70-16,829

LAUTEN, Doris Anne Higgins, 1927-
THE RELATIONSHIP BETWEEN INTELLIGENCE AND MOTOR PROFICIENCY IN THE INTELLECTUALLY GIFTED CHILD.

University of North Carolina at Greensboro, Ph.D., 1968
Psychology, general

University Microfilms, Inc., Ann Arbor, Michigan

THE RELATIONSHIP BETWEEN INTELLIGENCE AND MOTOR PROFICIENCY IN THE INTELLECTUALLY GIFTED CHILD

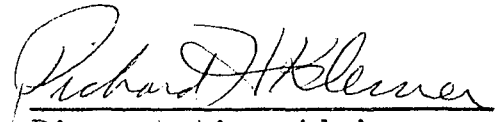
by

Doris Anne Higgins Lauten

A Dissertation Submitted to
the Faculty of the Graduate School at
The University of North Carolina at Greensboro
in Partial Fulfillment
of the Requirements for the Degree
Doctor of Philosophy

Greensboro
May, 1968

Approved by



Dissertation Adviser

ABSTRACT

LAUTEN, DORIS ANNE HIGGINS. Relationship Between Intelligence and Motor Proficiency in the Intellectually Gifted Child. (1968) Directed by: Dr. Richard H. Klemer. pp. 71.

The purpose of the study was to determine the relationship between motor proficiency as measured by the Lincoln Revision of the Oseretsky Tests of Motor Proficiency and intelligence as measured by the California Tests of Mental Maturity in the intellectually gifted child. Twenty gifted girls and twenty gifted boys comprised the experimental group. All of the I.Q.'s in the experimental group were 120 or higher. The control group was made up of twenty boys and twenty girls who had I.Q.'s of between 90 and 110. All subjects of both groups had passed their eighth birthday and had not yet reached their tenth birthday. All subjects were selected from upper middle-class neighborhoods.

Low positive correlation coefficients were found between subjects' I.Q. and Lincoln-Oseretsky scores in both the gifted and normal samples. This was expected, due to the relative homogeniety of I.Q. of subjects within each sample. A t-test of significance for the Pearson Product Moment Correlation Coefficient was computed for the combined samples and was found to be significant at the .01 level of confidence. The significant high positive correlation

between I.Q. and Lincoln-Oseretsky scores for the combined samples supports Hypothesis I which stated that both gifted and average children should show a significant positive correlation between intelligence and motor proficiency.

This study showed that gifted children had significantly higher motor scores than did normal children. This result supports Hypothesis II which stated that gifted children should demonstrate a definite superiority in motor proficiency when compared with average children of their own age.

Within the limits of this study, intellectually gifted children are definitely superior to average children of the same chronological age when comparing their motor proficiency. An intellectually gifted child tends to have better control over his sensori-motor responses than do children of lower I.Q.

It may be concluded that up to a point intelligence and motor proficiency are positively related, in so far as this study is concerned. It is obvious that intelligence is more than just an I.Q. score on a so-called intelligence test. Many factors enter into the concept of intelligence. Certainly this study indicates that motor proficiency may well be one of these factors. The implications of this study should be of value to educators, guidance directors, and psychologists who have the responsibility of establishing or modifying the educational programs of school children.

Further studies are needed in the area of motor

proficiency. One of the more important would be the establishment of the concept of "motor age" so that a child's motor expectancy may be determined as a guide for the counselor and educator. It would also be desirable to shorten the administration time of the Oseretsky Scale if possible. As it now stands, the length of time it takes to administer the entire test and the fact that it is an individual test make it impractical to use in most classroom situations.

APPROVAL SHEET

This dissertation has been approved by the following committee of the Faculty of the Graduate School at The University of North Carolina at Greensboro.

Dissertation Adviser _____

Oral Examination Committee Members _____

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May 10, 1968
Date of Examination

TO

JAKE, JOHN, AND MAX, who, through patience and understanding, made the whole process possible.

If he is indeed wise he does not bid you enter the house of his wisdom, but rather leads you to the threshold of your own mind.

"On Teaching," Kahlil Gibran, The Prophet

ACKNOWLEDGEMENTS

Acknowledgements provide a pleasant opportunity to recall with appreciation the many individuals who helped to make this study possible.

A debt of appreciation is owed to the children who served as subjects for the experiment. The eighty third-graders at Sternberger and Irving Park Elementary Schools made the experiment not only possible, but a genuine pleasure.

To my committee chairman, Dr. Richard H. Klemer, I extend my thanks for assiduous critical reading of the manuscript.

To my committee members, Dr. Marian Franklin, Dr. Barbara James, Dr. Mary Elizabeth Keister, Dr. Boyd R. McCandless, and Dr. Nancy White, I gratefully acknowledge appreciation for guidance throughout my program and their most helpful criticisms during the writing of the manuscript.

My sincerest appreciation is given to my colleague, Paul Vicinanza, for his assistance in data analysis.

D. H. L.

May, 1968

TABLE OF CONTENTS

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LIST OF TABLES

CHAPTER I

INTRODUCTION

Twenty-three centuries ago, the Greek philosopher Plato tried to devise a system of universal education in which each individual was educated or trained to the limit of his own ability. Those of lesser ability were assigned to tasks and positions in society for which their talents fitted them, while those who were more able continued on in formal training. It was a winnowing process which, when completed, left the gifted for positions of great responsibility in the society in which they lived.

In almost every society since Plato, though, those of superior gifts have been identified most often through pragmatic experience. At times, however, tests of skill, courage, and knowledge have been used to single them out. Our own culture, in spite of its egalitarian emphasis, is recognizing with increasing clarity the need to identify early those children with superior gifts. To this end tests of various types have been devised and used. Although the formal beginnings of such attempts to test involved the use of tests which were unstandardized and of doubtful validity, later studies have begun to identify and to classify the gifted children and to discover the various aspects of their development.

Only recently has any great emphasis been placed upon discovering facts that might be peculiar to the gifted child. This has been largely due to the fact that instruments capable of distinguishing the characteristics of the gifted child that identify him as different from other children have only recently been developed.

The magnum opus in the study of gifted children has been that of Terman and his associates (Terman, 1949). This longitudinal study has uncovered many facets concerning the nature and adjustment of gifted children through two generations. Curiously, Terman did not include a measure of motor ability in his studies of the gifted child. Little is known concerning this factor in gifted children. Perhaps the primary reason for this omission has been the lack of an adequate instrument in this country to measure motor ability.

The question of motor proficiency, especially of children, has been of interest to psychologists and educators for many years. It has become necessary to attempt to assess this variable in planning the school program of the student, especially where it concerns the physical education department and extra-curricular sports activities of the school. Some attempt has been made to adapt physical education activities and equipment in order to arrive at some measure which would aid in predicting the success or failure of the physical education student (Brace, 1937; Cowan and Pratt, 1934; Gire and Espenshade, 1942; Humiston, 1937;

Maroney, 1925; McCloy, 1937; Metheney, 1938; Ray, 1940).

As a result of these and other efforts, other studies have been made with various clinical groups in an effort to determine what part motor proficiency plays in adjustment and ability. The largest single group to be investigated in this manner has been the college student of either sex; the next largest group studied involved average children. Very few experimental studies have been made with superior children, and no experimental studies have appeared concerning the relationship of motor proficiency and intelligence in the intellectually gifted child. Concerning the mentally retarded child, very few studies exist purporting to measure motor ability of such children. It appears then that the children at the two extremes of the curve of intelligence have been the most neglected in studies of this kind.

Several questions can be raised concerning gifted children: 1. Why is there a lack of evidence concerning gifted children? 2. Is there an instrument capable of measuring motor ability in a sufficiently precise manner in order to differentiate between different etiological and clinical groups? 3. Is there any relationship between motor ability and intelligence? 4. What is the relationship, if any, between motor proficiency and intelligence in the intellectually gifted child?

The first question may be answered by the fact that there is a certain difficulty in getting enough gifted

children together to constitute an adequate sample. It is much easier to work with institutional children or with a normal school population which is readily available. Until recently the gifted child has been neglected in so far as his special capabilities are concerned. The other questions may be answered by reviewing the literature and by experimentation.

Statement of the Problem

The purpose of this study is to determine what relationship exists between motor proficiency and intelligence in the intellectually gifted child.

Importance of the Problem

For many years investigations have been carried out probing the relationship between sense stimulation and motor response. Obviously a certain degree of intelligence is predicated in all thinking types of responses. That such a relationship exists is stated in an almost over-simplification of the problem by Burt (1937, p. 260) who says:

> It is a truism in psychology that the mechanism of the mind stands on a sensori-motor basis. The world can stimulate the mind only through one of the senses; and, in return, all that the greatest intellect can do is to contract a set of muscles and move a set of bony levers. The end product of every mental process is simply a muscular reaction.

Gutteridge (1940, p. 168) pointed out the need for

scientific standards in the motor education of children and the necessity for more research in the area. In studying the motor achievements of children, she stated:

> It is suggested that the slowing down of the median curve of achievement so noticeable in certain activities after three years of age may be due not so much to completeness of motor development as to lack of environmental stimulation and challenge to further effort. In individual cases where there is apparent retardation of motor ability, study is needed in order to determine whether this is due to retarded physical development or to lack of opportunity suited to varying needs. There is evident lack of scientific standards for motor education of young children. A further investigation of the existing equipment and provision for motor activity in nursery school, kindergarten, and first grade is seriously needed.

It is reasonable to assume that a majority of the gifted children will find themselves in positions of leadership as they mature and take their places in society. It would be well for schools to identify more of these children early and shape their curriculum so that definite enrichment is available to them. Although other areas of the intellectually gifted child's development have been studied, little is known concerning the possibilities of enriching the physical education program or other units of study involving motor skills, due to the lack of knowledge concerning the motor proficiency of this type of child.

Definition of Terms

Intelligence. Although many definitions of intelligence

exist, in this study the concept of intelligence will be understood in the manner that Weschler (1944, p. 3) defines it, when he says intelligence is ". . . the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment."

