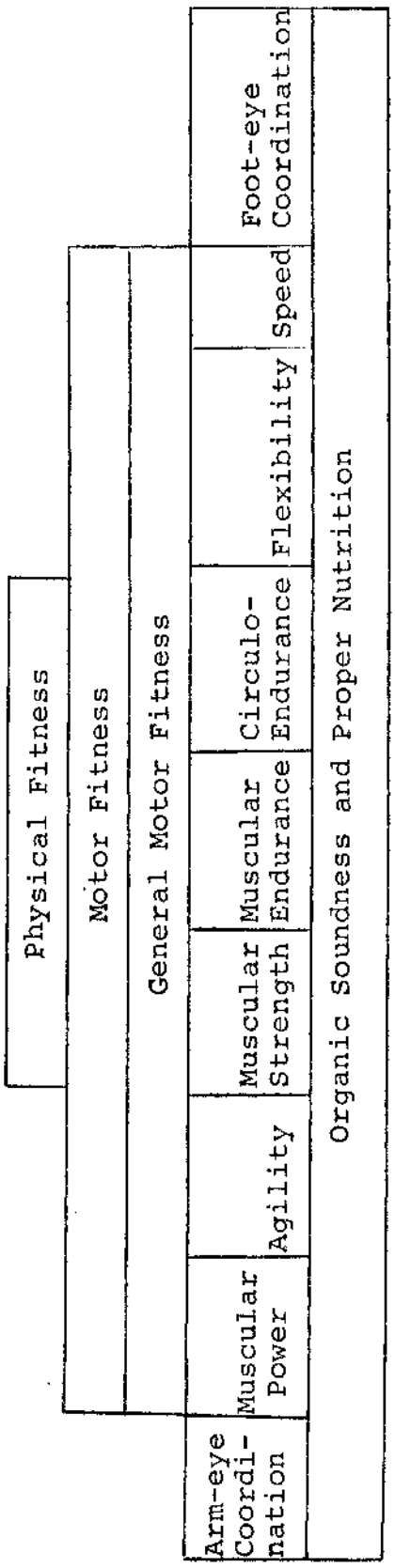

Fig. 2--Chart of Physical Elements (14, p. 202)

Flexibility is the range of movement in a joint or sequence of joints and is a component of the elephant walk.

These classifications represent the more unified factors of physical performance, which facilitate conceptualization of the major components and their relationship to the generalized ideas of physical ability. However, more useful for understanding the relationship between the factors included in this study is a finer taxonomy set forth by McCloy and Young (52). Each of these relates to one or more of the physical skills that were given emphasis in the training programs of this study.

In their discussion, McCloy and Young (52) refer to muscular components. Therein strength, speed, endurance, and circulo-respiratory areas were delineated and described in detail. Agility, flexibility and directionality comprised the second large category. Their third group of factors referred to were kinesthetic sensitivity and control, each comprising elements of body balance. Included here were classifications such as abilities to sense through proprioceptors in muscles and joints, positions of the body and coordination for combined type movements. The fourth group of components dealt broadly with spatial relations, the factor of perceiving geometrical interrelationships, use of sound judgment concerning time, height, distance and direction. The fifth broad group referred to timing and rhythm,

each of which is related to insight into the nature of a skill and to general kinesthetic sensitivity and control.

It is interesting to note that these categories, far from being mutually exclusive, were partially defined in terms of their relationships to other factors. However, the general trend appears to measure the independence of the development of specific skills rather than to attempt to identify a general factor of motor achievement. Such a line of development appeared in the writings of three leading researchers. Bovard and others quoted Brace in the 1927 edition of Measuring Motor Abilities: "For purposes of this study, the term 'motor ability' is used to apply to that ability which is more or less general, which is more or less inherent, and which permits an individual to learn motor skills easily and to become readily proficient in them" (9, p. 340). McCloy and Young (52) listed thirteen factors uncorrelated with other factors and nine compound factors comprised of two or more orthogonal factors. This trend toward more molecular emphasis in research was reflected by Clark: "The concept of specificity as contrasted with generality in motor performance must be recognized. The measurement of all specifics entering into complex motor activities of many types is the most desirable approach to their evaluation" (14, p. 263). Current research reflects stimulated interest in defining empirically the strength of

the relationships of these components. Laubach and McConville (49) investigated the relationship between muscle strength, flexibility and body size. Berger and Blaschke (6) attempted to determine whether static strength or dynamic strength was more highly related to motor ability; Berger and Henderson (7) studied the relative relationship between leg power and static and dynamic leg strength; Colgate (16) investigated the relationship between arm strength and arm speed.

Defining or classifying, as well as the process of developing motor skills is therefore a long range and complex set of activities. It appears to have numerous facets which directly affect one's physical well-being and development of motor skills.

Measurement of Physical Fitness and of Reading Achievement

Physical Fitness

Interest in the measurement of physical ability was manifest as early as 1873, when Sargent worked out his strength tests. A quarter of a century later Brace answered the demand for a scale of motor ability tests of general coordination, including twenty stunts to assess agility, balance, control, flexibility, and strength (9). These scales were designed to test what was considered to be a general motor ability for the homogeneous grouping of pupils for gymnastics.

In 1937 McCloy revised these tests, producing the Iowa Brace, whose correlation with stunt type activities was high (.45 to .60) but whose relationship to sport skill was weak (.00 to .35). Reliability measures indicated a high degree of consistency: test-retest correlations at six month intervals were .87 for children five to nine years of age, but declined to .53 to .88 for secondary pupils, and variability according to sex differences influenced the stability indices in the older group (24).

Oseretsky designed a series of tests for the purpose of designating motor development. A revision of the original scale, the Lincoln-Oseretsky Motor Development Scale, included items of hand and arm movements measuring speed, dexterity, coordination, and rhythm, motor items of balance, and jumping. Espechende concluded from findings reported by Sloan of low correlation with gross motor tests and the similarity of scores for boys and girls that this test does not measure strength or power (25). Carpenter adapted for primary children McCloy's General Motor Capacity and General Motor Ability tests (51).

Larson (48) listed motor tests in three categories: tests of fundamental elements underlying the performance of a skill, tests of fundamental skills, and tests of specific sports such as gymnastics, basketball, baseball, football, swimming, etc. Fundamental skills were listed as running, jumping, vaulting, throwing, kicking, climbing, and catching.

Elements underlying the performance of a skill are accuracy, speed, endurance, control of voluntary movement, agility, balance, body coordination, sensory motor coordination, rhythm, and strength. By factor analysis Larson attempted to determine the relation of each component to motor ability, and reported that dynamic strength, static dynometrical strength, gross body coordination, and abdominal strength were significant.

More recent development of physical fitness tests evolved from a search to measure the capacity of an individual to perform his daily tasks without undue fatigue. Franklin and Lebsten designed the Indiana Physical Fitness Tests for elementary and high school boys and girls to include straddle chins, floor push-ups, vertical jump, and squat thrusts for twenty seconds (14). The Washington Motor Fitness Test, developed by Kirchner for boys and girls six to twelve years of age, includes the standing broad jump, bench push-ups, curl-ups, squat jumps, and 30-yard dash (14). A more inclusive test prepared by the public schools in Tulsa, Oklahoma, includes the 25- or 50-yard dashes, pull-ups, zigzag run, sit and reach, sit-ups, 300- or 600-yard run-walk, broad jump, soft ball throw for distance, and the side-step. Percentile norms were developed for various categories (14). In 1954, Kraus and Hirschland (47) reported a test of minimum muscular fitness which measures muscular strength and flexibility. The test consists of six items:

1. Straight knee roll-up
2. Flex knee roll-up
3. Finger tip floor touch
4. Supine position leg lift
5. Prone position chest lift
6. Prone position leg lift

They were designed to measure the strength of the abdominal psoas muscles, strength of the abdominal muscles with the help of the psoas, strength of the psoas and lower abdominal muscles, strength of lower back muscles, and length of back and hamstring muscles (flexibility). However, Harris (32) reported that this test had not been adequately validated and that questions have been raised in regard to the arbitrary scoring system and to the disproportionate effects of certain test items in relation to the total test results.

The Oregon Motor Fitness Test measures six elements: arm and shoulder girdle strength and endurance, abdominal strength and endurance, muscular power, running speed and endurance, agility, and trunk flexibility. Test items selected to measure these elements revealed multiple correlation coefficients ranging from .91 to .95, and included, for boys, the standing broad jump, floor push-ups, and knee-touch, sit-ups, and for girls, hanging in flexed arm position, standing broad jump, and crossed-arm curl-ups (14).

The diversity of the elements measured by this test vividly exemplified the gradual morphology of current test

theory from a one-dimensional general factor approach to a multifactor sampling theory which undergirds present physical performance tests. According to Rarick (60), "It is held that the individual performing well in these tests is equipped to meet effectively the everyday physical demands of the American culture, with adequate reserve left for emergencies."

Reading

Fifty different tests of silent reading are listed in the Sixth Mental Measurements Yearbook (11), indicating active publication in this field. Reading tests may be grouped into three categories by function: survey tests which ascertain knowledge of vocabulary, comprehension, and rate, indicating generally the pupil's abilities, and reflect the grade level at which he is reading; diagnostic tests which give a more detailed analysis of specific skills; and special tests like vocabulary and speed.

The first of these, the survey test serves primarily to determine a child's general level of reading, and are primarily power tests. The Gates Primary Reading Tests, first published in 1926, test word recognition, sentence reading, and paragraph reading for children reading at grade one through grade two, five months (10). Anderson (1) considered the test to measure effectively the primary child's ability to recognize words and their meanings as expressed in pictures, to read sentences, and to read paragraphs. The format of the

word recognition test presents a picture accompanied by four words from which the child selects and marks the one which accurately names the picture. The sentence reading test presents a brief sentence accompanied by two pictures from which the child selects the one which accurately depicted the content of the sentence. Paragraph comprehension is measured by the child's ability to perform some task from written directions.

Beginning with the primary level and extending through the upper grades are such tests as the Stanford Achievement Tests, the Gates Basic Reading Tests, the Metropolitan Achievement Tests: Reading, and the more recently developed S.R.A. Achievement Series.

The reading section of the Stanford Achievement Test, first published in 1922, is a survey type which measures paragraph comprehension and word meaning and provides a gross indicator of reading achievement. Robinson (61) in reviewing the 1954 revision considered the split half reliabilities of the two parts for grades three through nine, which ranged from .82 to .92, to be satisfactory, but criticized the time limit requirement, which, in her opinion, diminishes its effectiveness as a power test. Townsend (73) observed that although the test requires a great deal of reasoning, it is limited by the scope of the skills which it samples. He recommended a supplementary test of study skills for use in the upper grades. The span of thirty-two years

between the original publication and the latest edition indicates that the demand for this type of test has been consistently strong for many years.

Another survey test for primary and upper grades, the Gates Basic Reading Test, first published in 1926 and revised as recently as 1958, produces a more refined report of a child's proficiency: three speed and accuracy tests, reading for general significance, reading for precise directions, and reading for details; and two power tests, vocabulary and comprehension. Dunn (21) pointed out that the wide range in the ages of children taking the tests makes the speed test, which contains material of fairly uniform difficulty, uninteresting for the older ones or too mature for the younger ones. It should be noted that percentile scores have in recent editions been presented to supplement the older indexes of reading age and reading grade level. The Metropolitan Achievement Tests: Reading, first published in 1939 and most recently revised in 1962, measure four levels, ranging from grades two through nine. Upper primary reading tests for grade two measure vocabulary and word recognition, a measure of phonic ability, and word discrimination. The upper levels yield scores of vocabulary and word recognition, and sentence and paragraph comprehension (61). Robinson points up that this test, although of the survey type, does offer possibilities for analyzing weaknesses and strengths.

Because the reliability for each sub-test is .79 to .96 and content validity appears to be substantial, examination of performance of each sub-test could yield a subjective indication of a child's performance in that type of reading.

The more recently developed S.R.A. Achievement Series: Reading, yields, like the previous ones, a two-fold measure--comprehension, designated by the child's ability to locate specific information and overall meaning, his ability to locate information in several places and compare the information to choose a correct alternative, and the ability to locate information and to make deductions and to form hypotheses; and vocabulary, designated by the child's knowledge of the literal meaning of a word and by his interpretation of the meaning of a word in context. Although the gross scores give a rough indicator of level, the types of skills sampled require the child to employ a diversity of reading skills, and like the Gates Basic Reading Test, represent a fairly refined, and thus a more sensitive, instrument than the earlier tests. Bryant (12) observed that because it is a power test, speed, especially important in the upper grades, is not measured. The unlimited time stipulation permits the child to search back over the material for an answer, a process which in his opinion limits its effectiveness in measuring comprehension. Derrick (20) criticized the length of the paragraphs and proposed that shorter passages could adequately measure comprehension. On the

other hand, he observed that the vocabulary words, taken from the context of the paragraphs, were limited. Therefore it would appear reasonable that the test makers may have lengthened the paragraphs in order to incorporate a more varied vocabulary. As was observed previously, percentile scores for this test supplement the older norms of reading age and reading grade level.

The continued use of reading achievement tests as a measure of a child's ability to make meaningful interpretations from written symbols would seem to indicate a rather widespread confidence in their efficacy. However, questions concerning the degree of relationship between the child's responses on the tests and his efficiency in the day-to-day process have been asked. One rather persistent question appears in the reviews concerning the nature of the information comprising the paragraphs and the amount of prior experience the child has had with the content of the material (1). Test makers attempt to control this factor by sampling a variety of fields (30). Another problem surrounds the interaction of speed and power: some tests measure only power, for example the S.R.A. Achievement Series: Reading Test cited previously; whereas others measure these separately, exemplified in the Gates Basic Reading Test. The problem is exemplified in reviews of two of the tests. Robinson (61) observed that the manual for the Stanford Achievement Test states that the tests are not speed tests, yet also states

that the time limits are to be extended under no conditions. She pointed out that an element of speed could influence a child's comprehension score under such a limitation, and recommended the Gates Basic Reading Test as a test of comprehension. However, in considering the comprehension section of the Gates Basic Reading Test, Bryant (12) held that the unlimited time allotment permits the child to search back over the material, thus possibly invalidating the test as a measure of comprehension. The problem of scope appears, especially in tests of the upper grades, in such skills as reasoning and evaluation (73). In spite of the apparent confusion concerning just what reading is, there appears a continued trend toward refinement and diversification, accompanied by additional descriptive interpretation of the results yielded by statistical data exemplified in the incorporation of percentile scores.

Possible Relationship between Physical Fitness and Reading Achievement

Concurrent with this effort to identify and measure specific factors, is a renewed interest in the interrelationships between physical abilities and academic performance (64). Recent interest in physical fitness in the muscular sense has generated interest in its effects on reading proficiency (69, 39, 64). The results of these studies are inconsistent and inconclusive in that the findings vary. Many of these studies have been correlational between factors at a single point in

time and have not assessed the relationship between increased physical proficiency and achievement.

Rosborough (63) outlined a diagnostic and training program for twenty children of average or above-average intelligence, ranging in age from five to seventeen--fourteen boys and six girls who were experiencing extreme reading problems. Diagnostic procedures revealed that the children exhibited one or more of the following symptoms:

Immaturity
Poor posture
Accident proneness
Necessity for orthopedic shoes
Articulation problem with *r*
Cognate sound confusion auditorially
Dropping to voiceless consonants
Immature eye functioning
Limited eye span
No eidetic memory
Reversals
Poor handwriting
Fist, rather than pincer grasp
Mixed dominance (63, p. 9).

She pointed out that musculo-skeletal performance is involved in each of these characteristics, and that this might be one of the aspects of the reading problems. Clinical tests of physical fitness revealed from the Kraus-Weber

Physical Fitness Test and specific observational tests that 100 per cent of the children could not perform the frontal sit-ups, while large portions of them failed to be proficient in the frontal leg lift, balance board mounting, and flexibility. Examinations indicated that all the children had tight heads and were unable to maintain steady eye movement. The children received training both in the office and at home. Results indicated that they had, at the time of the report, acquired the ability to do frontal sit-ups, to skip, to jump rope, and to do balance board work. Improvement was reported in hand coordination, use of eyes, reading, and school work in all classes.

Investigating the contention that physical fitness is related to mental achievement, researchers have conducted a wide variety of studies which compare intelligence with measures of physical ability, motor proficiency, motor power, physical efficiency, neuro-muscular capacity, dexterity, and athletic ability; and various aspects of motor ability have been compared to teachers' ratings, scholastic ratings, and achievement scores.

Although a number of these studies failed to reveal a direct relationship between physical fitness and achievement in school, relationships between factors showed promise of further study. In 1962, McCollum (53) compared physical fitness to intelligence, academic achievement, and attendance in school. His subjects were 172 male students enrolled at

Green County Technological High School, Paragould, Arkansas. The physically fit group consisted of 28 boys receiving the highest score on the AAHPER Test. The physically unfit group consisted of 28 boys who scored the lowest on the AAHPER Physical Fitness Test. Intelligence and achievement were measured by the California Test of Mental Maturity and teacher grades. Attendance was recorded daily for every student in each of his classes. Results indicated no significant difference between the physically fit and the physically unfit as measured by the fitness test and their performance on the intelligence test. The physically fit did, however, surpass the children in the unfit group in class attendance and grade point average.

