A comparison of cognitive abilities test scores of second graders from four different preschool backgrounds

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A comparison of cognitive abilities test scores of second graders from four different preschool backgrounds

Abstract
This study focused around a research question involving middle and upper socioeconomic status children: Do public school second graders who previously attended Montessori preschools demonstrate higher cognitive abilities (as measured by the Cognitive Abilities Test) than second graders who attended traditional preschools or did not attend preschool? Although there was a wide variability of scores within each group, t-tests analyses revealed significant differences favoring preschool attenders when compared to those who did not attend preschool, and for Montessori preschoolers when compared to the other groups.
A COMPARISON OF COGNITIVE ABILITIES TEST SCORES OF SECOND GRADERS FROM FOUR DIFFERENT PRESCHOOL BACKGROUNDS

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OF SECOND GRADERS FROM FOUR DIFFERENT 
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ABSTRACT

This study focused around a research question involving middle and upper socioeconomic status children: Do public school second graders who previously attended Montessori preschools demonstrate higher cognitive abilities (as measured by the Cognitive Abilities Test) than second graders who attended traditional preschools or did not attend preschool? Although there was a wide variability of scores within each group, t-tests analyses revealed significant differences favoring preschool attenders when compared to those who did not attend preschool, and for Montessori preschoolers when compared to the other groups.
PURPOSE OF THIS STUDY

In our present society, eighty-five percent of our preschoolers are in some type of daycare or nursery school. Although many studies have been conducted to determine the effectiveness of preschool intervention for lower-income or at-risk children, relatively few studies have been conducted to determine the effectiveness of preschool programs for middle or upper socioeconomic status children. Because many public school systems are currently being pressured to provide programs for all 4-year-olds, one of the most important questions that must be addressed is which early childhood programs are most effective in meeting the needs of young children, and consequently, the needs our society? The research study described in this paper addresses one aspect of the larger question: Do middle or upper socioeconomic status public school second graders who previously attended Montessori preschools demonstrate higher cognitive abilities (as measured by the Cognitive Abilities Test) than second graders who attended traditional preschools, church-affiliated preschools, or did not attend preschool?

HYPOTHESES

This research study will focus on long-term cognitive abilities. One hypothesis is that second graders of middle or upper socioeconomic status who attended formal preschools will score higher on the Cognitive Abilities Test than similar children who did not attend preschool. A second hypothesis is that the second graders who attended Montessori preschools will score higher on the Cognitive Abilities Test than similar second graders who attended other preschools.
DEFINITION OF TERMS

For the purpose of this paper, the following terms are defined to help clarify the intended meanings:

1. Authentic Montessori Preschool Classroom: A classroom that meets all the following criteria: (a) mixed age groupings, (b) a teacher fully certified in Montessori training, (c) a trained assistant, and (d) a wide variety of materials in the areas of (1) practical life, (2) sensorial training, (3) language, (4) mathematics, (5) social studies (with an emphasis on global education, geography, and history), (6) science, (7) music, (8) physical education, and (9) art education.

2. Church-Affiliated Preschool: A preschool that is sponsored by a religious organization, and whose curriculum includes some aspects of religious training.

3. Longitudinal Study: Developmental research which tracks the progress of a single group of subjects over a long period of time.

4. Post-facto Research: Research that does not involve a manipulated independent variable. Subjects are assigned to groups on the basis of characteristics that they already possess, and cause-and-effect relationships cannot be directly established. This type of research can be used to predict outcomes.
LITERATURE REVIEW

AN HISTORICAL PERSPECTIVE: COMMON ROOTS

A review of the development of early childhood education reveals a long and complicated history. The three facets of early childhood education (nursery school, kindergarten, and day care) have some common but also some separate roots, with several important educators having major influences in more than one area. Many prominent writers from within the field of education and some from outside the field have had a profound effect on the way that education for young children is perceived today. Though it is beyond the scope of this paper to describe a complete history, some important contributors will be mentioned, with an emphasis on the history of nursery schools.

Proponents of early childhood education can be traced back as far as Socrates (470-399 B.C.). Socrates' ideas influenced his famous student, Plato (427-347 B.C.), who publicly advocated education for children before the age of six. Plato's student, Aristotle (384-322 B.C.), introduced the idea of individual differences among children. Johan Amos Comenius (1592-1670), a Czech educator, advocated an education designed specifically for children that would accommodate for individual differences. He promoted the idea (as did Aristotle) that children learn through their senses, but Comenius went further by introducing the theory that children pass through developmental stages.