Gifted. In this study the term gifted will be used to denote intelligence quotients recorded in school records as 120 and above as measured by the California Test of Mental Maturity.

Motor Proficiency. The term motor proficiency, will be used in this study, as the ability of the subject to perform, with varying degrees of success, activities requiring muscular coordination. Included in this term are such activities as walking, running, writing, balance, speed, bilateral coordination, manipulation, and purposeful movement of both a molar and a molecular nature. This definition is similar to that proposed by Barrow, (1954, p. 24) who defines motor ability as ". . . the present level of acquired or innate ability to perform motor skills of a general or fundamental nature exclusive of highly specialized sports or gymnastic techniques."

Average. This term will be applied to those children who exhibit no obvious defect or gift which would cause them to deviate significantly from mental and physical norms of children with I.Q.'s between 90 and 110, as determined by

standard intelligence tests or scales.

Mentally Handicapped or Retarded. It is not the purpose of this study to discuss the distinction between the two terms of handicapped or retarded. When mentioned in the study, both terms will be applied to individuals or groups of individuals who deviate substantially from the accepted norm of 90 to 110 I.Q. points, such deviation being in the direction of a lower I.Q. In general, it would include all persons who show an I.Q. score of less than 70, regardless of the possible organic or genetic cause of such retardation.

The Oseretsky Scale. The name The Oseretsky Scale applies to the revised form of the test that is called The Lincoln Revision of the Oseretsky Tests of Motor Proficiency. This scale is designed to test the motor ability of children between the ages of six and fourteen years. It is an individually administered scale, consisting of thirty-six items which involve a wide variety of motor skills such as finger dexterity, eye-hand coordination and gross activity of the hands, arms, legs and trunk. The total possible score on this form of the test is 159 points. The manual of instruction is #37018, C. H. Stoelting Company, Chicago, Illinois, 1954.

CHAPTER II

REVIEW OF THE LITERATURE

The literature which is reviewed in this study is limited to that which deals primarily with motor proficiency or ability as an aspect of intelligence, learning, or ability to learn. The following divisions of the literature will be made: (1) studies using other types of motor tests, exclusive of the Oseretsky Tests, (2) studies using some form of the Oseretsky Tests of Motor Proficiency, and (3) literature that discusses or otherwise clarifies the Oseretsky Tests of Motor Proficiency or a revision of it.

Studies Using Other than Physical Education Type Tests

In respect to the relatively modern attempt to study motor proficiency scientifically, one of the early studies was made in 1900 by Bagley. In this early study, the motor data were determined experimentally by means of tests designed to assess motor ability in five respects. He listed these as (1900, p. 193): "1. strength, 2. rapidity of voluntary movement, 3. accuracy of voluntary movement, 4. control of voluntary movement, and 5. the amount and character of involuntary movement." The equipment that was used consisted of a specially constructed dynamometer, a special Morse key, a complicated scroll plate, and a recording

target. The subjects were scored on each of the tasks in terms of the reaction times and accuracy of performance. Bagley (1900) also had the teachers in charge of the various pupils, who acted as subjects for his experiment, give an estimate of the motor ability of the pupils they had observed in the process of their school work. These subjects were classified by their teachers as very clever, clever, medium, awkward, and very awkward. In the study these terms were later translated into numerical symbols for convenience in manipulation. The experimental sources of the data on mental ability consisted of various types of reaction times representing quantitatively the mental ability of the subject, mental excellence being represented by "the alertness of the mind reacting appropriately to given stimuli." Nowhere in this study did he indicate of what these mental stimuli consist. No statistical information is presented to check the accuracy of his conclusions which are quoted below and many of which have been refuted by later studies. Bagley concluded (1900, p. 205):

> 1. Under the conditions of the investigation, and with children that were tested, there is a general inverse relation between motor and mental ability; those who are the "brighter" pupils and those who have a quicker reaction time being, as a rule, deficient in motor ability, while those who are best developed physically, who are the strongest, and have developed "motor control" to the greatest extent, are generally deficient in mental ability. This rule, however, was found with the children tested, to have numerous individual exceptions, and a varying validity at different periods of development. 2. There seems to be little direct relation between mental ability as represented by reaction

> time, and mental ability as represented by class standing, except that excellence in either of these directions is apt to be accompanied by a deficiency in motor ability. 3. There is a gradual increase in motor ability with age. The increase in mental ability is not so well marked. 4. In general, the boys surpass the girls in motor ability while the reverse obtains in mental ability. Regarding cranial capacity as indicated by head girths, we notice a significant trend toward an inverse relation between mental ability and head girth.

An early study by Farmer (1927) agreed with some of Bagley's conclusions. Farmer thinks that the correlation between intelligence and motor capacity is very low or zero. It is his opinion that if the factor of intelligence were to be isolated, the motor tests would cease to correlate with intelligence. He stated (1927, p. 331):

> Among young children fairly high correlations have been found between certain motor tests and tests of intelligence, but these inter-correlations tend to become smaller as the age of the children increases. The explanation of this appears to be that motor tests for young children are not really tests of motor capacity but of intelligence, since with a partially developed intelligence it is only the really intelligent children who understand what is required of them in a motor test. As specialization increases this ceases to be the case and the fact that motor tests no longer correlate with intelligence shows that they have ceased to be tests of intelligence and have become, as they were intended to be, tests of motor capacity.

While he did not otherwise identify his subjects, Farmer (1927) stated in his article that he had given a battery of tests to "a large number" of subjects over a four year period. The tests he referred to are the Choice Reaction Test, the McDougall-Schuster Test, and the pursuit meter. He did not describe these tests, and they are apparently

not widely known in this country. Farmer gave the term "aestheto-kinetic tests" to this test battery and stated that the average correlation between the three tests is .25. Concerning this correlation, he believed that even though the correlation is low, the consistency shown between the intercorrelations on the various groups and the number of subjects tested make it significant. In regard to the correlation between his tests and intelligence, he found that the average intercorrelations between the aestheto-kinetic tests and intelligence was .05 and the intercorrelations between reaction and dynamometer readings was .02. Because of these low correlations, Farmer (1927) believed that they have no relation whatever with the qualities measured by an intelligence test. He concluded (1927, p. 345) that,

> . . . there is a small common element among the aestheto-kinetic tests used which shows itself consistently in all groups. This common element is not so well marked as that which connects intelligence tests and is not due either to intelligence or strength as there is no correlation between the factors in the aestheto-kinetic tests.

The number and type of subjects he used were not mentioned in his study.

Having a dissatisfaction with the general run of intelligence tests, Garfiel (1923) sought to find additional measurements which would assess the aspects of behavior untouched by mental ability tests. It was her opinion that motor ability was relatively neglected in determining intelligence of adults. Two preliminary studies were conducted

and the results of these studies were incorporated into a third experiment.

Her first experimental subjects were thirteen men and twelve women in a graduate class in experimental psychology. To each subject she administered the Army Alpha Mental Test and a special motor test of her own design. The motor test consisted of tapping a metal plate to determine the number of taps in one minute, inserting a metal stylus in a three-hole metal plate set at an angle of forty-five degrees in order to measure coordination, and a hand dynamometer test to measure strength. She found that the three subtests correlated poorly among themselves so that if they do measure motor ability, they apparently measure different aspects of it. The results of this preliminary experiment were inconclusive and unsatisfactory, since it was found that the correlation of any of the subtests with the average score on the three tests had no meaning.

These results led Garfiel (1923) to conduct a second experiment. In this experiment she catalogued the aspects of motor ability under the following headings: speed, coordination, steadiness, strength, and motor adaptability (capacity to solve motor situations, to make a new coordinated movement accurately). For speed she used the hand tapping test used previously and a foot tapping test, consisting of running in place on two boards electrically wired to score contacts. Coordination was measured with the

three-hole test previously used and a target test in which the subject threw a ball at a target marked with concentric circles with differing score points on them. Steadiness was also determined by the three-hole test. Strength was omitted in this study. Motor adaptability was determined by having the subject do a series of ten stunts or tricks that were demonstrated by the examiner. In this second study, it was found that tapping, foot speed, threshold test, and target correlated among themselves from .13 to .66. The tests of tapping, foot speed, three-hole, and target correlated .45 to .60 with teachers' estimates of motor ability, while steadiness and tricks correlated from -.31 to .17 with teachers' estimates.

Studies with the gifted in the area of motor proficiency have been surprisingly few. Terman's Genetic Studies of Genius (1949), although very comprehensive in investigating the various traits of gifted children, made no mention of any studies to determine correlation between intelligence and motor proficiency or ability in these gifted children.

One of the earlier studies in this area was made by Hollingworth (1939) who worked with gifted children with I.Q.'s of between 135 and 190. She tested grip strength, tapping, and jumping. In a test of grip strength, she stated (1939, p. 104), "Gifted children are as strong in the left hand and stronger in the right hand than average children and stronger in both hands than the stupid." With the

tapping test, she concluded (1939, p. 106), "The gifted are swifter, as a group, than their schoolmates of the same sex, race, and age, chosen without regard to intellect." In tests of chinning and jumping, she found (1939, p. 109), ". . . the superior neuromuscular energy of the gifted, shown in gripping and tapping, is not sufficient for superior performance where their greater body weight must be raised."

Greene (1952), reviewing the research dealing with development of children, agreed with Hollingworth (1939) and indicated that with pupils of a given mental age, the younger children in a mental age group would excel in speed of performance, especially where it involves observation and inference, as opposed to the dull or retarded subjects who show a slow rate performance. He concluded (1952) that the increased speed and skill shown by children who were of a given mental age but were younger in chronological age was due to their not having to lift as much body weight and due to their smaller size which added to their agility. By contrast the chronologically older subjects who were of the same mental age as the younger subjects, showed poorer performance probably due to the greater body weight and size being controlled by a less efficient mental ability. The implications of this study by Greene (1952) were that children who were gifted mentally would be more able to perform motor tasks than those who were not so gifted. In his study, the fact of size and weight were significant since he

compared the children on the basis of mental age and consequently had a range of chronological age, and therefore, of body size, with which to contend.

