

THE EFFICACY OF A DEVELOPMENTAL MOVEMENT PROGRAM ON THE  
MOTOR FITNESS OF ACADEMICALLY HANDICAPPED CHILDREN

---

A THESIS  
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF MASTER OF ARTS  
IN THE GRADUATE SCHOOL OF THE  
TEXAS WOMAN'S UNIVERSITY

COLLEGE OF  
HEALTH, PHYSICAL EDUCATION, AND RECREATION

BY  
KAY DAY CLARK, B.S.

---

DENTON, TEXAS  
DECEMBER 1980

1980  
05430  
012

## ACKNOWLEDGMENTS

The investigator wishes to express her sincere thanks to Dr. Claudine Sherrill for the continued encouragement, support, direction, and enthusiasm she provided in the planning and preparation of this study.

Further acknowledgments are extended to Dr. Joan Moran, Dr. Barbara Gench, and Dr. Michael Wiebe for their interest and assistance as members of the thesis committee.

The writer wishes also to express her gratitude to the students and teachers of Hedric and Central Elementary Schools, Lewisville, Texas; and Stonewall Jackson and Newton Razor Elementary Schools, Denton, Texas, for their cooperation and assistance in conducting this study.

Sincere thanks are also extended to Garth Tymeson and Luke Kelly for their assistance and advice. Further thanks to Janice Sewell for her patience and "fingers".

## TABLE OF CONTENTS

ACKNOWLEDGMENTS . . . . .	iii
LIST OF TABLES . . . . .	vi
Chapter	
I.    ORIENTATION TO THE STUDY . . . . .	1
Statement of the Problem . . . . .	3
Definitions and/or Explanations . . . . .	4
Hypothesis of the Study . . . . .	7
Delimitations of the Study . . . . .	7
II.   REVIEW OF RELATED LITERATURE . . . . .	9
Descriptive Research Concerning Motor Fitness and Related Abilities . . . . .	9
Experimental Research on Attempts to Improve Motor Fitness and/or Motor Proficiency . . . . .	37
III.  PROCEDURES FOLLOWED IN THE DEVELOPMENT OF THE STUDY . . . . .	67
Preliminary Procedures . . . . .	67
Selection of the Subjects . . . . .	68
Selection of the Test . . . . .	68
Collection of the Data . . . . .	69
Planning and Implementation of the Experimental Period . . . . .	70
Organization and Treatment of the Data . . . . .	73
Preparation of the Final Report . . . . .	74
IV.   FINDINGS OF THE STUDY . . . . .	75
Reliability of the Test . . . . .	76
Description of Subjects . . . . .	77
Description of Groups on Pretest and Posttest . . . . .	81
Testing the Hypothesis . . . . .	86

V. SUMMARY, CONCLUSION, AND RECOMMENDATIONS . . . . .	91
Conclusion . . . . .	96
Recommendations for Future Studies . . . . .	96
APPENDIX . . . . .	98
BIBLIOGRAPHY . . . . .	119

LIST OF TABLES

1.	Intraclass Reliability Coefficients of Six Items of the Motor Fitness Test . . . . .	76
2.	Number of Boys and Girls in Each Classification . .	77
3.	Number of Boys and Girls in Each Age Group According to Schools . . . . .	79
4.	Description of Subjects With Respect to Age and Intelligence Quotients . . . . .	80
5.	Description of the Subjects on Pre and Post Measures of Motor Fitness . . . . .	82
6.	Analysis of Covariance to Compare Groups on Six Motor Fitness Items . . . . .	88
7.	Pretest and Posttest Means and Adjusted Posttest Means . . . . .	89
8.	Descriptive Data on Experimental Group . . . . .	113
9.	Descriptive Data on Control Group . . . . .	114
10.	Experimental Group Individual Raw Data Means . . .	115
11.	Control Group Individual Raw Data Means . . . . .	116

## CHAPTER I

### ORIENTATION TO THE STUDY

An adapted physical education program for handicapped children has existed at the Texas Woman's University since the early 1960s, but no data have been collected to determine the efficacy of this program in achieving its objectives. The present study was designed to examine the effectiveness of this developmental movement program in improving the motor fitness of the eighteen children it serves.

Several researchers have reported that retarded children are significantly inferior to their normal counterparts on tests of motor fitness and/or performance.<sup>1</sup> This has been attributed to the fact that mentally retarded children must learn intentionally what normal children learn incidentally. While data are available indicating how retarded children score on tests of motor fitness and/or performance, few experimental studies can be found that document improved

---

<sup>1</sup>G. Lawrence Rarick and R. J. Francis, "Motor Characteristics of Mentally Retarded," Journal of Mental Deficiency 63 (March 1959):792-811; Wayne L. Sengstock, "Physical Fitness of Mentally Retarded Boys," Research Quarterly 37 (March 1966):113-120; Ben R. Londeree and Leon E. Johnson, "Motor Fitness of TMR vs EMR and Normal Children," Medicine and Science in Sports 6 (Winter 1974):247-252.

motor fitness for retarded children through structured physical education programs.<sup>1</sup> As early as 1963, Stein emphasized the need for "well-planned, carefully controlled, and scientifically executed experimental research" with experimental treatments "sufficiently long for results to be conclusive and for significant changes to develop."<sup>2</sup> More recently Moran has reiterated the need for "well-planned, carefully controlled, scientific experimental research."<sup>3</sup> Likewise, Sherrill discusses the need for educational accountability in public school physical education.<sup>4</sup>

---

<sup>1</sup>Amiel Soloman and Roy Pangle, "Demonstrating Physical Fitness Improvement in the EMR," Exceptional Children 34 (November 1967):177-181; Joe Brown, "The Effect of a Physical Fitness Program on the Muscular Fitness of TMR Boys," American Corrective Therapy Journal 22 (May-June 1968):80-81; Jack Campbell, "Improving the Physical Fitness of Retarded Boys," Mental Retardation 12 (June 1974):31-35.

<sup>2</sup>Julian Stein, "Motor Function and Physical Fitness of the Mentally Retarded, A Critical Review," Rehabilitation Literature 24 (August 1963):240.

<sup>3</sup>Joan M. Moran and Leonard H. Kalakian, Movement Experiences for the Mentally Retarded or Emotionally Disturbed Child (Minneapolis: Burgess Publishing Company, 1977), p. 23.

<sup>4</sup>Claudine Sherrill, Adapted Physical Education and Recreation: A Multidisciplinary Approach (Dubuque, Iowa: Wm. C. Brown Company Publishers, 1977), p. 10.

An experimental research design was used in this study to help determine the educational accountability of the Texas Woman's University developmental program in which children receive one-to-one and/or small group instruction as compared to a regular physical education program which utilizes only one teacher. Educational accountability was conceived as the ability to demonstrate that the program achieves at least one goal, the improvement of motor fitness.

#### Statement of the Problem

The problem was to investigate the efficacy of the Texas Woman's University developmental movement program in improving the motor fitness of academically handicapped children, ages six to twelve. A two-group experimental research design was implemented during the academic year of 1978-1979. The experimental group, comprised of eighteen children from two elementary schools in Denton, Texas, participated in the Texas Woman's University developmental movement program for twenty-five weeks, two days a week, for approximately forty-five minutes a day. The control group, comprised of twenty children matched as closely as possible on age, sex, intelligence quotient scores, and educational classification with those of the experimental group, participated in the physical education

programs provided in their two elementary schools in Lewisville, Texas.

Data were collected through the administration of six items selected from the Motor Fitness Test for the Moderately Mentally Retarded.<sup>1</sup> The six items included the standing long jump, the fifty-yard dash, the softball throw for distance, the bent knee sit-ups in thirty seconds, the flexed arm hang, and the tumbling progression. Findings were based upon comparisons of pretest/posttest data.

#### Definitions and/or Explanations

The investigator defined the following terms as they specifically applied to the present study:

Academically Handicapped - for purposes of this study, this term encompassed those children who were educationally classified for special education services in one of the following categories:

(1) Language and Learning Disabled - children who are so deficient in the acquisition of language and/or learning skills, including, but not limited to, the ability to reason, think, speak, read, write, spell, or to make mathematical calculations, as identified by educational and/or psychological and/or medical

---

<sup>1</sup>Leon Johnson and Ben Londeree, Motor Fitness Testing Manual for the Moderately Mentally Retarded (Washington, D. C.: American Alliance for Health, Physical Education, and Recreation, 1977).

diagnosis that they must be provided special services for educational progress.<sup>1</sup>

(2) Educable Mentally Retarded - refers to mentally retarded children who are usually capable of learning basic functional academic skills such as reading and arithmetic.<sup>2</sup>

(3) Trainable Mentally Retarded - a mentally retarded person who is capable of only very limited meaningful achievement in traditional basic academic skills but who is capable of profiting from programs of training in self-care, and simple job or vocational skills.<sup>3</sup>

(4) Minimal Brain Injured - children who are normal or above in intelligence but who have learning difficulties directly attributed to an organic defect caused by a neurological condition, and who are unable to adjust to or profit from a regular school program without the provisions of special education services.<sup>4</sup>

Developmental Movement Program - a program in which the child learns basic movement skills through carefully

<sup>1</sup>Texas 65th Legislature Regular Session-65th Legislature First Called Session, General and Special Laws (Chapter 715 to End, Austin, Texas, 1977), p. 20.

<sup>2</sup>Herbert J. Grossman, ed., Manual on Terminology and Classification in Mental Retardation (Washington, D. C.: American Association on Mental Deficiency, 1973; reprint ed., 1977), p. 134.

<sup>3</sup>Ibid., pp. 161-162.

<sup>4</sup>Texas Education Agency, Administration Guide and Handbook for Special Education--Bulletin 711 (Austin, Texas, TEA, March 1973), p. 33.

selected and guided developmental activities on a one-to-one teacher/student relationship.

Motor Fitness Test for Moderately Mentally Retarded-  
a test battery composed of thirteen items for use with mentally retarded children.<sup>1</sup> Norms for this test were established in 1973 for 1,097 mentally retarded children ranging in age from six to twenty-one at State Schools for Retarded Children located throughout Missouri.<sup>2</sup> No measure of reliability for the test as a whole was reported. Test-retest reliabilities for the flexed arm hang were reported as high as .90, and fall to spring correlations for the tumbling progression were in the .70s.

In this study, only six items were used: the standing long jump, the fifty-yard dash, the softball throw for distance, the bent knee sit-ups in thirty seconds, the flexed arm hang, and the tumbling progression. In this regard, Johnson and Londeree state, "It is suggested that a battery of six items--flexed arm hang, situps, standing broad jump, softball throw for distance, 50 yard dash, and 300 yard run-walk--will provide a satisfactory physical fitness profile

---

<sup>1</sup>Johnson and Londeree, Motor Fitness Testing Manual pp. 16-32.

<sup>2</sup>Londeree and Johnson, "Motor Fitness of TMR vs EMR and Normal Children."

of moderately retarded children."<sup>1</sup> With the exception of the three hundred yard run-walk, the items used in this study are the same as those recommended by Johnson and Londeree. The tumbling progression was used as a substitute for the three hundred yard run-walk.

#### Hypothesis of the Study

The following hypothesis was tested at the .05 level of significance: there is no significant difference between the groups.

#### Delimitations of the Study

The study was subject to the following delimitations: (1) twenty academically handicapped students with intelligence quotients between fifty and eighty from two elementary schools in Denton, Texas, as the experimental group; (2) twenty academically handicapped students with intelligence quotients between fifty and eighty from two elementary schools in Lewisville, Texas, as the control group; (3) the use of analysis of covariance to equate the two groups on the dependent variables; (4) ten trials given to each subject on each of the six selected test items; (5) the objectivity, reliability, and validity of the test items

---

<sup>1</sup>Johnson and Londeree, Motor Fitness Testing Manual, p. 15.

administered during the academic year of 1978-1979; (6) the degree to which the subjects were representative of the population from which they were drawn; and (7) attendance and participation of the subjects in a minimum of 75 percent of the training sessions, each forty-five minutes in duration.

## CHAPTER II

### REVIEW OF RELATED LITERATURE

A review of related literature reveals that the present study partially replicates previous designs. It does not, however, duplicate any completed research in that the subjects, the training method, and the duration of the experimental period all differ from those of other studies. This review of related literature is presented chronologically under the following subheadings: Descriptive Research Concerning Motor Fitness and Related Abilities, and Experimental Research Attempting to Improve Motor Fitness and/or Motor Proficiency.

#### Descriptive Research Concerning Motor Fitness and Related Abilities

Brace investigated the relationship between intelligence and motor learning and/or performance of physical skills in fifty girls from Austin State School in Austin, Texas.<sup>1</sup> The subjects ranged in chronological age from thirteen to eighteen years and intelligence quotients ranged from twenty-three to eighty-two.

---

<sup>1</sup>David K. Brace, "Motor Learning of Feeble-minded Girls," Research Quarterly 19 (December 1948):269-275.

Three tests, each with thirty trials, were administered as the measures of motor learning ability: (1) tennis ball bounce, (2) softball throw at a target, and (3) soccer kick at a target. These motor learning tests were scored in two ways, a gross total score, and the percent of possible gain following the first five trials. Brace concluded that the intelligence quotients of feeble minded girls studied had a slight relationship to motor learning but this relationship appeared partly due to motor ability and general athletic ability and was too low to have predictive value.

Tests of physical abilities included the Brace Motor Ability Test--first trial only, second trial only, sum of both trials, balance items only, and agility items only;<sup>1</sup> the Athletic Index comprised of combined T-scale scores of a fifty-yard dash, standing broad jump, and basketball throw for distance; strength, comprised of combined T-scale scores for sit-ups, modified pull-ups, and push-ups; and Physical Fitness Index comprised of fifty-yard dash, standing broad jump, basketball throw, push-ups, pull-ups, sit-ups, and ten-second squat thrust.

A fair degree of relationship was shown between intelligence scores and scores on the various physical tests.

---

<sup>1</sup>David K. Brace, Measuring Motor Ability (New York: A. S. Barnes and Company, 1927).

A substantial relationship between intelligence quotient and the best combination of motor ability and Athletic Index was shown by the coefficient of multiple correlation of  $R=.54$ . A close relationship ( $r=.79$ ) was depicted between the balance items and total percent gain on the three learning tests. Intelligence quotient and the Brace Motor Ability tests showed a relationship of  $r=.31$  but fell to  $r=.11$  when the effect of Athletic Index was partialled out. Intelligence quotient and Athletic Index yielded a relationship of  $r=.53$  but fell to  $r=.46$  when the Brace Motor Ability Test was held constant.

Brace suggested that among individuals of very low intelligence, slight differences in intelligence may have a significant effect upon motor learning and physical skill performance. The investigator concluded that emotional reaction patterns, rather than lack of physical abilities, may have also contributed to poor performance scores.

Fait and Kupferer compared performances by students in a school for the mentally retarded on two simple motor skills with standard norms.<sup>1</sup> Mansfield State Training

---

<sup>1</sup>Hollis F. Fait and Harriet J. Kupferer, "A Study of Two Motor Achievement Tests and Its Implication in Planning Physical Education Activities for the Mentally Retarded," American Journal of Mental Deficiency 60 (April 1956): 729-732.

School, Mansfield Depot, Connecticut, served as the experimental site in testing forty-one male students ranging in intelligence quotients from forty-two to eighty-seven and in ages from thirteen to twenty years.

The vertical jump, said to measure the explosive power of the leg in relation to the individual's weight, and the burpee squat thrust, believed to measure the general body agility, were used to determine motor ability. Scores for the vertical jump were recorded in inches as the difference between the height of the subject's reach during the jump and the height of his normal reach. The squat thrust test was given for ten seconds. The score recorded was the number of times the subject finished the complete cycle of movement. One-fourth of a point was recorded for each quarter of the burpee cycle completed.

The scores of the two tests were converted into T scores. The mean T score of the vertical jump was 47.68, and the mean T score of the squat thrust was 23.9. A correlation coefficient of  $r=.19$  was found between intelligence quotient and vertical jump and of  $r=.49$  between intelligence quotient and squat thrust. This indicated that there was little relationship between the ability to execute the vertical jump and intelligence quotient, and some relationship between intelligence quotient and performance of the squat

thrust. Some frustration was noted in performances by the subjects on the squat thrust, but none on the vertical jump.

Fait and Kupferer concluded that the physical education program for the mentally retarded should be varied from that offered to normal school children. The degree of success with which the individual is able to participate is dependent on the simplicity of the motoric effort.

Rabin investigated the relationship of age, intelligence, and sex to motor proficiency of sixty children, ages ten to fourteen years and with intelligence quotients from forty to sixty-nine, at two Illinois Public Institutions for mental defectives.<sup>1</sup> The subjects were divided into groups according to age, sex, and intelligence. At each of five age levels (10, 11, 12, 13, and 14), there were twelve subjects, six boys and six girls. Half of the subjects at each age had intelligence quotients between forty and fifty-four, and half had intelligence quotients between fifty-five and sixty-nine.