John Locke (1632-1704), an English philosopher with a medical background, believed that children are born inherently good. He advocated the observation of children so that the education system could be tailored to them instead of forcing the children to adjust to the traditional curriculum. Today educators refer to this idea as a "child-centered curriculum". During the 18th century lived another influential philosopher, Jean Jacques Rousseau (1712-1778)
of France. Like Locke, Rousseau perceived the child's nature as wholesome and
good, but apt to be corrupted by adults. Rousseau wrote the book, *Emile*, which
describes a natural method of child rearing based on protection of children as
they "unfold," moving through the stages of development. Heinrich Pestalozzi
(1746-1826), a Swiss educator, combined the ideas of these previously named
philosophers, and actually put them into practice. Pestalozzi professed that
children should learn from experiences rather than depend on an authority to
give them true knowledge. Pestalozzi founded several schools for children and
wrote several books, the most famous being *How Gertrude Teaches Her
Children*, which describes several activities that a mother could perform with
her child. A unique aspect of these activities was that they were developed in
consideration of the child's development, which was a very unusual perspective
for the time.

Another important person in the field of early childhood education was
one of Pestalozzi's students, Frederich Wilhelm Froebel (1782-1825), a German
educator who became known as "Father of the Kindergarten" (Auleta, 1969, p.
19). "Froebel believed that children could and should be taught outside the
home as well as within it and that such education should be provided by trained
teachers" (Elkind, 1987, p. 8). Froebel developed a curriculum for young
children and started a training school for teachers.

THE MONTESSORI MOVEMENT

One of the most important writers in this century was Maria Montessori
(1870-1952), who "laid the foundations for early childhood education as we
know it today" (Elkind, 1987, p. 8). Montessori, Italy's first female physician,
became interested in education for children while working with retarded
children in asylums. With her astute observations of how children learn,
combined with careful study of previous and contemporary philosophers and educators (including Itard and Seguin, who helped develop the field of special education), Montessori designed innovative ideas and learning materials that were so successful that her institutionalized students were able to pass public school examinations. Concerned by the fact that her retarded students could successfully pass examinations created for public school children, Montessori decided to focus her attention on creating a better school curriculum for normal children. Using her keen observational skills developed during her medical training, Montessori developed a complex interweaving of philosophy and method based on observations of how young children actually learn. Many of Montessori's innovations are now standard in all early childhood settings, such as child-sized furniture and cooking and cleaning utensils. Some of her materials and inventions which require professional training of the teacher are used primarily in schools bearing the Montessori name.

Although the Montessori movement expanded and has continued to flourish in many areas of the world, its initial introduction into the United States in the early part of this century was short-lived, due to harsh criticisms by respected American educators including William Heard Kilpatrick, John Dewey, and others. Despite its initial lack of success in the United States, the method was reintroduced in the late 1950s by Nancy Rambush. By that time, many of the original criticisms of Montessori's system had been refuted by findings in educational research. Advocates of Montessori's basic principles include Jean Piaget, Sigmund Freud, Anna Freud, Erik Erikson, J. McVicker Hunt, and several other contemporary philosophers and educators. Piaget, for example, was a strong proponent of Montessori, and served as the Superintendent of Montessori Schools in Switzerland during the 1930s. Anna Freud did most of her observations and research in Montessori schools. Erik Erikson completed a
two-year Montessori training course before combining Freudian and Montessori ideas to form his own theory of child development.

Growth in the number of Montessori schools in the United States has continued steadily over the past thirty-five years, and as of 1992, there are more than five thousand Montessori schools operating in the United States, with a growing number of Montessori classrooms being developed in public schools (Turner, *Montessori Reporter*, Winter 1991, p. 12). Like Froebel, Montessori believed that teachers had to be specially trained. She set up teacher training programs in several countries. "Today, Montessori oriented teacher training is one of the more rigorous early childhood teacher training programs in this country and abroad" (Elkind, 1987, p. 11).