Similar findings resulted from a 1961 study by Clark and Jarmon (15) conducted to study the relationship between the academic achievement of boys and certain growth and physical measurements. The question concerned whether or not a person's learning potential for a given level of intelligence is increased or decreased in accordance with his or her level of physical fitness. Subjects of this study were 217 white male students, 9, 12 and 15 years of age, enrolled in the public schools of Medford, Oregon. They were divided into high and low groups according to their performance on a strength index and on physical fitness indexes. The high groups had significantly superior grade point averages in their class work and significantly higher averages on standard scholastic achievement tests.

Kagerer (42) attempted to measure the relationship between various components of physical fitness--endurance, strength, and flexibility--and school achievement of first grade children. Using 409 children in the public school system of a midwestern city as subjects, Kagerer correlated, item by item, their test scores on the Metropolitan Readiness Test and the Kraus-Weber Test for Minimum Fitness. Two tests in the muscular battery reflected a significant correlation with all parts of the achievement test, while no other significant correlations existed. These tests measured strength and/or flexibility of the upper and lower back respectively. It was hypothesized that the back tests were an indication of postural insufficiency, and that difficulties in posture were related to school achievement.

An individualized physical training program was designed by Foster (27) to evaluate the effectiveness of mobility training, as outlined by Delacato, as a technique for improving reading achievement and intelligence test scores for fourth- and fifth-grade boys with mixed dominance. Seventy-one subjects selected on the basis of right-handedness and left-eyedness as measured on a test for peripheral dominance, were divided into three groups, matched in reading achievement and intelligence test scores. The first group received a training program as recommended by Delacato: ten minutes of motor development training, five minutes of target pursuit to improve eye-hand coordination, five minutes of footedness

training, and ten minutes of work with the stereo-reader to change eye dominance. The second group received training which opposed that recommended by Delacato's theory: physical activities stressed both sides of the body equally; music accompanied physical activities. Activities for this group were designed to weaken unilateral patterns of peripheral dominance and to strengthen tonality. A third group received the regular school program and served as a control for the two experimental. Results revealed no significant differences between the groups on tests of reading achievement or intelligence. Foster pointed up that the Delacato theory was not supported, but it is also interesting to note that the individualized physical training in neither of the two groups appeared to facilitate reading achievement. However, the physical training in this study was limited to the development of a particular pattern, and did not stress fluidity and diversity of activities.

A review of the literature would indicate that while there seems to be a preponderance of opinion which supports the organismic theory of the relationships between physical and mental development, and between general physical fitness and reading performance, there has been found little empirical relationship; however, there have been specific significant relationships in each study cited. All except one of the studies have attempted to describe an existing correspondence

between physical fitness and school achievement, rather than to investigate the effects of change in physical fitness upon school achievement.

Summary

Reading difficulty has been defined by reading authorities in terms of the discrepancy between reading level and reading capacity, age, or grade placement. Organismic psychology and behavioristic research infer that physiology cradles mental processes. Reading specialists also associate impaired physical fitness with reading difficulties. Measurement of physical fitness currently samples diverse factors of motor ability, strength, and endurance, whereas reading surveys assess vocabulary and comprehension, and give a gross indication of the child's reading level. Research has failed to show a direct general relationship between general physical fitness and reading achievement, but has revealed relationships between specific areas of physical fitness and reading achievement.

CHAPTER BIBLIOGRAPHY

1. Anderson, Irving H. and Walter F. Dearborn, The Psychology of Teaching Reading, New York, The Ronald Press, 1952.

2. Austin, Mary C., "Problem Readers," Reading: Seventy-Five Years of Progress, Proceedings of the Annual Conference on Reading Held at the University of Chicago, 1966, pp. 152-161.

3. Backus, B. and Marion Monroe, Remedial Reading, Boston, Houghton Mifflin, Boston, 1937.

4. Bateman, Barbara, "Learning Disabilities--Yesterday, Today and Tomorrow," Exceptional Children, XXXI (December, 1964), 167-177.

5. Bayley, Nancy, "The Development of Motor Abilities During the First Three Years," Social Research in Child Development Monographs, 1935, No. 1.

6. Berger, Richard, "Comparisons of Relationships Between Motor Ability and Static and Dynamic Strength," Research Quarterly, XXXVIII (March, 1967), 144-146.

7. _____ and Joe M. Henderson, "Relationship of Power to Static and Dynamic Strength," Research Quarterly, XXXVII (March, 1966), 9-13.

8. Betts, Emmet A., The Prevention and Correction of Reading Difficulties, Evanston, Illinois, Row, Peterson and Company, 1936.

9. Bovard, John F. and others, Tests and Measurements in Physical Education, Philadelphia, W. B. Saunders Company, 1949.

10. Buros, Oscar, editor, Fifth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1959, p. 634.

11. _____, editor, Sixth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1965.

12. Bryant, N. Dale, "S.R.A. Achievement Series: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959, pp. 656-657.

13. Carmichael, Leonard, "The Onset and Early Development of Behavior," Manual of Child Psychology, edited by Leonard Carmichael, New York, John Wiley and Sons, 1954, pp. 60-185.

14. Clark, Harrison, Application of Measurement to Health and Physical Education, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1959.

15. _____ and Boyd O. Jarman, "Scholastic Achievement of Boys Nine, Twelve and Fifteen Years of Age as Related to Various Strength and Growth Measures," Research Quarterly, XXXII (May, 1961), 155-162.

16. Colgate, John A., "Arm Strength Relative to Arm Speed," Research Quarterly, XXXVII (March, 1966), 14-22.

17. Cowan, E. A. and B. M. Pratt, "The Hurdle Jump as a Developmental and Diagnostic Test of Motor Coordination for Children from Three to Twelve Years of Age," Child Development, V (June, 1934), 107-121.

18. Dechant, Emerald, Improving the Teaching of Reading, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1964.

19. DeHirsh, Katrina and others, Predicting Reading Failure, New York, Harper and Row, Publishers, 1966.

20. Derrick, Clarence, "S.R.A. Achievement Series: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959, pp. 656-657.

21. Dunn, S. S., "Gates Basic Reading Tests," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959, pp. 656-657.

22. Eames, Thomas H., "Physical Factors in Reading," The Reading Teachers, XV (May, 1962), 427-432.

23. Edfeldt, Ake W., Silent Speech and Silent Reading, Chicago, Illinois, University of Chicago Press, 1960.

24. Espechende, Anna S., "Brace Scale of Motor Ability," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

25. _____, "The Lincoln-Oseretsky Motor Development Scale," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

26. Fernald, Grace M., Remedial Techniques in Basic School Subjects, New York, McGraw-Hill Book Company, Inc., 1943.

27. Foster, James Muriel, "Effect of Mobility Training upon Reading Achievement and Intelligence," unpublished doctoral dissertation, Department of Education, University of California, Los Angeles, California, 1965.

28. Garden, Sol, Address to the Texas Association for Children with Learning Disabilities, Houston, Texas, November 10, 1967.

29. Gesell, Arnold, "Maturation and the Patterning of Behavior," A Handbook of Child Psychology, edited by Carl Murchison, Worcester, Massachusetts, Clark University Press, 1933, pp. 335-373.

30. Green, H. A. and V. H. Kelley, Iowa Silent Reading Tests, Manual of Directions, Yonkers-on-Hudson, New York, World Book Company, 1943.

31. Harmon, D. B., Notes on a Dynamic Theory of Vision, University of Texas, Austin, Texas, 1957.

32. Harris, A. I. and W. Sternberg, "An Analysis of the Characteristics of Pupils in Three Remedial Classes at the High School Level," High Points, XXVI (September, 1944), 43-59.

33. Hartman, D. M., "The Hurdle Jump as a Measure of Motor Proficiency of Young Children," Child Development, XIV (December, 1943), 201-211.

34. Hebb, D. O., A Textbook of Psychology, Philadelphia, W. B. Saunders Company, 1958.

35. Hunt, J. McVicker, Intelligence and Experience, New York, The Ronald Press, 1961, pp. 258-259.

36. Hurlock, Elizabeth B., Developmental Psychology, New York, McGraw-Hill Book Company, 1959.

37. Jacobsen, Edmund, "Electrophysiology of Mental Activities," American Journal of Psychology, XL (October, 1932), 1-29, 677-694.

38. Jameson, Augusta, "Methods and Devices for Remedial Reading," Recent Trends in Reading, edited by William S. Gray, Supplementary Educational Monographs, No. 49, Chicago, University of Chicago, 1939, 1-144.

39. Jones, H. E., "The Environmental and Mental Development," Manual of Child Psychology, edited by Leonard Carmichael, New York, John Wiley and Sons, Inc., 1950, pp. 631-697.

40. _____, Motor Performance and Growth, Berkeley, California, University of California Press, 1949.

41. _____, "Relationship in Physical and Mental Development," Review of Educational Research, IX (February, 1939), 91-103.

42. Kagerer, Rudolph Lucan, "The Relationship of the Kraus-Weber Test for Minimum Muscular Fitness to School Achievement," unpublished master's thesis, Department of Psychology, Purdue University, Lafayette, Indiana, 1958.

43. Karpovich, Peter V., M.D., "Moto Ergo Sum," Anthology of Contemporary Readings, edited by Howard Slusher and Aileene Lockhart, Dubuque, Iowa, William C. Brown Company, Publishers, 1966.

44. Kephart, Newell C., The Slow Learner in the Classroom, Columbus, Ohio, Charles E. Merrill Books, Inc., 1960.

45. Kirk, Samuel, Educating Exceptional Children, Boston, Houghton Mifflin Company, 1962.

46. Kraus, Hans and Wilhelm Raab, Hypokinetic Disease, Springfield, Illinois, Charles C. Thomas, 1961.

47. _____ and Ruth P. Hirschland, "Minimum Muscular Fitness Tests in School Children," Research Quarterly, XXV (1954), 178-188.

48. Larson, L. A., "A Factor Analysis of Motor Variables, and Tests, with Tests for College Men," Research Quarterly, XII (1941), 499-517.

49. Laubach, Lloyd L. and John T. McConville, "Muscle Strength, Flexibility and Body Size of Adult Males," Research Quarterly, XXXVIII (October, 1966), 144-146.

50. McCandless, Boyd R., Children Behavior and Development, Dallas, Holt, Rinehart and Winston, Inc., 1967.

51. McCloy, Charles H., "How About Some Muscle?" The Journal of Health and Physical Education, VII (May, 1936), 302.

52. _____ and Norma Dorothy Young, Tests and Measurements in Health and Physical Education, New York, Appleton-Century-Crofts, Inc., 1954.

53. McCollum, Garland, "A Comparison between the Physically Fit and Physically Unfit in Intelligence, Academic Achievement and Attendance in School," unpublished master's thesis, College of Health, Physical Education, and Recreation, Arkansas State College, State College, Arkansas, 1962.

54. Mateer, Florence, "A First Study of Pituitary Dysfunction," Psychological Bulletins, XXXII (November, 1935), 736.

55. Max, L. W., "Experimental Study of Motor Theory of Consciousness: IV, Action Current Responses in the Deaf During Awakening, Kinesthetic, Imagery and Abstract Thinking," Journal of Comparative Psychology, XXIV (October, 1937), 301-344.

56. Monroe, Marion, Children Who Cannot Read, Chicago, University of Chicago Press, 1932.

57. Morris, J. N. and P. A. B. Raffle, "Coronary Heart Disease in Transport Workers," British Journal of Industrial Medicine, XI (October, 1954), 260.

58. Mussen, Paul Henry and others, Child Development and Personality, New York, Harper and Row, Publishers, 1963.

59. Paine, Richard S., "Organic Neurological Factors Related to Learning Disorders," Learning Disorders, Vol. I, edited by Jerome Hellmuth, Special Child Publications, Seattle, Bernie Staub and Jerome Hellmuth Company, 1965, pp. 1-29.

60. Rarick, Lawrence and William Reddan, "Youth Fitness and Health," Review of Educational Research, XXXII (December, 1962), 515-529.

61. Robinson, Helen M., "Stanford Achievement Test: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959, pp. 654-655.

62. Rogers, Martin, "Basic Body Mechanics: An Interpretation," Journal of Health, Physical Education and Recreation, XXXII (December, 1961), 20-22.

63. Rosborough, Pearl M., Physical Fitness and the Child's Reading Problem, New York, Exposition Press, Inc., 1963.

64. Ryan, Dean, "Relative Academic Achievement and Stabilometer Performance," Research Quarterly, XXXIV (May, 1963), 185-190.

65. Shirley, Mary M., "Sequence of Motor Development," The Child, edited by Jerome Seidman, New York, Holt, Rinehart and Winston, 1963.

66. Slater-Hammel, A. T., "Influence of Order of Exercise Bouts upon Neuromuscular Tremor," Research Quarterly, XXVI (March, 1955), 88-95.

67. Spache, George D., Toward Better Reading, Champaign, Illinois, Garrard Publishing Company, 1964.

68. Steinhaus, Arthur, "Significant Experiences--A Challenge to Physical Education," Anthology of Contemporary Readings, edited by Howard Slusher and Aileene Lockhart, Dubuque, Iowa, William C. Brown Company, Publishers, 1966.

69. Stout, H. G., "Variations in Normal Children," Journal of Experimental Education, VI (September, 1937), 84-100.

70. Strang, Ruth, "Variability in Reading Scores on A Given Level of Intelligence Test Scores," Journal of Educational Research, XXXVIII (February, 1945), 440-446.

71. Taylor, Henry L., "Coronary Heart Disease in Physically Active and Sedentary Populations," Journal of Sports Medicine and Physical Fitness, LXIV (June, 1962), 542-568.

72. Thompson, George G., Child Psychology, Boston, Houghton Mifflin Company, 1962.

73. Townsend, Agatha, "Stanford Achievement Test: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959, pp. 656-657.

74. Watson, J. B. and R. Raynor, Behavior, An Introduction to Comparative Psychology, New York, Henry Holt and Company, 1914.

75. Wilking, S. V., "Personality Maladjustment as a Causative Factor in Reading Disability," Elementary School Journal, XLII (1941), 268-279.

76. Williams, Jesse Feiring, "Education through the Physical," The Journal of Higher Education, I (May, 1930), 279-282.

77. Witty, Paul and D. Kopel, Reading and the Educative Process, Boston, Ginn and Company, 1939.

CHAPTER III

METHODS AND PROCEDURES

Subjects

Within the teaching profession, as well as within numerous other professions, the discussion about pupils with reading difficulties is flavored with concern, as well as with condemnation by some groups. In the midst of all this ferment, public school personnel often find themselves in a difficult spot. Thus, in the need for greater knowledge, both in theory and application, the process becomes particularly acute. Action research seems to be one of the main alternative sources to which school personnel may turn for the information needed in making instructional decisions. A very precise remark on this same theme was made by scientist Thomas Henry Huxley when he said:

> You have all heard it repeated, I dare say, that men of science work by means of induction and deduction, and that by the help of these operations, they, in a sort of sense, wring from nature certain other things, which are called natural laws, and causes, and that out of these, by some cunning skill of their own, they build up hypotheses and theories. And it is imagined by many that the operations of the common mind can be by no means compared with these processes, and that they have to be acquired by a sort of special apprenticeship in the craft. To hear all these large words, you would think that the mind of a man of science must be constituted differently from that of his fellow men; but if you will not be frightened by

> terms, you will discover that you are quite wrong, and that all these terrible apparatus are being used by yourselves every day and every hour of your lives (7, p. 15).

Criteria for Selection

This study evolved from a desire to meet the educational needs of elementary age pupils who are normal in intelligence, but whose reading achievement is deficient. The subjects included in this study comprised all those children in grades two, three, four, and five of the three elementary schools in one school district who met the criteria for special reading instruction. Specifically, they were those students in grades two through five who were normal in intelligence, but who were reading at a level six months or more below grade placement, or whose performance otherwise observed by the teacher indicated a deficiency in the reading processes.

In the spring of 1967 all elementary teachers, in their evaluation of each student's progress, listed the pupils who, from their nine months observational period were falling below grade level expectancy in reading achievement. In addition to furnishing administrators another source of information for grouping, the teachers' lists also served as a basis for referral to the special reading teacher and other specialized service personnel, including the school nurse, the elementary counselor, and the speech therapist.

Initial standardized evaluation of special reading students as measured by the Gates-MacGinitie Reading Tests began an intensive screening program. If careful study of the cumulative records indicated possible deficiency in hearing, vision, weight, or nutrition the child was referred for additional evaluation by other school personnel, such as the school nurse, who made the appropriate evaluation to screen out pupils exhibiting physical disabilities. Students who were eligible for any class in special education, including the mentally retarded, hard of hearing, deaf, orthopedically handicapped, emotionally disturbed, or diagnosed brain damage, were ineligible for participation in this study. If the record reflecting scores on a group intelligence test indicated a question concerning the pupil's ability to learn, the child was referred to the counselor for individual testing, in order to screen out those children below normal in intelligence. Two hundred ninety-seven children were initially recommended by the classroom teachers. Two hundred fifty-five of these met the criteria after the reading screening. Thirteen additional students were found ineligible because of below-normal intelligence and were therefore deleted from the special reading classes. Two children who passed the tests for placement later moved from the city during the study and one additional child was, at parental insistence, reassigned to the first grade. The remaining 239 completed

the total 12 weeks of this study. In Table I these facts are presented schematically.

TABLE I

INITIALLY REFERRED PUPILS AND THOSE PUPILS COMPLETING THE STUDY

Initial Number of Students Referred	Students Eligible After Reading Test	Students Eligible After Intelligence Screening	Students Lost Due to Moving	Students Reassigned	Students Remaining
297	255	242	2	1	239

In summary, the subjects of this study met the following criteria: they were similar in that each demonstrated reading difficulties, and their achievement level in reading was six months or more below expectancy; they exhibited no serious physical disabilities; they were similar in that they were selected from subjects whose intelligence quotient, based upon group mental ability tests, placed them in a normal range of 80 to 120.