A study closely allied with that of Greene (1952) was done by Unsicker (1951) who sought to determine differences between subjects of differing chronological age but of the same mental age. In this manner he hoped to determine the generality of the mental age concept. He worked with two groups from the third and fourth grades and two groups from the seventh and eighth grades. The elementary school groups were selected in terms of a high I.Q. or a "bright" classification, and the junior high groups were in a "retarded" classification. They were thus matched in terms of mental age, but were widely separated in terms of chronological age. He found (1951) that the bright children exceeded the dull children in delayed recall and in reasoning. However, the dull children exceeded the bright children in foresight and in spatial relationships. It was also discovered (1951) that the younger (and hence brighter) children exceeded the older dull children in language usage, while the older dull children were superior to younger bright children in all arithmetic skills, work study skills, and map reading. The superior language facility of the bright children was to be expected in terms of what has been discovered by use of intelligence tests such as the Binet or the WISC, wherein it was noticed that mental age is closely related to vocabulary

usage and understanding. Concerning arithmetic and other school subjects, the superiority of the dull children may be based in part upon the fact that the younger children probably had not yet been taught these fundamentals. Unsicker (1951, p. 78) concluded:

> On the whole, the differences were not marked. While a bright child and a dull child who earn the same score on an intelligence test might do so by responding successfully to different sets of items, the evidence is not sufficient to predict in detail which either is most likely to pass or fail.

Although his unpublished study indicated no relationship between intelligence and motor ability, it did point up the importance of the concept of mental age in a study of this type. While mental age and I.Q. are not identical concepts, still, for a given chronological age, the higher the I.Q. score the higher the mental age. This indicates that these factors need to be controlled when studies dealing with mental ability are involved.

More recently, Magaret and Thompson (1950) separated the items of the Stanford-Binet Scale into those requiring manual manipulation and those that were entirely verbal. After administering the test to superior, average, and mentally defective elementary school children, they concluded (1950, p. 167):

> Of those items which are easier for the mentally deficient than for the normal, 55 per cent require manual manipulation, as compared with 11 per cent of the items which are relatively easy for the normals. The difference between these percentages is significant beyond the one per cent level. Of those items which are easier for the mentally retarded

> than for the superior subjects, 80 per cent require manual manipulation, as compared with 29 per cent of the items which are relatively easier for the superior. The probability that a difference of this magnitude could result from chance alone is less than .01 but greater than .05.

This would appear to indicate that mentally handicapped children are less skillful in the verbal area than in the manipulative area, while the reverse appears to be true with the intellectually superior children. Apparently in this study by Magaret and Thompson (1950) no attempt was made to determine the influence of the chronological age of each subject on his test performance.

Wilson (1953) disagreed with Magaret and Thompson (1950). He administered a series of aptitude tests to a small group of eleven year old children who had spent most of their school life in the Hunter College Elementary School. This school, acting mostly as an experimental and teacher training school, gave preference to intellectually gifted children in the school enrollment. Wilson administered the Drake Musical Memory Test, The Calvert Science Information Test, the Ruch-Popenoe General Science Test, the Stanquist Mechanical Aptitude Test, The Detroit Mechanical Aptitude Test, and the Minnesota Paper Form Board Tests (revised). He concluded that the gifted children who made up his study group showed, in general, superiority in mechanical abilities, as well as superiority in art judgment, music memory, and Science. He used the standardized norms for each test as a basis for comparison with the scores that the gifted

children made on the tests. From this study he found a superior inclination on the part of the gifted child regarding motor ability as measured by the mechanical aptitude tests, however he gave no statistical evidence to substantiate his findings. It should also be noted that both of the mechanical aptitude tests he used were designed to measure insight into mechanical relationships and were not measures of mechanical dexterity or manipulation.

Studies Using Some Form of the Oseretsky Tests of Motor Proficiency

Regarding studies using the Oseretsky Tests of Motor Proficiency, Lassner (1948) has made a brief annotated bibliography of the European studies using the original form of the Oseretsky Tests of Motor Proficiency. He noted that all of the European studies published lacked standardization information or norms and were also lacking in statements of validity and reliability. The majority of the studies he cited dealt with the use of the Oseretsky Tests with various clinical groups such as the deaf, the psychotic, and the mentally defective. Since Lessner has made a rather detailed listing of these European studies they will not be repeated here. Only three of the studies he mentioned dealt with the relationship of I.Q. and motor proficiency. All of these studies used the original form of the Oseretsky Tests of Motor Proficiency. Without further identifying data Lassner (1948) cited a study by Abrahamson and Kepp in which they

found a correlation of .31 for boys and .30 for girls between motor quotient and intelligence quotient. Likewise, citing Spadeveceia, Lassner (1948) mentioned that no relationship was found between mental and motor development in mentally abnormal children. The third study that Lassner (1948) cited is that by Kemal who found that with normal children no correlation existed between mental development as measured by Terman's test and motor development as measured by the Oseretsky. With mentally retarded children, the correlation was .70 between the same two criteria.

Fallers (1948) used the Lincoln Adaptation of the Oseretsky Tests with thirty high-grade mentally defective girls and found "some" relationship between I.Q. and motor proficiency. She retained the seven areas of motor proficiency listed by Oseretsky and found that her experimental group scored lowest in speed and simultaneous movement. The highest motor scores were obtained in the areas of general static coordination, general dynamic coordination, dynamic manual coordination, and general dynamic coordination. No correlation figures were given.

The only other published study using the Lincoln Adaptation of the Oseretsky Tests was made by Sloan (1951) who also used mentally defective subjects. The experimental group consisted of twenty mental defectives equally divided as to sex. The control group consisted of twenty normal children, equally divided as to sex, from the Lincoln,

Illinois, elementary schools. The subjects selected were all approximately ten years of age (1951, p. 396)

> . . . since at this age the best measure of performance on the Oseretsky Test could be obtained. It was expected that the maximum spread of scores would be permitted at this age since the test extends six years in both directions from age ten.

The I.Q.'s of the experimental group were all between 45 and 70, while that of the control group were from 90 to 110. In both cases the I.Q. was determined by the Stanford-Binet Scale of Intelligence. After administering the Oseretsky Test, an analysis of variance was performed. The results showed no sex difference and also indicated that the experimental group were significantly poorer performers on the motor test than was the control group. This significance was greater than the one per cent level of confidence, with an F-score of 5.30. Sloan (1951, p. 405) concluded:

> Within the limits of this study we may conclude that motor proficiency is related to intelligence. Motor proficiency is not a distant aspect of functioning which can be isolated from general behavior, but is, rather, another aspect of the total functioning of the organism. It would appear that an adequate evaluation of adaptive capacity should include not only estimates of intelligence but of motor proficiency and social maturity as well. This study points up the desirability of developing incisive measures of motor proficiency. Further investigation of motor proficiency of different clinical groups is indicated.

Holbrook (1954) used Doll's translation of the Portuguese Edition of the Oseretsky Tests of Motor Proficiency. Selecting forty children at each age level from four through twelve years, she administered the Oseretsky

Tests to them. The mean intelligence quotient was 106. Two years after the original test was administered, she again tested twenty of these children in order to determine the consistency of the score. Both testings showed essentially zero correlation between motor proficiency and intelligence quotient. She also found no sex differences. In line with Cassel's (1950) and Sloan's (1951) experience, she found it necessary to severely modify the Oseretsky Test in order to use it with American children. Several of the original items were omitted, including the entire area that Oseretsky calls "asynkinesic" or precision of movement. She added numerous other items from other sources, notably physical education type motor tests. These exact sources were not identified. As a result of these modifications, it was found also necessary to change the administration procedure and the directions to the subjects. In view of the extensive revisions that Holbrook (1954) made, it is not possible to make comparisons of her results with any other available study using any published form of the Oseretsky Tests of Motor Proficiency.

In the only completed study using the Lincoln Revision of the Oseretsky Tests, Carey (1954) sought to compare the Oseretsky Scale with the Metheney-Johnson Test (1938), the Iowa-Brace Test (1937), and the Cowan-Pratt Test (1934). These last three named tests have been used for many years by physical education teachers and testers. Carey

administered the Oseretsky Scale to 148 boys at ages nine through thirteen years. The intelligence quotient of each subject selected was obtained from the school records. Where discrepancies existed between several I.Q. scores for the same individual, an average was calculated. The various motor tests were then administered and the scores were plotted on scattergrams. Carey then calculated the correlations existing between the Oseretsky Scale and the scores on the other tests. He found (1954, p. 54) the following correlations: .32 with the Iowa-Brace Test, .24 with the Metheney-Johnson Test, and .36 with the Cowan-Pratt Test. The correlations with the Iowa-Brace Test and the Cowan-Pratt Test were significant at the five per cent level of confidence. He considered the correlation with the Metheney-Johnson Test to be insignificant for purposes of physical education and thought it likely that this test measures a different phase of motor ability than does the Oseretsky Scale. In determining the correlation of the Oseretsky Scale with grade, Carey found a positive correlation of .67. The correlation of the Oseretsky Scale with height was .31, and the correlation with weight was .23. Carey (1954) also found a correlation of .37 between the Oseretsky Scale and age. This does not compare favorably with the correlation of .84 determined by Sloan (1951) using the same instrument during the standardization process of the Lincoln Revision of the Oseretsky Tests. Undoubtedly this difference

can be partially accounted for by the fact that in the study by Carey (1954), the age range was nine to fourteen years, with most of the subjects being ten, eleven, or twelve years of age, while Sloan (1951) distributed the age range evenly between the ages of six to fourteen.

Concerning this discrepancy Sloan (1955, p. 193) stated:

> The means and standard deviations for the 11 and 12 year olds did not differ significantly from the Lincoln Standardization data. There was a significant difference between the ten year old groups. It is believed, however, that this may be due to a selective factor since Carey's subjects for this age came from schools located in an upper and upper middle class area - professional people, etc. His 11 and 12 year old subjects, on the other hand, came from schools similar to the ones of our own standardization group.