**TRADITIONAL NURSERY SCHOOL MOVEMENT IN THE UNITED STATES**

In the United States, the first infant school was established by Robert Owen in New Harmony, Indiana in 1822. Bronson Alcott had similar ideas, but both men's experiments were short-lived and viewed as too radical for general acceptance during the early 1800s. Several years after these first experiments John Dewey (1859-1952), an American educational philosopher, presented his views which had a great deal of influence on early childhood education. He developed the "project" method which promotes the integration of subjects for meaningful and practical application. Margaret and Rachel McMillan (1860-1931), strong advocates of the benefits of early childhood education, were influential in establishing the American nursery school movement in both England and the United States in the early twentieth century. Most of the first American nursery schools were sponsored by colleges and universities who were motivated by a scientific interest in early childhood education. One of the first five colleges to incorporate a nursery school (created with federal monies
from the Spellman Grant) was Iowa State Teachers' College (now the University of Northern Iowa) in 1922. Unlike the European nursery schools, American nursery schools were primarily established for demonstrating educational methods and for child study rather than for the relief of working mothers and neglected children (Fischer, 1982). Until very recently nearly all nursery schools in the U.S. aimed to serve as a supplement rather than as a substitute for the home. Now, however, with more and more mothers of young children entering the work force, many nursery schools are extending their hours to include a day care component to accommodate family needs.

Another influential educator in the United States was Patty Smith Hill (1868-1946), a dedicated follower of Dewey. An adversary of Susan Blow (1843-1916), who established the first public school kindergarten in St. Louis, Missouri in 1873, Hill was instrumental in developing the curriculum of traditional public school kindergartens, and was also a catalyst for the development of nursery schools. Impressed by the work of Grace Owen (granddaughter of Robert Owen), who was with the McMillan sisters' nursery school in England, Hill invited Grace Owen to speak at Columbia Teacher's College (now Columbia University) in 1921. As a result, Columbia College started a nursery school that same year. Patty Smith Hill subsequently helped develop the forerunner of the National Association for the Education of Young Children (AEYC), currently the most prominent and influential organization for early childhood education in the United States.

Besides philosophers and educators, early childhood education has also been affected by the contributions of medicine, psychology, anthropology, sociology, and all other disciplines that in any way concern the lives and behavior of children. Psychiatrist Sigmund Freud (1856-1939) and his student Erik M. Erikson (1902- ) have been major contributors to early childhood
education, as was Arnold Gesell (1880-1961), an American psychologist who advanced ideas about developmental stages. Perhaps the most widely known author in the field of early childhood psychology, however, is Jean Piaget (1896-1980). Piaget emphasized the importance of development, and of the limits which it sets upon learning. The current movement towards "developmentally appropriate" practices in early childhood programs can be largely attributed to Piaget's theoretical work.

Despite numerous philosophical disputes among experts in the field, nursery schools grew quickly in the United States from 1922 through 1929, expanding from one in 1922 to 28 in eleven states in 1924. By 1928, there were 85 nursery schools in twenty-four states and the District of Columbia (Fischer, 1982). Then came the stock market crash of 1929 and the Depression. In this time of national crisis, the federal and state governments funded the creation and operation of many nursery schools. During the year 1933-34, a total of 2,979 emergency nursery schools were established, with an enrollment of 64,491 children. The following year, over 72,000 children were served by U.S. nursery schools (Fischer, 1982). Federally funded nursery schools continued to flourish until the end of World War II. When the war ended, so did government funding for nursery schools, accompanied by national propaganda to persuade women to leave the work force to make jobs available for returning soldiers. This situation provided a major setback in the American nursery school movement, for virtually the only nursery schools that survived were private schools aimed at providing supplemental experiences for middle or upper income level children. This trend continued until the creation of the Head Start Programs of the mid-1960s. Head Start, founded as compensatory nursery schools for low income or at risk children aged 4-5, was a part of President Johnson's War on Poverty Program. Much research has been conducted on these programs, both short-
term and longitudinal. Despite results indicating that Head Start children receive tremendous life-long benefits, our nation has been slow to realize or respond to its impact. As a result of inadequate funding, only an estimated twelve to seventeen percent of qualified children are able to attend Head Start Programs (Children's Defense Fund, 1990).

Studies to determine the effectiveness of middle and upper income nursery school programs have been less common than studies of programs for lower income children. Over the years, several different types of preschools have developed from the array of ideas promoted by the before mentioned leaders in the field as well as others. In addition, new ideas continue to be developed by current experts such as David Elkind, Constance Kami, Lilian Katz, and others.