Background of the Subjects

The three elementary schools from which these subjects were studied were comparatively large, with an enrollment of

approximately 1,000 pupils in kindergarten through the fifth grade. By prior action of the Board of Trustees for this school district, the schools were fully integrated; however, as no Negro children resided within the district, all subjects included in this study were white.

A study of the school records revealed that these children came from families of near-average income, based upon the types of occupations stated as those filled by the guardians and compared with the prevailing salaries paid in this location of the State of Texas. Further examination of the records indicated that 80 per cent of the parents of the students had completed the eleventh grade; 4 per cent were listed as professional people; 12 per cent show high school graduation with some college; while the remaining 4 per cent were below the eleventh grade. The school records did not reflect any unemployment on the part of the parents or guardians. Instead, it was revealed that in more than 60 per cent of the students studied, both parents worked away from the home in some type of gainful employment.

Number and Sex of Subjects

Each of the elementary schools had two full time instructors whose only instructional responsibility was to teach the special reading classes. Each group was limited to a maximum of 9 pupils per group; therefore each teacher worked with a maximum of 45 children. In the three schools, each having

two reading teachers, it was possible to work with a total of 270 students. However, only 242 pupils were placed in these initial groups at the onset of the study, and 239 completed the twelve-week study. All students, both boys and girls, meeting the criteria were accepted for the study. In Table II is presented the schema of the students by grades, schools, and sex.

The table reflects that male students outnumbered female students in all classes with the exception of fourth grade classes from two schools. The ratio in the classes varied from 1.19 males to 1 female in one class to 4.50 males to 1 female in another class; and the ratio of total distribution was 1.54 males to 1 female.

The number of pupils in each grade varied from forty-nine in grade four to seventy-one in grade five, with the second largest group of sixty-four coming from grade two. It may be observed, therefore, that the two largest grades in the study were the lowest (grade two) and the highest (grade five), with the intermediate grades (three and four) containing the fewest pupils.

Test Instruments

The Physical Fitness Tests

Physical fitness, one phase of total fitness, is often used interchangeably with motor fitness, and is harmonious with other facets--social, emotional, and intellectual (9).

TABLE II

GRADE AND SEX OF SUBJECTS

School	Individual School		Grade 2			Grade 3			Grade 4			Grade 5			Total
	M*	F*	M	F	Total	M	F	Total	M	F	Total	M	F	Total	
"A"	49	30	14	10	24	11	6	17	6	10	16	18	4	22	79
"B"	47	30	10	5	15	10	9	19	10	8	18	17	8	25	77
"C"	49	34	18	8	26	13	5	18	5	10	15	13	11	24	83
Grand Total	145	94	42	23	65	34	20	54	21	28	49	48	23	71	239

*M = Male; F = Female.

In Chapter I of this study, however, the specific definition of physical fitness is given as that state which characterizes the degree to which a person is able to function and it is this concept which the term designates.

"A Presidential Message to the Schools on Physical Fitness of Youth," in part, presented the following appropriate passage on this topic:

> The strength of our democracy is no greater than the collective well-being of our people. The vigor of our country is no stronger than the vitality and will of all our countrymen. The level of physical, mental, moral, and spiritual fitness of every American citizen (11, Foreword).

The development of the American Association for Health, Physical Education and Recreation Tests afforded an opportunity for cross-cultural fitness studies employing the Kraus-Weber Test (8). The authorities cited agreed unanimously that this generation of boys and girls is fundamentally healthier than previous generations, yet they hasten to qualify their statements by adding that most youths fail to develop strong, agile bodies. It is essential for every child to develop firm, supple, strong, flexible bodies--"fit to learn, fit to understand, to grow in grace and stature, to fully live" (11).

A significant fact is that 2,648 high schools in 25 states over a five-year period have been able to prove that achievement in course subjects at school was directly proportional to the quality of the program (1). This has been a

factor in the selection of a proven program, the scales from the American Association of Health, Physical Education and Recreation Tests.

A contribution in a related vein was Stein's (14) study of the regular physical education program in the Arlington County, Virginia schools. This study also used the American Association of Health, Physical Education and Recreation Tests, with controls necessary to obtain factual data. The students were given pull-ups, standing broad jump, shuttle run and sit-ups, fifty-yard dash, soft ball throw, and the six hundred yard run and walk tests, the same as were used in this study. Upon Stein's re-test, he employed the Pearson product-moment correlational technique to interpret his findings. Five of the tests had reliability coefficients from .93 to .98, a significance beyond the .001 level. It should however be pointed out that Stein's work was with secondary students. He emphasized the fact that his study was conducted during the student's regular physical education period, as was this study, and not in an experimental research setting. Stein's results could well be more meaningful if also used in a public school setting.

The subtests administered included the following items at all levels (grades two through five):

1. Arm Hang
2. Sit-ups
3. Shuttle Run

4. Fifty-yard Dash
5. Softball Throw
6. Three Hundred-yard Dash
7. Standing Broad Jump

Item 1, the arm hang, was a modification instituted because it was observed that some second grade children are unable to achieve any part of the original test item, the pull-ups. In order to make the test valid and uniform for all children in the study, the arm hang was substituted at all levels.

Performance on each subtest was reported in units of time, distance, or number: arm hang, time; sit-ups, number; shuttle run, time; fifty-yard dash, time; softball throw, distance; three hundred-yard dash, time; standing broad jump, distance. Testers and recorders at both the pre-test and post-test periods were the same persons. This measure served as a control in an effort to increase the reliability of assessment.

The Reading Tests

The pre-test and post-test measurement of reading achievement was obtained from performance on the Gates-MacGinitie Reading Tests, published by Teachers College Press. Gates, one of the most prominent researchers in the teaching of reading and other areas of educational and psychological research since the 1920's, along with MacGinitie designed this test series to replace the Gates Primary and Advanced

Primary Reading Tests and the Gates Reading Survey, used in public schools across the nation for many years (6).

At each grade level, the appropriate test was administered, with alternate forms varied from the pre-test period to the post-test period in an effort to prevent a spurious achievement gain from test item familiarity. Form 1 of the appropriate tests was given at the initial test phase, followed by form 2 of the same tests in the final test phase. Levels A and B include both vocabulary and comprehension, while levels C and D include vocabulary, comprehension, speed, and accuracy. These forms and levels are shown in Table III.

TABLE III

FORM AND LEVEL OF TEST ADMINISTERED

Grade	Pre-testing		Post-testing	
	Level	Form	Level	Form
2	Primary A	1	Primary A	2
3	Primary B	1	Primary B	2
4	Primary C	1	Primary C	2
5	Primary D	1	Primary D	2

A high degree of stability was reflected in the alternate form reliability coefficients, which ranged from a high of .87 to a low of .67. Highest stability occurred in the

vocabulary and comprehension at all levels, ranging from .81 to .89; and highest instability occurred in the speed tests, ranging from .67 to .89 (6). Although the coefficients are not so high as the split half reliability coefficients, they do reflect a high degree of stability, taking into consideration the variability of the subjects from one test period to the next, and thus presented a more realistic description congruent to the design of this study.

Results of the test were reported in terms of grade level, percentiles, or standard scores. However, because they are more efficacious in statistical analysis, the standard scores were used to report each child's reading achievement gain.

Ramsey (12), in a speech to the International Reading Association on "The Values and Limitations of Diagnostic Reading Tests for Evaluation in the Classroom," noted the dignostic value of this test. For a reading test to be truly diagnostic, he delineated the following essential criteria:

Reality--(tests the ability)

Guessing--not easy

Active response--overt and observable

Specificity--items should measure a single ability

Comprehension--should be tested other than by memory

The advantages of a diagnostic reading test, he said, are

that they are constructed by experts; they have graded paragraphs and graded word lists; and that they have established norms. His concluding remarks included the Gates-MacGinitie Tests among those tests which met these criteria.

Procedures

Physical Fitness Testing

In preparation for administration of the first phase of physical fitness testing, as in the tests of reading achievement, those participating in the measurement procedure met to receive instructions. The writer met with those directly involved in the administration of the physical fitness tests--the teachers, the student teachers, administrators, and teacher recorders--in schools "A," "B," and "C," the three participating schools, to explain the purposes of the tests, the nature of the tests, and to demonstrate to each of them individually the particular task he would perform. Although these orientation sessions were conducted with small groups, in some cases individual demonstrations were given.

The children were tested on the grounds of their own schools. All tests were conducted outdoors on the grass surfaces of each of the participating schools, beginning at one in the afternoon, for a duration of approximately two hours. The test schedule, replicated at each of the three schools, held constant such factors as the type of terrain, time of day, same testing and recording personnel, and the

same procedures for make-ups. The scheduling of this regular testing period provided an opportunity for those children who had been absent from school on the day their groups were tested to be included in the testing at another school. As soon as school "A" was tested, school "B" was begun the following day, with school "C" the day following, taking a total of three days. Thus, three children absent from school "A" on the first day were transported to school "B" the following day; others were tested at school "C" on the third day. On the fourth day, five pupils from school "A," three from school "B," and four from school "C" were tested in an over-all make-up test on the campus of school "A."

The effects of the ensuing twelve weeks of training were assessed at the end of this period by the second phase of physical fitness testing. The procedure for the post-test administration duplicated that of the first phase. The same teachers, student teachers, administrators, and teacher-recorders performed the tasks which they had completed in the pre-test administration. They were in all instances again oriented for their roles in the post-testing. The post-tests followed the same schedule as the pre-tests, with the other environmental conditions being held constant. In order to reduce extraneous variables, the same judges performed in both phases of the test; the same assistants--teachers, student teachers and administrators--repeated

their former tasks. The same schedule, time of day and location prevailed in the second test phase.

Reading Achievement Testing

As in the physical fitness testing, the assessment of reading achievement began with thorough orientation of the teachers and administrators who had direct contact with the pupils. The tests, the purpose of the tests, the scheduling, and the time of administration were explained in detail in order to insure a thorough understanding of the procedure. The children were oriented by the reading specialists in groups of nine. They were given explanations detailing the purposes for which the tests were to be used. They were not informed, however, of the nature of the study or the purpose of the tests in the study.

Following a thorough orientation period, the tests were administered on two consecutive days--the vocabulary on one day, and the comprehension on the next because of the length of the reading test, and because of the possibility of fatigue. Test periods were scheduled during the regular school day to coincide with the regular reading period, that is, while classmates of the study group were having their regular reading classes. This procedure avoided special scheduling, confusion, or absence from other classes.

The make-up procedure followed that of the physical fitness testing: children absent from school "A" were

tested the following day at school "B," etc. Two children who were absent for a longer period of time were transported to school "B", where special make-up tests were given.

The reading achievement post-testing was conducted at the end of twelve weeks. The tests were administered by the same teachers under the same conditions as the pre-testing.

Organization and Scheduling of Special Reading Classes

Organization and scheduling of the special reading classes may be briefly delineated:

1. Special reading students met with the special reading teacher at the time simultaneous with the reading period for the regular class.

2. The reading classes were fifty minutes in length with five minutes allowed for movement to and from classes.

3. Each class was limited to a maximum of nine students.

4. Each reading teacher was limited to five reading classes per day.

5. Special reading classes began on Monday of the second full week of school, immediately after the screening and compilation of test information.

6. The primary program started with the second grade and extended through the third grade.

7. The intermediate program started with the fourth grade and extended through the fifth.

8. The regular classroom teacher also taught reading for a second period to all students each day; therefore, during the second regular reading period, he worked closely with the special reading teacher in order to insure that both were working toward the same instructional goals.

All children included as subjects attended these special reading classes, the criterion for their selection for participation in the study.

Organization and Scheduling of the Physical Training Program

The three treatment groups were randomly assigned to each of the three schools by drawing for schedules of experimental and control plans. The schema presented in Table IV reflects the distribution of plans among the three elementary schools.

Experimental groups were those subjects receiving individualized physical education; control groups were subjects participating in the school's regular physical education classes and those children assigned to the sedentary recreation classes. It may be observed from the chart that the pupils were fairly evenly distributed among the three schools, ranging from seventy-seven at school "B" to eighty-three at school "C." Similarly the pupils were fairly evenly distributed among the three treatment groups: seventy-one pupils received the sedentary treatment; eight-two pupils participated in the regular physical education classes; eighty-six pupils received individualized physical fitness training.

TABLE IV

TREATMENT GROUPS BY SCHOOLS AND GROUPS

School	Grade 2		Grade 3		Grade 4		Grade 5		Total
	Treatment	No.	Treatment	No.	Treatment	No.	Treatment	No.	
"A"	Regular P.E.	24	Sedentary Recreation	17	Individualized P.E.	16	Regular P.E.	22	79
"B"	Sedentary P.E.	15	Individualized P.E.	19	Regular P.E.	18	Individualized P.E.	25	77
"C"	Individualized P.E.	26	Regular P.E.	18	Sedentary Recreation	15	Sedentary Recreation	24	83

Each class met daily for an average of thirty minutes per day for twelve consecutive weeks. Physical facilities and location scheduling were so arranged that in no instance were any of the students participating with or near another group of students. This approach in itself served as a control so that imitations or patternings were less likely. All participating subjects engaged in their activity, whether it was individualized physical fitness education, group physical education, or sedentary recreation at the same time their classmates engaged in their physical education activity; thus there was no alternation or change of student schedule in the school day.

Student teachers who were completing the final phase of their training for the bachelor's degree and who had been assigned to this school system for supervised teaching were given special training, orientation and lesson plans for the actual teaching in each of the three treatment groups. There was daily supervision of this study, followed by weekly meetings with the instructional staff for the purpose of making follow-up day-to-day plans or further implementation. Sharing ideas, demonstrations, and explanations constituted a large portion of the weekly planning meetings.

The Three Types of Programs

1. Individualized physical education.--The distinguishing feature of this program was the provision for individual

physical activities; thus the student worked on his own in the acquisition of the fundamental physical fitness skills. The purposes for these movement exercises were improving the student's individual proficiency in basic running, walking, jumping, carrying, lifting, pushing, pulling, catching, throwing, rolling, climbing, and swinging. He progressed systematically from the simple to the ones requiring more complex skill development. Fait (5) stated that these types of muscular movements are considered fundamental to effective living, and that they are routine in the daily life of every normal individual. He further reiterated the importance of maximum efficiency in the performance of these movements upon a well balanced body; and the acquisition of such skills, he stated, is easier in childhood than at any later time in one's life.

The classes met daily for thirty minutes for a period of twelve weeks for a total of thirty consecutive hours of instruction. An analysis of time spent in each area of physical activity is shown in Table V. The tabulations were compiled from the teachers' weekly reports.

Body balance (standing, walking, sitting) was developed in different positions, since posture is not static. Instead, balance depends upon development of many different parts of the body. Physical activities relating to posture were designed for development of the postural muscles. Neilson's (10) basic pattern for walking efficiently was used,

TABLE V

PROGRAM OF PHYSICAL ACTIVITIES

Activity	Hours Spent in Activity
Body Balance	6
Fundamental Skills	6
Locomotion Skills	6
Catching and Throwing Fundamentals	6
Selected Activities	6

as was Larson's (9) balance guide, which refers to balance as the ability of the individual in controlling organic equipment neuromuscularly. He continues by giving an example of balance in the execution of the hand stand. Larson also reiterates that balance is most important in normal life activities. It prevents falls when the walking pattern is disrupted, as well as maintaining equilibrium after riding. Balance, he says, is related to the components of coordination.

Fundamental skill development involved lifting, carrying, pushing and pulling. Locomotion skills making up the third set of activities included hopping, leaping, and jumping. Fundamentals of catching and throwing comprised the next series of physical activities. Specific throwing patterns included the overhand throw, the underhand toss, and the push pass.

The remaining six hours were spent in activities selected by the students from lists of activities stressing flexibility, speed, agility, coordination, balance, and accuracy. In some instances, repeat selections were made. However, for the most part, student curiosity alone brought forth most of the teacher suggestions listed below.

Grade 2	Grade 3	Grade 4	Grade 5
Egg Roll	Hand Stand	Knee Dip	Corkscrew
Crab Walk	Mulekick	Hand Stand	Hand Stand
Jumping Jack	Frog Dance	Upspring	Double Forward Roll
Hand Stand	Bear Dance	Human Rocker	
Inch Worm		Knee Mark	

Suggestions from Slusher (13), Foster (5), Fait (4), Neilson (10), and Clark (2) contributed to the formulation of the individualized physical education activities used, each emphasizing the following areas: eye-motor, figure-ground, form constancy, position in space and balance.

2. The regular physical education.--Physical education in the regular classes was distinctly different from the individualized program. This program was built around group and/or partner activity at all times. It is highly competitive in the organizational and implementation aspects. The students did not participate alone; partners or groups were often determined prior to the time the class commenced or they were selected by appointed or chosen group leaders.

Importance was attached to repetition of those activities that were of a high interest level to the students of each grade. Seasonal sports, even in the second grade, seemed to be those requested most by the student body, with Team Dodge Ball coming in for a close second among student choices.

The recent curriculum guide produced by the school personnel in which this study was conducted states the following as a philosophy:

> The regular physical education program of this school is based on the belief that every child should have the opportunity for positive growth in the physical, mental, emotional and social behavior in everyday life. It should provide an opportunity for all students to participate and for them to apply the skills which they have learned (3, p. 1).

The specific goals for this phase of the study were similar to most regular group physical education classes; that is, to be physically strong and well coordinated through exercise and other physical training activities.

