Assessing the Ability to Predict Academic Readiness for Education and Influence the Level of Academic Development of Grade School Children Through the Testing of and Improvement in Several Key Physical Skills

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ASSESSING THE ABILITY TO PREDICT ACADEMIC READINESS FOR EDUCATION AND INFLUENCE THE LEVEL OF ACADEMIC DEVELOPMENT OF GRADE SCHOOL CHILDREN THROUGH THE TESTING OF AND IMPROVEMENT IN SEVERAL KEY PHYSICAL SKILLS

A THESIS SUBMITTED TO THE FACULTY OF THE GRADUATE SCHOOL IN CANDIDACY FOR THE DEGREE OF MASTER OF ARTS DEPARTMENT OF CURRICULUM, INSTRUCTION AND EDUCATIONAL PSYCHOLOGY

BY CRAIG S NELSON, D.O., F.A.O.C.A.

CHICAGO, ILLINOIS JANUARY, 1998
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CHAPTER ONE: INTRODUCTION

Today's educators are facing the growing dilemma of large numbers of children entering America's school systems without the skills necessary for them to succeed. Education is recognizing how children are very different when they enter grade school. All children are individuals and their preschool development has been influenced by their own unique combination of genetic, environmental, and sociological factors. Since all children are unique, they might not be at the same stage of readiness when they begin their formal education. Chronological age should not necessarily be the determining factor to decide when a child should enter school. At the same chronological age, some children are more prepared to enter school than others. Bernard Ryan wrote (Ryan, 1980, p. 5):

No two children are alike... no two children are ready for school exactly the same... Your child is a very special person - a unique person. No other human being - even an identical twin - has ever grown at exactly the same rate, developed physical abilities at precisely the same age, or experienced just the same events.

To assume that all children entering elementary school are in an identical state of mental, physical, and physiological balance and, therefore, in an identical state of readiness is as inaccurate an assumption as to assume that all of the children entering grade school will be the exact same height and weight.
The opposite is closer to the truth, every child must be viewed as an individual and at his/her own unique level of physiological function. Howard R. Foye, Jr. and Stephen B. Sulkies wrote (Foye, 1994, p. 1):

The development of the human organism is a very complex topic. Every individual's path of growth and development through the life cycle is unique, with a range of complex, interrelated changes occurring from the molecular to the behavioral level. Furthermore, the patterns of development may be very different for individual children within the broad limits that characterize normal development.

WP Hedges and V. B. Hardin agree: (Hedges, 1972, p. 249):

Readiness for learning is not a state that comes to all children automatically; rather the state must be attained. For the child to attain readiness and to be successful with learning, a number of skills and abilities must be developed.

A child who is not ready to learn, can find himself/herself overwhelmed by the school experience. The child is unable to compete with the other members of his/her class. The child runs the risk of falling behind his/her classmates, and it becomes very difficult, then, for the child to catch up and to succeed in school, which usually translates into a poor self image. This poor self image causes the child to develop a low self-esteem. Neil L. Schnechter, while discussing developmental and behavioral disabilities, states (Schnechter, 1996, p. 87):

...less severe problems should not be trivialized, however, because they still may have a significant impact on the child's self-esteem.

School readiness for education is vital to the development of a child so that he/she can learn to his/her optimum level. The scope of readiness
should encompass all aspects of the child's mental, physical, physiological, and
social development. The body and the mind are closely linked. Janet
Lerner writes (Lerner, 1982, p. 90):

Philosophers and educators since the beginning of Western
civilization have realized the important relationship that exists between motor
development and learning. Plato places gymnastics at the first level of
education in the training of the philosopher-king. Aristotle writes that man's soul
is characterized by two faculties, sense and mind, and originating local
movement.

All parts of the body have effects on other parts. The function of
one system has a profound effect on the function of another. This
interrelationship of the functioning of the different parts of the body and how they
function as a whole unit is the foundation of an entire field of medicine. Andrew
Taylor Still founded Osteopathic Medicine on June 22, 1874. The first two
principles of Kirksville College of Osteopathic Medicine, Osteopathic Medicine's
oldest medical school, are (Martinke, 1991, p. 4):

1. The body is a unit. The human body does not function as a
collection of separate parts but as an integral unit. Obviously the body does
consist of parts - the ear, the lungs, the musculoskeletal system and so forth - all
working together to benefit the organism in totality.

2. Structure and function are reciprocally interrelated.... As
structure governs function, similarly abnormal structure governs dysfunction.

All children are placed in a formal educational setting of some sort around
the age of five. Every child is unique and is different from the other children
in the classroom. How does education ensure that a child's individualism is
accounted for when he/she enter this formal educational process? Ensuring a
child's individualism helps allow the child to reach his/her potential, not only, academically, but also in the other areas of learning the child must master.

The problem which faces education concerns normal childhood development and how this effects the child's readiness to learn. The mental development of a child is strongly influenced by the physical and social development of that child.

A child's readiness for education is not easily tested. The need for assessing the readiness of each child is a major concern facing modern education. No perfect technique or method of assessing readiness for education has been devised to date. There is clearly a need for more research and new ideas in this area. A method of assessment based on physical testing could prove to be a valuable instrument.
Modern education has come to the realization that every individual child is an unique individual. Each child comes to school in a different stage of development. This thought has led educators to the theory of "readiness to learn". The idea of readiness has been used by some educational psychologists for years. An early definition of readiness follows (Egan, 1983, p. 95):

Being 'ready' simply means the children have available the cognitive abilities which are prerequisite for mastery of some new skill, concept, or knowledge.

The Gesell Institute uses a similar definition (Meisels, 1987, p. 7):

School readiness as defined by the Gesell Institute, is the capacity to simultaneously learn and cope with the school environment.... The Gesell approach takes into account a child's emotional, social, physical, and adaptive capacities as being of equal concern to human development as intelligence.... To define school readiness as having only to do with intelligence, or as having only to do with achievement, or as having only to do with being given previous learning experiences, contradicts long-standing research and experience.


