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Beginning school age and academic achievement: Another look

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BEGINNING SCHOOL AGE AND ACADEMIC ACHIEVEMENT:

ANOTHER LOOK

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Submitted

In Partial Fulfillment

of the Requirements for the Degree

Specialist in Education

Mary Bridget Cameron

University of Northern Iowa

July 1986

This is to certify that

Mary Bridget Cameron
_____

✓ satisfactorily completed the comprehensive oral examination

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at the University of Northern Iowa at Cedar Falls

on 7/31/86   .

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ABSTRACT

This study examined the effect of beginning school age
on achievement as well as differences in achievement between
boys and girls and the interaction of age and gender on
achievement. The study also examined the relationship
between beginning school age and retention in grade.

The subjects for this study were 227 students who were
enrolled in the kindergarten class of the Cedar Falls
Community School District during the 1981-82 school year.
This group of children was divided into four age groups
according to the Iowa cut-off dates for school entrance. The
overage group consisted of 44 children who were more than 6
years old when they began kindergarten. These students had
been kept out of school for a full academic year by parental
choice or administrative recommendation. The older group
consisted of 76 students who were between 5 years, 9 months
and 6 years at school entry. The middle group was between 5
years, 5 months and 5 years 9 months, and the youngest group
was between 5 years of age and 5 months.

Achievement information was obtained from the cumulative
records. The Iowa Tests of Basic Skills was used to obtain
information on reading, math, and composite grade equivalents
in the second and fourth grades. The Cognitive Abilities
Test, given to each student in the first grade, was used as a

often than their older classmates. There was no advantage to
be realized, from the results of this study, from parents
keeping their children out of school for a year. The
apparent inconsistencies between the performance of the age
groups points up the need for multiple measures of readiness
for kindergarten.

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Entitled:

Beginning School Age and Academic Achievement: Another Look

has been approved as meeting the thesis requirement for the

Degree of   Specialist in Education

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CHAPTER ONE

The Problem

Introduction

Although it is agreed that chronological age is but one
measure of readiness, it is the one easiest to define with
the result that a minimum kindergarten age has become an
agreed upon date. In Iowa, the state guidelines indicate
that a child who has reached the age of five on or before
September 15th may start kindergarten. These guidelines are
typically interpreted as a legal minimum age so that parents
do not start their children before this age. Other
guidelines for starting children in school vary from district
to district or within schools themselves, ranging from a
standardized test of readiness (such as the Metropolitan
Readiness Test) to a series of evaluations by kindergarten
teachers, speech clinicians and audiologists, to a simple
process of presenting a birth certificate and registering a
child at the school office. Therefore, barring exceptional
circumstances, it is usually the parents' decision as to
whether to begin a child in kindergarten at age 5 or delay
entry for a year.

Current informal practice in some school districts in
Iowa has been to encourage parents to delay kindergarten
entry, especially for boys and children with summer birthdays

of either sex, because it has been believed they would have
greater chance for school success and fewer academic problems
if they were allowed another year to mature before beginning
formal schooling. These recommendations have usually been
based on the maturational philosophy espoused by Ames and
Chase (1974) who suggested that unless children were
developmentally ready they would experience failure in
beginning school experiences. Many researchers such as
Donofrio (1977) and Miller and Norris (1967) supported this
view but more recent evidence indicates that chronological
age alone may not be a major determinant of school success or
failure.

For example, Langer, Kalk and Searls (1984) have claimed
that, because of differing rates of development, girls should
be encouraged to begin school earlier than boys since
developmental lag among boys has more frequently led to boys
being retained in grade.

A related issue to the problem of when to properly begin
formal instruction in school is the concept of redshirting.
Although formerly thought of primarily as a technique used to
develop athletes, redshirting in lower elementary grades is a
process by which parents (sometimes upon the advice of
teachers or administrators) decide to withhold their children
from school in order to give them a competitive advantage
over other children. However, red shirting may lead to
unrealistic expectations and excess pressure being placed

upon both redshirted students and their traditionally placed classmates. Furthermore, some authorities have argued that an age span of two and one-half to three years of students in a classroom could create social as well as academic problems (Katz, Raths, & Torres, 1985).

Empirical evidence has indicated that more boys than girls are retained in grade during the elementary years (Rose, Medway, Cantrell & Marus, 1983). Additionally, younger boys and girls have been reported to be retained more frequently than their older classmates (Donofrio, 1977; Langer, Kalk & Searls, 1984). Methodological problems in these studies have raised questions about the interpretation of these results. None of the above mentioned studies accounted for IQ differences in the populations studied. Gredler (1980) and others point out the need for accounting for IQ when dealing with questions of academic achievement and retention.