Mass or group games and activities made up six hours of the instruction during the twelve-week, thirty-hour instructional period of time. Activities in this area included such favorites as tag, dodge ball, rag grab, kick ball, baseball, and volleyball.

Group rhythmic activities comprised another six hours of the thirty.

Free play was permitted for six hours under teacher supervision. It was during these times that student interest areas were considered.

Physical fitness exercising constituted the fourth six-hour period.

Relays of the various sorts, stunts, and imitative play made up an additional six hours of activities in physical education.

3. Sedentary recreation.--The intent of this program was to provide a program of instruction that did not have as a basic part of it any physical education. The programs did not involve special features. The emphasis was upon the sedentary recreational aspect, thereby using a variety of project opportunities.

Quiet games made up twelve of the thirty hours. Games such as Bingo, Old Maid, and Monopoly were used with the second and third grade students. At the fourth and fifth grade levels, the more popular activities included Bean Bag Toss, Shopping, Who Are You, and Name Them.

Pantomime activities in both the primary and intermediate grades were second in the non-physical education program, comprising eight hours of the thirty hour study.

Story-telling activities at both levels comprised another six hours, and art project activity that gave emphasis to seasonal programs made up the remaining four hours.

Chapter Summary

A total of 239 pupils in grades two through five, normal in intelligence, but reading at a level below expectation

were selected for special reading instruction. Preliminary measures of physical fitness were obtained by administering the American Association for Health, Physical Education and Recreation tests, and initial level of reading achievement was measured by the Gates-MacGinitie Reading Tests. Following a twelve-week physical fitness training program, the reading achievement was again measured by alternate forms of the same reading tests, and repetition of the physical fitness tests. Between the pre-test and post-test periods, an experimental program of physical training involved one-third of the subjects in individualized fitness activities; one control treatment, sedentary physical activities, involved one-third of the subjects in non-physical activities; and the other one-third, serving as a second control treatment joined regular physical activities stressing group games and organized sports.

CHAPTER BIBLIOGRAPHY

1. Brookwalter, Karl and Carolyn, editors, "Fitness for Secondary School Youth," National Association of Secondary School Principals and the American Association for Health, Physical Education, and Recreation, Washington, D.C., The American Association for Health, Physical Education and Recreation, 1956, p. 47.

2. Clark, H. Harrison, Application of Measurement to Health and Physical Education, New Jersey, Prentice-Hall, Inc., 1967.

3. Deer Park Public Schools, "Physical Education Guide," Deer Park, Texas, 1966.

4. Fait, Hollis F., Physical Education for the Elementary School Child, Philadelphia, W. B. Saunders Company, 1964.

5. Foster, James M., "Effect of Mobility Training Upon Reading Achievement and Intelligence," unpublished doctoral dissertation, Department of Education, University of California, Los Angeles, California, 1965.

6. Gates, Arthur I. and Walter MacGinities, Technical Manual for the Gates-MacGinitie Reading Tests, Teachers College Press, New York, 1965.

7. Huxley, T. H., "We Are All Scientists," A Treasury of Science, edited by Harlow Shapley, Samuel Rapport and Helen Wright, New York, Harper and Brothers, 1946, I, 15.

8. Kagerer, Rudolph Lucas, "The Relationship of the Kraus-Weber Test for Minimum Muscular Fitness to School Achievement," unpublished master's thesis, Department of Education, Purdue University, Lafayette, Indiana, 1958.

9. Larson, Leonard A. and Rachael Dunaven Yocom, Measurement and Evaluation in Physical Health and Recreation Education, St. Louis, The C. V. Mosby Company, 1951.

10. Neilson, N. P., Physical Education for Elementary Schools, rev. ed., New York, The Ronald Press Company.

11. President's Council on Youth Fitness, Youth Physical Fitness, Part I and II, Washington, D.C., Superintendent of Documents, 1961.

12. Ramsey, Wallace, "The Values and Limitations of Diagnostic Reading Tests for Evaluation in the Classroom," Perspectives in Reading Conference, Houston, Texas, November, 1966.

13. Slusher, Howard S., Anthology of Contemporary Readings, Los Angeles, William C. Brown Company, 1966.

14. Stein, Julian U., "The Reliability of the Youth Fitness Test," Research Quarterly, XXXV (October, 1964), 328-329.

CHAPTER IV

ANALYSIS OF THE DATA

Procedure

This study sought to determine the effects of individualized physical fitness, group physical education activities, and sedentary recreational activities on reading improvement. To assess the results the mean gain in reading achievement as measured by the three groups was analyzed by an analysis of variance. To determine the empirical relationship between the means in reading achievement and gain in physical fitness, differences between the pre-tests and post-tests in reading achievement and the physical fitness sub-tests were compared.

Because of the varied nature of the activities included on the physical fitness test, and because of the apparent lack of interrelation between motor abilities (9), the sub-tests were treated separately. The first comparison included all children by grades and employed Pearson's product moment correlation. The second comparison included only the 30 per cent making the greatest gains and the 30 per cent making the least gains on each of the sub-tests. A single classification analysis of variance yielded an F ratio for differences in the gains in reading achievement made by these two groups. The third comparison tested the difference in the gains on

each of the sub-tests made by the 30 per cent making the greatest gains in reading and by the 30 per cent making the least gains in reading achievement. A single classification analysis of variance, for these groups also, yielded an estimate of significance.

The analysis of variance and the correlation coefficient provided a means of estimating the probability that any observed differences or relationships could have occurred as a result of variations produced by sampling. When a significant F ratio occurred, the Fisher's test of t was employed to identify the probability of chance differences between the means of the sets of scores. A minimum level of .05 was selected as an acceptable criterion for statistical validity. However, as Edwards (4) has noted, statistical significance means only that the hypothesis is tenable, along with a host of other hypotheses which might be formed, and is not necessarily true. All data were programmed for IBM 1620 and processed in the North Texas State University Computer Center. The programs were designed using the formulas presented by McNemar (11).

The level of significance was determined by consulting tables for the significance of coefficients of correlation, F ratios, and t ratios (8, 3) and then by linear interpolation for computing the size of the coefficient necessary for the .05 level of confidence. For statistical testing the hypotheses are expressed in the null form.

Hypothesis I

Hypotheses I-A and I-B were restated to read thus: there will not be a significant difference in reading achievement of second grade pupils participating in the individualized physical fitness training during a twelve-week period and that of those second grade pupils participating in either the regular physical education program, or the sedentary recreation program. An analysis of variance at each grade compared the sum of squares based upon variation within the three groups to the sum of squares based upon the variation between the means of the three groups in reading gain.

Second Grade

The analysis of variance in reading gain for the three second grade groups is reflected in Table VI. As was stated in Chapter III, reading gain was expressed in standard score units.

TABLE VI

ANALYSIS OF VARIANCE OF THE READING GAIN MADE BY THREE SECOND GRADE GROUPS

Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Between	123.25	2	61.63	2.46
Within	1556.20	62	25.10	
Total	1679.45	64		

The F ratio did not reach the 3.15 required for the .05 level of confidence. The null hypotheses were accepted and Hypotheses I-A and I-B were rejected. However, as a suggestion for future experimentation, it would be useful to compare the gains demonstrated by the individual groups. Of the three treatment groups as presented in Table VII, the

TABLE VII

MEANS AND STANDARD DEVIATIONS OF READING GAIN BY SECOND GRADE

Treatment Group	Number	Mean Gain	Standard Deviation
Individualized Physical Education	26	9.46	4.08
Regular Physical Education	24	6.50	5.48
Sedentary Recreation	15	9.13	5.19

individualized physical training group demonstrated the greatest mean gain with the smallest variability. The sedentary recreation group showed the next highest gain with somewhat greater variability. The children from regular physical education showed the least gain and the greatest variability, although there was no significant difference in the means.

An anlysis of variance assessed the significance of the F ratios for the three treatment groups in each physical skill at each grade level (Tables XXIX-XXXII). Those skills reaching a minimum of the .05 level of confidence were then

tested using Fisher's t, to find the differences between the means of the groups receiving the three types of physical training.

To assess the differences in gain on each of the physical fitness tests for the three treatment groups at the second grade level, scores were tested by using the analysis of variance. At the second grade level five physical skills--sit-ups, shuttle run, broad jump, fifty-yard dash, and ball throw--reached a minimum of the .05 level of significance. Of these skills which reached the level of significance, the t tests between the means of the three treatment groups are reported in Table VIII.

TABLE VIII

DIFFERENCES BETWEEN MEANS FOR SIGNIFICANT MOTOR SKILLS BY TREATMENT GROUPS IN THE SECOND GRADE

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Sit-ups	Individualized P.E.	26	2.88	2.59	2.63	.05
	Regular P.E.	24	.67	3.14		
Sit-ups	Individualized P.E.	26	2.88	2.59	2.15	.05
	Sedentary Recreation	15	.80	3.06		

TABLE VIII--Continued

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Sit-ups	Regular P.E.	24	.67	3.14	- .14	*N.S.
	Sedentary Recreation	15	.80	3.06		
Shuttle Run	Individualized P.E.	26	1.77	2.08	2.01	.05
	Regular P.E.	24	.63	1.73		
Shuttle Run	Individualized P.E.	26	1.77	2.08	3.74	.001
	Sedentary Recreation	15	- .67	2.09		
Shuttle Run	Regular P.E.	24	.63	1.73	1.96	*N.S.
	Sedentary Recreation	15	- .67	2.09		
Broad Jump	Individualized P.E.	26	10.77	7.10	5.69	.001
	Regular P.E.	24	.88	5.59		
Broad Jump	Individualized P.E.	26	10.77	7.10	.631	.001
	Sedentary Recreation	15	1.80	4.32		
Broad Jump	Regular P.E.	24	.88	5.59	1.32	N.S.
	Sedentary Recreation	15	1.80	4.32		

TABLE VIII--Continued

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
50-yard Dash	Individualized P.E.	26	1.04	.98	.59	N.S.
	Regular P.E.	24	.88	1.01		
50-yard Dash	Individualized P.E.	26	1.04	.98	3.69	.001
	Sedentary Recreation	15	- .13	.81		
50-yard Dash	Regular P.E.	24	.88	1.01	3.13	.01
	Sedentary Recreation	15	- .13	.81		
Ball Throw	Individualized P.E.	26	5.12	2.49	2.52	.05
	Regular P.E.	24	2.50	2.83		
Ball Throw	Individualized P.E.	26	5.12	2.49	2.17	.05
	Sedentary Recreation	15	2.53	5.68		
Ball Throw	Regular P.E.	24	2.50	2.83	- .03	*N.S.
	Sedentary Recreation	15	2.53	5.68		

*N.S. = not significant.

It can be seen in Table VIII that the mean gain on the sit-up test for the individualized physical training group was significantly greater than that of either the regular physical

education group or the sedentary group, whereas there was not a significant difference between the two control groups. The mean gain on the shuttle run again revealed a significant difference of .05 between the gain made by children receiving the individualized training and that of those attending the regular classes, and a highly significant difference (.001) between the experimental group and those participating in sedentary recreation. No significant difference was found between the regular physical education group and the sedentary group. The mean gains of all three groups reflect relatively homogeneous gains, the standard deviations ranging from 1.7275 to 2.0869, with the greatest variability in the gains in the sedentary group. The individualized physical training group demonstrated gains significantly superior to those of the other two groups on the broad jump. As in the sit-up and the shuttle run, no significant differences were found between the two control groups. Similar patterns occurred in the ball throw. The individualized physical training group made gains significant at the .05 level of confidence over the two control groups, with very insignificant difference between the regular physical education group and the sedentary group. However, a different pattern occurred in the fifty-yard dash. The difference between the individualized physical education group and the sedentary group was highly significant; the difference between the regular physical education group and the

sedentary group was also fairly high; but the difference between the gains made by the individualized physical training group and those attending regular classes did not reach an acceptable level of confidence.

Of the seven physical skills, the second grade children receiving individualized physical training made gains significantly greater than those in the sedentary group in five areas. They made gains significantly greater than those of the regular classes in four areas; however, in only one test, the fifty-yard dash, did the regular physical education group make significant gains over the sedentary group, and in none did it significantly surpass those of the individualized training group. The children in the sedentary group did not show significant gains over either of the other two groups in any of these physical skills.

The null hypotheses were accepted and the research hypotheses I-A and I-B were rejected on the basis of the analysis of variance of these three sets of scores. The fact that on five of the seven physical fitness sub-tests, the individual physical fitness group surpassed the other two groups to a significant degree does indicate that on these tests there was superior improvement in those physical fitness factors operating in these performances. This finding tends by logic to make hypotheses I-A and I-B even weaker. Had there been no differences among the groups in physical fitness gain, then the lack of relationship between individual

physical training and reading would not have been so apparent.

Third Grade

Hypotheses I-C and I-D were restated to read thus: there will not be a significant difference in reading achievement made by third grade pupils participating in the individualized physical fitness training during a twelve-week period and that of those third grade pupils participating in either the regular physical education program or the sedentary recreation program. The analysis of variance in reading gain for the third grade groups is reflected in Table IX. The F ratio

TABLE IX

ANALYSIS OF VARIANCE OF THE READING GAIN MADE BY THREE THIRD GRADE GROUPS

Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Between	29.48	2	14.74	.95
Within	794.67	51	15.59	
Total	824.15	53		

did not reach the 3.18 required for the 5 per cent level of confidence. Because of the probability of differences by chance, the null hypothesis I-C was accepted and the research hypothesis was rejected. Similarly the null hypothesis I-D was also accepted and the research hypothesis rejected. Examination of the characteristics of mean gains in these

three groups revealed interesting comparisons (Table X.) As in the second grade, the children receiving the individualized physical training made a greater mean gain in motor skills than did the other two groups. Unlike the second grade groups, children in regular physical education made greater gains than those in sedentary activities.

TABLE X

MEANS AND STANDARD DEVIATIONS OF READING GAIN BY THIRD GRADE

Treatment Group	Number	Mean Gain	Standard Deviation
Individualized Physical Education	19	7.63	3.98
Regular Physical Education	18	6.89	4.28
Sedentary Recreation	17	5.82	3.11

Gains on the physical fitness tests revealed a much less consistent pattern than was shown in the second grade performances. The F tests resulted in four significant ratios for the seven physical fitness sub-tests (Table XXX), namely, sit-ups, broad jump, fifty-yard dash, and the three hundred-yard run-walk. Analysis by Fisher's t test assessed the significance of the differences between the means of the gains by children in the three treatment groups on these four sub-tests. An examination of Table XI shows that seven of the twelve mean differences were significant at the .05 level of confidence or higher. Children from the

TABLE XI

DIFFERENCES BETWEEN MEANS FOR SIGNIFICANT MOTOR SKILLS BY TREATMENT GROUPS IN THE THIRD GRADE

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Sit-ups	Individualized P. E.	19	5.00	4.86	4.86	.001
	Regular P.E.	18	.61	2.73		
Sit-ups	Individualized P.E.	19	5.00	2.87	4.30	.001
	Sedentary Recreation	17	1.06	2.36		
Sit-ups	Regular P.E.	18	.61	2.73	.48	*N.S.
	Sedentary Recreation	17	1.06	2.36		
Broad Jump	Individualized P.E.	19	- .58	3.69	-3.02	.01
	Regular P.E.	18	5.17	6.04		
Broad Jump	Individualized P.E.	19	- .58	3.69	.91	N.S.
	Sedentary Recreation	17	1.18	6.80		
Broad Jump	Regular P.E.	18	5.17	6.04	2.04	.05
	Sedentary Recreation	17	1.18	6.80		

TABLE XI--Continued

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
50-yard Dash	Individualized P.E.	19	.32	.86	-1.56	*N.S.
	Regular P.E.	18	.89	1.41		
50-yard Dash	Individualized P.E.	19	.32	.86	1.16	N.S.
	Sedentary Recreation	17	- .12	.90		
50-yard Dash	Regular P.E.	18	.89	1.41	2.66	.05
	Sedentary Recreation	17	- .12	.90		
300-yard Run-Walk	Individualized P.E.	19	9.58	9.59	2.20	.05
	Regular P.E.	18	4.11	4.98		
300-yard Run-Walk	Individualized P.E.	19	9.58	9.59	2.29	.05
	Sedentary Recreation	17	3.82	6.45		
300-yard Run-Walk	Regular P.E.	18	4.11	4.98	.11	N.S.
	Sedentary Recreation	17	3.82	6.45		

*N.S. = not significant.

individualized physical education group were superior in four of the seven pairs. They demonstrated greater gains on the sit-ups than either the regular or sedentary groups, and greater gains on the three hundred-yard run-walk than either the sedentary or regular groups. Children from the regular physical education group demonstrated significantly greater gain in three comparisons: they surpassed the sedentary recreation group and the individualized physical training group in the broad jump, and the sedentary group in the fifty-yard dash. As in the second grade performances, in no comparison did the sedentary group demonstrate significantly greater gains than the other two groups.

The differences between the third grade groups appear to be somewhat less consistently defined than those observed at the second grade level. The individualized physical training group did make significant gains over the other two groups in two of the tests, but failed to make significant gains in reading. The null hypotheses I-C and I-D were accepted and the research hypotheses rejected. The apparent superiority of this group in gains on two tests of physical fitness further delineates the weakness in the relationship between reading achievement and physical training.