Our clinical service at the Gesell Institute has for many many years been consulted regarding boys and girls who are having trouble in school. But not until the middle 1950's did we become aware that a major cause of school failure was simple unreadiness for the work of the grade the child was placed in.

Children who are not as ready as their peers run the risk of falling behind and are at-risk for the development of learning "difficulties" or "problems". Falling behind can be extremely detrimental to the child's future development.
An at-risk child must be found early so that he/she can receive help. Dr. Shonkoff formulated a series of three goals that can serve as the basis of an approach to a child's development (Shonkoff, 1994, p. 97):

(1) the need for early identification and early intervention of children....

(2) the need for supportive management of children with variations in abilities that may or may not evolve into significant disorders (e.g. mild expressive language delays, fine or gross motor inefficiencies, "hyperactivity" during the toddler period)

(3) the avoidance of premature labeling and the unnecessary utilization of scarce intervention resources for children who will truly outgrow their problems.

Screening for a child's readiness for learning must be a primary concern of education. The child must be evaluated, and this evaluation should focus on more than just the child's mental development because there is such a strong link between physical, intellectual, and social development. This link has been known for years. In Piaget's Stages of Cognitive Development, the Sensorimotor Stage and the Preoperational Stage are related to physical development. Howard R. Foye, Jr., M.D. interprets Piaget by writing in his textbook of pediatrics that during the sensorimotor stage (Foye, 1994, p. 15):

Learning occurs through activity, exploration, and manipulation of the environment. Motor and sensory impressions form the foundation of later learning.

Many famous theories on learning and behavior have at their base a relationship between the physical being and its mental development. Sigmund Freud and Erik Erikson explained behavior as a series of "developmental
milestones". Jack P. Shonkoff, M.D. agrees with the close association between the mind and the body when he writes that (Shonkoff, 1994, p. 97):

Growing up involves three interrelated processes, physical growth, sexual maturation, and the development of competence ... Current knowledge ... indicates that the mastery of specific skills unfolds within a highly dynamic and interactive process that depends on more than just the biological timetable.... Stated simply, the development of children is influenced by their life experiences.

C. Sheeil wrote a textbook for physical education in 1986. He discusses how some specific aspects of physical development that can have a profound effect on learning. He included in this group, vestibular, visual, hearing, proprioceptive, and tactile development in the child. He stated (Sheeil, 1986, p. 93)

When these systems exhibit delayed or abnormal functioning, motor development and/or learning is affected.

Arnold Gesell, regarded by some as the foremost American authority on the patterns of physical growth and development, saw that there was a link between physical and intellectual growth. While discussing Gesell, Ames stated (Ames, 1979, p. 6):

The Gesell philosophy of human behavior maintains, and has always maintained that behavior is a function of structure. This means that to a large extent we behave as we do because of the way our bodies are built, and because of the stage of development we have reached.

In his book, Child Development, Gesell stated (Gesell, 1949, p. 186):

Even manners and morals have a motor basis. We may well look for a motor ingredient in all the gradients of growth.
If one accepts the concept of a close relationship between physical and mental development, one must also realize that a successful child must be both mentally and physically "ready for learning" when he/she enters school. A problem in one of these areas can affect the child's performance in the other. In his textbook on developmental education, Jim Grant states (Grant, 1991, p. 9):

A child's ability to learn intellectually can be affected by many factors, such as being forced to sit still for extended periods of time.

A physical component to some forms of learning problems was implicated by N. C. Kephart when he wrote (Kephart, 1960, p. 32):

Even though some children exhibit no specific motor disabilities or medical or psychological problems, they do have trouble in school, and their learning problems may be attributed to inadequate motor learning.

Gesell's School of Developmental Education considers both the physical and mental side of learning. Jim Grant in his textbook on developmental education wrote (Grant, 1991, p. 9):

Developmental education takes into consideration the child's developmental age - the child's current stage of development - as well as the child's chronological age....The developmental approach to education recognizes that schools have a responsibility to nurture four key areas of a child's development - intellectual, physical, emotional, and social - because they are interrelated and integral.

In examining a child's readiness for learning one must include all aspects of the child's development, including the cognitive, physical, social, and psychological development of the child. Testing those areas of readiness is much more complex than merely recording the results of a standardized test. Dr.
Shonkoff writes (Shonkoff, 1994, p. 97):

Unlike traditional approaches to developmental screening that are based primarily on the periodic administration of a standardized test, developmental surveillance is a continuous process that extends over time.

The quality of the current preschool screening instruments for the detection of children who are not ready for their entrance into elementary school has been questioned. Rubin states (Rubin, 1978, p. 664):

A recent review of research published through 1973 (Schaer and Crump, 1976) points out the lack of consensus regarding the feasibility of early identification of learning disabilities. Studies since 1973 to the present provide no more reason to be confident about the validity of early identification of learning problems.

Success by students in elementary school is difficult to predict. Dr. Rubin cites numerous articles and studies involving the accuracy of predicting elementary school achievement from kindergarten testing. She concludes:

(Rubin, 1978, p. 664):

The present study and related research literature raise a serious note of caution regarding preschool identification of potential learning disabled children. Present evidence will not support attempts to make individual predictions regarding which preschool children will later experience serious academic skill difficulty.

Samuel J. Meisels wrote an article in which he expressed his opinion that no perfect screening tool has yet been developed. (Meisels, 1987, p. 4):

Professionals have misused and abused both screening and readiness tests. Tests without reliability and validity are inherently untrustworthy and should not be used to identify and place children. Yet, professionals persist in using invalid and unreliable tests.