Dietz and Wilson (1985) noted that local school districts can develop empirical data to assess the validity of these concepts. Such evidence should assist educators as they advise parents on the crucial issue of when to introduce their children to formal schooling. These studies should investigate the relationship between entrance age and later school achievement as well as gender differences and the degree to which redshirting and retention are practiced in the district. Dietz and Wilson found differences in

achievement between boys and girls but no differences among groups of students in three age categoires.

Statement of the Problem

The purpose of this study was to follow the kindergarten class of the 1981-82 school year through the fourth grade to determine if there were achievement differences in second and fourth grades that could be attributed to beginning school age. Students were assigned to four age categories: average (over 6 years old at entry to kindergarten), older (between 6 years and 5 years, 9 months), middle (between 5 years, 9 months and 5 years, 5 months), and youngest (between 5 years, 4 months and 5 years). Differences in achievement between boys and girls were also examined.

Research Questions

This study addressed the following questions:

1) Was there a difference in shcool achievement at grade 2 or grade 4 adjusted for intelligence among the four different age groups of children?

2) Was there an interaction between age and gender of the student that affected school achievement in second and fourth grade?

3) Were younger children retained more often in the primary grades?

4) Were children who were overage (i.e., kept out of school by parental choice or administrative recommendation) more successful in the primary grades than younger children?

Definition of Terms

Maturationalist: a concept of developmental readiness advocated by Gesell and other child development researchers which proposes that a child will not be successful in learning until he has reached a requisite stage of development (Ilg, Ames, Haines, & Gillespie, 1978).

Retention: refers to the repetition for one year of a particular grade level in school (Rose, Medway, Cantrell, & Marus, 1983).

Birthdate Effect: a term popularized by Donofrio (1977) to indicate that children entering kindergarten at younger chronological ages had more school problems than older children.

Overage: for purposes of this study overage refers to students who by parental choice or administrative recommendation were delayed by one academic year in beginning kindergarten.

Significance of the Study

Although parents, educators, and administrators have expressed concern about school readiness, there has been little agreement on how to best determine it. Schools are

left to their own devices and chronological age cut-offs
differ from state to state.

Results of this study will provide administrators with
additional information to assist parents and teachers in
making decisions regarding entry into kindergarten.

Assumptions

1)   It was assumed that the Iowa Test of Basic Skills
and Cognitive Abilities Test provided valid estimates of a
student's abilities and academic achievement.

2)   It was assumed that the students were exposed to
comparable educational opportunities even though there were
several teachers at each grade level at seven separate
elementary schools within the district.

Limitations of the Study

This study was limited in its generalizability since the
sample population represented few minority children and a
moderately narrow range of socio-economic groups. The Cedar
Falls school district serves 4,900 students in grades
kindergarten through twelve. Private and parochial school
students, and those students requiring special education
classrooms were not represented in the study.

Also, since only one student in the study started school
at an earlier than legal age in the state of Iowa,
implications cannot be drawn regarding progress students may

have made or academic difficulties they may have encountered
had they started school at an earlier age.

CHAPTER TWO

Review of the Literature

This review includes a definition and description of readiness for learning and a review of research on chronological age and academic achievement including gender differences. Finally, the issue of retention, and its related concept--redshirting--will be discussed.

Readiness

Readiness, sometimes referred to as developmental readiness, describes a set of physical, intellectual, and social skills which are prerequisites for successful learning. According to Gordon (1982), there are at least three differing views of readiness:

The nativists assume that readiness is principally a biological function and one must wait for the appropriate chronological period before the organism is ready for any given activity. The environmentalists assume that readiness is largely a result of matching reinforcement contingencies with the needs of the organism, although they also realize that one cannot expect individuals to perform certain physical acts if they are insufficiently prepared biologically. The

cognitive-developmentalists assume that if the genetic

and environmental conditions are appropriate, children

will be ready to perform, provided the children also

perceive the situation appropriately. (p. 1532)

Many school districts use some sort of screening device

(such as the Gesell Screening Test) to determine if entering

kindergarteners would profit from another year out of school

or would benefit more from beginning school. May and Welch

attempted to test the developmental placement theory in their

1984 study. Two hundred twenty-three children, who had

participated in a developmental screening program using the

Gesell Screening Test, were placed in groups according to the

scores they received on the screening instrument. Those

students who obtained a Developmental Age of 4.5 or less

(indicating developmental immaturity) were placed in either

the "buy a year" (BAY) group or "overplaced" (OP) group. The

students in the BAY group were recommended by the school's

staff to spend an extra year in kindergarten.