A COMPARISON OF RESEARCH STUDIES

MONTESSORI PRESCHOOL RESEARCH

In reviewing more than one hundred studies that have been conducted since 1966 comparing Montessori preschools and other early childhood programs, one of the most evident problems is adequately defining an authentic Montessori program. Even Montessorians do not always agree on the essential elements involved. Diversity in the field is not a new problem, as evidenced by a statement made by Mary Blackburn in 1915, "The disciples of Dr. Montessori seem to have divided themselves into two schools—those who are enslaved to the letter of their leader's teaching, and those who follow it to the best of their ability, in spirit and in truth" (Montessori Experiments in a Large Infants' School, p. 9). Modern Montessorians generally do agree, however, that an authentic Montessori class has mixed age groupings, a teacher fully certified in Montessori
training, a trained aid, and a wide variety of materials in the areas of practical life, sensorial, language, mathematics, social studies (with an emphasis on global education, geography, and history), science, music, physical education, and art. Unfortunately, a great many of the research studies have been done with classrooms in which one or more of these essential elements was missing (i.e. Karnes, 1969; Stodolsky, 1970). For example, more than 20% of these studies were conducted with classes that had teachers that were not certified (i.e. Miller and Medley, 1984; Marashiello and Prusso, 1978). Another problem is that some of the studies did not adhere to accepted professional standards for conducting research, for example providing a control for confounding factors (i.e. Hall, 1980). A third problem is that some of the researchers had very little understanding of Montessori's philosophy or materials. This caused them to miss valuable data or draw incorrect conclusions from their data (i.e. Stodolsky and Karlson, 1973; Tamminen and Weatherman, 1967). A further problem with some of the longitudinal studies in particular is that some of the researchers assumed that all traditional public school education programs are similar in quality. This assumption can easily be refuted merely by comparing the wide variety in standardized test scores from district to district.

Despite the problems acknowledged in the previous paragraph, certain patterns did emerge from the studies. One consensus was that low socioeconomic children benefit from Montessori preschool experience of even a short duration, and that the students' competency increases over time. (Banta, 1968; Johnson, 1965; Karnes, 1983; Levin, 1988; Miller et al., 1970; Miller & Bizzell, 1983; Miller & Dyer, 1975; Sciarra, 1974, 1976; Stodolsky & Karlson, 1970). A longitudinal study by Jane Stallings (1987) showed that at risk boys who attended one year of a Montessori preschool at age 4 were functioning significantly higher academically at age 15 than any of the other boys in the
study (with IQs that averaged 15.3 points higher than boys who attended a DARCEE preschool even though they initially had the same IQ scores in preschool). A study by Dawson (1987) in Houston using the Iowa Basic Skills and Metropolitan Achievement Tests concluded that Hispanic and Black minority students had impressive academic advantages after being enrolled in a Montessori magnet program for one or more years. Although the average scores were still lower than those of white children, the gap between the scores was significantly reduced.

Research studies done with middle socioeconomic status children generally indicate that these children also benefit from Montessori preschool experience. Miller (1970) showed that Montessori children demonstrated more curiosity and fine motor manipulation ability than control children. Miller & Dyer (1975) and Miller & Bizzell (1983) showed Montessori children superior in IQ, reading, and math achievement to control groups. Stodolsky & Karlson’s (1970) results indicated that Montessori children demonstrated an increase in IQ scores comparing favorably to control groups. A 1969 study by Prendergast showed the Montessori children made significantly greater gains in eye-hand coordination than the conventional nursery school children.

Conversely, some studies indicate that attendance in a Montessori preschool is not significant compared to other preschools in measuring IQ scores (Miller & Dyer, 1970); measuring I.Q., reading, and math (Jones and Miller 1979); measuring language (Stodolsky & Karlson, 1970); and measuring I.Q. and self-concept (Griffith, 1971). Karnes did an interesting longitudinal study that was completed in 1978. She noted that in her sample the Montessori children's intelligence test scores were lower than the other groups tested, yet more of the former Montessori students persisted in school and more completed high school than any other group in the study. One of the more famous preschool
comparison studies was done by Bereiter in 1969. He compared two methods, the Montessori method, and the Direct Verbal Instruction method. He used 19 subjects in each program and a control group from the Montessori waiting list. The study lasted six months, with pretests and post tests used to obtain results. The DV children scored higher on the post test. A problem with this study was the small sample and the short duration of the study. A critical factor in this study was what was measured. "Bereiter did not measure what the Montessori program was teaching by the measures he used. The instruments chosen directly mirrored the Direct Verbal instructional tasks" (Boehnlein, 1988).