Meisels continued to criticize the Gesell testing in his article when he
stated that (Meisels, 1987, p. 9):

As the use of the Gesell tests proliferate, the problems associated with false predictions and false identifications continue to grow.

Screening is not easily accomplished by psychological testing. In 1993 W.J.E. van IJzendoorn researched the ability of psychologists to develop a prognosis for a learning disabled children. He concluded that these prognoses appeared to be very inaccurate.

The Differential Ability Scales (DAS) screening is a tool that is used in the field of learning disabilities. The DAS scores are utilized in education to find specific areas of learning disabilities. In 1995 Steven K Shapiro published his research on the effect of the DAS on the child with a learning problem. He concluded that the effects of the DAS on the child's development was unclear. He stated (Shapiro, 1995, p. 247):

It remains unclear whether the cognitive characteristics measured by DAS will facilitate or improve the educational diagnostic and intervention processes currently utilized with LD children.

No method or technique has emerged that completely and adequately solves the problem of screening children for their readiness for education and identifying those who are at-risk for developing learning problems.

Any solution must take into account the total development of the child, considering all of the factors that the child has to deal with during his/her time in school. It must consider the social, physical, emotional, and intellectual
development of the child.

Any screening procedure would have to meet several criteria to be acceptable. First, it must be reliable and consistent, giving results that can be trusted. Secondly, it must be able to be given in a reasonable amount of time, so that mass screening of large numbers of children can be performed. It must also be inexpensive so that all districts could use the screen. It must take into consideration all aspects of the child's readiness, including mental and physical.

The Gesell Institute screening tool is the most widely accepted method of determining a child's readiness for learning. It is based on a multi-dimensional approach which includes the physical aspects of readiness. However their work has not yet meet with universal acceptance. There is still a need for a screening tool, which can be administered quickly, that is reliable, easy to give and grade, and considers both the physical and mental aspects of readiness.

The researcher have found an interesting program, that is screening children for the potential of being at-risk for learning problems through a battery of physical skills testing. The work is very much in line with the work of Gesell and the institute that is named for him. The purpose of the program is to identify and evaluate children (Johnson, 1991, p. 7):

... for lapses in readiness skills and to provide adapted physical instructional activities which will help the children to organize their bodies and to develop the readiness skills which are essential for successful academic learning.
The physical skills tests are listed below. Many of the physical skill areas are similar to the areas that are used by the followers of Gesell. (Johnson, 1991, p. 136):

1. Balance
2. General coordination
3. Body Image
4. Hand-eye coordination
5. Laterality or directionality
6. Tactile Touch

The tests that are being used are listed below. The series of 9 tests are very simple to administer. The entire process can be done in less than 5 minutes. Grading is on a five point scale, with five being the high value. A score of three or less means that the child is deficient in that skill. The nine physical skills tests are (Johnson, 1991, p. 136):

1. Hopping, running, walking and skipping
   This movement is graded on movement, balance, and coordination.

2. Throwing
   This movement is graded on the coordination of the leg and arm movement that is used during the act of throwing a ball.

3. Catching a thrown ball
   This movement is graded on the child's ability to follow the ball's movement and react properly to that movement.

4. Body parts Identification
   This is graded on the correct identification of the part of the body, and
whether there is any hesitation in the physical movement of pointing to the part.
5. Tactile touch

   This is graded on the correct identification of where the child has been touched.

6. Crossing the midline

   The movement is graded on whether or not the child will reach across an imaginary line in the sagittal plane. The sagittal planes divides the body into two halves, corresponding to the left and right side.

7. Imitation of movement

   This movement is graded on the correct duplication by the child of the observed movement. Also considered is the presence of any hesitation in the movement.

8. Static Balance

   This movement is graded on the ability to balance on one foot while the child's eyes are closed.

9. Dynamic Balance

   This movement is graded on the quality of movement during the exercise.

   If a child obtains a score of three or less on any three or more of the tests, the child is considered at-risk for learning problems. These children are eligible for program. Children can be referred into the program at the request of a participating teacher. Parents and administrators were also able to request that their child be included into the program.
There is an intervention program to improve a child's abilities in these key physical skills. The child can be helped in the classroom and at home. The child receives individualized attention in special classes at school. These classes are usually held in small groups. The individual schools utilizing the program differ slightly in the number of classes per week. Generally the aim is to have the students work for one half of an hour per day, five days per week.

The classroom teacher is kept informed of activities, so that any opportunity for reinforcement in the classroom is not overlooked. The teacher also acts as a member of the intervention team by acting as evaluator of the child's progress in the classroom.

Teacher newsletters are distributed on a monthly basis. A corresponding monthly newsletter is sent home to the family. The information relates to updates on the program, lists classroom implementation ideas, and shares information between all of the involved schools.
CHAPTER THREE: METHODS

Purpose

The purpose of the research was two fold: First, to determine whether a physical skills examination is a valid technique for screening children who are at-risk for learning problems and who demonstrate below average learning skills and development. The second area of focus dealt with the intervention program and whether a physical skills intervention program could improve the physical and/or academic skills of the child.

California Achievement Test

An accepted standard for the intellectual achievement of the students was needed as a reference value. The California Achievement Test (CAT) is a battery of tests that is designed to measure achievement in the basic skills commonly found in elementary school curriculums. The tests that are used have been normed on 300,000 pupils in the grades of kindergarten through the twelfth grade. The test utilizes multiple-choice questions at every level. Peter W. Airasian, a Professor at Boston College did a review of the test for The Tenth Mental Measurements Yearbook. In that review he explained about the acceptability and the longevity of the test. (Conoley, 1989, p 126):

The California Achievement Tests (CAT) have been a well-respected battery for over 50 years....designed to provide valid measurement of academic skills.
In discussing the validity and reliability of the CAT test, he states:

(Conoley, 1989, p127):

...the authors of the CAT have done about all that can be expected to identify common, representative, and relevant test content.