The students in the OP group had also been recommended

for the extra year in kindergarten, but by parental choice,

had not taken the extra year. The third group of students,

who had tested as developmentally mature, was designated

"traditional" (TR) and were placed in the same kindergarten

classes as the OP students. Reading and math scores on the

New York State Pupil Evaluation Program in third grade and

scaled scores on the full battery of the Stanford Achievement

Test in the second, fourth, and sixth grades were recorded for each student. Results indicated that TR students achieved significantly higher scores on the Pupil Evaluation Program than did the BAY or OP students, but there was no significant difference in the scores of BAY and OP students on this measure. On the Stanford Achievement Test battery there was a significant difference between the TR and BAY students but no significant difference between the OP and Bay students nor between the OP and BAY students on this measure.

The authors concluded that despite the extra year in school, the BAY students did not achieve as well as similar students who had not taken the extra year and interpreted this result to be a contradiction of Gesellian philosophy.

This study is an example of an empirical approach to the concept of readiness and its implications for parents. Those parents who decided to reject the advice of those administering and interpreting the screening device appear to have made the correct decision for their children.

In practice, many school districts employ types of screening devices, ranging from those with low validity and reliability to an approach which employs the judgment of experienced kindergarten teachers—one of the better approaches in dealing with readiness.

As in other areas of educational research, opinion, rather than evidence, appears to operate to determine levels

of readiness for entrance to school (Lichtenstein & Ireton, 1984).

Chronological Age

Although the majority of researchers caution against using a single criterion for determination of readiness for school entry, chronological age has been the most common criterion for school entrance. As early as 1843, administrators sought a minimum chronological age, and by 1909 a chronological age of 6 years was legally set as the minimum (Cominsky, 1957). Although there is some variation between states, and although there have been recent attempts to move up the cut-off dates within the year of eligibility (Uphoff & Gilmore, 1985), the most commonly accepted minimum age of enrollment is age five for kindergarten and age six for first grade.

Researchers studying chronological age and achievement typically have used one of two approaches: studying students who, for various reasons, sought early admission to school (i.e., before age five for kindergarten) and those who divided students of normal school age into groups by trimesters or quarters, according to their month of birth.

Carter (1956) studied early school entrants in the Austin Public Schools and sampled 50 underage students, matching them for sex and IQ with similar students. Test scores on the Metropolitan Achievement Test in sixth grade

were used to measure academic achievement and it was found that 87% of the underage children were below the average scholastic achievement of normal age classmates. The study was typical of early studies on this topic in that reasons for early entrance of these students were not consistent. In the case of this study, reasons included the belief that the student was accelerated for age, and the fact that there was no space for the student in kindergarten, but there was space in first grade.

A more recent attempt to measure effects of early admission was reported by Spillman & Lutz (1985). The sample consisted of 54 students who had entered kindergarten through their school district's early admissions policy. The younger students' ages were, at most, 4.8 years while they were matched with students whose chronological ages ranged from 4.9 to 6.4 years. Achievement measures for both groups of children were the Santa Clara Developmental Inventory (SCDI) which assessed motor coordination, visual motor development, visual perception, visual memory, auditory perception, auditory memory, language development, and concept development, and the Draw-A-Person Test (DAP). The main effects and interactions of age and sex on the eight component areas of the SCDI and the number of body parts on the DAP were analyzed with two-way analyses of variance. The results indicated no significant differences in the two groups of students. An important difference in the design of

this study is that the younger students in this study met specific requirements for early admission, in this case, a minimal score of 4 years and 9 months on the Developmental Indicators for the Assessment of Learning (DIAL). Spillman and Lutz concluded that those students who met such early entrance criteria could, indeed, successfully compete with older students.

Davis, Trimble, and Vincent (1980) compared early and "regular age" entrants to first grade in Kentucky schools. This study is often mentioned in the literature as an example of how poorly younger students do. In this study, students who were six by September first of their first grade year (as compared with those who were five at the same point in their grade) achieved significantly higher scores in the Comprehensive Test of Basic Skills in reading, language, math, and total score in first and fourth grades, but only in reading in the eighth grade. There appeared to be several methodological problems with this study, however, most notably a lack of control for IQ differences, lack of representation from large, urban school settings, and inability to determine whether students were in first grade for the first or second time.

Braga (1971) reviewed the literature on early admission and concluded that, despite unresolved questions on criteria to be used to decide eligibility for early admission and issues regarding social and emotional development of children

admitted to school earlier than their classmates, on the whole, children who are admitted early do as well as, or better than, their older classmates. In addition, although over 50% of school superintendents polled favored early admission, only 20% of all school systems allowed the practice. He concluded that opinion, rather than evidence, influenced admission policies.