Four hypotheses were presented: that motor proficiency of institutionalized mental defectives does not vary

---

<sup>1</sup>Herbert M. Rabin, "The Relationship of Age, Intelligence and Sex to Motor Proficiency in Mental Defectives," American Journal of Mental Deficiency 62 (November 1957): 507-516.

as a function of (1) age, (2) intelligence, or (3) sex, and (4) that there is no interaction between any pair of independent variables of age, intelligence, and sex or among all three of these variables.

Two psychologists administered the Lincoln-Oseretsky Motor Development Scale individually to the subjects.<sup>1</sup> The intelligence test given to most of the subjects was the 1937 Stanford Binet. Other subjects were administered the Verbal IQ of the Wechsler Intelligence Scale for Children.

A three-way analysis of variance of the motor scores at the .01 level yielded: (1) a significant relationship between chronological age and motor proficiency, (2) no significant relationship between motor proficiency and intelligence quotient, (3) no significant relationship between motor proficiency and sex, and (4) no significant interaction between any pair of, or among, the three independent variables.

Rabin reported that his findings might have been confounded by an examiner-institution variable which was found to be statistically significant. The two examiners, one at each institution, appeared to differ in testing procedures

---

<sup>1</sup>William Sloan, "The Lincoln-Oseretsky Motor Development Scale," Genetic Psychological Monograph 51 (February 1955):183-252.

in subtle ways, i.e., motivation, speed, etc. Rabin discussed this examiner-institution variable as a possible reason that he did not find a significant relationship between intelligence quotient and motor proficiency as had most other investigators.

Distefano, Ellis, and Sloan investigated the proficiency of mental defectives on a variety of motor skills and the interrelationships among various motor tests, mental age, and chronological age.<sup>1</sup> The seventy-six subjects (forty males and thirty-six females) were drawn from the population at the State Colony and Training School, Pineville, Louisiana, and ranged in chronological age from nine to thirty-two years and in mental age from five to eleven. The subjects were administered the Lincoln-Oseretsky Motor Development Scale, the Rail-Walking Test, the Placing and Turning subtests of the Minnesota Rate of Manipulation Test, hand steadiness test, and test for strength of grip.<sup>2</sup>

---

<sup>1</sup>Michael K. Distefano, Jr., Norman Ellis, and William Sloan, "Motor Proficiency in Mental Defectives," Perceptual and Motor Skills 8 (July 1958):231-234.

<sup>2</sup>Sloan, "Lincoln-Oseretsky Motor Development Scale," pp. 183-252; Roy Heath, Jr., "Clinical Significance of Motor Defect, with Military Implication," American Journal of Psychology 57 (October 1944):482-499; G. L. Betts, Minnesota Rate of Manipulation (Nashville: Educational Publishers, 1946).

The findings were as follows:

With the exception of the Minnesota turning test, males are more proficient than females. However, only the differences in rail-walking performance are statistically significant. A sex difference in score variance for CA, turning, and strength of grip was found. The F-ratios were 1.92, 1.71, and 4.82, respectively, with 35 and 39 df.<sup>1</sup>

The investigators concluded that no significant relationship was found between chronological age and motor scores; however, several motor tasks were highly correlated with mental age. This would suggest that intelligence and motor proficiency are positively related in mentally defective subjects whose chronological age is beyond that during which rapid motor development and intellectual abilities usually occur.

Francis and Rarick investigated the gross motor abilities of 284 mildly retarded children from public schools in Madison and Milwaukee, Wisconsin.<sup>2</sup> Motor achievement levels of mentally retarded children by sex and age were compared with normative data on normal children. Relationship

---

<sup>1</sup>Distefano, Ellis, and Sloan, "Motor Proficiency in Mental Defectives," pp. 231-232.

<sup>2</sup>Robert J. Francis and G. Lawrence Rarick, "Motor Characteristics of the Mentally Retarded," American Journal of Mental Deficiency 63 (March 1959):792-811.

between degree of mental retardation and motor achievement levels of the slow learner was investigated also. A battery of eleven motor performance tests designed to measure strength, power, balance, and agility was administered to subjects who ranged in chronological age from seven to fourteen and in intelligence quotients from fifty to ninety.

All test items were individually administered to the subjects. Static strength was measured by use of a Stoetling hand dynamometer; running speed was measured by time taken to run a distance of thirty-five yards from a standing position and by the time required to complete the last thirty yards of the same run; power or dynamic strength was measured by the vertical jump, standing broad jump, and the softball throw for distance; dynamic balance was measured by ability to walk a ten foot balance beam with no step-offs; and agility was determined by ability to perform squat thrusts and by the agility run.

Age and sex trends in motor proficiency yielded the following results. Tests using the hand dynamometer revealed that at each level the boys on the average were stronger than girls. Data on strength of pull and thrust depicted that boys improved in strength by chronological

age; girls showed maximum strength on this item at approximately twelve years of age. Dynamic strength test items of vertical jump and standing broad jump showed that boys excelled on both when compared with girls at six of the seven age levels. Data for the distance throw showed that boys were superior to girls at every age level. These findings follow the pattern of normal children. Net time for the thirty-yard dash revealed that boys showed progressively faster times with advancing age whereas the girls performed less regularly with increasing age. Average performance scores for boys and girls on the balance beam showed an increase with age; however, boys were superior to girls at most age levels. Agility runs of boys improved with age while girls depicted a similar trend although mean scores at age ten and fourteen were poorer than at ages nine and thirteen respectively. Agility performances of the boys were superior to those of the girls at each age level. The burpee test did not show clear-cut differences with chronological age, although boys were superior in performance to girls at all ages.

Comparisons of motor proficiency of mentally retarded and normal children were made also. Strength of grip for right and left hands showed that normal boys excelled over mentally retarded boys, and normal girls excelled over

mentally retarded girls. It was noted also that normal girls excelled over mentally retarded boys at most of the seven age levels. Normal children were markedly superior to the mentally retarded children at age levels for which normative data were available on the vertical jump. The dynamic strength test item of the standing broad jump showed that the differences between the two groups were great at each age level. Slope of the performance curves indicated that the mentally retarded group was showing no consistent gain in performance with advancing age. Performance gains of both sex groups showed similar increases; however, the normal groups did excel at each age level. The throwing behavior of both normal groups exceeded that of the two mentally retarded groups. The retarded boys excelled over the normal girls in throwing at every age level. The superiority of performance by both normal girls and boys was again evident in the running speed test item. The burpee test for agility showed only modest changes with advancing age although both normal groups showed better scores than did the mentally retarded groups.

Francis and Rarick concluded that the mentally retarded children were markedly inferior to the normal children on all of the motor proficiency test items and that deviations from the normal tended to become greater with

advancing age. Correlations between intelligence and motor performance, although low for the mentally retarded sample, were similar to correlations obtained between these variables on normal children.

Howe compared the motor skill performance of mentally retarded and normal public school children of matched chronological age, socio-economic background, and sex.<sup>1</sup> Each group consisted of forty-three subjects ranging in chronological age from six to twelve years. The mentally retarded group, ranging in intelligence quotients from sixty-four to sixty-seven, was drawn from three special classes for the retarded in Cedar Rapids, Iowa. The normal group, ranging in intelligence quotients from ninety-seven to ninety-nine, came from Cedar Rapids public schools.

Eleven motor tasks were used to collect data: the Sargent-jump, balancing on one foot, tracing speed, tapping speed, dotting speed, grip strength, zig-zag run, fifty-yard dash, squat thrust, ball throw for accuracy, and paper and pencil maze tracing. The tests were administered individually with the best of three trials recorded as the score.

---

<sup>1</sup>Clifford E. Howe, "A Comparison of Motor Skills of Mentally Retarded and Normal Children," Exceptional Children 25 (April 1959):352-355.

Significant F-values were determined for the boys' normal group on each of the motor tasks and for the girls' normal group except for grip strength and accuracy in throwing a ball at a target. It was noted that most of the mentally retarded group were unable to balance on one foot.

Howe concluded that most motor skills are learned incidentally by the normal elementary aged child in regular classrooms; whereas, the mentally retarded child must be taught specifically what normal children seem to learn incidentally. Further implications were drawn that a structured program of physical education may be a necessary part of the curriculum for mentally retarded children.

Malpass compared the motor proficiency of institutionalized and non-institutionalized retarded children and normal children.<sup>1</sup> The relationship between motor proficiency and intelligence for each group was investigated also. The institutionalized group (N=56) was drawn from the Lincoln State School; the non-institutionalized group (N=56) was drawn from Murphysboro, Marion, Herrin, Christopher, and Carbondale, Illinois, public schools. The institutionalized

---

<sup>1</sup>Leslie F. Malpass, "Motor Proficiency in Institutionalized and Non-Institutionalized Retarded Children and Normal Children," American Journal of Mental Deficiency 64 (May 1960):1012-1015.

and non-institutionalized groups ranged in intelligence quotients from fifty-two to eighty.

The Lincoln-Oseretsky Motor Development Scale was administered individually to each subject as an indicator of motor proficiency.<sup>1</sup> A t-test for independent samples revealed no significant differences between the scores of the institutionalized and public school retarded groups. Analysis revealed highly significant differences between the retarded and normal subjects with the latter group being the superior. Partial correlations, with chronological age held constant, suggested that the motor proficiency of retarded children is more highly related to intellectual ability than that of normal children. This was depicted by relationships ranging from .27 to .76 ( $p < .01$ ) for the retarded subjects and .06 to .07 for the normal group. Malpass concluded that relationships between motor proficiency and intelligence can be predicted for the mentally retarded but not for normal children.

Stein investigated the physical fitness of twenty-four educable mentally retarded boys relative to national

---

<sup>1</sup>Sloan, "Lincoln-Oseretsky Motor Development Scale," pp. 183-252.

age scales for boys of the same chronological age.<sup>1</sup> The subjects, ranging in age from 160 months to 203 months and in intelligence quotients from fifty-nine to seventy-five, were enrolled in three intermediate schools in Fairfax County, Virginia, during the academic year of 1962-1963. All of the subjects participated in a daily physical education program. The AAHPER Youth Fitness Test was administered during October, 1962, and May, 1963, as part of the regular physical education program in Fairfax County.<sup>2</sup> The test battery included pull-ups, standing broad jump, shuttle run, sit-ups, fifty-yard dash, softball throw for distance, and six hundred-yard run-walk.

Raw scores for each item were converted to percentile scores and then grouped into appropriate quartile distributions. Comparisons for each of the seven measures of fitness and for the total of the seven tests for October, May, and combined October-May scores were determined by use of chi square analyses. These twenty-four comparisons were in turn compared to national age scales. Twenty-two of the

---

<sup>1</sup>Julian U. Stein, "Physical Fitness of Mentally Retarded Boys Relative to National Age Norms," Rehabilitation Literature 26 (July 1965):205-208.

<sup>2</sup>American Association for Health, Physical Education, and Recreation, Youth Fitness Test Manual (Washington, D.C.: AAHPER, 1958).

twenty-four comparisons resulted in chi square ratios that were not significantly different from the anticipated quartile distributions. Comparisons for May sit-ups and for the combined October-May sit-ups resulted in significantly different distributions from the expected quartile distributions. This comparison favored the retarded subjects. Only 49.70 percent of the total test item scores fell below the mean of the national scores. October scores fell 49.40 percent below the national, as did 50 percent of the May scores.

Further comparisons were made of the subjects' scores with scores made by subjects in a study done by Brace at Austin State School, Austin, Texas.<sup>1</sup> Quartile deviations in every instance were significantly different. Comparisons of Brace's subjects and national age norms showed the norm group to be significantly superior.

Stein concluded by stating that comparisons of boys in residential schools and those attending public school special education classes cannot be equated or generalized from one group to the other. He further concluded that the

---

<sup>1</sup>David K. Brace, "Motor Fitness of Mentally Retarded Boys Relative to National Age Norms," paper read to the Research Section, American Association for Health, Physical Education, and Recreation Convention, Atlantic City, N. J., 18 March 1961.

results from this study, along with others, show the need for active participation by the mentally retarded in regular, systematic, planned, and progressive physical education programs.

Sengstock conducted a study to determine if mentally retarded boys differed from intellectually normal boys in physical fitness.<sup>1</sup> The subjects (N=90), randomly selected from five schools in Onondaga County, New York, were placed into three groups: (1) the educable mentally retarded (EMR) group, (2) the old normal (ON) group, and (3) the young normal (YN) group. The EMR and ON groups were matched according to chronological age (120 to 180 months). The EMR and YN groups were equated on the variable of mental age (72 to 144 months). The AAHPER Youth Fitness Test served as a measure of physical fitness.<sup>2</sup>

A t-test of significance was used to analyze the performances of the EMR and YN groups and the EMR and ON groups on the sit-ups, shuttle run, standing broad jump, fifty-yard dash, softball throw, and six hundred-yard run-walk. The Wilcoxon's Test for two matched samples was used to analyze performance on the pull-ups.

---

<sup>1</sup>Wayne L. Sengstock, "Physical Fitness of Mentally Retarded Boys," Research Quarterly 37 (March 1966):113-120.

<sup>2</sup>AAHPER, Youth Fitness Test Manual.

Sengstock concluded that the EMR group was significantly inferior to the ON group on all items of the fitness test. The EMR group was significantly superior to the YN group in all but the pull-ups and sit-ups tests. The investigator recommended that when integrating a child in a class of physical education instruction, the individual's motor skill ability should be the prime concern.

Brown determined the minimum muscular fitness of thirty-eight trainable mentally retarded (TMR) children enrolled in the education and training program at the Blue Grass School for Retarded, Lexington, Kentucky.<sup>1</sup> The subjects ranged in intelligence quotients from thirty to fifty-five and in chronological age from eight to sixteen years. Muscular fitness of the TMR group was compared with four groups of normal children from Iowa, Oregon, Indiana, and one group studied by Kraus.<sup>2</sup>

---

<sup>1</sup>Joe Brown, "Comparative Performance of Trainable Mentally Retarded on the Kraus-Weber Test," Research Quarterly 38 (October 1967):348-354.

<sup>2</sup>Margaret Fox and Janet Atwood, "Results of Testing Iowa School Children for Health and Fitness," Journal of Health, Physical Education, and Recreation 26 (September 1955):20-21; Glenn Kirchner and Don Clines, "Comparative Analysis of Eugene, Oregon, Elementary School Children Using the Kraus-Weber Test of Minimum Muscular Fitness," Research Quarterly 28 (March 1957):16-25; Marjorie Phillips et al., "Analysis of Results from the Kraus-Weber Test of Minimum Muscular Fitness in Children," Research Quarterly

The Kraus-Weber Test of minimum muscular fitness was used as the testing instrument.<sup>1</sup> The subjects were individually administered six test movements appraising strength and flexibility of trunk and leg muscles. No warm-up was given before testing, and if a child was unable to perform a certain task, he was assisted through that particular item so that he could experience success, even though a failure for that item was recorded.

Difference between two uncorrelated percents was used as the test of statistical significance. The TMR group's test performances were significantly inferior to those of the Kraus, Indiana, Iowa, and Oregon groups' test performance. Difference between percents indicated that girls were more muscularly fit than boys. Comparison of data further revealed "that girls had stronger abdominal plus muscles and lower back muscles and that they were more flexible than the boys."<sup>2</sup> There was no strength difference between boys and girls in their abdominal minus psoas, psoas, and upper back muscles.

---

26 (October 1955):314-323; Hans Kraus and Ruth Hirschland, "Minimum Muscular Fitness Tests in School Children," Research Quarterly 25 (May 1954):178-188.

<sup>1</sup>Kraus and Hirschland, "Muscular Fitness Tests," pp. 178-188.

<sup>2</sup>Brown, "Comparative Performance," p. 350.

Brown concluded this study revealed that TMR children are less muscularly fit than normal children. He further concluded that similar studies are needed in different geographical areas of the United States.

Rarick, Widdop and Broadhead compared the motor performance of educable mentally retarded children by age and sex with national standards on boys and girls of normal intelligence.<sup>1</sup> They also established a procedure whereby the present status and development of an EMR child can be plotted, using as referents the standards resulting from the present investigation.

Motor performance was measured by a modified AAHPER Youth Physical Fitness Test. The test included the following seven items: (1) the flexed arm hang, (2) sit-ups, (3) standing broad jump, (4) shuttle run, (5) fifty-yard dash, (6) softball throw, and (7) three hundred-yard walk-run.

The national sample was comprised of 4,235 educable retarded boys and girls, ages eight to eighteen. Forty Primary Sampling Units (PSU) in twenty-one states were used for the administration of the test. From every PSU,

---

<sup>1</sup>G. Lawrence Rarick, James H. Widdop and Geoffrey D. Broadhead, "The Physical Fitness and Motor Performance of Educable Mentally Retarded Children," Exceptional Children 36 (March 1970):509-519.

approximately eight EMR classrooms were selected. The tests were administered by a team of experienced physical educators from the University of Wisconsin. Every attempt was made to standardize the testing procedures.

Correlations between intelligence quotient and performance scores on each of the seven motor performance test items were positive but low. The data clearly showed that the performance levels of educable mentally retarded boys and girls on the AAHPER Physical Fitness Tests were well below published standards based on normal children.

Broadhead assessed gross motor performance of minimally brain injured (MBI) children as influenced by chronological age and sex.<sup>1</sup> The performance of the MBI children was compared also with that of educable mentally retarded (EMR) children in the same school districts and with national standards of EMRs. The MBI group (N=201) and EMR group (N=249) were drawn from special classes in elementary schools of three adjacently-sited school districts in Harris County, Texas.