James Wardrop, an Associate Professor of Educational Psychology at the University of Illinois also did a review of the CAT test. He stated (Conoley, 1989, p 128):

Standardized achievement batteries continue to be an essential component of school testing programs in an overwhelming majority of school districts. The California Achievement Test (CAT) rank as one of the most popular of such batteries.

The questions in this research project were answered based on the CAT test results and whether or not the physical skills test can be correlated to the CAT achievement test.

Questions

The first question deals with the primary purpose of the research project. If a physical skills test is going to be used as a screening device for children, the results of that test must show some level of agreement with an accepted test of academic achievement.

Question #1:
What is the percentage of agreement between a child's score on a physical skills screening test and the child's academic skills as measured by the CAT testing score for Math and Reading?

The final four questions deal with the secondary purpose of the research
project. Does a physical skills intervention program improve the physical and/or academic skills of the child.

**Question #2:**
After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year's CAT Reading test?

**Question #3:**
After participating in the intervention program did the child demonstrate an improvement in his/her math skills as measured by succeeding year's CAT Math test?

**Question #4:**
After participating in the intervention program did the child demonstrate an improvement in his/her physical skills as measured by a repeat testing of the child using the identical physical skills screening test?

**Question #5:**
After the intervention program did the child demonstrate an improvement in his/her behavior and attitudes toward his/her schoolwork?

**Sampling Technique**

The scores were obtained from the CAT test for Math and Reading for three grade school levels of an elementary school. Also obtained were the physical skills screening tests for the same classes.

The grade school is a public school located in the lower southwestern
area of Michigan. This district serves a rural area, although the school is actually located in a small town. The families that make up the district are basically from the middle and lower socio-economic class. The school has four classes for each grade level, and children participating in the program were chosen from each class and grade level. The sample was selected from twelve separate classrooms within the school.

The children are chosen for participation in the program by one of two methods. A child was chosen because he/she scored poorly on the physical skills screening exam. This exam was given to each class. A score of three or less on a five-point scale in three or more of the nine physical skills tests is an indication of potential problems. Children could also become eligible for the program upon the recommendation of the classroom teacher.

The children who were used in my research study had data maintained in the records of the program. The amount of hard data was limited, due to the size of the program and the short two year duration of the program. An exhaustive list was made of all of the children in the program for the years 1991 and 1992. To be in the research project a child needed to have the following available scores:

1. 1991 and 1992 physical skills test score
2. 1991 and 1992 CAT score for reading
3. 1991 and 1992 CAT score for math

Forty six children were selected for inclusion in the research because
they had all of the required scores for 1991. Some students did not have all of the scores for 1992. There were sixteen children from each of the second and third grade levels, while only fourteen from the first grade level were used. The sex distribution was almost even, with twenty-six males and twenty females.

The program also had a limited number of CAT scores of children who were not in the program but who had been screened by the physical skills tests. These children were used as the controls. A few children did not have a CAT score for both math and reading. The number of control children for reading was twenty-eight, making the total number of scores evaluated for the comparison of the reading test and the physical skills test equal to seventy-four. The number of control children for math was thirty-one, making the total number of scores evaluated for the comparison of the math and the physical skills test equal to seventy-seven.

To determine whether the intervention program improved the children's scores on the CAT test and the physical skills in 1992, the original forty-six children were again chosen as the subjects. The 1992 scores on the physical skills test for all forty-six children was available, however not all of the CAT scores were available in the data banks of the program. The researcher used all of the scores to which he had access. The researcher could only obtain the 1992 CAT Reading scores for only twenty-nine of the forty-six children in the program. The study could only use the 1992 CAT Math scores for thirty-three of the original forty-six children.
Evaluation Technique

A quantitative analysis of the data was performed for the evaluation of the first four questions.

Question # 1

What is the percentage of agreement between a child's score on the physical skills screening test and the child's academic skills as measured by the CAT testing score for Math and Reading?

Percentage Agreement

The first aspect of the analysis dealt with the ability of the physical skills testing to screen out those children who scored three or lower on the CAT. A child who scored a three or lower on the CAT is below the average for the test. A child who failed three or more of the physical skills tests is below the average on that test. A percentage of agreement between the two test scores was made.

Sensitivity

The sensitivity of the skills test in predicting a low score on the CAT was then examined. Whenever a test is being used to determine if a state, condition or disease is present in a subject, the sensitivity of that test can be determined. The sensitivity of a test is the probability that a test will be positive when the state, condition, or disease, that is being sought, is present in a subject. The condition that was tested for in this research project was a low CAT score of three or less. Only those children that had a score of three or less are used in the analysis. The factor that varied was the score on the physical skills
screening test. The formula for Sensitivity is:

\[ \text{Sensitivity} = \frac{A}{A + C} \]

A  # children with: low scores on skills test low scores on CAT test
C  # children with: high scores on skills test low scores on CAT test

**Specificity**

The specificity of the skills test in predicting an average or higher score on the CAT was examined. Whenever a test is being used to determine if a state, condition, or disease is present in a subject, the specificity of that test can be determined. The specificity of a test is the probability that a test will be negative when the state, condition, or disease, that is being sought, is not present in a subject. The condition that was tested for in this research project was a low CAT score of three or less. Only those children who had a score of four or more were used in the analysis. The factor that varied was the score on the physical skills screening test. The formula for Specificity is:

\[ \text{Specificity} = \frac{D}{B + D} \]

B  # children with low scores on skills test high scores on CAT test
D  # children with high scores on skills test high scores on CAT test

**Question #2**

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year's CAT Reading test?