Another common design for studies on the effect of chronological age on academic achievement is the use of groups within the normal age range for school entrance. Commonly, students are divided into groups based on the number of months (older, middle, or younger) compared with their classmates.

Langer, Kalk, and Searls (1984) undertook a study which investigated academic achievement and age at entry into first grade and ages relative to classmates. The sample used in their study included only those students who entered first grade and progressed through school at the normal rate for their school district. The birth month of each student was compared to the legal entry age in effect at the time the student would have entered first grade and students were classified as normal, advanced, or retained. The predictor variables included class age, relative age, sex, parental education, home environment, region, and type of community. The data was analyzed by stepwise multiple regressions, with relative age and class age entered first. <u>National</u>

Assessment of Educational Progress data in reading, mathematics, and science were the dependent variables. Results of the statistical analyses indicated that older Caucasian students achieved significantly more at age nine than their younger classmates, but that this trend decreased at age 13 and disappeared by age 17. For Blacks, while the trend did not decrease at age 13, it also disappeared by age 17. These findings were consistent with earlier studies comparing achievement levels of students of different ages by Bigelow (1934), Green and Simmons (1962), and Hall (1963). Langer, Kalk, and Searls (1984) advised clinically screening the youngest of entering students, based on the results of their research. As with several of the earlier studies, no control was present for intellectual ability.

The above studies could be seen as examples of the "birthdate effect"--a term coined by Di Pasquale, Moule, and Flewelling in 1980. In their study of 552 students in Ontario, the incidence of referrals to psychological services was found to be positively correlated with birthdates occurring close to the cut-off dates. The authors generalized, from these findings, to say that younger students, especially boys, were likely to experience more academic problems in school. It should be noted, however, that in place of grades or scores on standardized tests, these researchers used referrals for behavior problems as measures of readiness.

Other researchers have studied the relationship of age
of students and the number of subsequent students identified
as learning disabled. Swartz and Black, as quoted in Uphoff
and Gilmore (1985), noted that in their limited study of
birthdates of children identified as learning disabled in
their school districts, 71% had birthdates in the quarter of
the year from September to November. Diamond (1983) studied
Hawaiian public school students, including all students aged
5 to 20 in the 1979-1980 school year. A relationship between
the month of birth and incidence of learning disability was
found, but the findings were not explained in terms of
immaturity since the highest incidence was not among younger
students. Diamond hypothesized that maternal health during
the critical first trimester of pregnancy and exposure to
communicable diseases.

In a more recent study, Vail and Price (1984) found a
positive correlation between age at entry to kindergarten and
later academic achievement. Their study included all
students who entered kindergarten in 1977, 1978, and 1979 in
a small rural town in southeastern Wisconsin (N = 148).
These students were divided, on the basis of age, into three
groups--late 4's (4.75-4.99), late 5's (5.75-5.99) and in-
betweens (5.00-5.74). The Peabody Picture Vocabulary Test
was employed as a measure of estimation of the student's
academic ability and Stanford Achievement Test and
Metropolitan Achievement Test scores were employed as

measures of the students' actual achievement in school. Results of the study indicated a positive correlation between age and achievement test scores. It should be noted, however, that Vail and Price's "late 5's" group would have been eligible for kindergarten entrance one year earlier than they did enter. As defined in the present study, they could be called "overage" students.

Although the preponderance of studies cited in the literature appear to support the theory that older students are more likely to achieve academic success, Miller and Norris (1967) found conflicting results. Miller and Norris studied fourth and fifth graders in Tennessee schools and divided the groups into early, middle, and late students. Scores on the Metropolitan Achievement Test were used as a measure of school progress and the Lorge-Thorndike Intelligence Test was used to measure intelligence. Additionally, the researchers gathered data on referrals, socio-economic factors, and used a form of the Tuddenhan Reputation Test as further information on student adjustment. Significant achievement differences were noted between the early group and the two older groups at entrance to school, but appeared to diminish after the first grade. In terms of social/emotional adjustment, the older group did less well than either the younger or middle group.