Fourth Grade

Hypotheses I-E and I-F were restated to read thus: there will not be a significant difference in reading achievement

of the fourth grade pupils participating in the individualized physical fitness training during a twelve week period and those fourth grade pupils participating in either the regular physical education program or the sedentary recreation program. It can be seen in Table XII that the significance of the difference in mean gain in reading achievement made by the three groups of children was assessed by the F test. The ratio of the variances between the groups to the

TABLE XII

ANALYSIS OF VARIANCE FOR THE MEAN GAIN IN READING ACHIEVEMENT BY THREE FOURTH GRADE GROUPS

Source	Sum of Squares	Degree of Freedom	Variance Estimate	F Level
Between	3.67	2.	1.83	.10
Within	810.33	46.	17.62	
Total	814.00	48.		

variances within the groups was not large enough to reach the .05 confidence level of 3.20. The null hypothesis I-E was accepted and the research hypothesis was rejected. The null hypothesis I-F was accepted and the research hypothesis was rejected.

An examination of the means and standard deviations of the three groups (Table XIII) reflects that children in the sedentary group made greater gains than children in either of the other two groups. It may be noted that these children

TABLE XIII

MEANS AND STANDARD DEVIATIONS OF GAINS IN READING BY THREE GROUPS

Treatment Group	Number	Mean Gain	Standard Deviation
Individualized Physical Education	16	4.25	3.72
Regular Physical Education	18	4.00	3.90
Sedentary Recreation	15	4.67	4.58

had a higher mean gain, but also had a greater variability than those in the other groups. The children participating in the individualized activities made the second greatest gains with the least variability. The children in the regular physical education classes made the least gain. Although these differences were not statistically significant, it is interesting to notice the differences between these groups in gains on the physical fitness sub-tests. The simple analysis of variance of each physical fitness sub-test (Table XXXI) by comparison of the three sets of gains revealed that only three F ratios were significant at the minimum .05 level of confidence--the shuttle run, the ball throw, and the 300-yard run-walk. Table XIV depicts the comparison of these three groups on the sub-tests which were significant. The children achieving the greatest gain in the shuttle run were those in the individualized physical fitness group whose mean was significantly greater than those in either of the other two groups. Neither the sedentary group nor the regular physical

TABLE XIV

DIFFERENCES BETWEEN MEANS FOR SIGNIFICANT MOTOR SKILLS BY TREATMENT GROUPS IN THE FOURTH GRADE

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Shuttle Run	Individualized P.E.	16	1.38	1.11	2.88	.01
	Regular P.E.	18	.00	1.37		
Shuttle Run	Individualized P.E.	16	1.38	1.11	2.62	.05
	Sedentary Recreation	15	.07	1.53		
Shuttle Run	Regular P.E.	18	.00	1.37	- .14	*N.S.
	Sedentary Recreation	15	.07	1.53		
Ball Throw	Individualized P.E.	16	2.63	2.76	-3.00	.01
	Regular P.E.	18	6.72	4.75		
Ball Throw	Individualized P.E.	16	2.63	2.76	- .00	N.S.
	Sedentary Recreation	15	2.67	3.66		
Ball Throw	Regular P.E.	18	6.72	4.75	2.91	.01
	Sedentary Recreation	15	2.67	3.66		

TABLE XIV--Continued

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
300-yard Run-Walk	Individualized P.E.	16	-3.13	6.02	-4.04	.001
	Regular P.E.	18	4.67	5.14		
300-yard Run-Walk	Individualized P.E.	16	-3.13	6.02	-1.42	*N.S.
	Sedentary Recreation	15	- .27	5.14		
300-yard Run-Walk	Regular P.E.	18	4.67	5.14	2.51	.02
	Sedentary Recreation	15	- .27	5.14		

*N.S. = not significant.

education group made significantly different gains on this test. In the ball throw, children attending regular physical education classes made significantly greater gains with greater variability than those from either of the other two groups. There was no significant difference between the individualized physical training group and the sedentary recreation group. Similarly, in the three hundred-yard run-walk, the children in the regular physical education classes made gains significantly higher than those in the other two groups. Greatest variability was observed in the individualized physical training group but no significant difference was found between it and the sedentary group.

Of the three physical fitness sub-tests which were significant, the individual physical training group was superior to the other two in one test--the shuttle run. The children taking regular physical education made significant gains over the experimental group and the sedentary group in two activities--the ball throw and the three hundred-yard run-walk. The sedentary group did not make gains significantly superior to the other two groups on any of the physical fitness tests.

The findings in this grade show less distinctly patterned results than either the second or the third grades. The children in the individualized physical training group did not surpass the other groups on as many of the physical fitness tests as did those in regular classes. However, there appeared no relationship between this gain and reading gain. The rejection of the research hypotheses I-D and I-E on statistical grounds was reinforced by the apparent lack of relationship between physical fitness gains and reading gains.

Fifth Grade

Hypotheses I-G and I-H were restated to read thus: there will not be a significant difference in reading achievement made by the fifth grade pupils participating in the individualized physical fitness training during a twelve week period and those fifth grade pupils participating in either the regular physical education program or the sedentary recreation program.

A comparison of performances in reading achievement gain by the three treatment groups was made by a simple analysis of variance. A summary of the analysis is delineated in Table XV. Because the F ratio failed to reach the 3.14 required for the .05 level of confidence, the null hypothesis I-G was accepted and the research hypothesis rejected. The

TABLE XV

ANALYSIS OF VARIANCE OF READING ACHIEVEMENT GAINS BY THREE FIFTH GRADE GROUPS

Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Between	3.26	2.	1.63	.0458
Within	2417.89	68.	35.56	
Total	2421.16	70.		

null hypothesis for I-H was also rejected. An examination of Table XVI reveals an interesting relationship. The children

TABLE XVI

MEANS AND STANDARD DEVIATIONS OF GAIN IN READING ACHIEVEMENT BY THREE FIFTH GRADE GROUPS

Treatment Group	Number	Mean Gain	Standard Deviation
Individualized Physical Education	25	4.52	3.16
Regular Physical Education	22	4.09	7.90
Sedentary Recreation	24	4.58	5.76

in the sedentary group made a greater mean gain than those in either of the other two groups. The greatest variability occurred in the regular group; the smallest variability was observed in the individualized physical education group. Foster (6) in a physical training-reading study reported that after two types of motor treatment given to two experimental groups, there was no significant difference between their reading achievement and that of a third group receiving the regular school program.

Analysis of the performances of these children on the physical fitness test reflected an interesting pattern. The variability of these three groups was compared by an analysis of variance on each sub-test (Table XXXII). The level of significance of the mean gain in reading for each motor skill of the treatment groups is presented in Table XVII.

TABLE XVII

DIFFERENCES BETWEEN MEANS FOR SIGNIFICANT MOTOR SKILLS BY TREATMENT GROUPS IN THE FIFTH GRADE

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Arm Hang	Individualized P. E.	25	5.52	4.39	1.92	*N.S.
	Regular P.E.	22	3.00	4.50		

TABLE XVII--Continued

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Arm Hang	Individualized P.E.	25	5.52	4.39	2.84	.05
	Sedentary Recreation	24	1.88	4.28		
Arm Hang	Regular P.E.	22	3.00	4.50	.85	N.S.
	Sedentary Recreation	24	1.88	4.28		
Sit-ups	Individualized P.E.	25	2.96	2.41	.76	N.S.
	Regular P.E.	22	2.27	3.33		
Sit-ups	Individualized P.E.	25	2.96	2.41	2.63	.05
	Sedentary Recreation	24	.63	3.34		
Sit-ups	Regular P.E.	22	2.27	3.33	1.80	*N.S.
	Sedentary Recreation	24	.63	3.34		
Shuttle Run	Individualized P.E.	25	.64	1.16	-2.16	.05
	Regular P.E.	22	1.68	2.01		
Shuttle Run	Individualized P.E.	25	.64	1.161	.30	N.S.
	Sedentary Recreation	24	.50	1.6		

TABLE XVII--Continued

Motor Skill	Treatment Groups	Number	Mean Gain	Standard Deviation	Fisher t	Level of Significance
Shuttle Run	Regular P.E.	22	1.68	2.01	2.43	.05
	Sedentary Recreation	24	.50	1.61		
Ball Throw	Individualized P.E.	25	5.28	2.29	2.83	.05
	Regular P.E.	22	2.32	4.35		
Ball Throw	Individualized P.E.	25	5.28	2.29	2.80	.05
	Sedentary Recreation	24	2.42	3.66		
Ball Throw	Regular P.E.	22	2.32	4.35	- .09	N.S.
	Sedentary Recreation	24	2.42	3.66		
300-yard Run-Walk	Individualized P.E.	25	5.44	3.95	5.80	.001
	Regular P.E.	22	-3.05	6.74		
300-yard Run-Walk	Individualized P.E.	25	5.44	3.95	2.87	.05
	Sedentary Recreation	24	1.33	3.62		
300-yard Run-Walk	Regular P.E.	22	-3.05	6.74	-2.96	.05
	Sedentary Recreation	24	1.33	3.62		

*N.S. = not significant.

Five of the seven sub-tests reached the minimal level of confidence: arm hang, sit-ups, shuttle run, ball throw, and three hundred-yard run-walk. On the arm hang, the individual physical education group made gains significantly greater than the sedentary group, but no significant gains occurred between the individual group and the regular group or between the regular group and the sedentary group. The sit-up analysis reflected approximately the same relationships: the individual group mean gain was significantly greater than that of the sedentary, but there was no significant difference between the individual and the regular group and the regular group and the sedentary group. The shuttle run test results reflected that gains by the regular physical education group were significantly greater than gains made by the individual group and by the sedentary group. No significant difference occurred between the gains made by the individual groups and those made by the sedentary group. The pattern shifted again in the ball throw: the individual group, like those in the regular group in the shuttle run, made gains significantly greater than either of the other two groups; but no significant difference occurred between the regular physical education and the sedentary recreation groups. For the three-hundred yard run-walk, the individual group made gains very significantly greater than the regular group, and gains significant at the .05 level greater than the sedentary group. The sedentary group, on the other hand,

made gains significantly greater than those in the regular group. In summary, of the five physical fitness tests which were significant, fifteen comparisons of the means resulted in significantly greater gains seven times. The children from the regular classes made significantly greater gains on two of the comparisons, and children from the sedentary group were significantly greater once.

The fact that the individualized physical education group made significantly greater gain than one group on three tests and greater than both other groups on two tests indicates a strong pattern of physical fitness gains, a finding which reinforces the previous rejection on statistical grounds of the research hypothesis that the individualized physical fitness group would make greater reading gains.

The second grade and fifth grade individualized physical fitness groups made significant gains in a number of motor skill areas; the third and fourth grades reflected that they achieved significant gains in fewer areas. The apparent effectiveness of the individualized training in achieving motor skill did not result in improved reading achievement as measured by the tests.

Hypothesis II

To test Hypothesis II, which stated that there would be a significant correlation between gain in reading achievement at each grade and gain in proficiency in each of the selected

physical activities, a simple correlation compared each child's reading gain and gain in each of the physical fitness sub-tests. These correlation coefficients by grades are presented in Table XVIII. Hypothesis II was restated to read:

TABLE XVIII

CORRELATION OF READING ACHIEVEMENT GAIN WITH GAIN ON EACH PHYSICAL FITNESS SUB-TEST

Variables	Coefficients by Grade Level			
	Grade N = 65	Grade 3 N = 54	Grade 4 N = 49	Grade 5 N = 71
Reading and Arm Hang	.23	.01	-.28	.02
Reading and Sit-ups	.00	-.12	-.13	.12
Reading and Shuttle Run	.17	-.02	.11	-.11
Reading and Broad Jump	.12	-.14	.33*	.15
Reading and Fifty-yard Dash	-.02	.07	.16	-.01
Reading and Ball Throw	.13	.12	-.00	-.11
Reading and 300 Yard Run-Walk	-.09	.07	.01	-.00

*Exceeds .282 necessary for .05 level of confidence.

there will not be a significant correlation between gain in reading achievement at each grade level and gain in proficiency in selected physical activities. Bayley (1) reported that after fifteen months of age, relationship between achievements in motor and mental abilities is positive but low. An inspection of these coefficients revealed that only one, broad jump and reading at the fourth grade level, reached the acceptable level of significance. This sub-test for

fourth grade groups (Table XXXV) did not reach the required level of significance. Although there was a relationship by individuals in this grade between reading achievement gain and their gain in performing the broad jump, this physical fitness gain did not typify any of the groups to a significant degree. Therefore, this gain cannot be attributed to the differences in physical education. Changes in reading ability with maturation (7) and changes in motor skills with maturation (7, p. 75) make a vertical comparison by grades hazardous; however, a look at the low correlations between broad jump and reading found in the other three grades does seem to throw some doubt upon the tenability of conceptualizing a relationship between reading gain and gain on the broad jump. Further investigation of this factor at this level by experimentation may, however, be warranted. Borg (2) stated that correlations in this range may have a limited meaning in exploratory research. McNemar (11) suggested that the .05 level of significance is permissible only if the findings of the study are not to be used as a basis for theory, further hypotheses, or for social action, and if the experimental situation provides for good control of sampling.

On the strength of the obtained correlation coefficients reported in Table XVIII the null hypothesis II, which predicted no significant relationship between gain in reading achievement and gain on each of the physical fitness sub-tests,

was accepted with the exception of the broad jump at the fourth grade level, and the research hypothesis was rejected.

Hypothesis III

Hypothesis III was restated to read thus: there will not be a significantly greater mean gain in reading achievement made by the physical education groups than by the sedentary groups. It was tested by analysis of the variance of the gain in reading made by each of the three treatment groups at each grade level. These analyses were presented in the discussion of Hypothesis I, along with the means and standard deveiations within the three groups for each grade level. No significant differences were found at grades two, three, four, or five in the mean gain in reading made by the children in the regular physical education classes and the children participating in the sedentary recreation; therefore Hypothesis III was accepted and the research hypothesis rejected.

The analysis of variance compared the differences in the gains made by the three treatment groups on each of the physical fitness sub-tests. The t tests between the means of the regular and sedentary groups at each grade were presented in the discussion of Hypothesis I, because these groups served as controls for the experimental groups included there. An examination of Table VIII revealed that on one of the physical skills sub-tests, fifty-yard dash, there was a difference significant at the .01 level in the second grade, with the

regular group making greater gains. It can be noted in Table XI that on two of the sub-tests at the third grade level, broad jump and fifty-yard dash, children in the regular classes made significantly greater gains than those in the sedentary group. It can be seen in Table XIV that at the fourth grade level, children in the regular physical education classes made gains significantly greater than those in the sedentary group on two of the sub-tests, ball throw and 300-yard run-walk. The fifth grade comparisons (Table XVII) reversed the pattern which was observed in the three lower grades. The sedentary group surpassed those children in the regular classes to a significant degree on two of the sub-tests, shuttle run and 300-yard run-walk. In none of the seven sub-tests at the fifth grade level did the regular group make significantly greater gains than the sedentary group. However, in grades two through four, the sedentary group did not significantly surpass the regular group in gains on any of the sub-tests.

The comparisons on these sub-tests do reveal significant differences between the two groups on one physical skill at the second grade, and on two physical skills for each of the other grades. These differences apparently had no significant effects upon the reading gains made by these groups.

Hypothesis IV

Hypothesis IV was restated to read that there would be no significantly greater mean gain in reading made by the 30 per cent of the pupils making the greatest gains in each physical skill than would be made by the 30 per cent of the pupils making the least gain in each physical skill. To test this hypothesis the mean gains by grades on each sub-test were arranged in sequential order from high to low. The 30 per cent of the children making the greatest gains were selected from each sub-test; the 30 per cent of the children making the least gains were selected, also, from each sub-test. The mean reading gain of the high children was then compared to the mean reading gain of the low children for each physical fitness sub-test. An analysis of variance tested the significance of the difference between the reading gains made by the high 30 per cent and the low 30 per cent on each sub-test.

In Tables XIX, XX, XXI, and XXII can be seen the analyses of each of these comparisons at each grade level.

It can be seen from these tables that no group differences reached an acceptable level of significance. The null hypothesis was accepted and the research hypothesis was rejected. Although the comparison here was achievement gain rather than a particular level of achievement, the finding appears to be inconsistent with one reported by Kagerer (10),

TABLE XIX

ANALYSIS OF VARIANCE OF MEAN GAIN IN READING ACHIEVEMENT OF THE HIGH GROUP AND THE LOW GROUP ON THE PHYSICAL FITNESS SUB-TESTS IN THE SECOND GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	30.63	1.	30.63	1.26 N.S.*
	Within	920.75	38.	24.23	
	Total	951.38	39.		
Sit-ups	Between	.63	1.	.63	.02 N.S.
	Within	1141.15	38.	30.03	
	Total	1141.78	39.		
Shuttle Run	Between	18.23	1.	18.23	.61 N.S.
	Within	1130.75	38.	29.76	
	Total	1148.98	39.		
Broad Jump	Between	18.23	1.	18.23	.89 N.S.
	Within	781.75	38.	20.57	
	Total	799.91	39.		
50-yard Dash	Between	2.03	1.	2.03	.08 N.S.
	Within	951.35	38.	25.04	
	Total	953.38	39.		
Ball Throw	Between	48.40	1.	48.40	2.20 N.S.
	Within	837.20	38.	22.03	
	Total	885.60	39.		
300-yard Run-Walk	Between	.03	1.	.03	.00 N.S.
	Within	1115.95	38.	29.37	
	Total	1115.98	39.		

*N.S. = not significant.