Carey likewise determined the correlation between the results on the Oseretsky Scale and I.Q. as indicated by the school records (1954). This correlation was .06 and was not statistically significant. This compares with correlations between motor proficiency and intelligence as determined by the following: Abrahamson and Kepp (1946, p. 44) found a correlation of .30, Johnson (1942, p. 58) reported a correlation of .13, McCloy (1937) found a negative correlation of -.125, and Ray (1940) reported a correlation range of .11 to .27. While these correlations were not statistically significant, with one exception the evidence all pointed to a positive relationship existing between motor proficiency and intelligence. Even though this relationship may not be significant by itself, the consistency of the findings may

indicate that a positive relationship may exist.

It is to be noticed that Carey (1954) used boys who were prepubescent and also some who were pubescent. It is possible that the factor of the spurt of growth that is present at the start of adolescence was affecting the motor ability negatively (1935). Clumsiness, awkwardness, lack of coordination due to the rapid changes of body size and change of metabolism, and other growth factors all have adverse effect upon a motor test score. He used the higher age to get a measure of his tests on larger boys as well as on small boys, but this introduced an uncontrolled factor which probably influenced the Oseretsky score negatively as far as its relation with intelligence is concerned.

Carey (1954) concluded that on the basis of his findings it would be desirable to establish one set of Oseretsky norms for short, light, boys and another set for average and tall boys. He believed that classification by developmental level would be better than classification by any other criterion. Concerning the ability of the Oseretsky Scale to differentiate between age levels, Carey believed (1954) that it could satisfactorily differentiate between the ages of eleven and thirteen, and twelve and fourteen. Carey stated that the Oseretsky Scale is not feasible for general classroom use due to the time required for its administration, but because of its diagnostic qualities it could be given to students who are experiencing great difficulty in performing

motor activities. It could also be used to help an individual locate the areas of motor proficiency in which he is weak.

The Oseretsky Tests of Motor Proficiency

The Oseretsky Tests are a relatively new instrument in this country, although this scale has been in use for several years in Europe. They were first published in Russian in 1923 by their author in Moscow (Cassel, 1950; Doll, 1947; Lassner, 1948; Sloan, 1951). Lassner (1948) has made a listing with primary emphasis on the European studies using the Oseretsky Tests. According to Lassner (1948) a student who was retarded from one year to one and one-half years on the Oseretsky Tests was considered to have only slight motor retardation. From one and one-half to three years retardation was considered moderate, and marked retardation was evident in anyone who was from three to five years below the normal student. Anyone with a negative difference of five or more years was considered to be a "motor idiot." Lassner (1948) was concerned about the lack of standardization on the published studies and pointed out, "In spite of the wide use of the Oseretsky Scale in nine continental European countries none of the publications contain normative standardization data with experimental evidence as are usual for test development in this country."

In 1946, Doll (1948) sponsored a translation of the

Oseretsky Tests from the Portuguese edition. He found many specific inadequacies which he summarized as follows: 1. marked intellectual loadings; 2. equivocal administration procedures; 3. subjective scoring standards; 4. lack of clarity concerning lateral preference; and 5. inadequately described equipment. He did express interest in the instrument as being eventually useful in the area of education, even as it is now principally useful as an instrument for research. Doll concluded (1947, p. 5):

> Although originally the Oseretsky scale represents principally a means for clinical research, it has since become an excellent basis for pedagogical application. While the doctor is primarily concerned with the functioning of the organs, the pedagogue tries to classify and measure the inadequacies of this functioning in order to adopt then the most suitable method for each grade and each case. The educator is especially interested in verifying the causes of lack of motor ability in a given child, in estimating to what extent he will be able to obtain good results with him, and in being able to help him most efficiently. For this purpose he will need to know the value of the child's motor reactions and their cause, so that he may try to train him to control and coordinate his movements, improving with selected exercise those which are most deficient in order that the child may acquire manual ability, skill, and motor equilibrium. It is in this field that the Oseretsky Tests can provide him with an excellent gauge . . . .

Doll (1947) published this translation and stated (1947, p. 1), "In publishing this translation we hope to promote interest in this scale in this country. There has long been need for the clinical evaluation of developmental performance."

In reference to Doll's publication of the translation

of the Oseretsky Tests from the Portuguese edition, Lassner (1948, p. 36) stated:

> In the absence of any device for clinical evaluation of maturational motor performance, the recent publication of the Oseretsky Scale from the Portuguese Version has aroused considerable interest among psychologists and educators in this country.

The original Oseretsky Tests of Motor Proficiency purport to measure proficiency in six areas. As listed in the various translations that have appeared in this country (Cassel, 1950, Doll, 1947; Sloan, 1951) these are: 1. General static coordination, 2. Dynamic manual coordination, 3. General dynamic coordination, 4. Speed, 5. Simultaneous movement, and 6. Asynkinesia (precision of movement). Ten age levels from six to sixteen years are given and each age level has six sub-tests. Each sub-test is intended to measure one of the six areas listed above. Although all of the available translations have defined the term "asynkinesia" none of the translators apparently thought it necessary to determine just what Oseretsky meant by the other terms he used in setting up the areas of motor proficiency in his tests. In the revisions that have appeared in this country, these areas of motor proficiency are no longer identified under these terms.

Cassel (1949) attempted to apply the translation of the Oseretsky Tests from the Portuguese adaptation to one hundred subjects who were classified as mentally deficient. He made the following observation concerning this scale (1949,

p. 2): "Unfortunately, the tests as translated appear to have certain shortcomings which, until rectified, make impractical an American standardization of the scale." As a result of his studies he developed what he termed "The Vineland Adaptation of the Oseretsky Test." He dropped the asynkinesia category completely because of the unreliable scoring even after much time and energy were expended in trying to find a workable method of scoring. He mentioned two of the changes he found necessary to make as follows (1949, p. 29):

> After two subjects nearly injured themselves, the test of jumping onto a chair seat, which occurred at year XI-XII, was discarded because it appeared a bit too dangerous. The test of sorting cards into suits at year VII appeared to require too much "intelligence." Some of the subjects who possessed sufficient motor integration to sort cards were unable to distinguish between suits of the same color.

An additional factor which appeared to be uncontrolled in the original scale was that of the interaction of intelligence and motor ability. Cassel (1949, p. 30) continued:

> The intellectual loading of the tests deserve further comment. Superficially, it would appear that Oseretsky was unaware of this factor. However this may well have been purposeful instead of accidental. The motor proficiency required to do a particular task is increased if an intellectual component be added to the task. For example, greater motor proficiency is required to walk a two meter line while also solving arithmetic problems than simply to walk the line.

Cassel believed that this procedure was unwise because of the uncontrolled variables it introduced.

Cassel (1949) hoped that as a result of his study the

equipment, normative procedures, and scoring of the Oseretsky Test would be standardized and hence be of value to psychologists and educators in this country. He said (1949, p. 4):

> . . . such a scale, when standardized on American youth, should prove of immense value to all those interested in growing children, such as educators, psychologists, and guidance counselors. Moreover, it should prove to be an excellent tool, in the hands of competent researchers, for the investigation of motor proficiency per se and its relationship to other aspects of development.

Sloan (1948) has been working on revisions and standardizations of this scale. In 1948 he made an adaptation of the Oseretsky Tests in which instructions and equipment were modified so as to clear up existing difficulties in understanding how to perform the tasks and giving definite specifications concerning the equipment to be used. In 1950 Sloan began a series of standardization studies. As a result of early standardization attempts a 1953 revision was made (1953) which was standardized upon the elementary school population of Lincoln, Illinois. In this revision some of the items were modified or eliminated, so that the test was more adapted to American school children. This modification also cut the time required for administration of the scale to about one hour. The result was a 46-item test or scale, as opposed to the original Oseretsky Tests which contained 85 items and took considerably longer than an hour to administer.

Two years later, Sloan (1955) published still another

revision of the Oseretsky Test which he referred to as the Lincoln-Oseretsky Motor Development Scale. This revision eliminated forty-nine of the original eighty-five items on the basis of unreliability and of possible injury to the subject being tested. The remaining thirty-six items constitute a test that is highly reliable and has good discrimination from six through fourteen years of age. This evaluation instrument entails the use of a modest amount of testing materials and includes motor activities that are intrinsically interesting to the majority of boys and girls. This well-designed revision of the Oseretsky test should prove useful in research and in evaluating the motor development of children recovering from orthopedic handicaps or children undergoing special programs of remediation or enrichment in motor skills. (Thompson, 1962).

Validity. Carey (1954) using the Lincoln Revision of the Oseretsky Tests of Motor Proficiency found a .32 correlation between the Oseretsky Scale and the Brace Scale of Motor Ability (Brace, 1937). He also listed correlations of .37 between the Oseretsky Scale and the Cowan-Pratt Test (1934) and .24 between the Oseretsky Scale and the Metheney-Johnson Test (1938). All of these correlations were based on the relationship of age to motor proficiency. On this same Oseretsky Scale, Sloan reported that the odd-even correlation is about .96 and the correlation of scores with age is about .87. Concerning the Lincoln-Oseretsky Motor

Development Scale, Sloan (1955) reported an over-all split-half reliability coefficient of .96 for males and .97 for females. He believed that these high coefficients show high internal consistency and thereby help establish the validity of this revision.

Reliability. Reliability information on European studies using the original form of the Oseretsky Tests appeared to be lacking (1948). Likewise, Sloan (1948) gave no reliability figures on the Lincoln Adaptation of the Oseretsky Tests. With the Oseretsky Scale, Sloan indicated a correlation of motor test scores with age of .87 and an odd-even correlation of .96. The over-all reliability of the Lincoln-Oseretsky Motor Development Scale is given as .85 (1955, p. 241). Carey (1954) obtained reliability coefficients of .87 for the ten year old boys, .85 for the eleven year old boys, and .87 for the twelve year old boys. All these correlations were with age.