The modified AAHPER test battery was used to assess

---

<sup>1</sup>Geoffrey D. Broadhead, "Gross Motor Performance in Minimally Brain Injured Children," Journal of Motor Behavior 4 (June 1972):103-111.

gross motor performance.<sup>1</sup> The test battery included the following items: (1) flexed arm hang, (2) sit-ups, (3) shuttle run, (4) standing broad jump, (5) fifty-yard dash, (6) softball throw, and (7) three hundred-yard run.

Analysis of variance was computed for performance differences between the MBI and EMR children at each age level and for boys and girls. Visual examination was used for comparisons with national standards for the EMR. The following results were found for each item of the test battery:

Flexed arm hang. . . . the only difference which was statistically significant favored the EMR. For the girls there was little evidence of performance differences between the MBI and EMR. The national sample of EMR would appear to out-perform the MBI and EMR boys and girls in the Texas groups on this event.

Sit ups. . . . The level of performance for the MBI boys and girls was not significantly different from that of the Texas EMR boys and girls. Compared with the EMRs of the national sample, the MBI boys and girls, though of significantly higher measured intelligence appeared to perform at a lower level on this task.

Shuttle run. . . . The MBI boys recorded better scores on the shuttle run than the Texas EMR boys, but not one difference was statistically significant. The same feature tended to occur also for the girls, though a single significant difference favored the EMR. The mean scores of the MBI boys and girls were better than those of the EMR boys and girls of the national samples.

---

<sup>1</sup>American Association for Health, Physical Education, and Recreation, Special Fitness Manual for the Mentally Retarded (Washington, D. C.: AAHPER, 1968).

Standing broad jump. . . . In general the MBI boys out-performed the EMR boys in the national sample, whereas this occurred for the girls only at the extremes of the age span. The mean performance of the national samples of EMR boys and girls showed much greater linearity with age than that of the MBI children.

50-yard dash. . . . For the boys the level of performance of the brain injured did not appear different from that of the EMRs, while the single significant difference in mean performance between the MBI and EMR girls favored the 12 yr.-old retardates. Again, the EMR boys in the national sample out-performed the MBI boys at every age level from 8-13 yr., while the girls were superior at 4 of the 6 age levels.

Softball throw. . . . In comparing the mean scores of the two groups of boys, no significant differences were indicated. There was a close similarity in the performance of the MBI and EMR girls. Over the age range involved in this report it appeared that the boys and girls of the national sample of EMRs performed this task more effectively than did the MBI children, the discrepancy in scores for boys increasing with age.

300-yard run. . . . The level of performance of both MBI boys and girls improved with age. Although there were fluctuations in the performance curves, no marked differences by Disability, Sex or Age are observed for the Texas groups. The mean scores of the boys and girls in the national samples were superior to those of the MBI and EMR children from Texas.<sup>1</sup>

Broadhead concluded that MBI children generally have limited opportunities to participate in physical activity

---

<sup>1</sup>Broadhead, "Gross Motor Performance," pp. 107-109.

programs. The results of the investigation indicated, however, that MBI children have a higher achievement level than had been previously expected by teachers and researchers.

Pyfer and Carlson conducted a study to determine whether children in kindergarten to eighth grade demonstrate common specific or general motoric dysfunction characteristics.<sup>1</sup> Subjects (N=28) were children, ages five to thirteen years, who had been referred to the University of Kansas Perceptual-Motor Clinic by school psychologists or physicians for evaluation. The subjects ranged in intelligence quotients from 85 to 128.

Although seven academic and three motor-performance tests were administered individually to each subject, only the results of the Lincoln-Oseretsky Motor Development Scale were included in this study.<sup>2</sup> Total test scores ranges from 24 to 117 points and appeared to compare favorably with normative standards. Pearson product-moment correlations were computed between age and scores attained for

---

<sup>1</sup>Jean L. Pyfer and B. Robert Carlson, "Characteristic Motor Development of Children with Learning Disabilities," Perceptual and Motor Skills 35 (August 1972):291-296.

<sup>2</sup>William Sloan, The Lincoln-Oseretsky Motor Development Scale Manual (Chicago: Stoelting, 1954).

the total test score and for each subtest. Positive correlations were determined between age and each of the following: the total test score ( $r=.677$ ), general static coordination ( $r=.458$ ), dynamic coordination of hands ( $r=.849$ ), general dynamic coordination ( $r=.624$ ), motor speed of hands ( $r=.810$ ), and simultaneous voluntary movement ( $r=.686$ ).

Pyfer and Carlson concluded that children with learning disabilities demonstrate improvement with age in motor performance as measured by the Lincoln-Oseretsky Motor Development Scale; however, scores on tests purporting to measure general static coordination/balance were depressed. Pyfer and Carlson indicated that their findings supported Ayres' belief that children evidencing perceptual-motor dysfunction will also demonstrate static balance problems.<sup>1</sup>

Londeree and Johnson conducted a study to investigate the motor fitness of 606 male and 499 female trainable mentally retarded (TMR) children, ages six to nineteen, in state schools for retarded children in Missouri as compared to published norms for educable mentally retarded (EMR) and normal (N) children on a series of motor variables. Data

---

<sup>1</sup>A. Jean Ayres, "Patterns of Perceptual-Motor Dysfunction in Children: A Factor Analytic Study," Perceptual and Motor Skills 20 (April 1965):335-368.

<sup>2</sup>Ben R. Londeree and Leon E. Johnson, "Motor Fitness of TMR vs. EMR and Normal Children," Medicine and Science in Sports 6 (Winter 1974):247-252.

were collected during April and May of 1973 on the following items: (1) height, (2) weight, (3) flexed arm hang, (4) three hundred-yard run-walk, (5) fifty-yard dash, (6) sit-ups in thirty seconds, (7) softball throw for distance, and (8) the standing broad jump. The tests were administered by seven physical education instructors at thirty schools.

Standard statistical tests were not utilized because the data obtained from the literature for normal and EMR children did not include enough information; however, the first, second, and third quartiles for each variable were plotted by age for each sex. The TMR subjects were well below the EMR and normal subjects on all motor items. There were no apparent differences between the weights of the two groups, but the TMR subjects were slightly shorter than the normal subjects. Data showed an apparent improvement in scores with advancing age for the TMR group.

Londeree and Johnson suggested that only minimal impairment in motor function was found with minor retardation, but increased retardation was "associated with motor decrements in an exponential manner."<sup>1</sup> The investigators observed that the typical physical education program for mentally retarded students generally places emphasis on

---

<sup>1</sup>Londeree and Johnson, "Motor Fitness," p. 249.

perceptual motor skills and that little time is spent on physical fitness per se; therefore, this may be a basic reason for their poor performance on many of the motor fitness tasks.

Bruininks and Bruininks investigated the motor proficiency of fifty-five learning disabled and fifty-five nondisabled students selected from classrooms within thirty-two schools in Ontario, Canada, and in four states in the United States.<sup>1</sup> Both samples consisted of thirty-eight boys and seventeen girls with a mean age of nine years and three months.

The Bruininks-Oseretsky Test of Motor Proficiency was administered to each subject by trained examiners.<sup>2</sup> The test contained the following subtests: (1) running speed and agility--a thirty-yard shuttle run, (2) balance, (3) bilateral coordination, (4) strength--sit-ups, push-ups, and standing broad jump, (5) upper limb coordination, (6) response speed, (7) visual-motor control--paper and pencil tasks, (8) upper limb dexterity and speed.

---

<sup>1</sup>Virginia L. Bruininks and Robert H. Bruininks, "Motor Proficiency of Learning Disabled and Nondisabled Students," Perceptual and Motor Skills 44 (June 1977): 1131-1137.

<sup>2</sup>Robert H. Bruininks, Bruininks-Oseretsky Test of Motor Proficiency Manual (Circle Pines, MN.: American Guidance Service, 1977).

Reliabilities for the subtests ranged from .70 to .90 with coefficients for total and composite scores in the .80s.

A three-factor mixed design analysis of variance with repeated measures was used to compare the motor performance of learning disabled and nondisabled students. The learning disabled subjects were significantly lower than nondisabled subjects in over all motor performance. A significant interaction was found between groups and motor test scores. The learning disabled students scored lower in motor proficiency than the nondisabled students on all items except the response speed subtest. The learning disabled group was most deficient in balance skills, simultaneous or sequential bilateral coordination of movements involving arms and legs, and visual-motor coordination required in drawing designs and tracing mazes.

Bruininks and Bruininks suggested the need to provide learning disabled students with structured motor training in order to increase their attention span and reduce hyperactivity. This would aid not only in physical development but also in personal and social adjustment and in social acceptance.

Experimental Research on Attempts to Improve  
Motor Fitness and/or Motor Proficiency

Shotick and Thate investigated the responses of seven educable mentally handicapped (EMH) children to a program of physical education.<sup>1</sup> The subjects were from the intermediate class for EMH children at the University School of Southern Illinois University. The responses were categorized into three areas: (1) the level of enthusiasm for each activity, (2) the response to instruction, and (3) the response of the children to one another and their interaction during the activities. A special program of physical education began in September of 1957, and included the following categories of activities: (1) games of low organization, (2) fundamental skills, (3) stunts and tumbling, and (4) swimming.

Observers, including physical education and special education supervisors, student teachers, and university students selected by the supervisors, recorded anecdotally the children's performances and reactions for three months. A checklist was devised to record the children's responses in the three areas. A new category of rhythmic activities

---

<sup>1</sup>Andrew Shotick and Charles Thate, "Reactions of a Group of Educable Mentally Handicapped Children to a Program of Physical Education," Exceptional Children 26 (January 1960):248-252.

was added for the final period of testing. Responses were recorded for the next four months in all activities except swimming. A simple arithmetic mean was computed by dividing total score achieved by the class by the total number of individual participants. The findings were as follows:

Within these limitations it may be seen . . . that all the games of low organization rated moderate to high in "Enthusiasm" and all but volleyball rated moderate to high in "Response to Instruction."

. . . all the activities in "Fundamental Skills" rated moderate to high in "Enthusiasm" and in "Response to Instruction" with marching, hanging and walking with hands on a suspended ladder, and calisthenics lowest in both areas.

. . . all of the activities in Stunts and Tumbling rated very high in "Enthusiasm" and that all but balancing activities rated very high in "Response to Instruction."

A definite increase in "Enthusiasm" for rhythmic activities was noted as the term progressed; the youngsters entered into the dancing more readily, they listened to instructions more carefully, there was spontaneous laughter and gaiety and the level of interest remained high for a longer period of time.<sup>1</sup>

Anecdotal records were used for evaluation in the swimming program. Participation of the EMH students was 100 percent. Four non-swimmers learned to swim; two other non-swimmers learned to float during the course of the program.

Gearheart conducted a study to determine whether a special program in physical education would produce greater

---

<sup>1</sup>Shotick and Thate, "Reactions to a Program of Physical Education," p. 250.

development of motor skills in educable mentally handicapped children than would a standard program of physical education.<sup>1</sup> Children enrolled in special education classes at Fillmore and Jackson Elementary Schools in Cedar Rapids, Iowa, served as subjects for the two-group study. The control group consisted of fifty-five subjects, and the experimental group contained thirty-nine subjects.

Four motor skills were selected to measure balance, general coordination, jumping ability, and agility. Those selected were the hurdle jump, the broad jump, the rail walk, and the agility run. The matchsticks test was included to measure the development of finer motor skills not directly related to the more gross skills measured by other test items. A pretest was given in September, a mid-year test in January, and a posttest in May.

The experimental program consisted of a series of games and exercises. Teachers were briefed on the scope of the experiment. A weekly checklist was provided on which teachers indicated the dates when particular exercises or games were used.

---

<sup>1</sup>Bill Gearheart, "A Study of a Physical Education Program Designed to Promote Motor Skills of Educable Mentally Retarded Children Enrolled in Special Classes in Cedar Rapids, Iowa" (Ph.D. dissertation, Colorado State College, 1963).

Comparison of test scores yielded the following. Pre-test scores showed similar performance of the two groups on five motor skills tests. At the time of the mid-year test, certain differences in performance existed. Posttest scores depicted significantly better performance by the experimental group on the hurdle jump, the matchsticks test, and the rail walk. Difference in broad jump performance which existed at mid-year no longer existed. Gearheart therefore concluded that the experimental program was effective in improving the gross motor skills measured by the hurdle jump and rail walk tests. It was effective also in improving the finer motor skills as measured by the matchsticks test.

Corder investigated the effects of an intensive twenty day program of physical education on the intellectual, physical, and social development of educable mentally retarded (EMR) boys.<sup>1</sup> The subjects, consisting of twenty-four EMR boys enrolled in four special day classes in three schools of the Nashville metropolitan area, were placed into three groups of eight subjects each. The boys ranged in age from twelve to sixteen years and in intelligence quotients from fifty to eighty. Each of the subjects was pretested and

---

<sup>1</sup>W. Owens Corder, "Effects of Physical Education on the Intellectual, Physical, and Social Development of Educable Mentally Retarded Boys," Exceptional Children 32 (February 1966):357-364.

posttested on the WISC, the Youth Fitness Test, and the Cowell Personal Distance Scale.<sup>1</sup> The three groups were designated as training, officials, and control. The training group participated in one-hour progressive and systematic physical education lessons five times a week for four weeks. The officials group kept daily records of the number of pull-ups performed, times for the dashes and relays, and distances for the broad jump and softball throws done by the training group. The control group received the usual classroom instruction.

Corder predicted that the training group would make significantly higher gains on the WISC and the Youth Fitness Test than would the other two groups, and that the training and officials group both would make significantly higher gain scores on the Cowell Personal Distance Scale than the control group; however, there would be no difference between the training group and the officials group.

Analysis of variance was the major statistical technique used. The results showed that the full scale mean

---

<sup>1</sup>David Wechsler, Wechsler Intelligence Scale for Children (New York: Psychological Corporation, 1949); American Association for Health, Physical Education, and Recreation, AAHPER Youth Fitness Test Manual (Washington, D. C.: AAHPER, 1961); Charles C. Cowell and Hilda M. Schwehn, Modern Principles and Methods in High School Physical Education (Boston: Allyn and Bacon, 1958), pp. 306-308.

intelligence quotient and verbal intelligence quotient of the three groups were significantly different at the .05 level. There was no significant difference among the three groups in performance scale intelligence quotient. The t-test for differences between groups showed significance between the training group and the control group on the full scale and the verbal scale. The training group improved significantly over the officials and control group on all seven items of the fitness test: (1) pull-ups, (2) sit-ups, (3) fifty-yard dash, (4) shuttle run, (5) broad jump, (6) softball throw, and (7) six hundred-yard run-walk. There were no differences between the three groups on the Cowell Personal Distance Scale.

Corder and Pridmore partially replicated the study done by Corder but extended the lesson plans over thirty days.<sup>1</sup> Their purpose was to determine if a special education teacher could follow the lesson plans and obtain comparable results. Subjects were sixteen educable mentally retarded (EMR) boys from special education classes at Inman Junior High School, Inman, South Carolina. The subjects ranged in age from fourteen to seventeen years and in

---

<sup>1</sup>W. Owens Corder and Harold Pridmore, "Effects of Physical Education on the Psychomotor Development of Educable Mentally Retarded Boys," Education and Training of the Mentally Retarded 1 (January 1966):163-167.

intelligence quotients from sixty-one to eighty as measured by the Peabody Picture Vocabulary Test (PPVT).<sup>1</sup> Physical fitness was measured by the AAHPER Youth Fitness Test.<sup>2</sup> Social status was determined by the Cowell Personal Distance Scale.<sup>3</sup>

The sixteen subjects were assigned to two groups. The training group received a thirty day program of physical education. Included in the program were neck exercises, finger and arm exercises, jumping jacks, push-ups, sit-ups, twenty-five-yard dash, broad jump, wind sprints, hop-skip-jump, deep knee bends, and four hundred-yard run. The control group adhered to their regular class schedule.

Following the experimental period, analyses of pretest and posttest scores were made. A t-test for differences between mean intelligence quotient gain scores indicated significance at the .05 level. The training group indicated significance at the .05 level. The training group indicated significant improvement in five of the seven fitness items. No significant difference was found on the fifty-yard dash and the six hundred-yard run-walk. The training group

---

<sup>1</sup>Lloyd M. Dunn, Peabody Picture Vocabulary Test (Minneapolis: American Guidance Service, 1959).

<sup>2</sup>AAHPER, Youth Fitness Test.

<sup>3</sup>Cowell and Schwehn, Modern Principles and Methods.

showed significant improvement in mean gain scores on the Cowell Personal Distance Scale.

Corder and Pridmore concluded that the planned program of physical education enhanced the intellectual development, physical fitness level, and social status of EMR boys. They concluded also that it was feasible for a special education teacher to effectively conduct such a program.