TABLE XX

ANALYSIS OF VARIANCE OF MEAN GAIN IN READING ACHIEVEMENT OF THE HIGH GROUP AND THE LOW GROUP ON THE PHYSICAL FITNESS SUB-TESTS IN THE THIRD GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	10.13	1	10.13	.60 N.S.*
	Within	502.75	30	16.76	
	Total	512.88	31		
Sit-ups	Between	1.53	1	1.53	.09 N.S.
	Within	500.19	30	16.67	
	Total	501.72	31		
Shuttle Run	Between	.78	1	.78	.07 N.S.
	Within	351.69	30	11.72	
	Total	352.47	31		
Broad Jump	Between	.00	1	.00	.00 N.S.
	Within	470.88	30	15.70	
	Total	470.88	31		
50-yard Dash	Between	15.13	1	15.13	.75 N.S.
	Within	601.75	30	20.00	
	Total	616.88	31		
Ball Throw	Between	34.03	1	34.03	1.72 N.S.
	Within	594.69	30	19.82	
	Total	628.72	31		
300-yard Run-Walk	Between	.50	1	.50	.03 N.S.
	Within	540.38	30	18.01	
	Total	540.88	31		

*N.S. = not significant.

TABLE XXI

ANALYSIS OF VARIANCE OF MEAN GAIN IN READING ACHIEVEMENT OF THE HIGH GROUP AND THE LOW GROUP ON THE PHYSICAL FITNESS SUB-TESTS IN THE FOURTH GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	22.53	1	22.53	1.55 N.S.*
	Within	407.33	28	14.55	
	Total	429.87	29		
Sit-ups	Between	22.53	1	22.53	1.16 N.S.
	Within	544.93	28	19.46	
	Total	567.47	29		
Shuttle Run	Between	4.03	1	4.03	.21 N.S.
	Within	549.33	28	19.62	
	Total	553.37	29		
Broad Jump	Between	8.53	1	8.53	.51 N.S.
	Within	467.33	28	16.69	
	Total	475.87	29		
50-yard Dash	Between	2.70	1	2.70	.14 N.S.
	Within	540.00	28	19.29	
	Total	542.70	29		
Ball Throw	Between	1.20	1	1.20	.06 N.S.
	Within	526.00	28	18.79	
	Total	527.20	29		
300-yard Run-Walk	Between	20.83	1	20.83	1.78 N.S.
	Within	328.53	28	11.73	
	Total	349.37	29		

*N.S. = not significant.

TABLE XXII

ANALYSIS OF VARIANCE OF MEAN GAIN IN READING ACHIEVEMENT OF THE HIGH GROUP AND THE LOW GROUP ON THE PHYSICAL FITNESS SUB-TESTS IN THE FIFTH GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	1.17	1	1.17	.04 N.S.*
	Within	1229.81	40	30.75	
	Total	1230.98	41		
Sit-ups	Between	2.38	1	2.38	.08 N.S.
	Within	1146.76	40	28.67	
	Total	1149.14	41		
Shuttle Run	Between	10.50	1	10.50	.76 N.S.
	Within	549.62	40	13.74	
	Total	560.12	41		
Broad Jump	Between	59.52	1	59.52	1.62 N.S.
	Within	1466.95	40	36.67	
	Total	1526.48	41		
50-yard Dash	Between	4.67	1	4.67	.14 N.S.
	Within	1357.62	40	33.94	
	Total	1362.29	41		
Ball Throw	Between	14.88	1	14.88	.35 N.S.
	Within	1722.10	40	43.05	
	Total	1736.98	41		
300-yard Run-Walk	Between	12.60	1	12.59	.27 N.S.
	Within	1895.81	40	47.40	
	Total	1908.40	41		

*N.S. = not significant.

who found that strength of the upper and lower back muscles, as in sit-ups, was correlated with all parts of a reading readiness test.

Hypothesis V

Hypothesis V was restated to read thus: there will not be a significantly greater mean gain in each of the physical skills made by the 30 per cent of the pupils making the greatest gain in reading than would be made by the 30 per cent of the pupils making the least gain in reading at each grade level. To test its statistical validity, the children were arranged by magnitude of gain in reading achievement from high to low according to grades. The 30 per cent of the children observed to make the greatest gain in reading comprised one group; the 30 per cent of the children observed to make the least gain in reading composed the other group. These groups, by grades, were then subjected to analysis of variance according to their mean gain on each of the physical fitness sub-tests.

Hypothesis V-A was restated to read thus: there will not be a significant difference between these groups at the second grade level on each of the sub-tests. Rosborough's study found that twenty retarded readers failed the sit-up test, which requires abdominal muscle strength. Table XXIII delineates the analysis of variance of these groups. The summary presented in Table XXIII reflects that there was one ratio which reached the acceptable level of significance, the arm hang. The t test then was employed to test the difference between the means. A summary of this analysis is depicted in Table XXIV. The correlation between reading

TABLE XXIII

ANALYSIS OF VARIANCE OF THE MEAN GAIN IN READING OF THE HIGH 30 PER CENT WITH THE LOW 30 PER CENT ON EACH PHYSICAL FITNESS SUB-TEST IN THE SECOND GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	172.23	1	172.23	6.25 p .05
	Within	1046.55	38	27.50	
	Total	1218.78	39		
Sit-ups	Between	.23	1	.23	.03 N.S.*
	Within	331.75	38	8.73	
	Total	331.98	39		
Shuttle Run	Between	5.63	1	5.63	1.49 N.S.
	Within	143.75	38	3.78	
	Total	149.38	39		
Broad Jump	Between	140.63	1	140.63	2.16 N.S.
	Within	2473.15	38	65.08	
	Total	2613.78	39		
50-yard Dash	Between	.03	1	.03	.02 N.S.
	Within	47.35	38	1.25	
	Total	47.38	39		
Ball Throw	Between	30.63	1	30.63	1.70 N.S.
	Within	683.35	38	17.98	
	Total	713.98	39		
300-yard Run-Walk	Between	4.90	1	4.90	.03 N.S.
	Within	4914.60	38	129.33	
	Total	4919.50	39		

*N.S. = not significant.

TABLE XXIV

MEANS AND STANDARD DEVIATIONS OF THE HIGH AND LOW GROUPS IN READING ON THE ARM HANG FOR GRADE TWO

Group	Number	Mean	Standard Deviation	Fisher t	
High 30 per cent	20	3.75	5.41	2.50	.05
Low 30 per cent	20	- .40	4.80		

achievement gain and gain on the arm hang in the second grade (Table XVIII) was .23, which is a low positive relationship. According to Mode (12), this correlation strength would account for only about 5 per cent of the variance in these two factors. Table XIX, which describes the comparison of the reading achievement gain made by the children who made the greatest gain in the arm hang with the gain made by the children who made the least gain in the arm hang, reflects that there was no statistically significant difference between these groups. This variable, however, may warrant further investigation at the second grade level. Because of the lack of statistical validity, the null hypothesis V-A was accepted with the exception of differences between the high and low children in reading achievement gain and their performances on the arm hang. The research hypothesis, with the noted exception above, was rejected.

Hypothesis V-B was restated to read thus: there will not be a significant difference between the high and low groups in

reading on each of the physical fitness sub-tests at grade three. Table XXV reflects the analysis of variance obtained

TABLE XXV

ANALYSIS OF VARIANCE OF THE MEAN GAIN IN READING OF THE HIGH 30 PER CENT WITH THE LOW 30 PER CENT ON EACH PHYSICAL FITNESS SUB-TEST IN THE THIRD GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	.03	1	.03	.00 N.S.*
	Within	1195.69	30	39.86	
	Total	1195.72	31		
Sit-ups	Between	.28	1	.28	.03 N.S.
	Within	316.44	30	10.55	
	Total	316.72	31		
Shuttle Run	Between	.28	1	.28	.11 N.S.
	Within	75.94	30	2.53	
	Total	76.22	31		
Broad Jump	Between	26.28	1	26.28	.58 N.S.
	Within	1351.44	30	45.05	
	Total	1377.72	31		
50-yard Dash	Between	1.13	1	1.13	.75 N.S.
	Within	44.75	30	1.49	
	Total	45.88	31		
Ball Throw	Between	30.03	1	30.03	1.80 N.S.
	Within	500.94	30	16.70	
	Total	530.97	31		
300-yard Run-Walk	Between	60.50	1	60.50	.99 N.S.
	Within	1832.38	30	61.08	
	Total	1892.88	31		

*N.S. = not significant.

from these groups. An inspection of this table shows that all the F ratios are quite low, none approaching the required minimum. For this reason, and from examination of the tables

previously presented, the null hypothesis V-B was accepted and the research hypothesis rejected.

Hypothesis V-C was restated to read thus: there will not be a significant difference between the high and low groups in reading on each of the physical fitness sub-tests at grade four. Table XXVI reflects the analyses of variance

TABLE XXVI

ANALYSIS OF VARIANCE OF THE MEAN GAIN IN READING OF THE HIGH 30 PER CENT WITH THE LOW 30 PER CENT ON EACH PHYSICAL FITNESS TEST IN THE FOURTH GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	235.20	1	235.20	4.46 .05
	Within	1476.27	28	52.72	
	Total	1711.47	29		
Sit-ups	Between	14.70	1	14.70	1.54 N.S.*
	Within	266.67	28	9.52	
	Total	281.37	29		
Shuttle Run	Between	.13	1	.13	.06 N.S.
	Within	64.67	28	2.31	
	Total	64.80	29		
Broad Jump	Between	172.80	1	172.80	5.38 .05
	Within	899.20	28	32.11	
	Total	1072.00	29		
50-yard Dash	Between	2.70	1	2.70	4.05 N.S.
	Within	18.6	28	.67	
	Total	21.3	29		
Ball Throw	Between	.13	1	.13	.01 N.S.
	Within	645.33	28	23.05	
	Total	645.47	29		
300-yard Run-Walk	Between	10.80	1	10.80	.24 N.S.
	Within	1234.67	28	44.10	
	Total	1245.47	29		

*N.S. = not significant.

obtained from these groups. An inspection of Table XXVI reveals that two of the F ratios reached the .05 level of significance, the arm hang and the broad jump. The t test was employed to test the difference between the means. A summary of this analysis is presented in Table XXVII. It can

TABLE XXVII

MEANS AND STANDARD DEVIATIONS OF THE HIGH AND LOW GROUPS IN READING FOR GRADE FOUR

Sub-test	Group	Number	Mean	Standard Deviation	Fisher t	
Arm Hang	High 30 per cent	15	.33	5.75	-2.11	.05
	Low 30 per cent	15	5.93	8.09		
Broad Jump	High 30 per cent	15	4.40	3.84	2.32	.05
	Low 30 per cent	15	.40	6.72		

be seen from the table that the broad jump mean differences were significant at the acceptable level of confidence. This finding is consistent with the significant correlation of the total group between gain in reading achievement and gain in the broad jump at the fourth grade level. Thompson (14) reported low negative correlation between performance on the broad jump and reading achievement for fourth grade girls, and a very low positive relationship for boys in the fourth grade. However Table XXI presented no significant differences in reading achievement gain between the high and low reading groups on the broad jump. The strength of these analyses does not undergird the significant finding depicted

in Table XXVII, however, as Fisher (5) pointed out it may serve only as a suggestion for future experimentation.

Further inspection reveals that the low group in reading gain was significantly superior to the high group in the arm hang. Similarly, Table XVIII reflects a very low negative relationship between reading achievement gain and gain on the arm hang. In Table XXI, however, no significant difference between the reading achievement gains of the high and low groups on the arm hang can be seen. These findings, despite the statistical validity of the differences, make the difference appear quite tenuous. Further study, however, may be indicated.

Because the differences between the physical fitness gains of the high and low groups in reading achievement were not significant, with the exception of the arm hang and the broad jump, the null hypothesis V-C was accepted with the exception of the broad jump and the research hypothesis was rejected.

Hypothesis V-D was restated to read thus: there will not be a significant difference at the fifth grade level between the high and low groups in reading achievement gain on each of the physical fitness sub-tests. An analysis of variance was employed to test the significance of the two sets of scores. The results are presented in Table XXVIII. There

TABLE XXVIII

ANALYSIS OF VARIANCE OF THE MEAN GAIN IN READING OF THE HIGH 30 PER CENT WITH THE LOW 30 PER CENT ON EACH PHYSICAL FITNESS SUB-TEST IN THE FIFTH GRADE

Sub-test	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	F Level
Arm Hang	Between	.38	1	.38	.02 N.S.*
	Within	763.52	40	19.09	
	Total	763.90	41		
Sit-ups	Between	1.52	1	1.52	.15 N.S.
	Within	419.62	40	10.49	
	Total	421.14	41		
Shuttle Run	Between	2.38	1	2.38	.70 N.S.
	Within	135.24	40	3.38	
	Total	137.62	41		
Broad Jump	Between	11.52	1	11.52	.54 N.S.
	Within	859.81	40	21.50	
	Total	871.33	41		
50-yard Dash	Between	2.88	1	2.88	2.79 N.S.
	Within	41.24	40	1.03	
	Total	44.12	41		
Ball Throw	Between	.60	1	.60	.04 N.S.
	Within	666.38	40	16.66	
	Total	666.98	41		
300-yard Run-Walk	Between	9.52	1	9.52	.28 N.S.
	Within	1380.38	40	34.51	
	Total	1389.90	41		

*N.S. = not significant.

were no significant differences between these two groups on any of the seven sub-tests; therefore the null hypothesis V-D was accepted and the research hypothesis was rejected.

Summary

The data were analyzed by two basic techniques: analysis of variance and product moment correlation. It was stated in Hypothesis I that children in grades two, three, four, and five receiving individualized physical training would make significantly greater mean gains in reading than children attending regular classes and greater than that of children participating in sedentary recreation activities. Although there were significant differences in gains in motor skill, there were no significant differences in reading gains. Hypothesis II, which stated that there would be a significant relationship between gains in reading achievement and gains in physical skills, was tested by product moment correlation. One significant relationship occurred between the gain in the broad jump at the fourth grade and the gain in reading achievement. In Hypothesis III it was stated that children attending regular physical education classes would make significantly greater mean gains in reading than children participating in sedentary recreation activities. This was tested by analysis of variance. Although there were differences in gains in the physical skills, no significant gains occurred in reading. Hypothesis IV stated that the pupils making the greatest gain on each of the physical skills would make gains in reading achievement significantly greater than those children making the least gain on the physical fitness tests. The analysis of variance was

employed to test this hypothesis. No significant gains were found. Hypothesis V stated that those children making the greater mean gains in reading would make significantly greater gains on the physical skill than those children making the least gain in reading. Three significant ratios occurred: arm hang at the second grade, and broad jump and arm hang at the fourth grade level. The hypothesis was not statistically valid except for the arm hang at the second grade and the broad jump at the fourth grade. The strength of the significant relationships found throughout the analysis was considered useful only for further research.

CHAPTER BIBLIOGRAPHY

1. Bayley, Nancy, "The Development of Motor Abilities during the First Three Years," Social Research in Child Development Monographs, 1935, No. 1.

2. Borg, Walter R., Educational Research, New York, David McKay Company, Inc., 1965.

3. Downie, N. M., Basic Statistical Methods, New York, Harper and Row Publishers, 1965.

4. Edwards, Allen L., Statistical Methods for the Behavioral Sciences, New York, Rinehart and Company, 1955.

5. Fisher, R. A., The Design of Experiments, Edinburgh, Oliver and Boyd, 1942.

6. Foster, James Muriel, "Effect of Mobility Training upon Reading Achievement and Intelligence," unpublished doctoral dissertation, Department of Education, University of California, Los Angeles, California, 1965.

7. Gray, William S., "Physiology and Psychology of Reading," Encyclopedia of Educational Research, edited by Chester W. Harris, New York, The MacMillan Company, 1960, pp. 1096-1114.

8. Guilford, J. P., Fundamental Statistics in Psychology and Education, New York, McGraw Hill Book Company, 1965.

9. Jersild, Arthur T., Child Psychology, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960.

10. Kagerer, Randolph Lucan, "The Relationship of the Kraus-Weber Test for Minimum Muscular Fitness to School Achievement," unpublished master's thesis, Department of Psychology, Purdue University, Lafayette, Indiana, 1958.

11. McNemar, Q., Psychological Statistics, New York, John Wiley and Sons, 1955, pp. 103-269.

12. Mode, Elmer, Elements of Probability and Statistics, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1966.

13. Rosborough, Pearl M., Physical Fitness and the Child's Reading Problem, New York, Exposition Press, Inc., 1963.

14. Thompson, Margaret M., "A Study of the Relationship Between Performance in Selected Motor Skills and Mental Achievement," unpublished doctoral dissertation, Department of Physical Education, University of Iowa, 1961.

15. Wyrick, Waneen, "Comparison of Motor Creativity with Verbal Creativity, Motor Ability and Intelligence," unpublished doctoral dissertation, Physical Education Department, University of Texas, Austin, Texas, 1966.

CHAPTER V

SUMMARY, FINDINGS, CONCLUSI IMPLICATIONS AND RECOMMENDA

In nt research in cal fitness, prompted in comparisons of can children to those in o ries and in pa recent development of improved l fitness tests, med reasonable to investigate sible effects of al fitness training upon th ll performance o en--more specifically wheth ical training mig means of improving their readi ties. Such a th consistent with the total c ic concept of the ty of mental and motor perf Children who s m reading retardation migh from a program wh ed them to increased l proficiency throu idual development of impro r skills.

Summary

Th aim of this study w gn and to evaluate a program of physical fitness training which might benefit elementary age school children who were experiencing reading difficulties. Effectiveness was measured by comparing the reading achievement of children receiving this kind of training to that of children participating in group

physical education activities and to that of children participating in sedentary recreational activities.