Summary of the Data from the Literature

It will be noted that the large majority of the studies dealing with the subject of motor ability or proficiency have reported a low and non-significant correlation between intelligence and motor ability. While some negative correlations have been reported, most of the studies showed a consistent positive, though not statistically significant, relationship between the two variables. While the correlations themselves

were not significant, they were in the same positive direction. This would indicate that some relationship does exist between I.Q. and motor ability. It appears that the inability to obtain higher correlations may be partly due to the limitations of the tests, most of which have been in the physical education or stunt type and therefore quite probably under the influence of uncontrolled intellectual factors. The amount and kind of physical education training the subject had was likewise uncontrolled in any of these studies.

When the factor of "intellectual loading" is removed, the correlation between I.Q. and motor proficiency appears to be somewhat higher. In studies published in this country comparing intelligence and motor ability with mentally handicapped children, Sloan (1951) and Cassel (1950) found significant relationships between these two variables. No study has appeared which indicates the relationship of intelligence and motor ability in intellectually gifted children.

Choice of Instrument for this Study

The most obvious criticism of using the Oseretsky Scale is the fact that standardization data and norms appear to be inadequate. Even though it has been used in several European countries, standardization norms are not available for the original form of this motor test. Even if they were, it is highly doubtful that they would be valid for

American subjects. Sloan and others (Cassel, 1950; Doll, 1947; Lassner, 1948; Sloan, 1951-55) have indicated this in their various studies using this instrument. Sloan's two most recent revisions of the Oseretsky Test (1955) appeared to have overcome the latter objection however. Likewise, studies by Carey (1954) and Sloan (1951, 1955) have indicated a validity and reliability sufficiently high to indicate the probable usefulness of the Oseretsky Scale.

Numerous studies using, for the most part, physical education or stunt type tests, have indicated that there is a low and positive relationship between motor proficiency and age. Considerably fewer studies have attempted to determine the relationship of I.Q. and motor proficiency, and with the exception of the one study by Sloan (1951), they have all indicated low or even negative relationship. Lassner (1948) and others (Cassel, 1950; Doll, 1948; Sloan, 1951), in spite of several widely used physical education type tests purporting to measure motor proficiency or ability, have indicated the need for a clinical motor test in this country. Lassner (1948) and Doll (1947) have observed that the Oseretsky Test may be the instrument to fill the gap in the area of motor testing.

It has been demonstrated that motor skills are not general but specific to certain muscle groups (Cassel, 1950; Perrin, 1921; Sloan, 1951, 1955). Therefore low correlations shown with other tests probably indicated that these

testswere measuring different groups of skills which intercorrelated very low or zero among themselves. This low intercorrelation precludes the use of such tests as clinical instruments in determining relationships between intelligence and motor proficiency. Physical education type tests were rejected for this experiment for another very important reason. It is impractical if not impossible to control the amount of previous physical education each child who takes part in the study has received. Consequently a very large uncontrolled variable would have been introduced, which may have invalidated the results of this study. It appeared more logical to use an instrument which would be unfamiliar to the subjects participating in the experiment. Even though the various items of the scale are often of a nature similar to those which the vast majority of normal children experience in their daily lives, the application of these items in the test is probably new and unfamiliar to the child.

Sloan (1951) discovered as a result of his study that some of the items of the original Oseretsky Tests appeared to be misplaced as to age and difficulty in so far as the test was usable with American children. The Lincoln Revision is an attempt to correct these difficulties and at the same time simplify the test in order to make it more practical and easier to administer. The various sub-tests in the original Oseretsky Tests have been analyzed (Sloan,

1955) and those which were not substantially predictive have been eliminated. The division of the test into age level sub-tests has been eliminated. The items composing the test are listed in order of difficulty from the easiest to the most difficult. A single numerical score is obtained which replaces the many scores in the original as a measure of motor proficiency. This single score greatly simplifies comparison of over-all test results with other measures such as similar motor tests, intelligence, age, or other standardized test scores.

CHAPTER III

THE EXPERIMENT

Delimitation of the Problem

The present study is limited to a determination of the relationship between motor proficiency as measured by the Lincoln Revision of the Oseretsky Tests of Motor Proficiency and intelligence as determined by the California Test of Mental Maturity. The gifted group to be investigated was limited to those having I.Q.'s of 120 or higher. This study also was limited to children who had passed their eighth birthday and not yet reached their tenth birthday.

Hypotheses

While the relationship of I.Q. to motor proficiency has been reasonably established for mentally handicapped children, no study has appeared which would give any indication of what the relationship between the same two variables might be with intellectually gifted children.

Hypothesis I. Both gifted and average children will show a significant positive correlation between intelligence and motor proficiency when the factor of intellectual loading is removed from the test instrument.

Hypothesis II. No experimental evidence exists which

indicates what the degree of motor superiority, if any, would be when the gifted child is compared with average children of the same age. Therefore, this study will seek to determine that relationship. It is expected that gifted children will demonstrate a definite superiority in motor proficiency when compared with average children of their own age.

Selection of Subjects

Control of Variables in Selection. The major variables in this study are intelligence, motor proficiency, chronological age, sex, socio-economic level of the parents and physical condition of the subject. An attempt has been made to hold all of the variables under control leaving intelligence as the single independent variable and motor proficiency as the dependent variable.

Even though by definition the gifted child referred to in this study consists of one who obtains a score of 120 or above on a standardized intelligence test, it is recognized that intelligence is not so limited in actual practice. Many aspects of intelligence may not be measured by an I.Q. score alone. It is for this reason that Sloan (1951) suggested that a measure of motor proficiency and social maturity be added to the I.Q. score to help complete the analysis of a given child's intellectual level.

Occasionally the definition of intelligence tends to be

limited to that degree of intellectual endowment given to the child by his progenitors through the process of heredity. Boynton's (1933, p. 19) definition of intelligence incorporates this idea, when he defined intelligence as

> . . . an inherited capacity of the individual which is manifested through his ability to adapt to, and reconstruct the factors of his environment in accordance with the most fundamental needs of himself and his group.

More recently intelligence is being thought of in terms of the interaction of an organism with his environment. Goddard (1946, p. 68) recognized this when he stated: "Intelligence is the degree of availability of one's experiences for the solution of immediate problems and the anticipation of future ones." Closely approximating this definition is that of Weschler (1944, p. 3) who defined intelligence as ". . . the aggregate or global capacity of the individual to act purposefully, to think rationally, and to deal effectively with his environment." It is to be noted that both of these latter definitions imply more than just a score on a test, taking in the much larger area of purposeful behavior and rationalistic thinking which is necessary for adaptation to a changing society.

Motor proficiency implies a certain amount of skill and dexterity in which the subject makes overt and observable movements. Such activity has been measured in many ways by various investigators who have been investigating the motor processes of given subjects. Though they have not all been

in absolute agreement as to just what motor proficiency, or the less precise term, motor ability, is they all agree that it does have to do with the overt activity of an organism. That such activity is closely related to the intellectual functioning of the individual is recognized by psychologists (Anderson and Anderson, 1951) who have demonstrated that a degree of personality adjustment is shown by certain motor responses on existing tests. This factor, then, becomes the very important dependent variable upon which this experiment is primarily based.

The limits inherent in the construction of the Oseretsky Scale set the limits of the ages of those who could be considered as possible subjects for the experiment. The Oseretsky Scale is designed to measure motor proficiency within the age range of six to fourteen years (1951, 1955). For this test subjects who had not yet entered adolescence were secured. Dimock (1935, p. 195) pointed out that, ". . . awkwardness in adolescence is more likely to accompany the rather sudden beginnings of growth in the period during which pubescence is reached than in the later and more rapid growth."

The factor of sex was controlled by the selection of an equal number of subjects of each sex for the experimental and control groups. The female human body is constructed different from that of the human male, and it is recognized that, at maturity, the female is not as able to compete in

certain sports as are males. It is likewise true that certain activities show up the male to a disadvantage. Because of all these known factors, it was necessary to control the variable of sex.

Because a crippling condition obviously has an effect upon motor performance, any subject having such an obvious defect was not considered for this study. Also, if any subject were ill at the time the test was scheduled, the test administration was either postponed or the subject was eliminated, depending upon the degree and type of illness.

It was necessary to attempt to control the possible interfering effects of culture and home environment. The exact effects of social environment on a developing child have not been demonstrated. However, it has been demonstrated by several investigators (Piaget, 1950; Wilson, 1953) that children of professional people and those in the upper and upper-middle socio-economic groups tend to have higher I.Q.'s and, as a group, tend to be well adjusted socially.

Just what the effects of social environment on a developing child would be has not been experimentally demonstrated. Indeed, it would be exceedingly difficult to do so since the experimental measures that would need to be taken would involve the possible removal of all social stimulation from an experimental group in order to determine the effect that such social deprivation has on an individual. This, of

course, would not be tolerated by civilized and moral groups. Such research is limited to studies which seek to compare groups and individuals as they are found. Such studies are usually not conclusive. It is nevertheless true that any normal human being is entirely surrounded by a social environment from the moment of his birth. Such a social environment has strong influences upon an individual, since it imposes upon the individual child a system of values, limitations, mores and obligations which in turn work to modify the intellectual life of the child. A modification of the intelligence may possibly also modify the motor proficiency of the individual. It is also possible that social interaction and demands of a given level of society may have an unknown effect upon developing motor ability.

As the child begins to grow, he borrows concepts and ideas from his environment, thus he begins to fit himself into the society of which he is a part. Certainly a large part of this borrowing is in the form of imitation, even subconscious imitation. Therefore, it is reasonable to assume that the social class in which the child finds himself influences him. Such influence will naturally modify the manner and degree of development of the individual, limited, of course, by the physical limitations of the organism.