Carter conducted a study of the physical fitness of forty-four educable mentally retarded (EMR) boys from seven different special classes.<sup>1</sup> The subjects ranged in age from ten to fifteen years. Eight of the subjects were in a daily physical education program with non-retarded boys. Thirty-five non-retarded boys were randomly drawn from the local high school eighth and ninth grades and participated in a daily physical education program for forty-five minutes. The non-retarded group (NR) had been previously tested on the AAHPER Youth Fitness Test.<sup>2</sup> The EMR group was administered the same test over a three-week period.

---

<sup>1</sup>John L. Carter, "The Status of Educable Mentally Retarded Boys on the AAHPER Youth Fitness Test," TAHPER 34 (May 1966):8, 29-31.

<sup>2</sup>AAHPER, Youth Fitness Test Manual.

A percentile and mean raw score were computed for each item of the test. Comparisons were made between the two groups and national norms. The NR group scored consistently higher on all items than did the EMR group. The EMR boys had a mean raw score of five feet, four inches on the standing broad jump which was only one inch shorter than the national average. Both groups attained their lowest score on the fifty-yard dash. The EMR group scored a mean percentile of twenty-eight on the softball throw; the NR group scored a mean percentile of eighty-five. The six hundred-yard walk-run mean percentile for the EMR group was thirty-eight; the NR group scored in the ninetieth percentile. The grand mean percentile score for the eight EMR boys enrolled in physical education classes was 46.9, while those not enrolled in physical education attained a grand mean percentile score of 25.1.

Carter concluded that retarded boys can gain near average scores on the AAHPER Youth Fitness Test when given the opportunity to participate in an organized physical education program. This was demonstrated by the fact that the retarded group's total percentile score was essentially the same as the national norms.

Soloman and Pangle conducted a study to assess changes in physical fitness in educable mentally retarded (EMR) boys as a result of an eight-week structured physical education program.<sup>1</sup> Subjects (N=42) were enrolled in one of four EMR classes in the Metropolitan School System, Nashville, Tennessee. Ranging in chronological age from thirteen to seventeen years and mental age from seven to twelve years, the subjects were divided into experimental (N=24) and control (N=18) groups. The eight-week program of planned and progressive physical education activities was divided into three fifteen-minute segments: (1) warm-up and calisthenic drills; (2) self-testing, dual, and relay activities; and (3) teaching skills, and participating in stunts and games. Three items (chins, sit-ups, and fifty-yard dash) from the AAHPER Youth Fitness Test were used to assess physical fitness before and after the experimental physical education program.<sup>2</sup> Scores on the three test items were used in predicting the average percentile total test score for each subject. The conversion of raw scores into percentile ranks

---

<sup>1</sup>Amiel Soloman and Roy Pangle, "Demonstrating Physical Fitness Improvement in the EMR," Exceptional Children 34 (November 1967):177-181.

<sup>2</sup>American Association for Health, Physical Education, and Recreation, Youth Fitness Test Manual, 2d rev. ed., (Washington, D. C.: AAHPER, 1965).

was made using the chronological ages of the subjects in comparison to published normative data for non-retarded boys.

Chi square analyses resulted in significant values on the pretest. Posttest scores did not differ significantly on the chins and fifty-yard dash. A significant improvement was noticed on the sit-ups. A six week follow-up test revealed a significant improvement over pretest performance.

Soloman and Pangle concluded that the physical fitness of EMR boys can be improved through a planned and systematic physical education program. The results also indicated the ability of the EMR subjects to perform equally as well as, and in some instance superior to, their non-retarded counterparts.

Jenkins conducted a study to investigate the efficacy of physical education instruction as a means of improving the gross motor performance of trainable mentally retarded boys enrolled at the Denton State School, Denton, Texas, during the fall semester of the academic year of 1967-1968.<sup>1</sup> The subjects, who ranged in age from nine to fourteen, were randomly assigned to a control and experimental

---

<sup>1</sup>Kathryn Nessler Jenkins, "The Relationship Between Participation in Physical Education Instruction and the Gross Motor Performance of Institutionalized Trainable Mentally Retarded Boys" (Master's thesis, Texas Woman's University, 1968).

group. Nineteen boys were in each group. Subjects comprising the experimental group received approximately one hour of individual and/or group instruction in selected physical education activities daily for a period of seven weeks, whereas subjects comprising the control group followed the usual regime of the Denton State School.

Jenkins used four main tests to establish pretest and posttest scores of the gross motor performance of the subjects. These included the Nessler Test of Hopping a Square Pattern, the thirty-yard dash, the Heath Rail-walking Test, and the standing broad jump.<sup>1</sup> A t-test of significance was applied to examine each hypothesis. The subjects comprising the experimental group improved significantly in their abilities to broad jump, hop a square pattern, and walk rails of progressively narrower widths. No significant difference occurred in their pretest and posttest scores on the thirty-yard dash. The subjects of the control group showed no significant improvement on any of the motor tasks.

Comparison of the two groups on the posttest data indicated that only the hopping and rail walking skills

---

<sup>1</sup>Eugene G. Roach and Newell C. Kephart, The Purdue Perceptual-Motor Survey (Columbus, Ohio: Charles E. Merrill Books, Inc., 1966), p. 34; S. Roy Heath, "Rail-Walking Performance as Related to Mental Age and Etiological Type Among the Mentally Retarded," American Journal of Psychology 55 (April 1942):240-247.

showed significant improvement. Jenkins concluded that trainable mentally retarded boys, ages nine to fourteen, can improve significantly in the basic performance skills of rail walking, broad jumping, and hopping when given daily instruction in these movements.

Lillie conducted a study to determine the effects of motor development lessons on young mentally retarded children.<sup>1</sup> Three groups, of approximately sixteen children each, were referred to as (1) the experimental preschool group (EPG) from the experimental preschool project at Indiana University Laboratory School, (2) the kindergarten control group (KC) from a kindergarten class in Edinburg, Indiana, and (3) a home control group (HC). The children were selected on the following criteria: (1) chronological ages from fifty-seven to seventy months; (2) intelligence quotients from fifty to eighty-five; (3) social classes from lower to lower-lower class range as measured by the Warner Meeker Ells Index of Status Characteristics;<sup>2</sup> (4) freedom from any type of physical or sensory handicap,

---

<sup>1</sup>David L. Lillie, "The Effect of Motor Development Lessons on Mentally Retarded Children," American Journal of Mental Deficiency 72 (May 1968):803-808.

<sup>2</sup>William L. Warner, Social Class in America (New York: Harper, 1960).

as determined by a medical examination; and (5) no evidence of serious emotional maladjustment.

The Lincoln-Oseretsky Motor Development Scale was used as a pretest and posttest measure of motor proficiency.<sup>1</sup> The experimental period lasted a period of five months. The EPG group received sixty-five diagnostically based motor development lessons which included such activities as tracing, coloring, cutting, pasting, folding, finger games, gross motor activity games, and trampoline exercises. The KC group received a typical kindergarten curriculum consisting of instruction in socialization communication skills, skill readiness activities, and traditionally used motor experiences such as running games, jigsaw puzzles, bead stringing, coloring, cutting, some beginning writing exercises, drawing, clay modeling and other similar activities. The HC group received no formal instruction.

Analysis of covariance was used to analyze the data. No significant difference was shown in gross motor development among the three groups at the .01 level. Duncan's Multiple Range Test was used to locate the significant difference in fine motor development between all three groups at the .05 level of confidence. The experimental group (EPG)

---

<sup>1</sup>Sloan, "The Lincoln-Oseretsky Motor Development Scale."

displayed significantly greater proficiency in fine motor development than did the two control groups. Lillie suggested that an explanation for the absence of a treatment effect on gross motor skill might be that the HC subjects had been engaged in as much gross motor activity as the two school groups.

Lillie stated that this study was one of the first attempts to consider gross motor proficiency and fine motor proficiency as separate entities within a curriculum program. He suggested that more research is needed in this area.

Brown investigated the effect of a physical education program on the muscular fitness of thirty trainable mentally retarded boys, ages ten to seventeen years, enrolled in a special school.<sup>1</sup> The subjects were given pretests and posttests on the Kraus-Weber Test of Minimum Muscular Fitness.<sup>2</sup> The test consisted of six items, three for the abdominal muscles, two for the back muscles, and one for flexibility of the back and hamstring muscles. Each of the items was graded on a pass or fail basis.

---

<sup>1</sup>Joe Brown, "The Effect of a Physical Fitness Program on the Muscular Fitness of TMR Boys," American Corrective Therapy Journal 22 (May-June 1968):80-81.

<sup>2</sup>Hans Kraus and Rath Hirschland, "Minimum Muscular Fitness Tests in School Children," Research Quarterly 25 (May 1954):178-188.

The subjects participated in a physical education program for twenty-five minutes each day for six weeks. The program consisted of the following: (1) physical conditioning, i.e., strength, endurance, flexibility, and agility exercises; (2) individual activities, i.e., balance beam, bean bag tossing, obstacle course, and shuttle run; and (3) group activities, i.e., bean bag relay, shuttle run relay, and "Simon Says." Brown hypothesized that the muscular fitness of the TMR boys would be improved significantly as a result of their participation in the program.

A t-test to determine the difference between two correlated means showed that significant differences occurred in the total number of Kraus-Weber test items passed, total abdominal items passed, total back items passed, and total flexibility items passed. Brown concluded that participation in the six-week physical education program improved the muscular fitness of this single group study of trainable mentally retarded boys.

Ross conducted a three-group experimental study to determine the effects of an intensive motor skills training program on young educable mentally retarded children.<sup>1</sup>

---

<sup>1</sup>Sheila A. Ross, "Effects of an Intensive Motor Skills Training Program on Young Educable Mentally Retarded Children," American Journal of Mental Deficiency 73 (May 1969):920-926.

Forty subjects from eight preschool and primary classes for educable mentally retarded children in three school districts in Northern California were randomly assigned to either the experimental or control group. A group of twenty children of normal intelligence and of the same chronological age served as the average group.

The experimental period was of six months duration. During that time, the experimental group participated three times a week in twenty to twenty-five minute sessions. Included in the experimental training period was the use of lead-up games to teach the aspects of a standard game. Rules of play changed with each session. Each subject was given the option of changing the rules. Three or more different skills were worked on within game contexts during each session. The control group took part in the standard physical education program prescribed for special classes in California.

Two tests were administered before and after the experimental period. The Basic Skills Test, consisting of thirty-two items, measured the skills of hitting, throwing, catching, running, jumping, bouncing, kicking, hopping, skipping, balancing, and accuracy at target throwing. The Brace Items Test, consisting of eight items selected from the test developed by Brace, was used to measure general

motor ability.<sup>1</sup> The average group was given pretests in order to derive baseline data but were not given posttests.

Pretest scores for the experimental and control groups were far below those of the average group. Comparison of pretest and posttest scores of the experimental group on the Basic Skills Test and the Brace Items Test showed a significant improvement whereas the control group did not improve significantly.

Ross concluded that the experimental motor skills training program was effective in teaching game and sports skills to young retarded children. Concluded also was that deficits in the two areas of rate of response and ability to direct activities were, at least in part, the result of inadequate learning rather than inborn characteristics of the children.

Funk conducted a study to investigate the effect of a planned physical education program on the physical, intellectual, social, and psychological improvement of two groups of children classified as trainable mentally retarded at the

---

<sup>1</sup>Brace, Measuring Motor Ability.

Pearl Buck Center, Eugene, Oregon.<sup>1</sup> Eighteen subjects served as the experimental group and eighteen as the control group. A pretest was given at the beginning of the 1968-1969 school year.

Tests used were a physical fitness test which was a combination of Physical Fitness for the Mentally Retarded and the Special Fitness Test for the Mentally Retarded, the Kershner-Dusewicz Revision of the Vineland Adaption of the Oseretsky Test of Motor Proficiency, the Peabody Picture Vocabulary Test, the Goodenough-Harris Draw-a-Person Test, and the Cain-Levine Social Competency Scale.<sup>2</sup>

---

<sup>1</sup>Clarence D. Funk, "The Effects of a Physical Education Program on the Educational Improvement of Trainable Mentally Retarded Children" (Ph.D. dissertation, University of Oregon, 1969); D. D. Funk, "Effects of Physical Education on Fitness and Motor Development of Trainable Mentally Retarded Children," Research Quarterly 42 (March 1971): 30-34.

<sup>2</sup>Frank Hayden, Physical Fitness for the Mentally Retarded (Toronto: Metropolitan Toronto Association for Retarded Children, 1964); AAHPER and Kennedy Foundation, Special Fitness Test Manual for Mentally Retarded (Washington: AAHPER, 1968); Keith Kershner, Russell A. Dusewicz, and John Kershner, The KDK-Oseretsky Tests of Motor Development (Harrisburg: Bureau of Research, Administration and Coordination Department of Public Instruction, 1968); Lloyd M. Dunn, Expanded Manual for the Peabody Picture Vocabulary Test (Minneapolis: American Guidance Service, Inc., 1965); Dale B. Harris, Children's Drawings as Measures of Intellectual Maturity (New York: Harcourt, Brace and World, 1963); Leo F. Cain, Samuel Levine, and Feeman Elzey, Cain-Levine Social Competency Scale (Palo Alto, California: Consulting Psychologist Press, 1963).

Analysis of covariance was used to determine significance at the .05 level. The experimental group showed significant improvement on only the sit-ups and shuttle run items of the physical fitness test. No significant improvement was noted on the motor development test, the Peabody Picture Vocabulary Test, the Draw-a-Person Test, or the Cain-Levine Social Competency Scale.

Funk concluded that mentally retarded children can attain certain physical benefits from a daily thirty minute planned physical education program. He further concluded that the reason there was no significant improvement on the other items could be explained in the type of activities included in the program.

Chasey and Wyrick conducted a two-group study to determine the effects of a concentrated physical development program on the motor proficiency of forty-seven educable mentally retarded children who resided at the Austin State School, Austin, Texas.<sup>1</sup> The subjects ranged in chronological age from six to twelve years and in intelligence quotients from fifty to eighty-five. The Oseretsky Motor

---

<sup>1</sup>William C. Chasey and Waneen Wyrick, "Effects of a Physical Development Program on Psychomotor Ability of Retarded Children," American Journal of Mental Deficiency 64 (May 1960):1012-1015. 1971

Development Scale was used to measure motor proficiency.<sup>1</sup> The scale consisted of the following components: (1) general static coordination, (2) dynamic hand coordination, (3) general dynamic coordination, (4) motor speed, (5) simultaneous voluntary movements, and (6) synkinesia. Two hypotheses proposed were: (1) that EMR children, given a concentrated development program, would show significant improvement of fine motor skills, and (2) that the experimental group would be significantly superior to the control group in the final motor proficiency test.

Student clinicians were assigned to three or four subjects for the fifteen-week program. The subjects participated in the program five days a week for one hour a day. The program included ball skills, individual games, gymnastics activities, tumbling, and conditioning exercises such as long distance running. The control group received no formal physical education instruction but did participate in the same free play as the experimental group.

At the end of the experimental period, results indicated that there were significant differences between groups on dynamic coordination of the hands, general dynamic

---

<sup>1</sup>William Sloan, "The Lincoln-Oseretsky Motor Development Scale," Genetic Psychology Monographs 51 (May 1955):183-252.

coordination, motor speed, and simultaneous voluntary movement. The experimental and control groups were not, however, significantly different on the final total Oseretsky scores. The control group increased in synkinesia, while the experimental group decreased significantly in this area.

Chasey and Wyrick stated that the two groups were not significantly different on the total Oseretsky score for two reasons. First, the experimental group's motor skills were more retarded on the pretest than those of the control group. Secondly, the components labeled motor speed and simultaneous voluntary movements heavily loaded a factor that accounted for roughly 27 percent of the total variance.

Adams investigated the efficacy of instruction in physical education as a means of improving the motor proficiency and social adjustment of educable mentally retarded (EMR) girls and the effectiveness of separating EMR girls from their intellectually normal peers for physical education instruction. Subjects were drawn randomly from six regular physical education classes at each of two public junior high schools. The EMR experimental group was subdivided into two classes of ten at one school and eleven at

---

<sup>1</sup>Kela O. Adams, "The Effect of Adapted Physical Education Upon the Social Adjustment and Motor Proficiency of Educable Mentally Retarded Girls," American Corrective Therapy Journal 25 (May-June 1971):64-67.

another and were taught adapted physical education on alternate days for one semester with greater emphasis on individual and dual activities. The EMR control group consisted of twenty girls who were instructed in regular physical education classes along with the intellectually normal control group of twenty-three girls.

Testing instruments included the KDK-Oseretsky Tests of Motor Development, the Cowell Social Adjustment Scale, and the Cowell Personal Distance Scale.<sup>1</sup> The Cowell Social Adjustment Scale was administered during the sixth lesson of the semester to allow girls in the adapted class to get to know each other.

The findings indicated that pretest scores on the KDK-Oseretsky Test and the Cowell Social Adjustment Index significantly favored the intellectually normal subjects over both groups of EMR girls. Scores on the Cowell Personal Distance Scale showed the EMR control group to be significantly less acceptable to their classmates than was the normal group or the EMR experimental group. Posttest scores at the end of the experimental period yielded the same findings as the pretests.

---

<sup>1</sup>Kershner, Dusewicz, and Kershner, The KDK-Oseretsky Tests of Motor Development; Harold Barrow and Rosemary McGee, A Practical Approach to Measurement in Physical Education (Philadelphia: Lea and Febiger, 1964), pp. 421-429.