Children from grades two through five who were of normal intelligence but reading below expectation were selected for special reading classes. Pre-test measures of physical fitness were obtained by administering the American Association for Health, Physical Education, and Recreation Tests, and a pre-test measure of reading achievement was obtained by the Gates-MacGinitie Reading Tests. After a twelve-week physical fitness training program, physical fitness was again measured by repetition of the earlier tests and by administration of alternate forms of the same reading tests. Between the pre-test and post-test periods, an experimental program of physical training engaged one-third of the subjects in individualized fitness activities; one type of treatment, sedentary physical activities, engaged one-third of the subjects serving as controls; and the other control group joined regular physical activities stressing group games and organized sports.

The relative effects of these three treatments were assessed by tabulating a gain or loss for each child on each of the physical fitness sub-tests, and by establishing a gain or loss in reading achievement by tabulating the difference in standard scores for each child between the two test periods.

The general hypotheses of this study were twofold: first, that the individualized physical training would result in greater mean gains in reading than either of the two control treatments; and second, that gains in physical fitness would be significantly related to reading gain. The first, third, fourth, and fifth hypotheses were tested by application of the analysis of variance. The second hypothesis was tested by Pearson product moment correlation. The .05 level of significance was selected as the criterion for statistical validity.

Hypotheses I-A, I-B, I-C, I-D, I-E, I-F, I-G, I-H stated that children participating in the individualized physical fitness training at the second, third, fourth, and fifth grades would make significantly greater mean gains in reading achievement than children participating in regular physical education classes or than children engaged in sedentary recreation classes. The magnitude of the F ratio indicated no significant difference between the sets of scores; therefore, it was concluded that in this group there were no statistically valid differences between the groups in reading gain. The hypotheses were rejected.

Hypothesis II predicted a significant relationship between gain in reading achievement and gain on each physical fitness sub-test at grades two, three, four, and five. The coefficient between broad jump gain and reading achievement gain at the fourth grade reached the designated level

of significance. The strength of this relationship may indicate a possible direction for further study. All other parts of the hypothesis were rejected.

Hypothesis III stated that children participating in the regular physical education groups would make gains in reading significantly greater than children participating in sedentary recreation classes in grades two, three, four and five. Because the F ratio failed to reach an acceptable level of significance, the hypothesis was rejected.

Hypotheses IV-A, IV-B, IV-C, and IV-D, predicted that the 30 per cent of the children making the greatest gain on each of the sub-tests would make significantly greater gains in reading than the 30 per cent of the children making the least gains at grades two, three, four, and five. No significant differences were found in the analysis of variance of the high and low groups at each grade level on each of the sub-tests. The hypotheses were rejected.

Hypothesis V-A predicted that there would be a significantly greater mean gain in each physical skill (arm hang, sit-ups, shuttle run, broad jump, 50-yard dash, ball throw, and 300-yard run-walk) made by the 30 per cent of the second grade pupils making the greatest gain in reading than by the 30 per cent making the least gain. On one sub-test, the arm hang, the high reading achievement group made gains significantly greater than the low group. The correlation between arm hang and reading gain was low and positive. It was

concluded that although lacking sufficient evidence to make any generalizations, the statistical significance made this part of the hypothesis tenable. All other parts of the hypothesis were rejected.

Hypothesis V-B predicted a significant difference between the high and low groups in reading on each of the physical fitness sub-tests at grade three. No significant differences were found, and the hypothesis was rejected.

Hypothesis V-C predicted a significant difference between the high and the low groups in reading on each of the physical fitness sub-tests at grade four. As reflected in the product moment correlation on the broad jump, the high group in reading made gains significantly greater than the low group. As was expressed previously, this one finding is not adequate basis for forming a conclusion. The low group in reading achievement gain made significantly greater gains on the arm hang than did the high group. However, in the correlation results, the low negative relationship did not reach a significant magnitude. Relationship between reading achievement and the arm hang and reading achievement and the broad jump at the fourth grade level may warrant further investigation. All other parts of the hypothesis were rejected.

Hypothesis V-D stated that there would be a significant difference at the fifth grade between the high and low groups

in reading achievement gain on each of the physical fitness sub-tests. As no significant differences were observed, the hypothesis was rejected.

Analysis of the gains made by the three treatment groups at each grade in each of the physical skills did produce some very distinct patterns. In grade two, the children receiving individualized physical fitness training made gains significantly greater than either of the control groups in four activities (sit-ups, broad jump, shuttle run, and ball throw) and gains significantly greater than one control group in another (the fifty-yard dash). In grade three, the individualized training group made gains significantly greater than the regular physical education group on three of the sub-tests (sit-ups, broad jump, and 300-yard run-walk) and gains significantly greater than the sedentary group on two of the tests (sit-ups and 300-yard run-walk). The fourth grade children receiving individualized physical training made significantly greater gains than the regular group on one of the sub-tests (shuttle run), while the regular physical education group made gains significantly greater than the other two groups on the ball throw and the 300-yard run-walk. In the fifth grade, the individualized group made gains significantly greater than the regular on two of the sub-tests (the ball throw and the 300-yard run-walk) and gains significantly greater than the other two groups on the shuttle run. The sedentary group made gains significantly

greater than the regular group on the 300-yard run-walk. It was concluded that the individualized physical fitness training group did make gains significantly greater than children from the two control groups on a number of the physical fitness tests.

Findings

The findings of this study are three-fold: those which pertain to the effects of physical training upon reading, those which pertain to the relationship of physical fitness improvement upon reading, and the effects of physical training upon physical fitness.

1. The individualized physical training program did not significantly affect the reading gains of the groups of children in grades two through five who were experiencing reading difficulties. Participation in the regular physical education program similarly did not affect their gain in reading. Sedentary recreational activities did not have observable significant effects upon their reading gain.

2. Little significant relationship was found between reading achievement and physical fitness gain. The children who made the greatest gains in physical skills did not have a parallel gain in reading. The children who made the greatest gains in reading did not consistently show a greater gain in physical skills. Therefore, a gain in reading did not parallel a gain in physical skills, nor did a gain in physical skills parallel a gain in reading.

3. Individual relationships did, however, occur. These were the broad jump at the fourth grade level and the arm hang at the second grade level and at the fourth grade level. These did in one or more comparisons reflect a statistically valid relationship--the arm hang at the second grade level and the broad jump at the fourth grade level being positively related, and the arm hang at the fourth grade being conversely related to reading.

4. The physical training program did affect the gain in physical fitness. The regular physical education group achieved greater improvement at the second and fifth grades on a large number of physical skills, but did not approach the number of significant gains made by the experimental group. The sedentary group made the least gains, making significantly greater gains on only one sub-test.

5. The second grade group receiving the individualized physical training showed physical fitness gains on more of the sub-tests than the experimental groups in the other three grades.

Conclusions

On the basis of these findings the following conclusions were made:

1. Reading achievement and physical fitness in grades two through five appear to be unrelated.

2. An individualized physical training program will produce greater gain in physical fitness than either group physical activity or sedentary activities.

3. Individualized physical training is more effective in producing gains in motor skills of younger children than of older children.

Implications

The evidence presented in this study points toward an apparently independent development of motor skills and reading ability. To institute a program of individualized physical training for children with reading difficulties could not be expected to result in improved reading.

The apparent variation of the effectiveness of the training programs upon physical fitness from grade to grade might prove to be a profitable avenue of study. Could this be a characteristic peculiar to these children, or is this indicative of a developmental trend? If the greater plasticity of the younger age child caused him to respond more definitely to individualized training, then would this difference be sustained if the training were sustained? If physical fitness superiority could be achieved early in the primary school, then what would be its long-term effects upon reading?

Recommendations

1. The responsiveness in physical fitness gain of the second grade to the individualized physical training program makes it appear worthwhile to extend the experimental program to kindergarten and first grade, to discover whether this training program would produce similar effects at this age level, and to repeat the study in the second grade.

2. It is recommended that the effects of individual physical fitness training upon reading gain be studied in kindergarten, first grade, and second grade. It is conceivable that such a program might be related to the child's readiness for reading.

3. It is further recommended that the effects on physical fitness of individualized physical training on children in kindergarten, first grade, and second grade be compared to its effects on children in third, fourth, and fifth grades.

4. A comparison of the effects of individualized physical fitness training upon the physical performance of children who are average readers is recommended. Would such a training program be more effective or less effective or have no effects upon the motor performance of average readers?

5. The individualized training program stressed individuality and self improvement, while the regular classes stressed group activities and competition. Would these two differing approaches have diverse effects upon achievement

motivation? A pre-test and post-test of this factor would offer one method of discovering any effects.

6. One facet of the individualized program is that the child is placed in a non-threatening, non-competitive situation. What effects would functioning in such an atmosphere have upon his self-concept? Would a sense of individual accomplishment reinforce him and give him confidence? It is recommended that pre- and post-measures of self-concept be made to test these effects.

APPENDIX

TABLE XXIX

ANALYSIS OF VARIANCE OF THE THREE TREATMENT GROUPS ON PHYSICAL FITNESS SUB-TESTS, SECOND GRADE

Activity	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	Level	Significance
Arm Hang	Between	150.47	2	75.23	2.92	N.S.*
	Within	1596.55	62	25.75		
	Total	1747.02	64			
Sit-ups	Between	73.40	2	36.70	4.12	.05
	Within	552.39	62	8.91		
	Total	625.78	64			
Shuttle Run	Between	57.41	2	28.71	7.13	.01
	Within	249.57	62	4.03		
	Total	306.98	64			
Broad Jump	Between	1927.34	2	963.67	25.54	.01
	Within	2339.64	62	37.74		
	Total	4266.98	64			
50-yard Dash	Between	14.13	2	7.06	7.38	.01
	Within	59.32	62	.96		
	Total	73.45	64			
Ball Throw	Between	105.67	2	52.84	3.92	.05
	Within	836.39	62	13.49		
	Total	942.06	64			
300-yard Run-Walk	Between	244.89	2	122.45	1.26	N.S.
	Within	6027.72	62	97.22		
	Total	6272.62	64			

*N.S. = not significant.

TABLE XXX

ANALYSIS OF VARIANCE OF THE THREE TREATMENT GROUPS ON PHYSICAL FITNESS SUB-TESTS, THIRD GRADE

Activity	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	Level	Significance
Arm Hang	Between	174.86	2	87.43	2.71	N.S.*
	Within	1646.79	51	32.29		
	Total	1821.65	53			
Sit-ups	Between	216.04	2	108.02	14.30	.01
	Within	385.22	51	7.55		
	Total	601.26	53			
Shuttle Run	Between	7.07	2	3.53	1.35	N.S.
	Within	133.77	51	2.62		
	Total	140.83	53			
Broad Jump	Between	317.73	2	158.87	4.76	.05
	Within	1701.60	51	33.36		
	Total	2019.33	53			
50-yard Dash	Between	8.94	2	4.47	3.58	.05
	Within	63.65	51	1.25		
	Total	72.59	53			
Ball Throw	Between	33.85	2	16.92	.91	N.S.
	Within	944.47	51	18.52		
	Total	978.31	53			
300-yard Run-Walk	Between	387.95	2	193.98	3.41	.05
	Within	2900.88	51	56.88		
	Total	3288.83	53			

*N.S. = not significant.

TABLE XXXI

ANALYSIS OF VARIANCE OF THE THREE TREATMENT GROUPS ON PHYSICAL FITNESS SUB-TESTS, FOURTH GRADE

Activity	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	Level	Significance
Arm Hang	Between	197.63	2	98.81	2.34	N.S.*
	Within	1942.37	46	42.23		
	Total	2140.00	48			
Sit-ups	Between	60.78	2	30.39	3.15	N.S.
	Within	444.00	46	9.65		
	Total	504.78				
Shuttle Run	Between	19.52	2	9.76	5.06	.05
	Within	88.68	46	1.93		
	Total	108.20				
Broad Jump	Between	1.11	2	.55	.02	N.S.
	Within	1352.28	46	29.40		
	Total	1353.39	48			
50-yard Dash	Between	4.06	2	2.03	2.11	N.S.
	Within	44.15	46	.96		
	Total	48.20	48			
Ball Throw	Between	189.31	2	94.65	5.98	.05
	Within	728.69	46	15.84		
	Total	918.00	48			
300-yard Run-Walk	Between	530.95	2	265.47	8.41	.01
	Within	1452.68	46	31.58		
	Total	1983.63	48			

*N.S. = not significant.

TABLE XXXII

ANALYSIS OF VARIANCE OF THE THREE TREATMENT GROUPS ON PHYSICAL FITNESS SUB-TESTS, FIFTH GRADE

Activity	Source	Sum of Squares	Degrees of Freedom	Variance Estimate	Level	Signif-cance
Arm Hang	Between	170.88	2	85.44	4.25	.05
	Within	1366.87	68	20.10		
	Total	1537.75	70			
Sit-ups	Between	69.92	2	34.96	3.62	.05
	Within	656.95	68	9.66		
	Total	726.87	70			
Shuttle Run	Between	18.96	2	9.48	3.49	.05
	Within	184.53	68	2.71		
	Total	203.49	70			
Broad Jump	Between	48.26	2	24.13	1.05	N.S.*
	Within	1570.05	68	23.09		
	Total	1618.31	70			
50-yard Dash	Between	.68	2	.34	.21	N.S.
	Within	110.62	68	1.63		
	Total	111.30	70			
Ball Throw	Between	137.31	2	68.66	5.37	.01
	Within	869.65	68	12.79		
	Total	1006.96	70			
300-yard Run-Walk	Between	842.88	2	421.44	16.81	.01
	Within	1704.45	68	25.07		
	Total	2547.32	70			

*N.S. = not significant.

TABLE XXXIII

CORRELATION COEFFICIENTS BETWEEN PHYSICAL FITNESS SUB-TESTS, GRADE TWO

Activity	Sit-ups	Shuttle Run	Broad Jump	50-yd. Dash	Ball Throw	300-yd. Run-Walk
Arm Hang	.41	.11	.07	.03	.17	.03
Sit-ups		.23	.21	.11	.02	.22
Shuttle Run			.26	.13	.05	.13
Broad Jump				.09	.19	.09
50-yard Dash					.01	.02
Ball Throw						.02
300-yard Run-Walk						
Level of Significance	.001	N.S.	.05	N.S.	N.S.	N.S.

N.S. = not significant.
df = 63.

TABLE XXXIV

CORRELATION COEFFICIENTS BETWEEN PHYSICAL FITNESS SUB-TESTS, GRADE THREE

Activity	Sit-ups	Shuttle Run	Broad Jump	50-yd. Dash	Ball Throw	300-yd. Run-Walk
Arm Hang	.40	-.04	-.10	.00	.15	.15
Sit-ups		-.07	-.17	.04	.11	.19
Shuttle Run			.35	.01	-.07	.04
Broad Jump				.05	-.16	.12
50-yard Dash					.15	-.03
Ball Throw						
300-yard Run-Walk						
Level of Significance	.01	N.S.	.01	N.S.	N.S.	N.S.

N.S. = not significant.
df = 52.

TABLE XXXV

CORRELATION COEFFICIENTS BETWEEN PHYSICAL FITNESS SUB-TESTS, GRADE FOUR

Activity	Sit-ups	Shuttle Run	Broad Jump	50-yd. Dash	Ball Throw	300-yd. Run-Walk
Arm Hang	.20	.08	-.24	-.00	.06	-.08
Sit-ups		.21	.07	.09	.22	-.04
Shuttle Run			-.04	.22	-.15	-.04
Broad Jump				.04	.21	.16
50-yard Dash					-.07	-.01
Ball Throw						.08
300-yard Run-Walk						
Level of Significance	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

N.S. = not significant.
df = 47.

TABLE XXXVI

CORRELATION COEFFICIENTS BETWEEN PHYSICAL FITNESS SUB-TESTS, GRADE FIVE

Activity	Sit-ups	Shuttle Run	Broad Jump	50-yd. Dash	Ball Throw	300-yd. Run-Walk
Arm Hang	.10	-.14	-.09	.18	.09	.12
Sit-ups		-.02	.06	.07	.02	.15
Shuttle Run			-.10	.07	.17	-.25
Broad Jump				.10	-.21	.03
50-yard Dash					-.10	.09
Ball Throw						.25
300-yard Run-Walk						
Level of Significance	N.S.	N.S.	N.S.	N.S.	N.S.	.05

N.S. = not significant.
df = 69.

BIBLIOGRAPHY

Books

Anderson, Irving H. and Walter F. Dearborn, The Psychology of Teaching Reading, New York, The Ronald Press, 1952.

Backus, B. and Marion Monroe, Remedial Reading, Boston, Houghton Mifflin, Boston, 1937.

Barrow, Harold M. and Rosemary McGee, A Practical Approach to Measurement in Physical Education, Philadelphia, Lee and Febiger, 1964.

Betts, Emmet A., The Prevention and Correction of Reading Difficulties, Evanston, Illinois, Row, Peterson and Company, 1936.

Borg, Walter R., Educational Research, New York, David McKay Company, Inc., 1965.

Bovard, John F. and others, Tests and Measurements in Physical Education, Philadelphia, W. B. Saunders Company, 1949.

Buros, Oscar, editor, Fifth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1959.

_____, editor, Sixth Mental Measurements Yearbook, Highland Park, New Jersey, The Gryphon Press, 1965.

Bryant, N. Dale, "S.R.A. Achievement Series: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

Campbell, William R. and Richard H. Pohndorf, "Physical Fitness of British and United States Children," Health and Fitness in the Modern World, edited by Leonard A. Larson, Chicago, Athletic Institute, 1961.