Piaget (1950) pointed out this interaction and its effects upon the developing organism very succinctly when he

said (1950, p. 157):

> The "effect of social life" is a concept which is just as vague as that of "the effect of physical environment" if it is not described in detail. From birth to adult life, the human being is subject, as nobody denies, to social pressures, but these pressures are of extremely varied types and are subject to a certain order of development. Just as the physical environment is not imposed on developing intelligence all at once or as a single entity, but in such a way that acquisitions can be followed step-by-step as a function of experience, and especially as a function of the kinds of assimulation or accommodation - varying greatly according to mental level - that governs these acquisitions, so the social environment gives rise to interactions between the developing individual and his fellow, interactions that differ greatly from one another.

Since the effects that socio-economic status may have on motor proficiency have not been demonstrated, and since a number of studies have indicated that there is a positive relationship between intellegence and socio-economic status, it appeared to be desirable to attempt to control the effects of this factor as much as possible in this study.

In this study, the socio-economic level of each family was controlled by selecting all children from two schools in which the largest number of parents were middle to upper-middle class and from homes with similar real estate values.

Procedure

In terms of the criteria for selection, all pupils enrolled in the third grade who had passed their eighth birthday and who had not yet reached their tenth birthday were screened as to I.Q. The screening instrument was the

California Test of Mental Maturity which was administered in the classroom by the classroom teacher as part of the public school testing program. The use of these test materials was made possible through the cooperation of Mr. Philip Weaver, Superintendent of the Greensboro City Schools, and Mr. Frank Saunders, Director of Special Education in the city system.

Those students with an indicated I.Q. of 120 or above were placed in the gifted or experimental group, while those with an indicated I.Q. of between 90 and 110 were placed in the normal or control group.

After such selection standards had been satisfied, all of the pupils whose names remained on the list were contacted and a letter was sent to each pupil's parents requesting permission to have their child take part in this study. A copy of this letter is included in the appendix.

As the letters began to be returned, subjects were scheduled for testing. As soon as a test was completed, it was given a file number in terms of (1) gifted or control and (2) boy or girl. When twenty gifted girls had been tested, no more girls in this category were selected. Likewise, when twenty boys had been selected, no more gifted boys were included. The same procedure was applied to the control groups. No attempt was made to alphabetize these names nor to select certain I.Q.'s except in terms of gifted or control classifications of this study.

In order to isolate the factor of intelligence of the subjects taking the test, any necessary help was given to enable the child to understand fully just what was expected of him. This included having the examiner repeat or reword instructions and demonstration of any or all of the test items.

The importance of motivating the child to do his best on the test items was not overlooked, nor was the equally important factor of rapport. In no case was a parent told that his child was either gifted or average. They were informed that their child's name had been chosen and that their cooperation was requested.

The child was told that the examiner wished to play some games with him. Where the child appeared hesitant or fearful, time was spent in talking to him, and making him feel at ease. At any time that the child appeared to be losing interest or showed signs of fatigue, the test situation was interrupted and the child was made to feel at ease or was allowed to rest.

Since equipment is not standardized in all schools, and since the condition of the surface of the table has an effect upon the ability of the child to handle some of the test items, the examiner used a large card-table on which the Oseretsky Scale items were placed and used. This helped standardize this otherwise variable condition.

The reliability of scoring the items was verified by the presence of another examiner.

CHAPTER IV

TREATMENT OF RESULTS

Since the Oseretsky Scale gives a single numerical score for each individual as a measure of motor proficiency, this score was recorded along with I.Q. scores. Tables I through IV give the raw scores for the California Test of Mental Maturity and for the Oseretsky Scale. Age of subject is given in years and any fraction of a year. Table V shows the means for subjects in each of the samples employed in the study.

Analyses of variance between boys' scores and girls' scores on I.Q. and motor ability were computed for the gifted and normal subjects. Only the analysis of variance between I.Q. scores of normal boys and girls was found to be significant beyond the .05 level of confidence ($F = 22.6662$ with 1 and 38 degrees of freedom). Normal girls had significantly higher I.Q.'s than normal boys. Additionally, no significant difference was found to exist for subjects' chronological age within the research samples. Analyses of variance between gifted and normal subjects' I.Q.'s within the same sex indicated that there were significant I.Q. differences between gifted and normal boys as well as between gifted and normal girls. These results are shown in Tables VI and VII.

TABLE I

GIFTED GIRLS
RAW SCORE DATA

File No.	Age	California Score	Oseretsky Score
1	8.415	134	140
2	8.415	133	110
3	9.166	131	126
4	9.083	130	130
5	8.415	130	127
6	8.750	129	139
7	9.083	129	130
8	9.083	129	148
9	8.415	127	146
10	8.917	126	107
11	8.583	126	124
12	9.250	125	133
13	8.583	125	95
14	9.332	125	137
15	9.166	124	132
16	9.332	124	145
17	8.500	123	131
18	9.332	122	128
19	9.250	122	129
20	9.332	122	127

TABLE II

GIFTED BOYS
RAW SCORE DATA

File No.	Age	California Score	Oseretsky Score
1	9.166	138	128
2	9.083	133	129
3	9.332	132	120
4	9.250	132	131
5	9.332	131	129
6	9.250	131	124
7	9.000	131	129
8	8.917	129	131
9	8.750	127	117
10	8.917	126	122
11	8.415	126	125
12	8.415	125	115
13	8.833	124	123
14	9.083	124	115
15	8.500	124	136
16	9.083	123	123
17	9.332	123	133
18	9.250	121	129
19	8.750	121	126
20	9.332	121	128

TABLE III

CONTROL GIRLS
RAW SCORE DATA

File No.	Age	California Score	Oseretsky Score
1	9.166	110	104
2	8.833	110	97
3	9.083	110	107
4	9.917	110	83
5	8.500	110	87
6	8.500	109	89
7	9.000	109	138
8	8.583	109	100
9	8.667	109	100
10	8.667	109	84
11	8.917	108	92
12	8.583	108	89
13	8.332	107	100
14	9.000	107	71
15	8.833	104	103
16	9.583	103	99
17	9.250	102	121
18	8.500	99	79
19	9.000	99	47
20	9.332	95	115

TABLE IV

CONTROL BOYS
RAW SCORE DATA

File No.	Age	California Score	Oseretsky Score
1	9.083	107	96
2	8.500	106	110
3	8.583	106	108
4	9.583	105	97
5	8.667	104	80
6	9.750	104	101
7	9.332	102	96
8	8.415	101	121
9	8.917	100	105
10	8.500	99	90
11	9.166	99	108
12	8.667	97	87
13	8.917	97	94
14	9.415	97	102
15	8.415	95	81
16	8.583	94	88
17	9.000	94	110
18	9.415	93	108
19	9.415	92	102
20	9.667	91	62

TABLE V

MEANS FOR SUBJECTS IN EACH OF THE SAMPLES

	Gifted			Normal		
	Boys N=20	Girls N=20	Combined N=40	Boys N=20	Girls N=20	Combined N=40
I.Q.	127.1	126.8	126.9	99.1	106.7	102.9
L-O	125.6	129.4	127.5	97.1	95.5	96.5
C.A.	8.9	8.7	8.8	8.9	8.9	8.9

TABLE VI

ANALYSIS OF VARIANCE FOR GIFTED BOYS' I.Q.'S
vs. NORMAL BOYS' I.Q.'S

Source of Variation	SS	df	MS	F
Between sums of squares	7812.025	1	7812.025	322.548*
Within sums of squares	920.35	38	24.220	

TABLE VII

ANALYSIS OF VARIANCE FOR GIFTED GIRLS' I.Q.'S
vs NORMAL GIRLS' I.Q.'S

Source of Variation	SS	df	MS	F
Between sums of squares	4182.025	1	4182.025	250.757*
Within sums of squares	633.750	38	16.677	

*Significant at .01 level of confidence

Since, with the exception of one grouping, there were no significant differences within gifted and normal subjects' I.Q. and motor scores, the researcher collapsed sex differences with samples and computed an analysis of variance between gifted and normal subjects' motor scores. This difference was found to be significant beyond the .01 level of confidence and the F ratio is reported in Table VIII. Gifted children had significantly higher motor scores than did normal children. This result supports Hypothesis II which states that gifted children should demonstrate a definite superiority in motor proficiency when compared with average children of their own age.

TABLE VIII

ANALYSIS OF VARIANCE BETWEEN GIFTED AND NORMAL SUBJECTS' OSERETSKY SCORES

Source of Variation	SS	df	MS	F
Between sums of squares	19574.50	1	19574.50	107.7214*
Within sums of squares	14473.70	78	181.71	

*Significant at .01 level of confidence

Pearson Product Moment Correlation Coefficients were computed between I.Q. and Oseretsky scores for subjects in the gifted and normal samples as well as the combined samples. Table IX shows these correlation coefficients.

TABLE IX

PEARSON PRODUCT MOMENT CORRELATION COEFFICIENTS BETWEEN I.Q. AND OSERETSKY SCORE

	Gifted N=40	Normal N=40	Combined N=80
r =	.04	.11	.72

Low positive correlation coefficients were found between subjects' I.Q. and Lincoln-Oseretsky scores in both the gifted and normal samples. This was expected due to the relative homogeniety of I.Q. of subjects within each sample. This homogeniety within samples was specific in defining the two samples. The correlation coefficient between subjects' I.Q. and Lincoln-Oseretsky scores for the combined samples was .72. A t-test of significance for the Pearson Product Moment Correlation Coefficient was computed for the combined samples and was found to be significant beyond the .01 level of confidence (t = 9.187).

The .72 correlation coefficient is spuriously high due to the fact that the extreme groups were combined and there were no middle scores.

The significant high positive correlation between I.Q. and Lincoln-Oseretsky scores for the combined samples supports Hypothesis I which states that both gifted and average children should show a significant positive

correlation between intelligence and motor proficiency when the factor of intellectual loading is removed from the test instrument.