In 1982, McKinnon, Flieger, and Patterson conducted a study comparing the effects of preschool education on middle class children. Using parent and teacher questionnaires to measure elementary children's abilities, they found no significant differences among the three groups. "They all seemed to function at the same level" (McKinnon et al., 1982). The researchers had two possible explanations for their results. The first possible explanation was that the enriched home environment was more influential than the type of preschool for middle class children. The second possibility was that upon entering public school kindergarten advanced children were held at the same learning pace as their peers with no academic skills, which tended to negate any advantages Montessori children might have had entering public school.

OTHER PRESCHOOL RESEARCH

With the exception of the studies previously mentioned which compared Montessori models with other preschool settings, very little research has been conducted which involved middle or upper income status children who attended either traditional or church-affiliated preschools. Most preschool research has been done with children from lower income levels. Results from
these research efforts are quite impressive. Perhaps the most famous and comprehensive preschool intervention longitudinal study to date is the Perry Preschool Project, which has followed the progress of twelve experimental and control groups for over twenty-five years. Lasting effects of preschool intervention were found. Specifically in elementary school, significantly fewer children who had attended preschool were assigned to special education classes, and fewer children were retained in grade from the experimental group. Preschool attenders also scored higher on fourth-grade mathematics and reading achievement tests than control groups (Schweinhart and Weikart, 1980). In adolescence, former preschool attenders were less likely to be arrested for vandalism, less likely to become pregnant before high school graduation, more likely to graduate from high school, and were more likely to receive post-high school education. Subsequently, adults in these studies who had previously attended preschool earned higher incomes at age 25, had more stable family relationships, and required fewer social and correctional services than non-attenders (Weikart, 1991). These studies strongly indicate that children from lower income families and our society in general benefit from early childhood education. However, since these studies did not include children from middle or upper income families, one cannot assume that all children receive these same benefits from preschool attendance. This study addresses the question of whether higher cognitive abilities can be predicted for middle and upper income status students who formerly attended preschools when compared with similar children who did not attend preschool.
METHOD

SUBJECTS AND DESIGN

This study explored possible relationships between tuition-based preschool attendance and subsequent public school functioning. Because tuition-based preschool programs primarily serve middle and upper income level families, the subjects included in this study were all second graders of middle or upper socioeconomic status in the Cedar Falls, Iowa Public School system. On the basis of ineligibility for the free or reduced school lunch program, one hundred fifty-two students from five public elementary schools qualified for the study. Subjects were divided into four groups according to where they attended preschool during the 1988-89 school year. The four groups were: (1) Montessori, (2) Traditional, (3) Church-Affiliated, and (4) Control Group (those who did not attend a formal preschool program). There were 31 students in the Montessori group, 48 students in the Traditional group, 33 in the Church-Affiliated group, and 40 students in the control group. Subjects were identified by sex to determine if gender might be a significant factor. In total there were scores from 77 girls and 75 boys in the study. The location of the preschools, cost of attendance, number of hour per week that children attended, age groupings, preschool teacher training and years of experience, and the number of years each preschool had been operating were all possible variables that were investigated. Interviews with preschool directors and teachers revealed that all the preschools in this study were well-established programs in residential neighborhoods, and all had been in operation for over five years (actually between six and twenty-three years). All the teachers had teaching degrees in either elementary, early childhood, or special education. Montessori A teachers also were certified in Montessori Education. Montessori B's director
was certified in Montessori Education, but the head teacher, who had not yet
taken the Montessori training, held degrees in elementary and special education.
Of all the teachers, only the Church School A's teacher was a first-year teacher,
and only she and the Montessori B teacher were first-year teachers at their
present schools. (The Montessori B's teacher had formerly taught special
education at the elementary level.) All the other teachers had been teaching at
their present locations for five years or longer.