Carmichael, Leonard, "The Onset and Early Development of Behavior," Manual of Child Psychology, edited by Leonard Carmichael, New York, John Wiley and Sons, 1954.

Clarke, Harrison, Application of Measurement to Health and Physical Education, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1967.

Dechant, Emerald, Improving the Teaching of Reading, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1964.

DeHirsh, Katrina and others, Predicting Reading Failure, New York, Harper and Row, Publishers, 1966.

Derrick, Clarence, "S.R.A. Achievement Series: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

Downie, N. M., Basic Statistical Methods, New York, Harper and Row, Publishers, 1965.

Dunn, S. S., "Gates Basic Reading Tests," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

Edfeldt, Ake W., Silent Speech and Silent Reading, Chicago, University of Chicago Press, 1960.

Edwards, Allen L., Statistical Methods for the Behavioral Sciences, New York, Rinehart and Company, 1955.

Espechende, Anna S., "Brace Scale of Motor Ability," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

_____, "The Lincoln-Oseretsky Motor Development Scale," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

Fait, Hollis F., Physical Education for the Elementary School Child, Philadelphia, W. B. Saunders Company, 1964.

Fernald, Grace M., Remedial Techniques in Basic School Subjects, New York, McGraw-Hill Book Company, Inc., 1943.

Fisher, R. A., The Design of Experiments, Edinburgh, Oliver and Boyd, 1942.

Gessell, Arnold, "Maturation and the Patterning of Behavior," A Handbook of Child Psychology, edited by Carl Murchison, Worcester, Massachusetts, Clark University Press, 1933.

_____ and Frances L. Ilg, Child Development, New York, Harper and Brothers, 1949.

Good, Carter V., editor, Dictionary of Education, 2nd ed. rev., New York, McGraw-Hill Book Company, Inc., 1959.

Guilford, J. P., Fundamental Statistics in Psychology and Education, New York, McGraw-Hill Book Company, 1965.

Harris, Albert J., How to Increase Reading Ability, New York, Longmans, Green and Company, 1950.

Hebb, D. O., A Textbook of Psychology, Philadelphia, W. B. Saunders Company, 1958.

Havighurst, Robert J., Developmental Tasks and Education, New York, Longmans, Green and Company, 1952.

Hunt, J. McVicker, Intelligence and Experience, New York, The Ronald Press, 1961.

Hurlock, Elizabeth B., Developmental Psychology, New York, McGraw-Hill Book Company, 1959.

Huxley, T. H., "We Are All Scientists," A Treasury of Science, edited by Harlow Shapley, Samuel Rapport and Helen Wright, New York, Harper and Brothers, 1946.

Jameson, Augusta, "Methods and Devices for Remedial Reading," Recent Trends in Reading, edited by William S. Gray, Supplementary Educational Monographs, No. 49, Chicago, University of Chicago, 1939.

Jersild, Arthur T., Child Psychology, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1960.

Jones, H. E., "The Environmental and Mental Development," Manual of Child Psychology, edited by Leonard Carmichael, New York, John Wiley and Sons, Inc., 1950.

_____, Motor Performance and Growth, Berkeley, California, University of California Press, 1949.

Karpovich, Peter V., M.D., "Moto Ergo Sum," Anthology of Contemporary Reading, edited by Howard Slusher and Aileene Lockhart, Dubuque, Iowa, William C. Brown Company, Publishers, 1966.

Kephart, Newell C., The Slow Learner in the Classroom, Columbus, Ohio, Charles E. Merrill Books, Inc., 1960.

Kirk, Samuel, Educating Exceptional Children, Boston, Houghton Mifflin Company, 1962.

Kraus, Hans and Wilhelm Raab, Hypokinetic Disease, Springfield, Illinois, Charles C. Thomas, 1961.

Landreth, Catherine, Early Childhood, New York, Alfred A. Knopf, 1967.

Larson, Leonard A. and Rachael Dunaven Yocom, Measurement and Evaluation in Physical Health and Recreation Education, St. Louis, The C. V. Mosby Company, 1951.

McCandless, Boyd R., Children Behavior and Development, Dallas, Holt, Rinehart and Winston, Inc., 1967.

McCloy, Charles Harold and Norma Dorothy Young, Tests and Measurements in Health and Physical Education, New York, Appleton-Century-Crofts, Inc., 1954.

McNemar, Q., Psychological Statistics, New York, John Wiley and Sons, 1955.

Miles, Matthew B., Innovation in Education, New York, Bureau of Publications, Teachers College, Columbia University, 1964.

Mode, Elmer, Elements of Probability and Statistics, Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1966.

Monroe, Marion, Children who Cannot Read, Chicago, University of Chicago Press, 1932.

Monroe, Ruth M. and B. Backus, Remedial Reading, Boston, Houghton Mifflin Company, 1937.

Munn, Norman, Psychology, New York, Houghton Mifflin Company, 1961.

Mussen, Paul Henry and others, Child Development and Personality, New York, Harper and Row, Publishers, 1963.

Natchez, Gladys, Personality Patterns and Oral Reading, New York, New York University Press, 1959.

Neilson, N. P., Physical Education for Elementary Schools, rev. ed., New York, The Ronald Press Company.

Paine, Richard S., "Organic Neurological Factors Related to Learning Disorders," Learning Disorders, Vol. I, edited by Jerome Hellmuth, Special Child Publications, Seattle, Bernie Staub and Jerome Hellmuth Company, 1965.

Prudden, Bonnie, Is Your Child Really Fit? New York, Harper and Brothers, 1956.

Robinson, Helen M., "Stanford Achievement Test: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

Robinson, H. M., Why Pupils Fail in Reading, Chicago, University of Chicago Press, 1946.

Rosborough, Pearl M., Physical Fitness and the Child's Reading Problem, New York, Exposition Press, Inc., 1963.

Shirley, Mary M., "Sequence of Motor Development," The Child, edited by Jerome Seidman, New York, Holt, Rinehart and Winston, 1963.

Slusher, Howard S., Anthology of Contemporary Readings, Los Angeles, William C. Brown Company, 1966.

Smith, Nila Blanton, American Reading Instruction, Newark, Delaware, International Reading Association, 1965.

Spache, George D., Toward Better Reading, Champaign, Illinois, Garrard Publishing Company, 1964.

Steinhaus, Arthur, "Significant Experiences--A Challenge to Physical Education," Anthology of Contemporary Readings, edited by Howard Slusher and Aileene Lockhart, Dubuque, Iowa, William C. Brown Company, Publishers, 1966.

Terman, L. M., editor, The Gifted Group at Mid Life, Follow-up of the Superior Child, Vol. V of Genetic Studies of Genius, Stanford, Stanford University Press, 1959.

Thompson, George G., Child Psychology, Boston, Houghton Mifflin Company, 1962.

Townsend, Agatha, "Stanford Achievement Test: Reading," Fifth Mental Measurements Yearbook, edited by Oscar Buros, Highland Park, New Jersey, The Gryphon Press, 1959.

Watson, J. B. and R. Raynor, Behavior, An Introduction to Comparative Psychology, New York, Henry Holt and Company, 1914.

Witty, Paul and D. Kopel, Reading and the Educative Process, Boston, Ginn and Company, 1939.

Articles

Bateman, Barbara, "Learning Disabilities--Yesterday, Today and Tomorrow," Exceptional Children, XXXI (December, 1964), 167-177.

Bayley, Nancy, "The Development of Motor Abilities during the First Three Years," Social Research in Child Development Monographs, 1935, No. 1.

Berger, Richard, "Comparisons of Relationships between Motor Ability and Static and Dynamic Strength," Research Quarterly, XXXVIII (March, 1967), 144-146.

_____ and Joe M. Henderson, "Relationship of Power to Static and Dynamic Strength," Research Quarterly, XXXVII (March, 1966), 9-13.

Clarke, Harrison and Boyd O. Jarman, "Scholastic Achievement of Boys Nine, Twelve and Fifteen Years of Age Related to Various Strength and Growth Measures," Research Quarterly, XXXII (May, 1961), 155-162.

Colgate, John A., "Arm Strength Relative to Arm Speed," Research Quarterly, XXXVII (March, 1966), 14-22.

Cowan, E. A. and B. M. Pratt, "The Hurdle Jump as a Developmental and Diagnostic Test of Motor Coordination for Children from Three to Twelve Years of Age," Child Development, V (June, 1934), 107-121.

Crooks, T. G. and Margaret Greens, "Some Characteristics of Children with Two Types of Speech Disorders," British Journal of Educational Psychology, XXXIII (February, 1963), IV, 31-40.

Eames, Thomas H., "Physical Factors in Reading," The Reading Teacher, XV (May, 1962), 427-432.

Fox, Margaret and Janet Atwood, "Results of Testing Iowa School Children for Health and Fitness," Journal of Health, Physical Education and Recreation, XXVI, No. 6 (September, 1955), 20-21.

Gates, Arthur, "The Role of Personality Maladjustments in Reading Disability," Journal of Genetic Psychology, LIX (September, 1941), 77-83.

Hartman, D. M., "The Hurdle Jump as a Measure of Motor Proficiency of Young Children," Child Development, XIV (December, 1943), 201-211.

Harter, G. L., "Overt Trial and Error in Problem Solving of Pre-school Children," Journal of Genetic Psychology, XXXVIII (Spring, 1930), 361-372.

Jacobsen, Edmund, "Electrophysiology of Mental Activities," American Journal of Psychology, XL (October, 1932), 1-29, 677-694.

Jones, H. E., "Relationship in Physical and Mental Development," Review of Educational Research, IX (February, 1939), 91-103.

Kephart, Newell C., "Perceptual-Motor Aspects of Learning Disabilities," Exception Children, XXXI (1964), 23.

Kirchner, G. and D. Glines, "Comparative Analysis of Eugene, Oregon, Elementary School Children Using the Kraus-Weber Test of Minimum Muscular Fitness," Research Quarterly, XXVIII, No. 1 (March, 1957), 16-25.

Kraus, H. and Ruth P. Hirschland, "Minimum Muscular Fitness Tests in School Children," Research Quarterly, XXV (1954), 178-188.

Larson, L. A., "A Factor Analysis of Motor Variables and Tests, with Tests for College Men," Research Quarterly, XII (1941), 499-517.

Laubach, Lloyd L. and John T. McConville, "Muscle Strength, Flexibility, and Body Size of Adult Males," Research Quarterly, XXXVIII (October, 1966), 144-146.

McCloy, Charles H., "How About Some Muscle?" The Journal of Health and Physical Education, VII (May, 1936), 302.

Mateer, Florence, "A First Study of Pituitary Dysfunction," Psychological Bulletin, XXXII (November, 1935), 736.

Max, L. W., "Experimental Study of Motor Theory of Consciousness: IV, Action Current Responses in the Deaf During Awakening, Kinesthetic, Imagery and Abstract Thinking," Journal of Comparative Psychology, XXIV (October, 1937), 301-344.

Morris, J. N. and P. A. B. Raffle, "Coronary Heart Disease in Transport Workers," British Journal of Industrial Medicine, XI (October, 1954), 260.

Orton, Samuel T., "Specific Reading Disability--Strephosymbolia," Journal of American Medical Association, XC (April 7, 1928), 1095-1099.

Phillips, Marjorie, "How Fit are Our American School Children?" Journal of Health, Physical Education and Recreation, XXVI (September, 1955), 14-15.

_____ and others, "Analysis of Results from the Kraus-Weber Test for Minimum Muscular Fitness in Children," Research Quarterly, XXVI, No. 3 (November, 1955), 314-322.

Rabinovitch, Ralph D. and Winifred Ingram, "Neuro-psychiatric Considerations in Reading Retardation," The Reading Teacher, XV (May, 1962), 433-438.

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

_____ and William Reddan, "Youth Fitness and Health," Review of Educational Research, XXXII (December, 1962), 515-529.

Rogers, Martin, "Basic Body Mechanics: An Interpretation," Journal of Health, Physical Education and Recreation, XXXII (December, 1961), 20-22.

Ryan, Dean, "Relative Academic Achievement and Stabilometer Performance," Research Quarterly, XXXIV (May, 1963), 185-190.

Schiffman, Gilbert, "Early Identification of Reading Disabilities, The Responsibility of the Public School," Bulletin of the Orton Society, XIV (1964), 42-44.

Sherman, Mandel, "Emotional Disturbances and Reading Disability," Recent Trends in Reading, Supplementary Educational Monographs, No. 49, Chicago, University of Chicago Press, 1939, pp. 126-134.

Silver, Archie A. and Rosa A. Hagin, "Specific Reading Disability: Follow-up Studies," American Journal of Orthopsychiatry, XXXIV (January, 1964), 95-102.

Slater-Hammel, A. T., "Influence of Order of Exercise Bouts upon Neuro-muscular Tremors," Research Quarterly, XXVI (March, 1955), 88-95.

Stein, Julian U., "The Reliability of the Youth Fitness Test," Research Quarterly, XXXV (October, 1964), 328-329.

Stout, H. B., "Variations in Normal Children," Journal of Experimental Education, VI (September, 1937), 84-100.

Strang, Ruth, "Variability in Reading Scores on a Given Level of Intelligence Test Scores," Journal of Educational Research, XXXVIII (February, 1945), 440-446.

Taylor, Henry L., "Coronary Heart Disease in Physically Active and Sedentary Populations," Journal of Sports Medicine and Physical Fitness, LXIV (June, 1962), 542-568.

Tulchin, S., "Emotional Factors in Reading Disabilities in School Children," Journal of Educational Psychology, XXVI (1935), 443-454.

Wilking, S. V., "Personality Maladjustment as a Causative Factor in Reading Disability," Elementary School Journal, XLII (1941), 268-279.

Williams, Jesse Feiring, "Education through the Physical," The Journal of Higher Education, I (May, 1930), 279-282.

Reports

Garden, Sol, Address to the Texas Association for Children with Learning Disabilities, Houston, Texas, November 10, 1967.

Gates, Arthur I. and Walter MacGinitie, Technical Manual for the Gates-MacGinitie Reading Tests, New York, Teachers College Press, 1965.

Green, H. A. and V. H. Kelley, Iowa Silent Reading Tests, Manual of Directions, Yonkers-on-Hudson, New York, World Book Company, 1943.

Harmon, D. B., Notes on a Dynamic Theory of Vision, University of Texas, Austin, Texas, 1957.

Harris, A. J. and W. Sternberg, "An Analysis of the Characteristics of Pupils in Three Remedial Classes at the High School Level," High Points, XXVI (September, 1944), 43-59.

Publications of Learned Organizations

American Association for Health, Physical Education and Recreation Youth Fitness Test Manual, Washington, D.C., American Association for Health, Physical Education and Recreation, 1965.

Austin, Mary C., "Problem Readers," Reading: Seventy-Five Years of Progress, Proceedings of the Annual Conference on Reading Held at the University of Chicago, 1966.

Brookwalter, Karl and Carolyn, editors, "Fitness for Secondary School Youth," National Association of Secondary School Principals and The American Association for Health, Physical Education, and Recreation, Washington, D.C., The American Association for Health, Physical Education and Recreation, 1956.

Hall, Sue M., editor, Children and Fitness: A Program for Elementary Schools, A Report of the National Conference on Fitness of Children of Elementary School Age, Washington, D.C., American Association for Health, Physical Education and Recreation, 1960.

President's Council on Youth Fitness, Youth Physical Fitness, Part I and II, Superintendent of Documents, 1961.

Rosenbloom, Alfred A., Jr., O.D., "Promoting Visual Readiness for Reading," Changing Concepts of Reading Instruction, International Reading Association Conference Proceedings, New York, Scholastic Magazine, 1961.

Smith, Nila Blanton, "Reading: Seventy-five Years of Progress," Reading: Seventy-Five Years of Progress, Proceedings of the Annual Conference on Reading Held at the University of Chicago, 1966, XXVIII, Chicago, University of Chicago Press, 1966.

Encyclopedia Articles

Gray, William S., "Physiology and Psychology of Reading," Encyclopedia of Educational Research, edited by Chester W. Harris, New York, The MacMillan Company, 1960, pp. 1096-1114.

Unpublished Materials

Deer Park Public Schools, "Physical Education Guide," Deer Park, Texas, 1966.

Foster, James Muriel, "Effect of Mobility Training upon Reading Achievement and Intelligence," unpublished doctoral dissertation, Department of Education, University of California, Los Angeles, California, 1965.

Kagerer, Rudolph Lucas, "The Relationship of the Kraus-Weber Test for Minimum Muscular Fitness to School Achievement," unpublished master's thesis, Department of Psychology, Purdue University, Lafayette, Indiana, 1958.

McCollum, Garland, "A Comparison between the Physically Fit and Physically Unfit in Intelligence, Academic Achievement and Attendance in School," unpublished master's thesis, College of Health, Physical Education, and Recreation, Arkansas State College, State College, Arkansas, 1962.

Page, C. Getty, "Case Studies of College Men with Low Physical Fitness Indicates," unpublished master's thesis, Syracuse University, Syracuse, New York, 1940.

Ramsey, Wallace, "The Values and Limitations of Diagnostic Reading Tests for Evaluation in the Classroom," Perspectives in Reading Conference, Houston, Texas, November, 1966.

Thompson, Margaret M.,"A Study of the Relationship Between Performance in Selected Motor Skills and Mental Achievement," unpublished doctoral dissertation, Department of Physical Education, University of Iowa, 1961.

Wyrick, Waneen, "Comparison of Motor Creativity with Verbal Creativity, Motor Ability and Intelligence," unpublished doctoral dissertation, Physical Education Department, University of Texas, Austin, Texas, 1966.