A pretest, intervention program, post test scenario was used. (XYX model)
The CAT test score from the beginning of the academic year of 1991 was obtained. During that academic year the children were part of a physical skills intervention program, designed to improve their physical skills in the key areas. The CAT test score for the following year, 1992, was then obtained. A standard t test was used to determine if there was a statistically significant change in the performance of the children on the CAT Reading test before and after the intervention program. The t test is a method of determining whether the difference in the means of two groups is large enough so that it is not due to chance alone. In his book on statistics, James Popham writes (Popham, 1992, p 122):

The t test is a statistical model designed to determine whether two groups, as represented by their means, are significantly different.

Statistical significance testing is accomplished through the use of the null hypothesis. The null hypothesis postulates that there is no difference between the groups, that the samples are taken from the same group. If the t test is significant to the 0.05 level, then the null hypothesis is rejected.

Null Hypothesis for Questions #2

1. There is no difference in the results of the CAT Reading test scores before and after the intervention program.

Question #3

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year's
CAT Math test?

A pretest, intervention program, post test scenario was used. (XYX model)

The CAT test score from the beginning of the academic year of 1991 was obtained. During that academic year the children were part of a physical skills intervention program, designed to improve their physical skills in the key areas. The CAT test score for the following year, 1992, was then obtained. A standard t test was used to determine if there was a statistically significant change in the performance of the children on the CAT Math test before and after the intervention program.

Statistical significance testing is accomplished through the use of the null hypothesis. The null hypothesis postulates that there is no difference between the groups. The samples are taken from the same group. If the t test is significant to the 0.05 level, then the null hypothesis is rejected.

Null Hypothesis for Question #3

1. There is no difference in the results of the CAT Math test scores before and after the intervention program.

Question #4

After participating in the intervention program did the child demonstrate an improvement in his/her physical skills as measured by a repeat testing of the child using the identical physical skills screening test?

A pretest, intervention program, post test scenario was used. (XYX model)

The physical skills test score from the beginning of the academic year of 1991
was obtained. During that academic year the children were part of a physical skills intervention program, designed to improve their physical skills in the key areas. The physical skills test score for the following year, 1992, was then obtained. A standard t test was used to determine if there was a statistically significant change in the performance of the children on the physical skills test before and after the intervention program.

Statistical significance testing is accomplished through the use of the null hypothesis. The null hypothesis postulates that there is no difference between the groups. The samples are taken from the same group. If the t test is significant to the 0.05 level, then the null hypothesis is rejected.

Null Hypothesis for Question #4

1. There is no difference in the results of the physical skills test before and after the intervention program.

Question # 5

After the intervention program did the child demonstrate an improvement in his/her behavior and attitudes toward his/her schoolwork?

A qualitative analysis was made for the evaluation of this question. An educational evaluation of the program, which consisted of a questionnaire was reviewed. This questionnaire had been completed by the sixteen teachers in the elementary school that had children from their class in the program. The questionnaire can be found in Appendix A. The questionnaire consisted of four questions. The proper response to each question was circled by the
teacher. There was a section for comments below each question. The questions are listed below. (Johnson, 1991, p 26)

1. Has there been any change in the quantity of classroom problems encountered during your daily academic sessions demonstrated by the children that are involved in the program?

2. Has there been a recognizable change in the physical skills demonstrated by the children that are involved in the program?

3. Has there been any change in the social and emotional behavior demonstrated by the children that are involved in the program?

4. Has there been any difference in the daily attendance to your class demonstrated by the children that are involved in the program?
CHAPTER FOUR: RESULTS

The research focused on two main points. The primary area of the investigation was to determine if a physical skills test could be used as a screening tool to find a child that has below average academic skills and may be at-risk for learning problems. A secondary purpose was to determine if a physical skills intervention program can improve the physical and/or academic skills of that child.

Question # 1

What is the percentage of agreement between a child's score on the physical skills screening test and the child's academic skills as measured by the CAT testing score for Math and Reading?

This question deals with the first purpose of the research project, to determine whether the physical skills examination is a valid technique for screening children who are at-risk for learning problems and who demonstrate below average learning skills and development.

**Percentage Agreement**  
CAT Reading

Seventy-four students were analyzed, comparing their scores for the 1991 CAT Reading test with the physical skills test. The physical skills test correctly
matched the CAT test as being above or below average in fifty-six out of the seventy-four children, which is seventy-five percent. (Table 1)

<table>
<thead>
<tr>
<th>Table 1: Agreement of Reading Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of Risk</td>
</tr>
<tr>
<td>Agreement</td>
</tr>
<tr>
<td>Disagreement</td>
</tr>
</tbody>
</table>

Forty-four of the children were below average on both tests while twelve scored average or higher on both tests. The physical skills test had seven children failing more than three tests, however, they scored average or above on the CAT Reading test. Eleven children failed two or fewer of the skills tests, yet they scored below average on the CAT reading test. (Table 2)

<table>
<thead>
<tr>
<th>Table 2: Reading and Skills Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skills Test</td>
</tr>
<tr>
<td>Failed</td>
</tr>
<tr>
<td>3 or more</td>
</tr>
<tr>
<td>2 or less</td>
</tr>
</tbody>
</table>

_The Percentage Agreement_ CAT Math

Seventy-seven students were analyzed, comparing their scores for the 1991 CAT Math test with the physical skills test. The physical skills test correctly matched the CAT test as being above or below average in forty-five out of the seventy-seven children, which is fifty-eight percent. (Table 3)
Table 3: Agreement of Math Ability

<table>
<thead>
<tr>
<th>Level of Risk</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agreement</td>
<td>45</td>
<td>58%</td>
</tr>
<tr>
<td>Disagreement</td>
<td>32</td>
<td>42%</td>
</tr>
</tbody>
</table>