A vast majority of the preschool classes operated 2 1/2 hours per day,
three days per week for these children (most of whom were four years old at the
time). Two schools, Montessori A and Church School A, had 3-hour sessions.
One difference was found between the Montessori schools and the other schools
in class arrangement. Only the Montessori schools had mixed age groupings
within their classes. However, a significant majority of students in the
Montessori three-day programs were four years old. Although the total average
cost per month for the three-day programs was $51.14, the two schools which
had the highest number of children included in this study, Traditional A and
Montessori B, had tuition fees of $55 and $58, respectively. Montessori A had
the highest tuition at $68 per month, and Traditional B had the lowest fee at $40
per month. The church-affiliated preschool fees ranged from $42 to $50 per
month.

Table 1 shows the breakdown of the number of second graders who
attended each preschool.
Table 1  

Preschool Attendance

GROUP I: MONTESSORI PRESCHOOLS

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>FEMALES</th>
<th>MALES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Montessori A</td>
<td>1</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>Montessori B</td>
<td>15</td>
<td>10</td>
<td>25</td>
</tr>
<tr>
<td>Montessori Totals</td>
<td>16</td>
<td>15</td>
<td>31</td>
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</tbody>
</table>

GROUP 2: TRADITIONAL PRESCHOOLS

<table>
<thead>
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<th>SCHOOL</th>
<th>FEMALES</th>
<th>MALES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional A</td>
<td>17</td>
<td>24</td>
<td>41</td>
</tr>
<tr>
<td>Traditional B</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Traditional Totals</td>
<td>20</td>
<td>28</td>
<td>48</td>
</tr>
</tbody>
</table>

GROUP 3: CHURCH-AFFILIATED PRESCHOOLS

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>FEMALES</th>
<th>MALES</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Church School A</td>
<td>2</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Church School B</td>
<td>7</td>
<td>6</td>
<td>13</td>
</tr>
<tr>
<td>Church School C</td>
<td>6</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>Church School D</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>Church School Totals</td>
<td>19</td>
<td>14</td>
<td>33</td>
</tr>
</tbody>
</table>

GROUP 4: CONTROL GROUP (NO PRESCHOOL ATTENDANCE)

<table>
<thead>
<tr>
<th>SCHOOL</th>
<th>FEMALES</th>
<th>MALES</th>
<th>TOTAL</th>
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<tbody>
<tr>
<td>Control Totals</td>
<td>21</td>
<td>19</td>
<td>40</td>
</tr>
</tbody>
</table>

MATERIALS

Information used in this study included individual raw scores on the Cognitive Abilities Test (October 1991), class lists, and lists of students who qualified for free and reduced lunches. The second grade teachers identified the preschools children attended by polling the children and/or their parents.
Specific information about preschool programs was obtained through telephone interviews of preschool directors.

The Cognitive Abilities Test is a nationally normed standardized test that was first introduced in 1968 but was revised and updated in 1978 and again in 1982. The test measures the development of cognitive skills of children in grades K-3. Specifically the test measures (1) the ability to comprehend oral English, (2) the ability to follow directions, (3) the ability to hold material in short-term memory, (4) the possession of effective strategies for scanning pictorial and figural stimuli to obtain either specific or general information, (5) possession of a store of general information and verbal concepts, (6) the ability to compare stimuli and detect similarities and differences in relative size, position, quantity, shape, and time. The test also measures (7) the ability to classify, categorize, or order familiar objects, and (8) the ability to use quantitative and spatial relationships and concepts (Cognitive Abilities Examiner's Manual, 1983). It should be noted that although the Cognitive Abilities Test is nationally widely used, the validity and reliability scores of the test were not available to this researcher, since neither the principals nor the central administration office had this information. Scores from the Cognitive Abilities Tests that were given by classroom teachers in October 1991, class lists identifying preschools attended in 1988-89, and lists of second graders on the free and reduced lunch programs were obtained from the elementary building principals. Since this was a study comparing scores of middle and upper income students only, scores from students who received free or reduced lunches were deleted. After grouping students and their individual scores according to preschool attended, each group's scores were averaged and statistically analyzed using t-tests to compare gender differences, preschool versus non-preschool, and Montessori versus all other groups.
RESULTS

Table 2 shows the mean and standard deviation for each group, gender, and the interaction of group and gender. The average score for girls and boys was almost identical ($\bar{x} = 72.48$) ($\bar{x} = 72.07$), which revealed no significant difference between girls and boys. The average raw score on the CAT for students who attended Montessori preschools was 74.00 for females and 74.85 for males with a combined average of 74.37. Traditional preschool attenders scored an average of 70.70 for females and 73.14 for males, totaling 72.12 overall. The church-affiliated attenders scored an average of 74.15 for females and 70.93 for males, which averaged out at 72.78 all together. Preschool non-attenders scored an average of 71.42 for females and 69.26 for males, with a combined mean of 70.40. The combined mean for all preschool attenders was 72.9, with the preschool non-attenders averaging 70.4.