CHAPTER V

DISCUSSION

Hypothesis I predicted that when the factor of what Doll (1947) termed "intellectual loading" was removed from the motor test, a positive and significant relationship between motor proficiency and intelligence should be expected with both average and gifted children. Sloan (1951) determined that such a relationship exists with mentally deficient children. The results of this study show that there is a higher positive correlation between intelligence and motor proficiency, as measured, with the control group than there is with the experimental group. Therefore, the evidence gives only partial support to Hypothesis I. The reasons for this may be due in part to the physical limitations of the Oseretsky Scale and partly due to the non-linear relationship that apparently exists between motor proficiency and intelligence at the upper end of the I.Q. scale. Since subjects with I.Q.'s of 130 and above were too few to generalize upon, additional research is needed with children who have I.Q.'s higher than 130. It is possible, however, that a point would be reached where an increase in I.Q. would not be expected to give an increase in motor proficiency due to the physical limitations of the subject. It will be noted that no subject in this study passed all of

the items on the Oseretsky Scale; therefore, it is concluded that the scores earned are a reasonably true assessment of the motor ability of each subject as measured by the Oseretsky Scale.

Hypothesis II, based upon non-experimentally determined conclusions (Hollingworth, 1929; Witty, 1951), predicted that intellectually gifted children should show a higher level of motor proficiency than average children of the same chronological age. The data, as given in Table V, indicate that a significant superiority is shown in the motor performance of the experimental group as opposed to the control group. The subjects in the control group showed no significant differences in performance due to sex; some difference due to sex was noticed in the gifted group, probably due to the differing rates of development between the two groups. The superiority of the gifted group is higher than is the average group where motor proficiency and I.Q. are concerned. Therefore, in addition to being taller, stronger, and better adjusted (Hollingworth, 1929; Terman, 1949; Witty, 1951), the gifted child in this study shows greater motor proficiency than the average child of the same age.

An item analysis of the test responses of the experimental and control groups revealed the fact that two distinct patterns of response exist. The gifted group passed all test items in the first third of the test and then began to miss but continued to pass items throughout

the test. The average group began missing items with the second item of the test and continued to pass or miss items until two-thirds of the test had been completed. Then, abruptly they missed most of the remaining items in the scale.

Certain motor deficiencies were revealed as the missed items were analyzed. Gifted boy subjects number three and number nine, for example, both revealed a large discrepancy between their I.Q. and their motor score. A visual inspection of the data shows that, within broad limits, the higher the I.Q. the higher the motor test score. In investigating causes for this discrepancy, the investigator discovered that both of these subjects showed a deficiency in items involving balance and, in the case of number nine, an inability to do two things simultaneously. The cause of this deficiency would have to be left to a medical examination; however, additional motor training may help to correct the situation.

The significance of these findings point out several factors. First, it indicates the need for more adequate tests than are currently being used to predict motor ability. If there is a significant relationship between I.Q. and motor proficiency with various etiological and clinical groups, it is obvious that consideration must be given to this fact when activities or decisions relating to motor ability are to be initiated or modified. Second,

sound educational planning for gifted children must incorporate a knowledge of the assets and limitations of these children. If they are capable of motor proficiency to a higher degree than average children, it is only proper educational planning to enrich their physical education, vocational, and co-curricular programs in order to allow them to operate at the peak of their abilities in the motor area as well as in the academic area. Third, a knowledge of the motor ability expectations of the gifted child aids the clinician, psychologist, or guidance personnel in helping the child make healthy adjustments to his environment, including the pressures of schooling and the desires of the child to participate or not to participate. The Oseretsky Scale should prove very helpful as such a diagnostic tool in helping locate areas of motor non-development or impairment in both gifted and average children. Fourth, it is now increasingly evident that intelligence is a many factored trait which many of the intelligence tests do not adequately assess. Other studies (Carey, 1954; Sloan, 1951, 1955) have indicated a possible need to include some measure of motor proficiency in any intellectual evaluation of children in order to arrive at a more complete diagnosis concerning the level of intellectual ability of the child.

Conclusions

Within the limitations of this study, the following

conclusions may be drawn:

1. A low positive and not statistically significant correlation between motor proficiency and intelligence exists in the intellectually gifted child. Although no other study appears to have been published establishing this relationship with gifted children, these findings are in agreement with conclusions of other studies regarding the relationship between these two criteria with average subjects.

2. A positive correlation exists between motor proficiency and I.Q. in children who show normal intelligence scores of between 90 and 110. This is contrary to findings of some earlier studies as discussed in the review of the literature. The relationship between I.Q. and motor proficiency appears to be approximately linear up to about 130 points. There are too few cases with I.Q.'s beyond this point to generalize concerning the continued linearity of the relationship. Sloan (1955) found a curvilinear relationship between motor proficiency and age. It is possible that a point may also be reached where an increase in I.Q. would no longer show a corresponding increase in motor proficiency due to the physical limitations of both the subject and the test instrument. The upper limit of the Oseretsky Scale is unknown in so far as motor proficiency is related to intelligence. None of the subjects in this study passed all items of the Oseretsky Scale; therefore, it is believed that

the results are a relatively accurate measure of the motor proficiency of both the experimental and control groups.

3. The motor proficiency of most gifted children is much higher than is the motor proficiency of average children. This should aid educators, counselors, and psychologists in planning the physical education, sports programs and other motor activities of these children.

4. The Oseretsky Scale appears to be a valuable addition to the clinician's test armamentarium. It is useful as a tool for diagnosing levels of motor proficiency and, when subjected to an item analysis, it should also be useful in determining specific areas of motor deficiency as well.

Recommendations

1. It would appear to be desirable to use a measure of motor proficiency as well as an I.Q. score to arrive at a wider understanding of the ability of the child.

2. The Lincoln Revision of the Oseretsky Tests of motor proficiency should be of definite value to psychologists, clinicians, guidance directors, educators, and physical education teachers in planning the educational programs for children.

3. It would appear to be desirable to establish a concept of "motor age" so that a child's motor potential may be determined as a guide in helping adults to plan his educational program. Such a concept would be very useful as a

direct comparison with mental age in determining the degree of superiority or inferiority with other children of the same mental or chronological age.

4. As the Oseretsky Scale now stands, it is not feasible for classroom administration since it takes approximately one hour to administer and is an individual test. Studies to determine a modification of this scale are needed so that the Oseretsky Scale could possibly be used with groups of children and thereby increase its usefulness.

5. As an aid in shortening the Oseretsky Scale, the possibility of eliminating the testing of the less preferred hand or foot, and limiting all tests to one trial only should be investigated. This would materially shorten the instrument so that it would take about half the time it now requires for its administration.

CHAPTER VI

SUMMARY

This study has established the relationship between motor proficiency as measured by the Lincoln Revision of the Oseretsky Tests of Motor Proficiency and intelligence as measured by the California Tests of Mental Maturity in the intellectually gifted child. Twenty gifted girls and twenty gifted boys comprised the experimental group. All of the I.Q.'s in the experimental group were 120 or higher. The control group was made up of twenty boys and twenty girls who had I.Q.'s of between 90 and 110. All subjects of both groups had passed their eighth birthday and had not yet reached their tenth birthday. All subjects were selected from essentially the same socio-economic level of their community.

Low positive correlation coefficients were found between subjects' I.Q. and Lincoln-Oseretsky scores in both the gifted and normal samples. This was expected due to the relative homogeniety of I.Q. of subjects within each sample. The correlation coefficient between subjects' I.Q. and Lincoln-Oseretsky scores for the combined samples was .72. A t-test of significance for the Pearson Product Moment Correlation Coefficient was computed for the combined samples and was found to be significant beyond the .01 level of

confidence. The significant high positive correlation between I.Q. and Lincoln-Oseretsky scores for the combined samples supports Hypothesis I which stated that both gifted and average children should show a significant positive correlation between intelligence and motor proficiency.

This study showed that gifted children had significantly higher motor scores than did normal children. This result supports Hypothesis II which stated that gifted children should demonstrate a definite superiority in motor proficiency when compared with average children of their own age.

Within the limits of this study, intellectually gifted children were found to be definitely superior to average children of the same chronological age in respect to both intelligence and motor proficiency. An intellectually gifted child has better control over his sensori-motor responses than does the child of lower I.Q.; nevertheless, as Hollingworth (1929, p. 109) has pointed out, the superior motor proficiency of the gifted is not sufficient to maintain a continually high correlation between intelligence and motor proficiency where the greater weight of the gifted child must be taken into consideration, as in jumping, tapping, and such activities. It is also evident that a point is reached in the correlation of intelligence and motor proficiency where an increase in I.Q. does not necessarily result in a like increase in motor proficiency. This may be

due partly to the limitations of the test instrument and partly to the physical limitations of the organism.

It may be concluded that up to a point intelligence and motor proficiency are positively related, in so far as this study is concerned. It is obvious that intelligence is more than just an I.Q. score on a so-called intelligence test. Many factors enter into the concept of intelligence. Certainly this study indicates that motor proficiency may well be one of these factors. The implications of this study should be of value to educators, guidance directors, and psychologists who have the responsibility of establishing or modifying the educational programs of school children. It would appear to be desirable to use some measure of motor proficiency in enriching the school programs of gifted children. This would release them from the lock-step educational pattern that is prevalent in some school systems where everyone is expected to follow exactly the same curriculum at the same time.

Further studies are needed in the area of motor proficiency. One of the most important would be the establishment of the concept of "motor age" so that a child's motor expectancy may be determined as a guide for the counselor and educator. It would also be desirable to shorten the administration time of the Oseretsky Scale if possible. As it now stands, the length of time it takes to administer the entire test and the fact that it is an individual test makes

it impractical to use in most classroom situations.

An interesting study could be developed involving subjects with I.Q.'s of 90 - 110 in classrooms in which these intelligence quotients are among the highest of the group. These subjects' motor proficiency scores could be compared to those used in the present study. The 90 - 110 I.Q. scores in the present study were among the lowest in the two school populations.

In a future study it might be helpful to use a full range of I.Q. scores from ninety on to the highest score in a defined population. It would be interesting to know the motor performance of the middle group, i.e., those with I.Q.'s of 111 - 119.