Thirty-one of the children were below average on both tests while fourteen scored average or higher on both tests. The physical skills test had seven children failing more than three tests, however, these children had average or above scores on the CAT test for math. Twenty-five children failed two or fewer of the physical skills tests, yet they scored below average on the CAT Math test. (Table 4)

Table 4: Math and Skills Scores

<table>
<thead>
<tr>
<th>Skills Test</th>
<th>CAT Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failed</td>
<td>Below Ave</td>
</tr>
<tr>
<td>3 or more</td>
<td>31</td>
</tr>
<tr>
<td>2 or less</td>
<td>25</td>
</tr>
</tbody>
</table>

**Sensitivity** CAT Reading Test

The sensitivity of the skills test in predicting a low score on the CAT Reading test was examined. Whenever a test is being used to determine if a state, condition, or disease is present in a subject, the sensitivity of that test can be determined. The sensitivity of a test is the probability that a test will be positive when the state, condition, or disease, that is being sought, is present in a subject. The condition that was tested for in this research project was a CAT score of three or less. The skills test matched forty-four out of fifty-five low CAT
Reading scores, which is a sensitivity of eighty percent.

**Sensitivity** CAT Math Test

The sensitivity of the skills test in predicting a low score on the CAT Math test was examined. Whenever a test is being used to determine if a state, condition, or disease is present in a subject, the sensitivity of that test can be determined. The sensitivity of a test is the probability that a test will be positive when the state, condition, or disease, that is being sought, is present in a subject. The condition that was tested for in this research project was a low CAT score of three or less. The skills test matched thirty-one out of fifty-six low CAT Math scores, which is a sensitivity of sixty-seven percent.

**Specificity** CAT Reading Test

The specificity of the skills test in predicting a average or higher score on the CAT Reading was examined. Whenever a test is being used to determine if a state, condition, or disease is present in a subject, the specificity of that test can be determined. The specificity of a test is the probability that a test will be negative when the state, condition, or disease, that is being sought, is not present in a subject. The condition that was tested for in this research project was a low CAT score of three or less. The skills test matched twelve out of nineteen average or higher CAT Reading scores, which is a specificity of sixty-three percent.

**Specificity** CAT Math Test

The specificity of the skills test in predicting a average or higher score on
the CAT Math was examined. Whenever a test is being used to determine if a state, condition, or disease is present in a subject, the specificity of that test can be determined. The specificity of a test is the probability that a test will be negative when the state, condition, or disease, that is being sought, is not present in a subject. The condition that was tested for in this research project was a low CAT score of three or less. The skills test matched fourteen out of twenty-one average or higher CAT Math scores, which is a specificity of sixty-six percent.

Question # 2

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year’s CAT Reading test?

This question deals with the second area of the study, whether a physical skills intervention program could improve the physical and/or academic skills of the child. Would there be a statistically significant change in the performance of the children on the CAT Reading test after the intervention program?

The results of the CAT Reading scores displayed an increase in the average scores. The mean of the group was 2.93 on the 1991 CAT test. The mean increased to 3.21 on the 1992 CAT test. The results of a t test was a value of 0.78. The null hypothesis is not rejected which indicates that the difference is not statistically significant. (Table 5)
Table 5: CAT Reading Scores After Intervention Program

<table>
<thead>
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<td>3</td>
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<tr>
<td>Total</td>
<td>Ave</td>
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<td>Ave</td>
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<td>85</td>
<td>2.93</td>
<td>1992</td>
<td>93</td>
<td>3.21</td>
</tr>
</tbody>
</table>

Null Hypothesis for Question #2

There is no difference in the results of the reading CAT scores of students in the program after the intervention program.

The researcher failed to reject the null hypothesis even though there was an improvement in the mean of the children on their CAT Reading scores after the intervention program, because, this change was not statistically significant. The intervention program did not make a significant change in the academic skills of the children. This is based on the difference of the CAT Reading test score in the pretest year of 1991 when it was compared to the scores for the CAT Reading test in 1992, the latter of which was taken after one year of the intervention program.
Question # 3

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year's CAT Math test?

This question deals with the second area of the study, whether a skills intervention program could improve the physical and/or academic skills of the child. Would there be a statistically significant change in the performance of the children on the CAT Math test after the intervention program?

The results of the CAT Math scores displayed an increase in the average scores. The mean of the group was 3.67 on the 1991 CAT test. The mean increased to 3.70 on the 1992 CAT test. The results of a t test was a value of 1.08. The null hypothesis is not rejected which indicates that the difference is not statistically significant. (Table 6)

<table>
<thead>
<tr>
<th>Table 6: CAT Math Scores after Intervention Program</th>
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<tbody>
<tr>
<td>-------------------</td>
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<tr>
<td>1 1 5</td>
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<td>9 6 2</td>
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<tr>
<td>10 2 5</td>
</tr>
<tr>
<td>11 3 3</td>
</tr>
<tr>
<td>Total Ave</td>
</tr>
<tr>
<td>1991 121 3.67</td>
</tr>
</tbody>
</table>
Null Hypothesis for Question #3

1. There is no difference in the results of the CAT Math test scores before and after the intervention program.

The researcher failed to reject the null hypothesis even though there was an improvement in the mean of the children on their CAT Math scores after the intervention program, because, this change was not statistically significant. The intervention program did not make a significant change in the academic skills of the children. This is based on the difference of the CAT Math test score in the pretest year of 1991, when it was compared to the scores for the CAT Math test in 1992, the latter of which was taken after one year of the intervention program.

Question #4

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by a repeat testing of the child using the identical physical skills screening test?

This question deals with the second area of the study, whether a physical skills intervention program could improve the physical and/or academic skills of the child. Would there be a statistically significant change in the performance of the children on the physical skills test before and after the intervention program?