Table 2

Analysis of Variance Procedure for Gender Comparison
c=church, d=didn't attend, m=Montessori, t=traditional

<table>
<thead>
<tr>
<th>GROUP LEVEL</th>
<th>N</th>
<th>MEAN</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>33</td>
<td>72.79</td>
<td>7.04</td>
</tr>
<tr>
<td>d</td>
<td>40</td>
<td>70.40</td>
<td>6.07</td>
</tr>
<tr>
<td>m</td>
<td>31</td>
<td>74.39</td>
<td>5.71</td>
</tr>
<tr>
<td>t</td>
<td>48</td>
<td>72.13</td>
<td>7.30</td>
</tr>
<tr>
<td>female</td>
<td>77</td>
<td>72.48</td>
<td>6.37</td>
</tr>
<tr>
<td>male</td>
<td>75</td>
<td>72.067</td>
<td>7.07</td>
</tr>
</tbody>
</table>

GROUP*GENDER F Value = 1.52 Pr > F = 0.21
Table 3 shows that there was a significant difference at 0.05 ($t = -2.08$, $p < 0.03$) between preschool attenders and preschool non-attenders.

Table 3

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>MEAN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>not</td>
<td>40</td>
<td>70.40</td>
<td>6.07</td>
</tr>
<tr>
<td>pre</td>
<td>112</td>
<td>72.95</td>
<td>6.82</td>
</tr>
</tbody>
</table>

For HO: Variances are equal, $F' = 1.26$ DF = (111,39) $\text{Prob} > F' = 0.41$

A final analysis comparing Montessori preschool attenders VS. all other groups found a significant difference (Table 4) in favor of the Montessori children ($x = 74.3)(x = 71.7$) ($t = -1.98$, $p < 0.04$).

Table 4

<table>
<thead>
<tr>
<th>GROUP</th>
<th>N</th>
<th>MEAN</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>not</td>
<td>121</td>
<td>71.74</td>
<td>6.86</td>
</tr>
<tr>
<td>mont.</td>
<td>31</td>
<td>73.39</td>
<td>5.71</td>
</tr>
</tbody>
</table>

For HO: Variances are equal, $F' = 1.44$ DF = (120,30) $\text{Prob} > F' = 0.25$
DISCUSSION

Because this was a post-facto study in which the students were not randomly grouped, no claims about causation can be made as a result of this research. However, this information can be used for predictive purposes. A middle or upper socioeconomic status second grader who attends preschool is more likely to score higher on the Cognitive Abilities Test than a similar student who does not attend preschool. Additionally, a student who attends a Montessori preschool is more likely to demonstrate higher cognitive abilities (as measured on the CAT) than a student who attends another preschool or does not attend preschool. Several other preschool comparison studies indicated that females generally outperform males at this age level except for students who attend Montessori preschools (Stall, 1987; Nauman, 1967; Tatem, 1977; Prendergast, 1969). This current study, however, showed no significant differences between males and females from either traditional, church, or Montessori settings. Although this finding contradicts several other studies involving traditional preschools, for Montessori boys to score as high or higher than Montessori girls is not unusual. To quote Nancy Stall, "We can only speculate that an interaction exists between four-year-old boys' cognitive structure and self-paced, self-correcting materials such as those used in the Montessori preschool program" (Stall, 1987, p. 9). Of course, this does not mean that girls do not benefit from Montessori preschool experiences, but perhaps to receive full benefits girls should begin preschool at age three rather than four, since they generally mature cognitively sooner than do boys (Stall, 1987).

STRENGTHS OF STUDY

In undertaking this study, the researcher had no influence on the scores that the children received, nor were specific children pre-selected to participate.
All scores were included except those listed on the free or reduced lunch list and a few in which the preschool background could not be determined (i.e. student had attended more than one preschool during 1987-88 school year). The Cognitive Abilities Test was given to all second grade children in the district by their current teachers before they knew this study was being conducted. Until they became involved with this study, the teachers for the most part did not even know what preschools the children had attended, since this information was not in the children's records. The preschools included in the study were those that the students had attended and all were well-established, but were not pre-selected by the researcher. The researcher had expected more children from Montessori A to be included, on the basis of the number of students who attend that preschool. According to a subsequent investigation by the school's director, many of the Montessori A children from this particular class either opted for private schools or moved away from the district.