Analysis of difference scores (computed by subtracting initial from final scores) on all measures for the three groups yielded the following: (1) no significant difference in mean difference scores between the two EMR groups on the Cowell Social Adjustment Index, (2) no significant difference in mean difference scores on the Cowell Personal Distance Scale, and (3) difference scores on the KDK-Oseretsky Tests for the two EMR groups were significantly better than for the normal control group. No significant difference between the two EMR groups was found on the KDK-Oseretsky Tests.

Adams concluded that participation of EMR girls in physical education was associated with greater gains in motor performance than was the participation of the normal girls. He concluded also that the adapted program appeared to be no more effective than the regular program in promoting motor development among EMR girls, and that social adjustment as assessed through teachers' ratings and peer acceptance among EMR girls appeared to be better achieved through participation in an adapted physical education program than in a regular physical education class.

Campbell conducted an adapted version of the Royal Canadian Air Force (RCAF) Physical Fitness Program with forty male subjects selected from an institution for the

mentally retarded in Central Pennsylvania. The subjects, ranging in age from ten to fourteen years and in intelligence quotients from twenty to eighty-four, were randomly assigned to control or experimental groups. The experimental group received a contingency managed adapted RCAF program. The control group received the same physical fitness program but on a non-contingent basis.

The RCAF program consisted of five basic exercises: (1) toe touches in one minute, (2) straight leg sit-ups in one minute, (3) head and shoulder lifts in one minute, (4) push-ups in one minute, and (5) run in place for two minutes. The contingency management form was a token economy and a non-token economy condition. Daily performances were recorded for each subject on each of the five exercises. After the first day, the experimental group received a point or token for every extra repetition completed on each of the five exercises.

Weekly means and variances were calculated and t-tests between experimental and control groups were performed to determine differences at the .05 level. The weekly differences in performances revealed that the experimental group

---

<sup>1</sup>Jack Campbell, "Improving the Physical Fitness of Retarded Boys," Mental Retardation 12 (June 1974):31-35; Royal Canadian Air Force, Exercise Plans for Physical Fitness (New York: Pocket Books, Inc., 1962).

was favored on three of the five exercises at the end of the experimental period: (1) toe touches, (2) sit-ups, and (3) push-ups. There was no significant difference on the head and shoulder lifts and the run in place. Campbell concluded that, based on the results of this study, mentally retarded boys participating in a contingency management physical fitness program can benefit more than boys not under a contingency based program.

Vodola conducted four studies to compare the effects of an individualized-personalized physical activity program and a traditional physical education program on the motor performance of children evidencing low motor ability (Studies I and III), mental retardation (Studies II and IV), emotional disturbances (Study IV), neurological and perceptual impairments (Study IV).<sup>1</sup> Subjects in Study I (N=34) were drawn from Township of Ocean; subjects in Study II were drawn from Asbury Park School District; and subjects in Studies III (N=57) and IV (N=53) were drawn from Jersey City.

The Township of Ocean Motor Ability Test was used to measure gross body coordination (GBC), balance-postural orientation (BPO), eye-hand coordination (EHC), eye-hand

---

<sup>1</sup>Thomas M. Vodola, A.C.T.I.V.E. Research Monograph: Competency-Based Teacher Training and Individualized-Personalized Physical Activity (Oakhurst, New Jersey: Township of Ocean School District, 1978), pp. 19-24.

accuracy (EHA), and eye-foot accuracy (EFA).<sup>1</sup> The Motor Ability Index (MAI) was a composite test battery score. Reliability coefficients of .53 and .60 were obtained on two separate administrations of the test.

For each study, the subjects were randomly divided into experimental and control groups. Each subject was pretested on the Motor Ability Test. The experimental group then received individualized-personalized (IP) programming based on specific deficits of each subject for a minimum of two thirty-minute or three twenty-minute periods per week for six months. The control groups participated in traditional (T) physical education.

A t-test for independent means between initial and final composite motor ability test scores showed the experimental group in Study I significantly superior to the control group in motor proficiency. Significant t-values were obtained in favor of the experimental group for each of the following test items: GBC, BPO, EHC, EHA, and EFA.

The Wilcoxon signed-rank test for matched pairs was utilized to determine significant differences in Study II. Findings revealed that the experimental group was significantly superior to the control group in BPO, EHC, and EFA;

---

<sup>1</sup>Ibid., pp. 75-81.

however, there was no significant difference between the two groups on GBC and EHA.

The results of Study III were statistically treated by a t-test for correlated samples. It was determined that the experimental male group improved significantly in motor performance, but that no significant difference occurred in the experimental female group. Analysis of covariance showed superiority of the IP program over the T program for both males and females.

Analysis of covariance of initial, final, and adjusted motor ability test battery scores of Study IV showed a significant difference in favor of the IP program over the T program in improving motor performance. Vodola concluded that children evidencing low motor ability, mental retardation, emotional disturbances, neurological and perceptual impairment will significantly improve motor performance from involvement in an individualized-personalized physical education program.

Vodola conducted six studies to determine the effects of individualized-personalized (IP) and traditionalized (T) physical education instruction on the physical fitness of children exhibiting low physical vitality (Studies I-IV), and children with neurological impairment and emotional

disturbances (Study VI).<sup>1</sup> In Studies I (N=13), II (N=14), III (N=8), IV (N=10), and V (N=18), the subjects were drawn from Paramus, Morris Hills, Asbury Park, Township of Ocean, and Red Bank Primary school districts. Subjects in Study VI (N=55) were drawn from Jersey City, New Jersey. All subjects were matched on the basis of age, sex, handicapping condition, and pretest scores. They were then assigned to experimental and control groups.

All subjects were pretested and posttested on the Township of Ocean Physical Fitness Test Battery.<sup>2</sup> Test reliabilities ranged from .93 to .95. The Wilcoxon Matched-Pairs test was used to analyze data in Studies I-V. Analysis of covariance was applied to the data in Study VI.

Data from the pretest were used in prescribing IP activities for the experimental groups. The control groups received a T physical education program.

Analysis of data in Study I showed a superiority of the IP instruction over the T instruction at the .01 level for males and females, ages five to six years. Analysis of data yielded by Studies II (males, age four) and III (males and females, ages six to ten), V (males and females, ages

---

<sup>1</sup>Ibid., pp. 25-30.

<sup>2</sup>Ibid., pp. 82-83.

six to nine years), and VI (males and females, ages seven to thirteen) showed superiority of IP instruction over T instruction. Findings in Study IV resulted in no significant difference in the physical fitness of males, age nine years.

Vodola stated that the lone study which was not significant might indicate one of the frailties in the non-parametric design--that of involving a small number of subjects (N=10). On the basis of the significant findings of the other studies, it was concluded that IP instruction can be beneficial in improving the physical fitness level of children exhibiting low physical vitality and/or classified as mentally retarded, neurologically or perceptually impaired, or emotionally disturbed.

## CHAPTER III

### PROCEDURES FOLLOWED IN THE DEVELOPMENT OF THE STUDY

The specific purpose of this study was to investigate the motor fitness improvement of academically handicapped children enrolled in a developmental movement program. The procedures followed in the development of the study are presented under seven main headings: (1) Preliminary Procedures, (2) Selection of the Subjects, (3) Selection of the Test, (4) Collection of the Data, (5) Planning and Implementation of the Experimental Period, (6) Organization and Treatment of the Data, and (7) Preparation of the Final Report.

#### Preliminary Procedures

Prior to the collection of data, the investigator surveyed, studied, and assimilated materials pertinent to all aspects of the present investigation. From these sources, a tentative outline of the proposed study was developed and presented to the thesis committee for suggestions and corrections. After receiving the approval of the members of the thesis committee, permission was secured from the Human Subjects Review Committee to conduct the study.

A prospectus of the study was submitted to the office of the Dean of the Graduate School at the Texas Woman's University. The investigator then completed the review of literature and wrote Chapters I and II of the thesis.

### Selection of the Subjects

The criteria established to govern the selection of subjects for inclusion in the study specified that each subject be (1) classified as educable mentally retarded, trainable mentally retarded, learning disabled, or minimal brain injured; (2) enrolled in a special education class in selected elementary schools; and (3) between the ages of six and twelve years. The number of subjects in the experimental group was dependent on the number of undergraduate practicum students available for the developmental movement class on Monday, Wednesday, and Friday from twelve noon until one o'clock at the Texas Woman's University. The subjects comprising the control group were selected and matched as closely as possible by age, sex, intelligence quotient, and educational classification with those in the experimental group.

### Selection of the Test

The test selected for the study was subject to the following criteria: (1) established norms,

(2) validity, reliability, and objectivity; (3) directions easily understood by the subjects; (4) items of the test relevant to the objectives of the developmental movement program; (5) ease of administration; and (6) standardization of procedures. Six items from the Motor Fitness Test for Moderately Mentally Retarded were selected in accordance with these criteria.<sup>1</sup> These items included sit-ups in thirty seconds, flexed arm hang, tumbling progression, fifty-yard dash, standing long jump, and softball throw for distance. Directions for administering each of these items appear in the Appendix.

#### Collection of the Data

To insure reliability of the testing procedure, two sets of ten trials were administered each subject for each item. One set was given by the investigator, the second by a doctoral student from the Texas Woman's University. From the twenty trials, the best three scores for each subject were selected for use in the study. A sample scoring form is included in the Appendix of the thesis.

The educational files of the subjects were reviewed for relevant personal data such as chronological age, sex, intelligence quotient, and special education classification.

---

<sup>1</sup>Johnson and Londeree, Motor Fitness Testing Manual.

Arrangements were made with each teacher as to the best time for the testing. Procedures were standardized as much as possible since the areas and conditions for testing varied at each school.

The pretest was administered during the last two weeks of September 1978; the retest during the first two weeks of October 1978; and the posttest during the last week of April and the first week of May 1979. A copy of the raw data appears in the Appendix.

#### Planning and Implementation of the Experimental Period

A university practicum student was assigned to each subject in the experimental group for a period of approximately twelve weeks during the fall semester of 1978. New practicum students were assigned at the beginning of the spring semester of 1979. The twenty-five week program was conducted two days a week for approximately forty-five minutes a day. The program provided a wide variety of activities including ball skills, gymnastic skills, tumbling skills, and other basic motor skills. The control group received the physical education programs provided by their elementary schools.

A copy of the instructional objectives for the developmental movement program and lesson plans are included in

the Appendix of the thesis. Two groups of twenty undergraduate practicum students registered for the movement program during the fall and spring semesters of 1978-1979. Since the undergraduates varied so widely in background, those who had more experience working with handicapped children were assigned the more involved subjects. Those who had more experience in motor activities were assigned the more highly skilled subjects.

During the beginning two weeks of each semester, the undergraduate practicum students were instructed in the psychomotor characteristics of each handicapping condition, developmental teaching sequences, and developmental movement activities specific to the areas outlined in the instructional objectives. Correct spotting techniques were also covered during this time.

The experimental developmental movement program began on September 9, 1978. Each child's weaknesses, as well as strengths, were noted during the testing in order to plan activities which would enhance these strengths and ameliorate the weaknesses. Each forty-five minute lesson consisted of a ten minute group warm-up at the beginning of the session, twenty-five minutes of individualized instruction in basic movements, and a final ten minutes for group games, relays, or activities.

Each undergraduate practicum student was instructed to compile a card file of activities specific to her child's needs. A sample card is included in the Appendix. The undergraduate practicum students were given a list of resources in which activities could be located. These sources are also in the Appendix of the thesis. In addition, undergraduate practicum students were instructed to create some of their own games and/or activities. The activities were to be in the following areas: (1) physical fitness--arm/shoulder strength, leg strength, abdominal strength; and (2) general motor ability--eye-hand coordination, balance and postural orientation, and gross body coordination. Anecdotal records for the sessions were kept by the investigator to note the strengths and weaknesses of each.

Since the subjects attended the class only on Mondays and Wednesdays, Fridays were used as instructional and organizational time. The week's classes were discussed; the strengths and weaknesses of the program were cited; and suggestions and assignments were made for the following week.

The control group participated in its regular daily schedule. Seven of the control subjects received individualized or small group physical education instruction. One of the subjects participated in a regular physical education program. The remaining twelve subjects received only

a daily free-play recess period.

Organization and Treatment  
of the Data

An intraclass correlation coefficient was computed for each group using an analysis of variance technique described by Safrit.<sup>1</sup> Reliabilities for each test item were computed.

The twenty scores for each subject on each item of the pretest were reduced to a single mean score by taking the average of the top three scores of the pretest and retest. The top three scores of the posttest were also averaged to give a single mean posttest score for each item. This procedure was recommended by Hinson.<sup>2</sup> The range, mean, standard deviation, and standard error of the mean were computed for each set of data.

The hypothesis of the study was tested by an analysis of covariance with repeated measures design; the appropriate pretest was the covariate in each analysis. The Texas Woman's University DECsystem 20 computer was employed.

---

<sup>1</sup>Margaret Safrit, ed., Reliability Theory (Washington, D. C.: AAHPER, 1976).

<sup>2</sup>Interview with Marilyn Hinson, Dean of College of Health, Physical Education, Recreation, Texas Woman's University, Denton, Texas, November 1978.

Appropriate tables were developed for inclusion in Chapter IV.

Preparation of the Final Report

Upon the completion of the statistical treatment of the data, the investigator presented the findings in tabular form, interpreted the data, developed the written report, stated the conclusion to the study, and made recommendations for further studies. The Bibliography and Appendix were developed for the study.

## CHAPTER IV

### FINDINGS OF THE STUDY

The purpose of this study was to determine the efficacy of the Texas Woman's University developmental movement program in improving motor fitness of academically handicapped children. The experimental group received their training by means of a one-to-one teacher/student relationship for twenty-five weeks, two days a week, while the control group participated in its regularly scheduled daily program. Seven of the students in the control group received one-to-one or small group adapted physical education instruction; one was a participant in a regular physical education class; the remaining twelve students received only their daily free-play period. It was hypothesized that there would be no significant difference between groups at the end of the experimental period. The findings of this study are presented under the following headings:

- (1) Reliability of the Test, (2) Description of Subjects,
- (3) Description of Groups on Pretest and Posttest, and
- (4) Testing the Hypothesis.

Reliability of the Test

Reliability over twenty trials for each of the six test items yielding data for the study was determined by the intraclass correlation technique. The twenty trials for each test item were administered at the beginning of the study within a period of two weeks. Table 1 presents the intraclass reliability coefficients for the six test items for the control and experimental groups.

TABLE 1  
INTRACLASS RELIABILITY COEFFICIENTS OF  
SIX ITEMS OF THE MOTOR FITNESS TEST

Item	Experimental (N=18)	Control (N=20)
Flexed Arm Hang	.94	.99
Sit-ups	.99	.99
Long Jump	.99	.99
Tumbling Progression	.99	.99
Fifty-Yard Dash	.99	.98
Softball Throw	.99	.99

The intraclass reliability coefficients presented in Table 1 show that the items yielded dependable measures for the subjects in this study. While the findings presented in Table 1 are based upon twenty trials for each item,

it should be noted that intraclass reliability correlations were calculated also on the first ten trials, the first seven trials, and the first five trials. Each calculation resulted in the same intraclass reliability coefficients as presented in Table 1, indicating that five trials for each item would have yielded dependable data.

#### Description of Subjects

The subjects utilized in the study were thirty-eight academically handicapped children from elementary schools in Denton and Lewisville, Texas. Table 2 describes the subjects with respect to handicapping conditions and sex. The prevalent handicapping conditions were approximately the same for each group, with most of the subjects classified as learning disabled or trainable mentally retarded.

TABLE 2  
NUMBER OF BOYS AND GIRLS  
IN EACH CLASSIFICATION

	LD	TMR	EMR	MBI	TOTAL
Experimental					
Boys	4	2	3	1	10
Girls	2	4	1	1	8
Total	6	6	4	2	18
Control					
Boys	5	2	3	2	12
Girls	2	4	1	1	8
Total	7	6	4	3	20

The number of girls was the same for the experimental and the control group; the control group had two more subjects (both boys) than the experimental group.

Table 3 describes the subjects with respect to age and sex by schools. The subjects comprising the experimental group attended two schools in Denton; nine subjects came from each school. The subjects comprising the control group attended two schools in Lewisville; eighteen came from one school and two from the other school. Table 3 indicates that while the subjects ranged from six to twelve years in age, most subjects were ages six to eight.

Table 4 reveals that the ages of the subjects in the experimental group ranged from six to eleven years with a mean of 7.83 years. The ages of the control group ranged from six to twelve years with a mean of eight years. A t-test between two independent means indicated that there was no significant difference between the experimental group and the control group with respect to age.