An all Negro population would be interesting to study in order to know what ethnic differences there might be.

REFERENCES

Anastasi, Anne. Differential Psychology, New York: Mac-Millan Co., 3rd. Ed., 1958.

Anderson, H. H., and Anderson, C. L., An introduction to projective techniques. New York: Prentice-Hall, 1951.

Bagley, W. C. On the correlation of mental and motor ability in school children. Amer. J. Psychol., 1900, 12, 193-205.

Barrow, H. M. "A test of motor ability for college men." Unpublished doctor's dissertation, Indiana University, 1954.

Barrow, H. M. and Rosemary McGee, A practical approach to measurement in physical education. Philadelphia, Lea and Febiger, 1965.

Boynton, P. L., Intelligence. New York: Appleton, 1933.

Brace, D. K. Measuring Motor ability. New York: Appleton-Century, 1937.

Burt, C. The backward child. Appleton-Century, 1937.

Carey, R. A. "A comparison of the Lincoln revision of the Oseretsky tests of motor proficiency with selected motor ability tests on boys at the elementary level." Unpublished doctor's dissertation, Indiana University, 1954.

Carmichael, L. Manual of child psychology. New York: John Wiley and Sons, Inc., 1954.

Cassel, R. H. The Oseretsky tests: Vineland Adaptation. J. ment. Def., 1950, 55, 251-256.

Cassel, R. H., The Vineland adaptation of the Oseretsky test. Train. Sch. Bull., 1949, 46, 1-32.

Cowan, E. A., and Pratt, B. M. The hurdle jump as a developmental and diagnostic test of motor coordination for children from three to twelve years of age. Child Developm., 1934, 5, 107-121.

Dimock, H. S. A research in adolescence, pubescence, and physical growth. Child Developm., 1935, 6, 177-195.

Doll, E. A. (editor) The Oseretsky tests. Train. Sch. Bull., 1946-7, 43, 1-13, 27-28, 50-59, 62-74.

Doll, E. A. The feeble-minded child. In Carmichael, L. Manual of child psychology. New York: John Wiley and Sons, 1946, 845-885.

Doll, E. A. The Oseretsky tests of motor proficiency: A translation from the Portuguese adaptation. Minneapolis: Educational Test Bureau, 1948.

Fallers, J. "An investigation of the motor ability of thirty high grade mentally defective girls with the Oseretsky tests of motor proficiency." Unpublished master's thesis, MacMurray College, 1948.

Farmer, E. A group factor in sensory-motor tests. Brit. J. Psychol., 1927, 17, 4, 327-342.

Garfiel, E. The measurement of motor ability. Arch. Psychol, 1923, 62, 1-47.

Gire, E. and Espenshade, A. The relationship between measures of motor educability and learning of specific skills. Res. Quart., 1942, 13, 43-56.

Goddard, H. H. What is intelligence? J. soc. Psychol., 1946, 24, 51-70.

Greene, E. B. Measurements of human behavior. New York: Odyssey Press, 1952.

Gutteridge, M. V. A study of motor achievements of young children. Arch. Psychol., 1939-40, 34, 1-178.

Hays, William L. Statistics for Psychologists. New York: Holt, Rinehart, and Winston, 1963.

Heath, R. S., Jr. Clinical significance of motor defect, with military implications. Amer. J. Psychol., 1944, 57, 482-499.

Hoffman, M. L. and Lois Hoffman, Review of Child Development Research, Russell Sage Foundation, New York, Vols I, II, 1966.

Holbrook, S. F. "A Study of the development of motor abilities between the ages of four and twelve using a modification of the Oseretsky test." Unpublished doctor's dissertation, University of Minnesota, 1954.

Hollingworth, L. S. Gifted children: Their nature and nurture. New York: MacMillan, 1939.

Humiston, D. A measurement of motor ability in college women. Res. Quart., 1937, 8, 182-183.

Johnson, G. B., A study of the relationship that exists between physical skills as measured and the general intelligence of college students. Res. Quart., 1942, 13, 57-59.

Kepp, H. Oseretsky Tests. Amer. J. ment. Def., 1946, 50, 485-486.

Lassner, R. Annotated bibliography of the Oseretsky tests of motor proficiency. J. consult. Psychol., 1948, 12, 1948, 12, 37-47.

Magaret, Ann and Thompson, C. W. Differential test responses of normal, superior, and mentally defective subjects. J. abnorm. soc. Psychol., 1950, 45, 163-167.

Maroney, F. W. Motor ability tests. Amer. phys. educ. Rev., 1925, 30, 1925, 30, 311-318.

McCandless, Boyd R. Children: Behavior and Development. Holt, Rinehart, and Winston, New York, 1967.

McCandless, Boyd R., and Fahmida Ali. Relations among physical skills and personal and social variables in three cultures of adolescent girls. J. ed. Psych., 1966, 57, 366-272.

McCloy, O. H. An analytical study of the stunt type test as a measure of motor educability. Res. Quart., 1937, 8, 46-55.

Metheney, E. Studies of the Johnson test as a test of motor educability. Res. Quart., 1938, 9, 105-114.

Perrin, F. S. C. An experimental study of motor ability, J. exp Psychol, 1921, 4, 24-56.

Piaget, J. The psychology of intelligence. New York: Harcourt Brace, 1950.

Ray, H. C. Inter-relationships of physical and mental abilities and achievements of high school boys. Res. Quart., 1940, 11, 129-141.

Ray, William S. Statistics in Psychological Research. New York: MacMillan Company, 1962.

Sloan, W. Motor proficiency and intelligence. Amer. J. Ment. Def., 1951, 55, 394-406.

Sloan, W. Lincoln adaptation of the Oseretsky test. Illinois: Lincoln State School and Colony, 1948.

Sloan, W. The Lincoln-Oseretsky motor development scale. Genet. Psychol. Monogr., 1955, 51, 183-252.

Sloan, W. The Lincoln revision of the Oseretsky tests of motor proficiency. Illinois: Lincoln State School and Colony, 1953.

Terman, L. M., et al., Genetic studies of genius. Vols. 1-5. California: Stanford University Press, 1925-49.

Thompson, George G. Child Psychology (2nd ed.) Boston: Houghton Mifflin Co., 1962.

Tyler, Leona E. The psychology of human differences (2nd ed.) New York: Appleton-Century-Crofts, Inc., 1956.

Unsicker, C. "A psychological study of bright and dull children with comparable mental ages." Unpublished doctor's dissertation, Iowa University, 1951.

Weschler, D. Measurement of adult intelligence. (3rd ed.) Baltimore: Williams and Wilkins, 1944.

Wilson, F. T. Some special activity test scores of gifted children. J. genet. Psychol., 1953, 82, 59-68.

Witty, P., The gifted child. Boston: D. C. Heath, 1951.

Witty, P., What is special about special education? The Gifted Child. Exceptional Child, 1953, 19, 255-259.

APPENDIXES

APPENDIX I

COPY OF THE LETTER SENT TO PARENTS

Following is a copy of the letter sent to the parents of the children whose names were secured for possible use in this study:

To the parents of (Name) :

Your child has been selected to participate in a research study which is to be done as a part of a research program in Child Development and Family Relations at the University of North Carolina at Greensboro. Eighty children have been chosen. We would like to give these children a simple test of motor proficiency which will last less than one hour and will be done at his school during the month of March. There will be no testing of intelligence or personality, just a simple task or game. Your child will not be exposed to any hazard, nor will these tests interfere with his school progress. The completed study will use only statistics, not names.

This testing program has been approved by Mr. P. J. Weaver, Superintendent of the Greensboro Schools, Mr. Frank Saunders, Director of Special Education, and the Principal of your school.

We very much would like your child to participate, and would you give your approval by signing the appropriate space at the end of this request and have your child return it to his teacher? Your cooperation will be appreciated.

Sincerely yours,

Richard H. Klemer, Ph. D., Chairman
Dept. of Child Development and Family Relations, UNC-Greensboro, N. C.

I will permit my child to be tested as stated above _____.

I would prefer not to have my child participate in this study _____.

_____
Signature

APPENDIX II

THE LINCOLN-OSERETSKY MOTOR DEVELOPMENT SCALE SCORE SHEET

Name_____ Birth Date_____ Age___ Sex___

Education____ Physical Defects____ Score___ Percentile Rank_

Examined at_____ Examiner_____ Date_____

ITEM	DESCRIPTION	R - L	Trs.	Pts.	Notes
1	Walking backwards, 6 ft.		2		
2	Crouching on tiptoe		2		
3	Standing on one foot	R/L	2/2	/	
4	Touching nose		1		
5	Touching fingertips	R/L	2/2	/	
6	Tapping rhythmically with feet and fingers		1		
7	Jumping over a rope		1		
8	Finger movement		3		
9	Standing Heel to toe		2		
10	Close and open hands alternately		3		
11	Making dots		2		
12	Catching a ball	R/L	5/5	/	
13	Making a ball	R/L	2/2	1	
14	Winding thread	R/L	1/1	/	
15	Balancing a rod crosswise	R/L	3/3	/	
16	Describing circles in the air		1		
17	Tapping (15")	R/L	2/2	/	
18	Placing coins and matchsticks		1		
19	Jump and turn about		1		
20	Putting matchsticks in a box		1		
21	Winding thread while walking	R/L	1/1	/	
22	Throwing a ball	R/L	5/5	/	
23	Sorting matchsticks	R/L	1/1	/	
24	Drawing Lines	R/L	2/2	/	
25	Cutting a circle	R/L	1/1	/	
26	Putting coins in box (15")	R/L	1/1	/	
27	Tracing mazes	R/L	1/1	/	
28	Balancing on tiptoe		1		
29	Tapping with feet and fingers		1		
30	Jump, touch heels		1		
31	Tap feet and describe circles		1		
32	Stand on one foot	R/L	1/1	/	
33	Jumping and clapping		1		
34	Balancing on tiptoe	R/L	1/1	/	
35	Opening and closing hands		1		
36	Balancing a rod vertically	R/L	3/3	/	