The results of the physical skills test scores displayed an improvement in the average scores. The mean of the group for the number of physical skills
tests failed was 5.93 out of 9 tests prior to the program. After the year of the intervention program, the group mean dropped to 2.78 out of 9 tests. The results of a t test was a value of 7.29. The null hypothesis is rejected which indicates that the difference is statistically significant. (Table 7)

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</table>

Null Hypothesis for Question #4

1. There is no difference in the results of the physical skills test before and after the intervention program.

This Null hypothesis must be rejected. There was a dramatic and
statistically significant improvement in the physical skills of the children. The intervention program did make a significant change in the physical skills of the children. This is based on the difference of the physical skills score in the pretest year of 1991, when it was compared to the scores for the physical skills test in 1992, the latter of which was taken after one year of the invention program.

**Question #5**

After the intervention program did the child demonstrate an improvement in his/her behavior and attitudes toward his/her schoolwork?

This question deals the second area of the study, whether a physical skills intervention program could improve the physical and/or academic skills of the child. A questionnaire was used for this question and is contained in Appendix A.

*Questionnaire*

The survey was taken by all 16 teachers that had students from their classrooms in the program.

1. Has there been any change in the quantity of classroom problems encountered during your daily academic sessions demonstrated by the children that are involved in the program?

<table>
<thead>
<tr>
<th>Decrease</th>
<th>Problems in classroom</th>
<th>68%</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change</td>
<td>Problems in classroom</td>
<td>28%</td>
</tr>
<tr>
<td>Increase</td>
<td>Problems in classroom</td>
<td>4%</td>
</tr>
</tbody>
</table>
Comments on question #1:

A. "They gain a lot of success out there and I think that's carrying over into their daily work habits...They seem to concentrate a lot better especially after coming from that program and getting back into to their work"

B. "There have been improvements in writing, organizational skills, reading, listening, and attentiveness."

C. "I have one little guy - the last two chapter math tests have been perfect. I would never have guessed it.

2. Has there been a recognizable change in the physical skills demonstrated by the children that are involved in the program?

| Decrease | Physical skills | 9% |
| No change | Physical skills | 4% |
| Increase | Physical skills | 84% |

3. Has there been any change in the social and emotional behavior demonstrated by the children that are involved in the program?

| Decrease | Social Skills | 7% |
| No change | Social Skills | 27% |
| Increase | Social Skills | 66% |

Comments on question #3:

A. "...they no longer say, "I can't do it". We give them a new task to try and I never hear "I can't" any more. It's always "I want to be first."

B. "I've seen self-esteem improve."
C. "Students are more confident."

D. "Students are trying harder."

4. Has there been any difference in the daily attendance to your class demonstrated by the children that are involved in the program?

<table>
<thead>
<tr>
<th>Change</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decrease</td>
<td>1%</td>
</tr>
<tr>
<td>No change</td>
<td>99%</td>
</tr>
<tr>
<td>Increase</td>
<td>0%</td>
</tr>
</tbody>
</table>
CHAPTER FIVE: CONCLUSIONS

The topic of "readiness" for education is as current a topic as any that education faces. Ernest Bayer expressed how current the concept is in his book, *Ready to Learn. A Mandate for the Nation.*, when he quotes President George Bush from his first State of the Union Address (Bayer, 1992, p. xvi):

By the year 2000, he declared, every child in America should start school ready to learn.

If an individual is not "ready" for school then the identification of the problem or problems involved must be as early as possible. This early identification allows earlier intervention which greatly enhances the educational outcome.

Readiness for education is not just a problem of intellectual development. The physical and social aspects of the child's development must also be considered. Evidence to support the interrelationship of intellectual and physical development has been researched and a small amount of that research has been presented in this paper. The work of Gesell and his followers in the developmental school of education continues to demonstrate how the body and the mind must grow together. An extension of the relationship between the body and the mind is that the improvement in the development of the body can have a impact on the intellectual development of the child.
The first purpose of the research was to determine whether a physical skills examination is a valid technique for screening children who are at-risk for learning problems and who demonstrate below average learning skills and development. The first research question of this paper explored that purpose.

**Question #1:**

What is the percentage of agreement between a child's score on the physical skills screening test and the child's academic skills as measured by the CAT testing score for Math and Reading?

**Reading**

The seventy-five percent agreement between the children's scores on the CAT Reading test and their scores on the physical skills tests is very impressive. The sensitivity of the test was eighty percent while the specificity of the test for reading was sixty-three percent. The interpretation of these tests demonstrates that the physical skills testing can correctly screen eight out of ten children who are below average in their reading skills. This can be used as a screening device to locate children of below average reading skills from a class.

**Math**

The percentage of agreement between the physical skills and the math skills was not as high as the reading. The overall agreement between the two test results was fifty-eight percent. The sensitivity of the test for screening
out children who have a below average ability in math was sixty-seven percent. The test's specificity was sixty-six percent. The physical skills testing can accurately screen about two out of three students who are below average in math ability and also those who have average or above math skills. The physical skills testing is not a useful device that can be used to screen children for their math skills because one third of the children are incorrectly grouped.

The second purpose dealt with the intervention program and whether the physical skills intervention program could improve the physical and/or academic skills of the child. Questions two through five were used to explore this purpose.

**Question #2:**

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year's CAT Reading test?

After the intervention program, there was a change in the average for the CAT Reading test scores for the children that were involved in the program. The change, however, was not statistically significant. This could be explained by the fact that the sample size of the research project was too small.

There are many factors that must be considered in a child who has below average reading skills. While the majority of these factors may be more involved in the intellectual development of the child, a physical component must be present, or else the physical skills test would not have been able to screen out children who score below average in their reading skills. The improvement
in all aspects of a child's development, including the physical development, should have an impact on the reading skills of the child.

Question #3:

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by succeeding year's CAT Math test?