The intelligence quotient scores of the subjects in the experimental group ranged from 37 to 103 with a mean intelligence quotient score of 63.44. The intelligence quotient scores of the control group ranged from 38 to 108 with a mean intelligence quotient score of 70.85. All subjects in the control group were evaluated utilizing the

TABLE 3

NUMBER OF BOYS AND GIRLS IN EACH  
AGE GROUP ACCORDING TO SCHOOLS

Group	Age in Years						Total
	6	7	8	9	10	11	
<u>Experimental</u>							
Newton Rayzor							
Boys	1	1				2	4
Girls	2	1	1			1	5
Total	3	2	1			3	9
Stonewall Jackson							
Boys	1	3		2			6
Girls		1	2				3
Total	1	4	2	2			9
TOTAL	4	6	3	2		3	18
<u>Control</u>							
Lewisville Central							
Boys	1	4	2	2	2		12
Girls	2	1	2			1	6
Total	3	5	4	2	2	1	18
Hedrick							
Boys							
Girls		2					2
Total		2					2
TOTAL	3	7					20

Stanford-Binet Intelligence Test. Subjects in the experimental group, however, were evaluated by different tests as follows: Stanford-Binet, four subjects; Wechsler Intelligence Scale for Children, eight subjects; Wechsler Intelligence Scale for Children-Revised, three subjects; and

Catell Infant Intelligence Scale, one subject. Because a uniform intelligence test could not be administered to all children, the findings should be interpreted with caution. A t-test between the means indicated that there was no significant difference between the two groups with respect to intelligence. Although Table 4 indicates that the two groups were equated with respect to age and intelligence quotient scores, it was decided to use analysis of covariance in the inferential treatment of the data because factors like kind of intelligence test given and distribution of handicapping conditions within groups could not be controlled.

TABLE 4

DESCRIPTION OF SUBJECTS WITH RESPECT  
TO AGE AND INTELLIGENCE QUOTIENTS

Variable	Group	N	Range	M	SD	SE <sub>m</sub>	t
Age	Experimental	18	6-11 (5)	7.83	2.17	.53	.30
	Control	20	6-12 (6)	8.00	2.25	.52	
IQ	Experimental	18	37-103 (63.44)	63.44	13.02	3.16	.73
	Control	20	38-108 (70.85)	70.85	13.77	3.16	

Description of Groups on Pretest and Posttest

Pretest and posttest descriptive data for the flexed arm hang, sit-ups, long jump, tumbling progression, fifty-yard dash, and softball throw are presented in Table 5. These data are presented in terms of eligibility for the Kennedy Foundation CHAMP Award, i.e., performance at the eighty-fifth percentile on the norms developed by Johnson and Londeree for 606 male and 499 female trainable mentally retarded children, ages six to nineteen, from thirty schools in Missouri.<sup>1</sup> These are the only norms available for the Motor Fitness Test for the Moderately Retarded, which was used in the present study. The eighty-fifth percentile level (eligibility for the highest award) was chosen as the criterion for discussion since the subjects in the present study had mean intelligence quotients (63.44 and 70.85 for the experimental and control groups respectively) beyond that of the trainable child for whom the test was developed originally. In retrospect, the Motor Fitness Test for the Moderately Retarded was probably not the best data collection instrument for the subjects in the present study. This

---

<sup>1</sup>Johnson and Londeree, Motor Fitness Manual, p. 9; Londeree and Johnson, "Motor Fitness of TMR," p. 247.

TABLE 5

DESCRIPTION OF THE SUBJECTS ON  
PRE AND POST MEASURES OF MOTOR FITNESS

	Pretest				Posttest			
	Range	M	SD	SE <sub>m</sub>	Range	M	SD	SE <sub>m</sub>
Flexed Arm Hang								
Experimental	0.00-53.83 (53.83)	13.22	17.16	4.04	0.00-31.93 (31.93)	9.19	9.59	2.26
Control	0.00-23.36 (23.36)	7.68	8.21	1.84	0.00-30.60 (30.60)	6.38	7.67	1.71
Sit-ups								
Experimental	0.00-24.00 (24.00)	12.20	8.38	1.97	1.00-22.00 (21.00)	12.81	7.22	1.70
Control	0.00-22.66 (22.66)	10.30	7.75	1.73	0.00-24.00 (24.00)	9.92	7.97	1.78
Long Jump								
Experimental	15.00-65.66 (50.65)	39.44	17.26	4.07	14.67-68.33 (53.66)	41.35	14.98	3.53
Control	16.66-80.66 (64.00)	41.26	13.93	3.11	17.00-89.33 (72.33)	42.53	16.19	3.62
Softball Throw								
Experimental	9.33-108.66 (99.33)	38.05	28.20	6.35	9.33-118.67 (109.34)	39.85	30.41	7.17
Control	7.33-131.66 (124.33)	34.28	28.20	6.31	8.67-138.00 (129.33)	34.98	30.26	6.77
Fifty-Yard Dash								
Experimental	7.26-17.13 (9.87)	11.10	2.92	.69	7.73-17.40 (9.67)	11.47	2.70	.64
Control	7.30-35.20 (27.90)	13.59	6.02	1.35	7.37-21.00 (13.73)	13.08	3.97	.89
Tumbling								
Experimental	1.00-8.00 (7.00)	5.17	2.15	.51	5.00-8.00 (3.00)	6.69	1.16	.27
Control	1.00-8.00 (7.00)	5.25	2.00	.45	1.00-7.00 (5.00)	4.90	1.52	.34

insight came too late, however, to change the data collection instrument.

### Flexed Arm Hang

Table 5 reveals that the average scores on the flexed arm hang for the pretest and posttest respectively were 13.22 and 9.19 seconds for the experimental group and 7.68 and 6.38 seconds for the control group. The standard deviations were larger than the means, indicating many individual differences among the subjects. To qualify for the Kennedy Foundation CHAMP Award, children in the six to twelve age range must hold the flexed arm hang from 1 to 4.6 seconds. In the present investigation, the average performance of the groups on all trials was above the eighty-fifth percentile of the normative group. The multiple correlation (R) was .69, indicating that analysis of covariance added precision to the design.

### Sit-ups

Table 5 reveals that the average scores on sit-ups for the pretest and posttest respectively were 12.20 and 12.81 sit-ups for the experimental group and 10.30 and 9.92 for the control group. To qualify for the Kennedy Foundation CHAMP Award, children in the six to twelve age range must perform from one to thirteen sit-ups in thirty seconds. In the present investigation, the average performance of the

groups on all trials was above the eighty-fifth percentile of the normative group. The multiple correlation (R) was .96 indicating that analysis of covariance added precision to the design.

### Long Jump

Table 5 reveals that the average scores on the long jump for the pretest and posttest respectively were 39.44 and 41.35 inches for the experimental group and 41.26 and 42.53 inches for the control group. On the standing long jump, to qualify for the Kennedy Foundation CHAMP Award, children in the six to twelve age range must jump nineteen to fifty-one inches or an average across ages of 32.14 inches. The multiple correlation (R) was .95, indicating that analysis of covariance added precision to the design.

### Softball Throw

Table 5 reveals that the average scores on the softball throw for the pretest and posttest respectively were 38.05 and 39.85 feet for the experimental group and 34.28 and 34.98 feet for the control group. To qualify for the Kennedy Foundation CHAMP Award for the softball throw, children in the six to twelve age range must throw fourteen to sixty-five feet or an average across ages of 33.71 feet. The multiple correlation (R) was .98, indicating that analysis of covariance added precision to the design.

Fifty-Yard Dash

Table 5 reveals that the average scores on the fifty-yard dash for the pretest and posttest respectively were 11.10 and 11.47 seconds for the experimental group and 13.59 and 13.03 seconds for the control group. To qualify for the Kennedy Foundation CHAMP Award for the fifty-yard dash, children in the six to twelve age range must run between 9.3 and 16.0 seconds or an average across ages of 11.80 seconds. The multiple correlation (R) was .55, indicating that analysis of covariance added precision to the design.

Tumbling Progression

Table 5 reveals that the average scores on the tumbling progression for the pretest and posttest respectively were 5.17 and 6.69 points for the control group. Three rolls were used for this item and were scored in the following manner:

## Log roll--

unable to perform -	0 pt.
able to perform four consecutive rolls -	1 pt.
able to perform four consecutive rolls deviating less than one foot from a straight line -	2 pt.

## Forward roll--

unable to perform -	0 pt.
able to roll over with poor form -	1 pt.
good form in getting over but unable to rise to feet without use of hands -	2 pt.
good form throughout -	3 pt.

## Backward roll--

unable to perform -	0 pt.
able to roll over with poor form -	1 pt.
able to roll over and land on feet -	2 pt.
good form throughout -	3 pt. <sup>1</sup>

The final score for the tumbling progression was the sum of the best trials for each type of roll. The Kennedy Foundation CHAMP Award does not encompass performance on the tumbling progression. The multiple correlation (R) was .84, indicating that analysis of covariance added precision to the design.

Summary

In summary, the findings in Table 5 seem to indicate two trends. First, over all trials the subjects in both groups were performing well compared to the normative group for whom the Motor Fitness Test for the Moderately Retarded was developed. While it appears that the test may not have been the best one for use in the present study, it should be noted that twelve of the thirty-eight subjects were trainable retarded, with intelligence quotients ranging from thirty-seven to fifty; it was believed that a more difficult test would have excluded them. The second trend was a tendency for the posttest scores to be worse than the pretest scores; comparisons cannot, of course, be made on descriptive data but this observation was disconcerting.

---

<sup>1</sup>Johnson and Londeree, Motor Fitness Manual, p. 31.

### Testing the Hypothesis

The hypothesis of the study was that there would be no significant difference between the experimental and control groups at the end of the twenty-five week experimental period. To test this hypothesis, data concerning pretest and posttest performance on the flexed arm hang, sit-ups, long jump, tumbling progression, fifty-yard dash, and soft-ball throw were analyzed separately using a one way analysis of covariance design with the appropriate pretest as the covariate in each analysis. The Texas Woman's University DECsystem 20 computer was utilized.

According to Huck, Cormier, and Bounds, analysis of covariance is used to control statistically any initial differences in the students which might have been present and which might confound the findings.<sup>1</sup> Since it was impossible to equate the Denton and Lewisville groups of subjects on motor fitness at the beginning of the study, analysis of covariance was selected as the appropriate statistical technique.

Table 6 shows the use of ANACOVA to compare groups on the six dependent variables after the group means have been

---

<sup>1</sup>Schuyler W. Huck, William H. Comier, and William G. Bounds, Jr., Reading Statistics and Research (New York: Harper and Row, Publishers, Inc., 1974), p. 135.

TABLE 6

ANALYSIS OF COVARIANCE TO COMPARE GROUPS  
ON SIX MOTOR FITNESS ITEMS

Source of Variance	df	SS	MS	F
<u>Flexed Arm</u>				
<u>Hang</u>				
Between	1	1.04	1.04	
Within	35	1319.54	659.77	.03
Total	37	2754.43	74.44	
<u>Sit-ups</u>				
Between	1	12.75	12.75	
Within	35	165.58	4.73	.11
Total	37	2172.21	58.71	
<u>Standing</u>				
<u>Long Jump</u>				
Between	1	2.83	2.83	
Within	35	858.41	24.53	.74
Total	37	8806.40	238.01	
<u>Tumbling</u>				
<u>Progression</u>				
Between	1	31.57	31.57	
Within	35	29.51	.84	37.44*
Total	37	97.21	2.65	
<u>50-Yard</u>				
<u>Dash</u>				
Between	1	4.29	4.29	
Within	35	312.41	8.95	.49
Total	37	447.62	12.10	
<u>Softball</u>				
<u>Throw</u>				
Between	1	6.09	6.09	
Within	35	1239.17	35.41	.17
Total	37	33338.30	901.04	

\* $F_{1,35}(.05)=4.13$

TABLE 7

PRETEST AND POSTTEST MEANS AND  
ADJUSTED POSTTEST MEANS

Variable	Pretest Means		Posttest Means		Adjusted Post Means	
	EG	CG	EG	CG	EG	CG
Flexed Arm Hang	13.22	7.68	9.19	6.39	7.89	7.55
Tumbling Progression	5.17	5.25	6.69	4.90	6.71	4.88
Softball Throw	38.05	34.28	39.98	34.98	37.71	36.91
Sit-ups	12.20	10.30	12.81	9.92	11.90	10.74
Standing Long Jump	39.44	41.26	41.35	42.53	42.26	41.72
50-Yard Dash	11.10	13.60	11.47	13.08	11.95	12.65

adjusted for differences on the covariate (pretest) variables. Table 7 presents the means and adjusted means for the posttest on the six items.

Table 6 shows that at the end of the twenty-five week experimental period, the two groups were significantly different on only one motor fitness item, the tumbling progression. The F ratios of .03 for the flexed arm hang, .11 for sit-ups, .74 for the standing long jump, .49 for the fifty-yard dash, .17 for the softball throw failed to reach the 4.13 needed for significance at the .05 level. On the other

hand, the F ratio of 37.44 for the tumbling progression far surpassed the 4.13 needed for significance. Table 7 shows that the adjusted means for the experimental and control groups on the tumbling progression were 6.71 and 4.88, respectively. The reason for the experimental group performing significantly better than the control group on the tumbling progression (but not the other items) was probably the fact that the curricula for the experimental and control groups were similar except for instruction in tumbling. With the experimental group, tumbling and mat activities were emphasized while running and throwing activities were limited by space available within the gymnasium of the Texas Woman's University. Within the limitations of space and equipment, the curricula for the two groups had to be similar in order to comply with the individualized education program specifications for the individual children. The teaching methods, pupil-teacher ratio, and environmental climate for the experimental and control groups were tremendously different in that the former involved busing children to a university setting for one-to-one instruction and much individual attention; the latter entailed the routine, group approach followed in most elementary schools. Findings in Table 6 and 7 showed that approach made no difference.

## CHAPTER V

### SUMMARY, CONCLUSION, AND RECOMMENDATIONS

The purpose of this study was to determine the efficacy of the Texas Woman's University developmental movement program in improving motor fitness of academically handicapped children, ages six to twelve. The experimental group, comprised of eighteen children from two elementary schools in Denton, Texas, participated in the Texas Woman's University developmental movement program for twenty-five weeks, two days a week, for approximately forty-five minutes a day. The control group, comprised of twenty children matched as closely as possible on age, sex, intelligence quotient scores, and educational classification with those of the experimental group, participated in the physical education programs provided in their two elementary schools in Lewisville, Texas.

Data were collected through administration of items selected from the Motor Fitness Test for the Moderately Retarded.<sup>1</sup> The six items included the standing long jump, the fifty-yard dash, the softball throw for distance, the

---

<sup>1</sup>Johnson and Londeree, Motor Fitness Manual.

bent knee sit-ups in thirty seconds, the flexed arm hang, and the tumbling progression. Findings were based upon comparisons of pretest and posttest data.

A review of related literature revealed a large number of studies showing significant improvement in motor performance of handicapped subjects after participation in carefully planned physical education programs. Vodola, Gearheart, Corder and Pridmore, Ross, and others found positive relationships between specially designed programs and improved motor performance.<sup>1</sup> Funk and Chasey and Wyrick found significant results on other motor items.<sup>2</sup> Lillie found no significant improvement after participation in a special program.<sup>3</sup>

Three specific criteria were established to govern the selection of subjects for inclusion in the present study;

---

<sup>1</sup>Vodola, A.C.T.I.V.E. Research Monograph, pp. 19-24; Gearheart, "A Study of a Physical Education Program"; Corder and Pridmore, "A Study of a Physical Education Program to Promote Motor Skills"; Ross, "Effects of an Intensive Motor Skills Training Program"; and others.

<sup>2</sup>Funk, "The Effects of a Physical Education Program"; Chasey and Wyrick, "Effects of a Physical Development Program."

<sup>3</sup>Lillie, "The Effect of Motor Development Lessons."

(1) that each subject be classified as educable mentally retarded, trainable mentally retarded, language and learning disabled, or minimal brain injured; (2) that each subject be enrolled in a special education class in selected elementary schools; and (3) that each subject be between the ages of six and twelve years. The total number of subjects in the experimental group was governed by the number of undergraduate practicum students available for the developmental movement class. The subjects comprising the control group were selected and matched as closely as possible with those in the experimental group.

Each subject in the experimental group was assigned to a university practicum student for a period of approximately twelve weeks during the fall semester of 1978. New practicum students were assigned at the beginning of the spring semester of 1979. The twenty-five week program was conducted twice a week for approximately forty-five minutes a day. A wide variety of activities were provided including ball skills, gymnastic skills, tumbling skills, and other basic motor skills. During the two weeks prior to the arrival of the subjects, the undergraduate practicum students were instructed in the psychomotor characteristics of each handicapping condition, developmental teaching sequences, correct spotting techniques, and developmental

movement activities specific to the areas outlined in the instructional objectives. The control group participated in its regular daily schedule.

An intraclass correlation coefficient was computed for each group using an analysis of variance technique. Reliabilities for each test item were computed. The top three scores of the pretest and retest were averaged to give a single mean score. This was also done for the posttest scores. An analysis of covariance with repeated measures design was used to test the hypothesis of the study; there is no significant difference between groups. The Texas Woman's University DECSYSTEM 20 computer was utilized to treat the data.

Performance reliabilities of the thirty-eight academically handicapped students were extremely high, indicating that, over ten trials, no significant change was made by the subjects in motor fitness. The total number of boys in the experimental group was two less than the control group. An equal number of girls were in each group.