LIMITATIONS OF STUDY

One weakness of this study was that the teacher of the Montessori classes which produced a large majority of the Montessori group was not yet Montessori certified. This factor should have worked against the hypothesis, though. All the other requirements for an authentic Montessori class as described in the literature review were met. Since that time the Montessori teacher has completed the Montessori training, so perhaps a more conclusive study could be undertaken when the current group of preschoolers become second graders.

Another problem with this study is that its design can not be used to establish causation. Ideally, children from the community could be randomly selected to participate in the various preschool programs, and then long-term
results could be recorded and analyzed. A third factor to be considered is that the Cognitive Abilities Test is only one way to measure cognition, and school success is based on much more than just this. Self-esteem, social acceptance, leadership, learning autonomy, creativity, physical abilities, and academic achievement are other important factors involved in school success. Each of these areas needs to be researched to more fully determine the most appropriate preschool curriculums for our young children. However, this study does provide an indication that the formal preschool experiences of children of middle or upper socioeconomic status can help predict cognitive ability functioning (as measured by the CAT) three years later, and that Montessori preschool attenders may have an advantage over the other groups.
REFERENCES


JUDY CONNER, graduate student in Early Childhood Education, University of Northern Iowa; Director/Teacher, Montessori System School, Cedar Falls, Iowa. Certifications: Early Childhood Education, Special Education (Behavior Disorders, Mental Disabilities, Learning Disabilities), Elementary Education, St. Nicholas Montessori Certification.
APPLICATION FOR PERMISSION TO CONDUCT RESEARCH
IN THE CEDAR FALLS COMMUNITY SCHOOLS

Date Sept. 22, 1991

Type this form in duplicate and return to either the Director of Elementary Education or the
Director Secondary Education, Cedar Falls Community Schools, 1002 W. First Street, Cedar Falls, IA
50613.

1. General Information

Applicant's Name: Judy A. Conner
Phone: (319) 266-8181
Address: 2115 Merner Ave., Cedar Falls, IA
Zip Code: 50613

Resident of Cedar Falls? Yes No
Resident of Iowa? Yes No
Cedar Falls Contract Teacher? Yes No
Student Teacher? Yes No

Sponsoring Institution/Agency: University of Northern Iowa

2. Your proposed research project must include the following details:
- Title of Study
- Purpose for pursuing research (thesis, advance degree work, personal information, etc.)
- Description of problem, including hypotheses and statistical treatment
- Specific data required
- Schools to be surveyed (if known)
- Number of pupils to be surveyed
- Number of teachers and other staff members to be surveyed
- Dates research will be conducted (if known)
- Estimated amount of staff and student time required
- An outline of procedures you will follow in distribution, administration, and collection
  of instruments requiring staff or student response

PLEASE NOTE:
1. Do not contact individual buildings until so directed by the appropriate director.
2. This application must be accompanied by one copy of all instruments used in the research.
3. Allow five weeks for review and evaluation of your request. Please understand that the Cedar
   Falls Community Schools have a responsibility for the education of 5,000 students. With
   several colleges and universities in the region, it may not be possible to honor all requests
   because of the many applications.
4. To avoid conflicts in opening and closing school activities, research must be scheduled
   between October 1 and April 1.
5. An interview with the applicant may be necessary.
6. Any news release or story must be cleared through the appropriate director.

I understand that the granting of permission to pursue this research project in the Cedar Falls
Community Schools obligates me to provide three copies of an abstract of findings to the Director of
Elementary or Secondary Education or designated representative, and one copy to each principal of
the building where the project was carried out. At the request of school officials, I agree to
provide them with one complete copy of all findings directly resulting from the study. I further
agree to comply with all conditions described in "Instructions for Requesting Approval to Conduct
Research in the Cedar Falls Community Schools."

Signature of Applicant: Judy A. Conner
Date: 9/22/91

Signature of Sponsoring Professor: [Signature]
Date: 9/24/91

Director of Elementary Education
Date: [Signature]

Director of Secondary Education