After the intervention program, there was a change in the average for the CAT Math test scores for the children that were involved in the program. The change, however, was not statistically significant. This could be explained by the fact that the sample size of the research project was too small.

There are many factors that must be considered in a child who has below average math skills. While the majority of these factors may be more involved in the intellectual development of the child, a physical component cannot be completely eliminated as a factor in that intellectual development. The improvement in all aspects of a child's development, including the physical development, could have an impact on the math skills of the child.

Question #4:

After participating in the intervention program did the child demonstrate an improvement in his/her reading skills as measured by a repeat testing of the child using the identical physical skills screening test?

The physical skills intervention program made a significant improvement in the child's ability to perform those skills as measured by the physical skills
test. It is not surprising that a physical education based program would improve the physical skills of a child. The benefit of improved physical skills will have a tremendous effect on the child as a whole. The self-esteem of the child will rise, as they successfully use the improved physical skills. Peer acceptance should also improve as the child becomes more effective in his/her physical skills interactions within the peer group. The improvements in the physical skills and the improvement in the child's self-esteem will greatly benefit the child.

Question #5:

After the intervention program did the child demonstrate an improvement in his/her behavior and attitudes toward his/her schoolwork?

The qualitative analysis of the program appears to be was excellent. The teachers seem very impressed with the behavioral changes that the students have displayed. An improvement in the social development of the children was reported by the teachers. The children seem to get along better with and are more accepted by their peers. This acceptance greatly decreased the disciplinary problems with the children. Acting out behavior sometimes is an effort to attract attention. If children truly feel that they are accepted by their peers, few children will risk losing that acceptance by exhibiting this type of acting out behavior. The new found confidence that the children have is carried over into their intellectual and social development.
Screening Children for Educational Readiness

The need for a rapid, reliable, and cost effective screening tool to screen for the readiness of children as they enter school is very much in need. The current research has convinced the researcher that any screening tool must consider all aspects of the child, including the child's social, physical, and intellectual development. The study has generated the need for such an instrument.

1. The instrument must be reliable and consistent, giving results that can be trusted. It must be consistent for students from all social and economical classes and from all cultural, ethnic, and racial backgrounds.

2. The instrument must be able to be given in a short amount of time, so that mass screenings of large numbers of children can be performed.

3. The instrument must be inexpensive so that all districts could use the screening tool.

4. The instrument must take into consideration all aspects of the child's readiness, including the child's social, physical, and intellectual development.

Future Research on Physical Skills Testing

Future research should be done on the program in two areas. First, a quantitative prospective study could be done using the physical skills test and the CAT test for Reading and Math. The number of students in the study should be increased, possibly reaching a total number of more than one hundred. Cultural and social aspects of the child's background should be used as
additional variables in the research. The research could study the physical skills test as a screening device. The intervention program as a teaching technique for improving the academic skills of the students could also be researched.

Secondly, a prospective qualitative study could be done. The research would be in a double blind format. The children would be screened out from the class using the usual method of the program. The group of children that leave the class would be split into two groups. Each would serve as the control for the other. One group would be sent to a reading room for the intervention period, while the other group would participate in the actual intervention program. The teacher would be asked to fill out a questionnaire on each child every month. The questionnaire would deal with the social and emotional attitudes of each student. After a three month period, the groups would change activities, with the reading group receiving the intervention program, and the original intervention group being in the reading room. The questionnaires would continue to be filled out by the teacher throughout the school year. At the end of the year the intervention program could be compared to the reading room for the effect of each on the student's social and emotional behavior.

Conclusions

The results have summarized the main points that have been made based on the research. Six points could serve as the basis of any further research in the area of readiness for education.

1. Any screening instrument for the evaluation of the readiness for
education of a child must consider the total child. This includes the social, physical, and intellectual development of the child.

2. The physical skills screening test is an effective and rapid screening instrument for children who have below average skills in reading. It has an excellent sensitivity and an acceptable specificity.

3. The physical skills screening test is not an effective screening instrument for children who have below average skills in math. It has a sensitivity and a specificity that is not acceptable for a screening instrument.

4. The physical skills screening test is an effective screening instrument for children who have below average skills in physical development.

5. The physical skills intervention program is an effective teaching technique to improve the physical skills in the children who were screened out as being below average in their skills by the screening test.

6. There is an improvement in the social skills of the children who are enrolled in the physical skills intervention program as measured by the qualitative evaluations. The children seem to have an improved attitude toward school. The children also seem to get along with their peers better.
APPENDIX A

Questions that were used by the intervention program in their questionnaire.

1. Has there been any change in the quantity of classroom problems encountered during your daily academic sessions demonstrated by the children that are involved in the program?

   Decrease   No change   Increase

   Comments:

2. Has there been a recognizable change in the physical skills demonstrated by the children that are involved in the program?

   Decrease   No change   Increase

   Comments:

3. Has there been any change in the social and emotional behavior demonstrated by the children that are involved in the program?

   Decrease Social Skills   No change   Increase Social Skills

   Comments:

4. Has there been any difference in the daily attendance to your class demonstrated by the children that are involved in the program?

   Decrease   No change   Increase

   Comments:
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Tests

California Achievement Test Scores 1991

California Achievement Test Scores 1992
VITA


In 1977, he earned two Bachelor of Science degrees from Illinois College in Jacksonville, one in Biology and one in Chemistry. He entered medical school at the Chicago College of Osteopathic Medicine and graduated in 1981. Dr. Nelson completed his internship and a residency in Anesthesiology in 1984.

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The final copies have been examined by the director of the thesis and the signature which appears below verifies the fact that any necessary changes have been incorporated and that the thesis is now given final approval by the committee with reference to content and form.

The thesis is, therefore, accepted in partial fulfillment of the requirements for the degree of Master of Arts.

August 24, 1997
Date

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