The mean age of the experimental group was 7.83 years. The mean age of the control group was 8.00 years. A t-test between the means indicated that there was no significant difference between the two groups with respect to age.

The mean intelligence quotient of the experimental group was 63.44. The control group had a mean intelligence quotient score of 70.85. A t-test between the means indicated that there was no significant difference between the two groups with respect to intelligence.

The average scores of the two groups appeared to compare with the eighty-fifth percentile award of the standard scores for the six to twelve year age groups on the Motor Fitness Test for the Moderately Mentally Retarded. Although no study has been conducted on normal subjects utilizing this particular motor fitness test, subjects in this study appear to have scored considerably lower than did their normal counterparts (ages ten to twelve) on the AAHPER Youth Fitness Test.<sup>1</sup>

A one-way analysis of covariance design with the appropriate pretest as the covariate in each analysis was used to test the hypothesis of the study. At the end of the twenty-five week experimental period, the two groups were significantly different on only one motor fitness item, the tumbling progression.

---

<sup>1</sup>AAHPER, Youth Fitness Test Manual.

### Conclusion

Based upon the results of this study, it may be concluded that the experimental developmental movement program did not improve the overall motor fitness of the eighteen academically handicapped subjects as measured by the Motor Fitness Test for the Moderately Mentally Retarded. Significant difference was found only on the tumbling progression test item. Tumbling was a skill taught within the developmental movement program, whereas the other test items were used solely as evaluation items. This fact might account for the significant difference in pretest and post-test data on the tumbling progression item.

### Recommendations for Future Studies

Based on the findings of this study, the following recommendations for future studies are suggested:

- (1) A similar investigation should be conducted utilizing a testing instrument more suited to the specific goals of the developmental movement program.
- (2) A similar investigation should be conducted in which the experimental program is extended over a greater number of weeks.
- (3) A similar investigation should be conducted in which the participants in the experimental program are drawn

from only one educational classification, i.e., only educable mentally retarded, only trainable mentally retarded, only minimal brain dysfunction, only learning disabled, only visually handicapped, etc.

(4) A similar investigation should be conducted utilizing a sample of a smaller age range.

(5) A similar investigation should be conducted utilizing undergraduate practicum students majoring in physical education only.

APPENDIX

TEXAS WOMAN'S UNIVERSITY

DENTON, TEXAS 76204



THE GRADUATE SCHOOL  
P.O. Box 22479, TWU STATION

February 5, 1979

Ms. Loma Kay Day  
605 Bolivar  
Denton, Texas 76201

Dear Ms. Day:

I have received and approved the Prospectus for your re-  
search project. Best wishes to you in the research and writing  
of your project.

Sincerely yours,

A handwritten signature in cursive script that reads "Phyllis Bridges".

Phyllis Bridges  
Dean of the Graduate School

PB:dd

cc Dr. Claudine Sherrill  
Dr. Jane Mott  
Dr. Marilyn Hinson  
Graduate Office

TEXAS WOMAN'S UNIVERSITY  
Human Research Committee

Name of Investigator: Kay Day Center: Denton  
Address: 605 Belvoir Date: 10-6-78  
Denton, TX 76201

Dear Kay Day

*Gross Motor Ability of Mentally Retarded  
Children Resulting from a Developmental Movement  
Education Program.*  
Your study entitled *Children Resulting from a Developmental Movement  
Education Program.* has been reviewed by a committee of the Human Research Review Committee and it appears to meet our requirements in regard to protection of the individual's rights.

Please be reminded that both the University and the Department of Health, Education and Welfare regulations require that written consents must be obtained from all human subjects in your studies. These forms must be kept on file by you.

Furthermore, should your project change, another review by the Committee is required, according to DEW regulations.

Sincerely,

*C. K. Rozier*

Chairman, Human Research  
Review Committee  
at Denton



January 25, 1979

Dr. Phyllis Bridges  
Dean of Graduate School  
Texas Woman's University  
Denton, Texas 76204

Dear Dean Bridges:

This is to inform the Graduate School that permission has been granted to Kay Day to include data obtained from selected students from our Special Education program in her Master study. This study will be used to determine motor ability of educationally handicapped children. All data will be held confidential.

Sincerely,



Ben Harman

BH/fw

TESTING CRITERIA

- (1) Established norms
- (2) Validity, reliability, and objectivity
- (3) Ease of administration
- (4) Directions easily understood by the subjects
- (5) Items of test relevant to movement education program
- (6) Standardization of procedure

## THE MOTOR FITNESS TEST FOR THE MODERATELY MENTALLY RETARDED

The Motor Fitness Test for the Moderately Mentally Retarded was selected to measure proficiency in basic gross motor skill.<sup>1</sup> The test originally consisted of thirteen items; however, only six items were selected for use in this study: (1) sit-ups in thirty seconds, (2) standing long jump, (3) softball throw for distance, (4) fifty-yard dash, (5) flexed arm hang, and (6) tumbling progression. These six items were selected according to suitability to the independent variable, i.e., the developmental movement program.

Sit-ups in thirty seconds--This item was selected to measure abdominal strength and endurance. The subject lay on his back with knees flexed to less than 90 degrees. The fingers were interlaced and placed behind the head. On the command "Go", the subject curled up to a sit-up position and touched the elbows to the knees and returned to a lying position. The purpose was to perform as many sit-ups as possible in thirty seconds. Only correctly performed sit-ups were counted, i.e., use of the hands or elbows to rise constituted an incorrectly performed sit-up.

---

<sup>1</sup>American Alliance for Health, Physical Education, and Recreation, Motor Fitness Testing Manual for the Moderately Mentally Retarded (Washington, D. C.: AAHPER, 1977).

Standing long jump--This item was selected to measure explosive leg power. The subject stood behind a restraining line. A tape measure was placed along the side of the restraining line running perpendicular to it. The subject jumped off of, and landed on, both feet. The distance jumped was recorded to the nearest inch. The subject was given three practice jumps.

Softball throw for distance--This item was selected to measure coordination. A restraining line was placed along the ground. The subject used any approach (running or standing) to release the ball. He could not, however, cross the restraining line before releasing the ball. Only overhand throws were scored. Each throw was measured to the nearest foot. Each subject was given three practice throws. If, in the scorer's judgment, a throw was not well executed, the subject was given the chance to throw again.

Fifty-yard dash--This item was selected to measure speed. The subject started running approximately five yards behind the starting line to insure that speed was measured and not reaction time. The timer stood just beyond the finish line and began timing when the starter dropped his arm as the runner passed the starting line. The runner's time was recorded to the nearest tenth of a second.

Flexed arm hang--This item was selected as a measure of arm/shoulder strength. The subject was instructed to grasp the bar with an overhand grip with palms facing away from the body. A spotter lifted the subject up until his chin was level and above the bar. The timer started timing as soon as the spotter released the subject. Timing stopped when the chin dropped below the bar or the head tilted backward to keep the chin above the bar. The subject's time was recorded to the nearest tenth of a second.

Tumbling progression--This item was selected to measure integration of strength, flexibility, agility, and coordination. There were three parts to the progression: (1) the log roll, (2) the forward roll, and (3) the backward roll. A piece of tape was placed down the center of the mat. The rolls were scored on the following criteria:

Log roll:	
Unable to perform-----	0 pt.
Able to perform four consecutive rolls-----	1 pt.
Able to perform four consecutive rolls deviating less than one foot from a restraining line-----	2 pt.
Forward roll:	
Unable to perform-----	0 pt.
Able to roll over but with poor form-----	1 pt.
Good form in getting over but unable to rise to feet without use of hands-----	2 pt.
Good form throughout-----	3 pt.
Backward roll:	
Unable to perform-----	0 pt.
Able to roll over but with poor form-----	1 pt.
Able to roll over and land on feet-----	2 pt.
Good form throughout-----	3 pt.

The score was the sum of trials for each type roll.

The subjects were given a demonstration and then "talked through" each task before attempting the skill. After each trial, subjects were given verbal and visual cues as to ways on improving their skill. A brief warm-up was given before the subject started the tumbling progression or any of the testing items.

NAME \_\_\_\_\_ # \_\_\_\_\_

IQ \_\_\_\_\_ DOB \_\_\_\_\_ AGE \_\_\_\_\_ SEX \_\_\_\_\_ ED. CLASS. \_\_\_\_\_

MOTOR FITNESS TEST SCORE SHEET

Pre \_\_\_\_\_  
 Re \_\_\_\_\_  
 Post \_\_\_\_\_

Items	1	2	3	4	5	6	7	8	9	10
Sit-ups in 30 seconds										
Standing Long Jump										
Softball Throw										
Fifty-Yard Dash										
Flexed Arm Hang										
Tumbling Progression										
Log Roll										
Forward Roll										
Backward Roll										

Scoring Key:

1. Sit-ups--Record number of correctly performed sit-ups.
2. Standing Long Jump--Record to nearest inch.
3. Softball Throw--Record to nearest foot.
4. Fifty-yard Dash--Record to nearest tenth.
5. Flexed arm Hang--Record to nearest tenth of a second.
6. Tumbling Progression--
  - Log Roll-----Unable to perform----- 0
  - Able to perform four consecutive----- 1
  - Able to perform four consecutive  
                  deviating less than one foot----- 2
  - Forward Roll--Unable to perform----- 0
  - Able, but with poor form----- 1
  - Good form, but use of arms to rise--- 2
  - Good form throughout----- 3
  - Backward Roll--Unable to perform----- 0
  - Able, but poor form----- 1
  - Able and lands on feet----- 2
  - Good form throughout----- 3

INSTRUCTIONAL OBJECTIVES FOR THE DEVELOPMENTAL  
MOVEMENT PROGRAM

(1) To improve upper arm strength as measured by the flexed arm hang item of the Motor Fitness Test for Moderately Mentally Retarded.

(2) To improve abdominal strength as measured by the sit-ups item of the Motor Fitness Test for Moderately Mentally Retarded.

(3) To improve explosive leg strength as measured by the standing long jump item of the Motor Fitness Test for Moderately Mentally Retarded.

(4) To improve coordination as measured by the softball throw for distance item of the Motor Fitness Test for Moderately Mentally Retarded.

(5) To improve speed as measured by the fifty-yard dash item of the Motor Fitness Test for Moderately Mentally Retarded.

(6) To improve integration of strength, flexibility, agility, and coordination as measured by the tumbling progression item of the Motor Fitness Test for Moderately Mentally Retarded.

## LESSON PLANS

Weeks 1 and 13 (undergraduate students only)Day 1

Equipment orientation

Course outline

Reserve material handout

Assignment: Read Developmental Gymnastics,  
by Garland O'Quinn

Day 2

Introduction of stations

Developmental gymnastics handout

Assignment: Adapted Physical Education: A Multidisciplinary Approach, by Dr. Claudine Sherrill-  
Read Chapter 7, pp. 464-479; Chapter 25

Weeks 2 and 14Day 1

Demonstration/explanation of Vodola's Gross Motor  
Ability Test

Assignment: Read Vodola's GMA test procedures

Day 2

Demonstration/explanation of Vodola's Physical Fitness  
Test

Assignment: Read Vodola's PF test procedures

Day 3

Discuss activities to improve physical fitness and  
gross motor ability

Introduce and explain activity cards

Assignment: Movement Experiences for the Mentally  
Retarded or Emotionally Disturbed Child,  
by Joan Moran and Leonard Kalakian-  
Read Chapters 4 and 9

Develop 10 activity cards: 5 for motor  
ability and 5 for physical fitness

Weeks 3 and 15Day 1

Assign children to undergraduates and discuss each  
Students present one of their activities from each  
area

Day 2

Students continue presentations with partners

Day 3

Review class procedure and use/care of equipment  
Prepare for visit by Thomas Vodola (week 3 only)

Weeks 4 and 16Day 1

Vodola/Tymeson presentation/explanation of program

Day 2

Divide students into groups--Each group practices  
administration of motor ability and physical fit-  
ness tests--comments made by Vodola/Tymeson

Day 3

Final preparation for arrival of children  
Review of spotting techniques/safety precautions

Weeks 5 and 17Day 1

Introduce children to their undergraduate student  
assistants (USA)  
Go over rules of the class with children  
Introduce equipment to children  
Allow time for "rap" session between child and USA

Day 2

Group warm-up (10 min.)  
Formation: Large circle  
Sequence: Raise and lower arms slowly, large circles  
with arms (forward and backward); raise arms over-  
head; up on toes and stretch; lower arms to touch  
toes; stand erect; clasp hands and circle right,  
left; drop hands and two-foot hop around circle

one-half way around; monster step rest of way around; arms straight out to side and twist to left and right; drop arms and run in place.

Individual instruction (25 min.)

Each USA takes assigned child and works on assigned equipment. At five minute intervals, whistle is blown to indicate that it is time to move to next station/equipment

Group activity (10 min.)

Divide children into two groups according to skill level. Set up relay and run in stages:

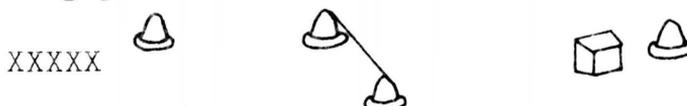
Stage 1: run to cone and back



Stage 2: run, jump over rope, run to cone and back to start



Stage 3: repeat stage 2 with addition of throwing yarn ball in box



Dismiss class

Day 3

Discuss problems, concerns, successes, etc. of the two previous days. Assign four USA's to present group warm-up and group activity for next week.

Assignment: Fill out card files for next week. Remind students to turn in card files each Friday for review by instructor. Card files will be returned prior to beginning of class on Mondays

Weeks 6-12 and 18-25Days 1 and 2

Return card files to USA's	
Warm-up led by assigned USA	10 min.
Individual instruction	25 min.
Group activity	10 min.
Dismiss	

Day 3

Discuss week's strengths and weaknesses, problems, successes, concerns, etc. Assign group warm-up and group activity for next week. Take up card files for next week

TABLE 8

## DESCRIPTIVE DATA ON EXPERIMENTAL GROUP

Subject	IQ*	Sex	Age	Ed. Class.
A	59 <sup>b</sup>	M	11	EMR
B	42 <sup>d</sup>	M	7	TMR
C	44 <sup>b</sup>	M	11	TMR
D	91 <sup>b</sup>	M	7	LD
E	60 <sup>e</sup>	F	7	MBI
F	73 <sup>a</sup>	F	8	LD
G	72 <sup>a</sup>	M	9	LD
H	103 <sup>e</sup>	M	7	LD
I	66 <sup>a</sup>	M	7	EMR
J	62 <sup>a</sup>	M	9	LD
K	38 <sup>a</sup>	F	6	TMR
L	37 <sup>a</sup>	F	8	TMR
M	68 <sup>c</sup>	M	7	EMR
N	54 <sup>b</sup>	F	11	TMR
O	59 <sup>a</sup>	F	7	EMR
P	67	M	5	MBI
Q	78 <sup>e</sup>	F	8	LD
R	69 <sup>a</sup>	F	6	TMR

<sup>a</sup>Wechsler Intelligence Scale for Children

<sup>b</sup>Stanford-Binet Intelligence Scale

<sup>c</sup>Vineland Social Maturity Scale

<sup>d</sup>Cattell Infant Intelligence Scale

<sup>e</sup>Wechsler Intelligence Scale for Children-  
Revised

TABLE 9

## DESCRIPTIVE DATA ON CONTROL GROUP

Subject	IQ*	Sex	Age	Ed. Class.
A	41	F	11	TMR
B	77	M	10	LD
C	72	F	7	LD
D	38	M	12	TMR
E	51	F	8	TMR
F	68	F	6	MBI
G	72	M	7	EMR
H	78	M	7	EMR
I	108	M	9	LD
J	49	F	6	TMR
K	73	M	10	LD
L	68	F	8	LD
M	107	M	6	MBI
N	70	M	7	LD
O	85	M	8	EMR
P	83	M	8	TMR
Q	80	M	7	LD
R	71	F	7	EMR
S	58	F	7	TMR
T	68	M	9	MBI

\*Stanford-Binet Intelligence Scale

TABLE 10  
EXPERIMENTAL GROUP INDIVIDUAL RAW DATA MEANS (N=18)

S	Flexed Arm Hang (sec)		Sit-Ups (# 30 sec.)		Long Jump (inches)		Softball Throw (feet)		50-Yard Dash (seconds)		Tumbling (tot. pt.)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A	16.40	16.53	19.66	19.67	65.00	63.33	22.66	33.00	7.26	7.73	7.00	7.00
B	00.00	1.17	00.00	2.33	15.00	14.67	13.00	13.33	16.33	17.40	2.00	6.00
C	00.00	00.00	3.33	9.33	29.00	38.00	50.00	40.33	9.50	11.20	2.00	6.00
D	30.33	25.13	13.66	18.00	54.00	55.00	41.66	50.33	9.10	9.20	3.00	8.00
E	53.56	12.40	14.33	15.00	35.00	46.00	21.00	23.67	10.93	11.40	3.00	3.00
F	11.26	15.53	24.00	22.00	50.66	47.67	35.00	51.00	9.96	10.53	7.00	3.00
G	16.33	12.26	19.00	19.67	64.00	59.33	108.66	113.67	3.23	9.40	6.00	3.00
H	16.33	9.96	19.00	21.33	57.66	51.67	55.33	53.00	9.16	9.16	6.00	3.00
I	11.06	6.43	20.33	15.00	23.66	33.33	39.66	37.33	10.36	10.13	6.00	5.00
J	18.76	31.93	17.66	20.00	65.66	65.67	63.33	59.00	3.25	3.33	7.00	5.00
K	00.00	.60	00.00	2.33	24.00	27.00	15.00	13.33	17.13	15.33	1.00	5.00
L	1.16	2.20	7.66	7.00	17.00	25.00	12.33	14.33	14.26	14.57	5.00	6.00
M	1.03	.96	3.00	7.00	24.66	29.00	13.33	14.33	10.66	11.33	3.00	5.33
N	.33	.16	5.33	3.00	23.66	33.00	24.33	24.33	10.23	11.63	3.00	5.00
O	53.63	20.16	18.66	18.00	40.00	43.67	28.33	23.33	10.13	10.97	5.00	7.00
P	00.00	4.56	4.66	7.00	40.00	32.33	25.33	20.00	13.10	11.53	5.00	6.00
Q	7.53	6.56	19.33	17.00	52.00	47.66	40.66	36.66	9.60	10.13	7.00	7.00
R	(Unable to perform)		00.00	1.00	24.00	27.00	9.33	9.33	15.53	16.00	5.00	7.00

TABLE 11

CONTROL GROUP INDIVIDUAL RAW DATA MEANS (N=20)

S	Flexed Arm Hang. (sec)		Sit-Ups (#/30 sec.)		Long Jump (inches)		Softball Throw (feet)		50-Yard Dash (seconds)		Tumbling (tot. pt.)	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
A	5.26	7.36	14.66	14.67	54.33	57.67	41.66	41.33	8.53	8.97	8.00	7.00
B	23.36	18.73	22.66	24.00	80.66	89.33	131.66	138.00	7.30	7.36	8.00	6.33
C	23.36	9.13	19.33	14.00	45.00	47.67	18.33	18.00	11.16	11.00	6.00	5.00
D	00.00	00.00	5.00	5.67	26.00	22.00	16.33	14.33	15.66	15.33	1.00	1.00
E	3.13	4.63	7.00	7.00	27.33	26.67	14.66	10.00	17.33	19.83	4.00	4.00
F	2.63	00.00	5.33	.33	30.33	25.00	10.66	10.33	15.83	13.80	3.33	4.00
G	.56	.96	10.66	11.00	28.33	37.33	12.00	10.00	14.90	21.10	4.00	3.00
H	1.50	7.73	12.33	16.00	47.66	44.33	28.00	23.00	35.20	11.13	5.00	5.66
I	4.80	5.70	15.33	16.67	47.00	50.00	72.33	69.67	9.50	10.63	7.00	6.00
J	10.80	.20	00.00	.33	27.66	23.00	13.66	10.33	18.46	15.70	5.66	3.00
K	1.16	00.00	1.33	00.00	39.33	39.67	29.33	38.33	11.43	12.53	6.00	6.00
L	4.00	5.66	15.00	13.67	41.33	41.00	21.00	24.00	10.40	11.43	6.00	6.00
M	21.96	30.60	20.66	21.33	50.66	54.00	42.00	52.00	10.20	10.26	7.00	6.00
N	1.20	.80	00.00	00.00	44.66	42.00	27.00	21.33	13.83	13.30	6.00	6.00
O	19.23	10.43	00.00	00.00	39.00	41.67	26.00	21.00	12.60	13.23	5.00	4.00
P	8.90	8.53	11.33	11.33	43.33	46.33	52.00	53.33	10.10	10.10	6.00	5.00
Q	12.80	12.80	16.66	18.33	49.33	57.00	46.66	48.66	8.90	9.00	7.00	6.00
R	5.16	3.33	18.66	17.33	52.83	50.00	42.33	49.66	10.33	10.06	6.00	6.00
S	.76	.66	1.00	00.00	16.66	17.00	7.33	8.66	17.40	17.60	3.00	3.00
T	00.00	00.00	3.00	6.67	33.66	39.00	32.66	41.66	12.53	12.53	1.00	5.00

SAMPLE CARD FILE

Undergraduate \_\_\_\_\_

Date \_\_\_\_\_

Student \_\_\_\_\_

HC \_\_\_\_\_

Area: PF \_\_\_\_\_  
A/S \_\_\_\_\_  
AB. \_\_\_\_\_  
LS. \_\_\_\_\_

GM \_\_\_\_\_  
Bal. \_\_\_\_\_  
GBC \_\_\_\_\_  
E/HC \_\_\_\_\_

E/HA \_\_\_\_\_  
Tumb. \_\_\_\_\_

Description of Activity:

Equipment Needed:

Comments (successful, unsuccessful, modifications made, etc.):

## REFERENCE MATERIALS FOR UNDERGRADUATE PRACTICUM STUDENTS

- Moran, J. M., and Kalakian, L. H. Movement Experiences for the Mentally Retarded or Emotionally Disturbed Child. Minneapolis, Minnesota: Burgess Publishing Co., 1977.
- O'Quinn, Garland, Jr. Developmental Gymnastics: Building Physical Skills for Children. Austin, Texas: University of Texas Press, 1978.
- Rarick, G. L. "Growth Characteristics of the Mentally Retarded: Implications for Physical Education and Recreation." Paper presented at a workshop on Physical Education and Recreation for the Mentally Retarded, Billings, Montana, 28 April 1967.
- \_\_\_\_\_. "Research in Physical Education as it Pertains to the Mentally Retarded Child." Unpublished paper, University of Wisconsin at Madison.
- \_\_\_\_\_. "The Value of Physical Education for the Mentally Retarded." Paper presented at The University of Texas, Austin, Texas, 13 January 1968.
- Sherrill, C. Adapted Physical Education and Recreation--A Multidisciplinary Approach. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1976.
- Stein, J. "A Clarification of Terms." Journal of Health, Physical Education, and Recreation (September 1971): 63-66.
- Vodola, T. Diagnostic-Prescriptive Motor Ability and Physical Fitness Tasks and Activities: For the Normal and Atypical Individual. New Jersey: C. F. Wood Company, Inc., 1978.

## BIBLIOGRAPHY

### Books

- American Association for Health, Physical Education, and Recreation. Special Fitness Manual for the Mentally Retarded. Washington, D. C.: AAHPER, 1968.
- \_\_\_\_\_. Youth Fitness Test Manual. Washington, D. C.: AAHPER, 1958.
- Barrow, Harold, and McGee, Rosemary. A Practical Approach to Measurement in Physical Education. Philadelphia: Lea and Febiger, 1964, pp. 421-429.
- Betts, G. L. Minnesota Rate of Manipulation. Nashville: Educational Publishers, 1946.
- Brace, David K. Measuring Motor Ability. New York: A. S. Barnes and Company, 1927.
- Bruininks, Virginia L., and Bruininks, Robert H. Bruininks-Oseretsky Test of Motor Proficiency Manual. Circle Pines, Minnesota: American Guidance Service, 1977.
- Cain, Leo F.; Levine, Samuel; and Elzey, Feeman. Cain-Levine Social Competency Scale. Palo Alto, California: Consulting Psychologist Press, 1963.
- Cowell, Charles C., and Schwehn, Hilda M. Modern Principles and Methods in High School Physical Education. Boston: Allyn and Bacon, 1958.
- Dunn, Lloyd M. Expanded Manual for the Peabody Picture Vocabulary Test. Minneapolis: American Guidance Service, Inc., 1965.
- \_\_\_\_\_. Peabody Picture Vocabulary Test. Minneapolis: American Guidance Service, 1959.
- Grossman, Herbert J., ed. Manual on Terminology and Classification in Mental Retardation. Washington, D. C.: American Association on Mental Deficiency, 1973; reprint ed., 1977.

- Harris, Dale B. Children's Drawings as Measures of Intellectual Maturity. New York: Harcourt, Brace and World, 1963.
- Hayden, Frank. Physical Fitness for the Mentally Retarded. Toronto: Metropolitan Toronto Association for Retarded Children, 1964.
- Huck, Schuyler W.; Comier, William H.; and Bounds, William G. Reading Statistics and Research. New York: Harper and Row, Publishers, Inc., 1974.
- Johnson, Leon, and Londeree, Ben. Motor Fitness Testing Manual for the Moderately Mentally Retarded. Washington, D. C.: American Alliance for Health, Physical Education, and Recreation, 1977.
- Kershner, Keith; Dusewicz, Russell A.; and Kershner, John. The KDK-Oseretsky Tests of Motor Development. Harrisburg: Bureau of Research, Administration and Coordination Department of Public Instruction, 1968.
- Moran, Joan M., and Kalakian, Leonard H. Movement Experiences for the Mentally Retarded or Emotionally Disturbed Child. Minneapolis: Burgess Publishing Co., 1977.
- Roach, Eugene G., and Kephart, Newell C. The Purdue Perceptual-Motor Survey. Columbus, Ohio: Charles E. Merrill Books, Inc., 1966.
- Royal Canadian Air Force. Exercise Plans for Physical Fitness. New York: Pocket Books, Inc., 1962.
- Safrit, Margaret, ed. Reliability Theory. Washington, D. C.: AAHPER, 1976.
- Sherrill, Claudine. Adapted Physical Education and Recreation: A Multidisciplinary Approach. Dubuque, Iowa: Wm. C. Brown Co., Publishers, 1977.
- Sloan, William. The Lincoln-Oseretsky Motor Development Scale Manual. Chicago: Stoelting, 1954.
- Texas 65th Legislature Regular Session--65th Legislature First Called Session. General and Special Laws. Ch. 715 to End, Austin, Texas, 1977.

- Texas Education Agency. Administration Guide and Handbook for Special Education--Bulletin 711. Austin, Texas: TEA, March 1973.
- Vodola, Thomas M. A.C.T.I.V.E. Research Monograph: Competency-Based Teacher Training and Individualized-Personalized Physical Activity. Oakhurst, New Jersey: Township of Ocean School District, 1978.
- Warner, William L. Social Class in America. New York: Harper, 1960.
- Wechsler, David. Wechsler Intelligence Scale for Children. New York: Psychological Corporation, 1949.

#### Articles

- Adams, Kela O. "The Effect of Adapted Physical Education Upon the Social Adjustment and Motor Proficiency of Educable Mentally Retarded Girls." American Corrective Therapy Journal 25 (May-June 1971):64-67.
- Ayres, A. Jean. "Patterns of Perceptual Motor Dysfunction in Children: A Factor Analytic Study." Perceptual and Motor Skills 20 (April 1965):335-368.
- Brace, David K. "Motor Learning of Feeble-Minded Girls." Research Quarterly 19 (December 1948):269-275.
- Broadhead, Geoffrey D. "Gross Motor Performance in Minimally Brain Injured Children." Journal of Motor Behavior 4 (June 1972):103-111.
- Brown, Joe. "Comparative Performance of Trainable Mentally Retarded on the Kraus-Weber Test." Research Quarterly 38 (October 1967):348-354.
- \_\_\_\_\_. "The Effect of a Physical Fitness Program on the Muscular Fitness of TMR Boys." American Corrective Therapy Journal 22 (May-June 1968):80-81.
- Campbell, Jack. "Improving the Physical Fitness of Retarded Boys." Mental Retardation 12 (June 1974):31-35.

- Carter, John L. "The Status of Educable Mentally Retarded Boys on the AAHPER Youth Fitness Test." TAHPER Journal 34 (May 1966):8, 29-31.
- Chasey, William C., and Wyrick, Waneen. "Effects of a Physical Development Program on Psychomotor Ability of Retarded Children." American Journal of Mental Deficiency 64 (May 1960):1012-1015.
- Corder, W. Owens. "Effects of Physical Education on the Intellectual, Physical, and Social Development of Educable Mentally Retarded Boys." Exceptional Children 32 (February 1966):357-364.
- Corder, W. Owens, and Pridmore, Harold. "Effects of Physical Education on the Psychomotor Development of Educable Mentally Retarded Boys." Education and Training of the Mentally Retarded 1 (January 1966):163-167.
- Distenfanso, Michael K., Jr.; Ellis, Norman; and Sloan, William. "Motor Proficiency in Mental Defectives." Perceptual and Motor Skills 8 (July 1958):231-234.
- Fait, Hollis F., and Kupferer, Harriet J. "A Study of Two Motor Achievement Tests and Its Implication in Planning Physical Education Activities for the Mentally Retarded." American Journal of Mental Deficiency 60 (April 1956):729-732.
- Fox, Margaret, and Atwood, Janet. "Results of Testing Iowa School Children for Health and Fitness." Journal of Health, Physical Education, and Recreation 26 (September 1955):20-21.
- Funk, C. D. "Effects of Physical Education on Fitness and Motor Development of Trainable Mentally Retarded Children." Research Quarterly 42 (March 1971):30-34.
- Heath, Roy, Jr. "Clinical Significance of Motor Defect, with Military Implication." American Journal of Psychology 57 (October 1944):482-499.
- \_\_\_\_\_. "Rail-Walking Performance as Related to Mental Age and Etiological Type Among the Mentally Retarded." American Journal of Psychology 55 (April 1942):240-247.

- Howe, Clifford E. "A Comparison of Motor Skills of Mentally Retarded and Normal Children." Exceptional Children 25 (April 1959):352-355.
- Kirchner, Glenn, and Clines, Don. "Comparative Analysis of Eugene, Oregon, Elementary School Children Using the Kraus-Weber Test of Minimum Muscular Fitness." Research Quarterly 28 (March 1957):16-25.
- Kraus, Hans and Hirschland, Ruth. "Minimum Muscular Fitness Tests in School Children." Research Quarterly 25 (May 1954):178-188.
- Lillie, David L. "The Effect of Motor Development Lessons on Mentally Retarded Children." American Journal of Mental Deficiency 72 (May 1968):803-808.
- Londeree, Ben R., and Johnson, Leon E. "Motor Fitness of TMR vs EMR and Normal Children." Medicine and Science in Sports 6 (Winter 1974):247-252.
- Malpass, Leslie F. "Motor Proficiency in Institutionalized and Non-Institutionalized Retarded Children and Normal Children." American Journal of Mental Deficiency 64 (May 1960):1012-1015.
- Phillips, Marjorie, et al. "Analysis of Results from the Kraus-Weber Test of Minimum Muscular Fitness in Children." Research Quarterly 26 (October 1955):314-323.
- Pyfer, Jean L., and Carlson, B. Robert. "Characteristic Motor Development of Children with Learning Disabilities." Perceptual and Motor Skills 35 (August 1972):291-296.
- Rabin, Herbert M. "The Relationship of Age, Intelligence, and Sex to Motor Proficiency in Mental Defectives." American Journal of Mental Deficiency 62 (November 1957):507-516.
- Rarick, Lawrence, and Francis, R. J. "Motor Characteristics of Mentally Retarded." Journal of Mental Deficiency 63 (March 1959):792-811.

- Rarick, Lawrence G.; Widdop, James H.; and Broadhead, Geoffrey D. "The Physical Fitness and Motor Performance of Educable Mentally Retarded Children." Exceptional Children 36 (March 1970):509-519.
- Ross, Sheila A. "Effects of an Intensive Motor Skills Training Program on Young Educable Mentally Retarded Children." American Journal of Mental Deficiency 73 (May 1969):920-926.
- Sengstock, Wayne L. "Physical Fitness of Mentally Retarded Boys." Research Quarterly 37 (March 1966):113-120.
- Shotick, Andrew, and Thate, Charles. "Reactions of a Group of Educable Mentally Handicapped Children to a Program of Physical Education." Exceptional Children 26 (January 1960):248-252.
- Sloan, William. "The Lincoln-Oseretsky Motor Development Scale." Genetic Psychological Monogram 51 (February 1955):183-252.
- Soloman, Amiel, and Pangle, Roy. "Demonstrating Physical Fitness Improvement in the EMR." Exceptional Children 34 (November 1967):177-181.
- Stein, Julian. "Motor Function and Physical Fitness of the Mentally Retarded, A Critical Review." Rehabilitation Literature 24 (August 1963):240.
- \_\_\_\_\_. "Physical Fitness of Mentally Retarded Boys Relative to National Age Norms." Rehabilitation Literature 26 (July 1965):205-208.

#### Unpublished Material

- Brace, David K. "Motor Fitness of Mentally Retarded Boys Relative to National Age Norms." paper read at the Research Section, American Association for Health, Physical Education, and Recreation Convention, Atlantic City, N.J., 18 March 1961.
- Funk, Clarence D. "The Effects of a Physical Education Program on the Educational Improvement of Trainable Mentally Retarded Children." Ph. D. dissertation, University of Oregon, 1969.

- Gearheart, Bill. "A Study of a Physical Education Program Designed to Promote Motor Skills of Educable Mentally Retarded Children Enrolled in Special Classes in Cedar Rapids, Iowa." Ph. D. dissertation, Colorado State College, 1963.
- Jenkins, Kathryn Nessler. "The Relationship Between Participation in Physical Education Instruction and the Gross Motor Performance of Institutionalized Trainable Mentally Retarded Boys." Master's thesis, Texas Woman's University, 1968.