Dietz and Wilson (1985) examined the records of 117 students who were initially enrolled in the West Delaware

school district during the 1978-1979 school year and divided
the students into three groups by age, with the older group
having a mean age of 71 months, the middle group having a
mean age of 66 months, and the younger group having a mean
age of 62 months at the time of kindergarten entry.
Kindergarten readiness test scores, as measured by the
Metropolitan Readiness Test, standardized achievement test
scores, as measured by the Iowa Tests of Basic Skills, and
group ability test scores, as measured by the Cognitive
Abilities Test, were examined to determine if there were
differences among the three age groups or between boys and
girls. Records were also examined to determine if age was
related to retention in grade. There were no significant
differences on readiness scores among the age groups or
between boys and girls. There were no significant
differences noted among age groups for second grade ITBS
reading, math, or composite scores, but boys scored six
months lower than girls in reading and four months lower on
the composite score. In the fourth grade, significant
differences were noted only in the composite score, where
boys scored six months lower than did girls. There were no
significant interactions between age and gender. Of the ten
students who were retained at a later date, three were in the
youngest group, six in the middle group, and one in the
oldest group. These results indicated that there appears to
be little or no effect on academic achievement or retention

that could be attributed to the birthdate of a student. A
further finding from the study is that those students who
were retained at a later date were not necessarily the
younger students.

This type of well-controlled district-wide study, which
isolates the issue of chronological age as the factor to be
considered, gives valuable empirical evidence upon which to
base recommendations for school entrance.

Mental Age or IQ as a Criteria for Admission

Although chronological age has been the most widely used
criterion for school entrance, mental age or IQ has often
been considered as an alternative. An early study by Bigelow
(1934), of 88 children who were under six years of age when
they entered first grade led to the recommendation that a
mental age of at least six years and four months was
necessary for success in first grade.

Other studies have focused on the necessary mental age
to have success in learning to read. Although types of
reading instruction and quality of teachers were
methodological problems, Gates (1937) found that, depending
upon the amount and quality of instruction, the mental age
requirement for successfully learning to read ranged from a
low of 5.0 years to a high of 7.0 years.

As with the issue of chronological age, research has
indicated that mental age alone should not be considered as

the single factor in determining school entrance. Hedges (1977) reviewed the literature on mental age and found that it was most useful to consider mental age as a criterion in individual cases where there was a question of whether the student could benefit from more help.

The issue of IQ as a criterion for school entrance has been considered along with the concept of mental age. Many studies concentrate on those students who, because of suspected high IQ, wish to enter school earlier than the traditional chronological age. Birch (1954) completed a study of this issue. Children had to demonstrate an IQ of 130 or higher to qualify for early entrance. Results of the study indicated that these very bright children succeeded as well as their older peers academically, socially, and emotionally.

Gender Differences

As part of studies on other issues, i.e., chronological age, readiness, or mental age/IQ, many of the researchers already mentioned in this review have also investigated the effect gender plays in academic achievement. Ames and Chase (1974) argued that girls mature physically, cognitively, and socially much more quickly than do boys. She further stated that girls should begin schooling earlier than boys.

Carter (1956) and Carroll (1963), among others, found that girls appeared to consistently achieve higher scores on

standardized tests, especially in reading, than do boys.
Braga (1971), while admitting that there appeared to be
significant differences between boys and girls in
achievement, especially in the early primary grades,
cautioned against using these differences to accelerate girls
reasoning--that by fourth or fifth grade boys and girls
achieve parity in academics.

Moore and Moore (1975) and Hall (1963) called for
differential entrance age to school based on gender, a
proposal which would be unworkable, given constitutional
protections. Therefore, as with the variables of
chronological age, readiness, and mental age, gender
differences alone do not appear to be appropriate to use as a
single criterion for entrance to school.

Retention

Retention, the repetition of a grade in school, has been
studied with regard to the issue of relative age.
Maturational theorists have argued that younger children are
at greater risk of being retained than are their older
classmates. A related issue, redshirting, a practice by
which parents voluntarily keep their child out of school for
a year to give the child a competitive advantage, has
developed based on this same theory of the older, the better
(Jones & Sutherland, 1984). Although Donofrio (1977)
recommended retention as a method for improving the success

rate of younger children, there appears to be no empirical evidence to justify this claim.

Langer, Kalk, and Searls (1984), as part of their study on academic success by age, did note an increasing proportion of retained students among younger male students, especially those with December, January, and February birthdays. It is important to note, however, that this study did not control for IQ differences.

As already mentioned, Dietz and Wilson (1985) did not find younger students to be retained more frequently than their older classmates, although the sample size was small. Once again, as with the other variables described in this review, determining entrance age in response to the fear of the student's being retained, does not seem a practical approach.

Although the issue of the most beneficial entrance age has remained controversial, it appears that opinion, rather than empirical evidence, has influenced the practice of local school districts. Specifically, although most theorists agree that there should be no single criterion for school entrance (Braga, 1971; Langer, Kalk, & Searls, 1984; Zeitlin, 1976), the majority of school districts continue to determine school entrance age by chronological age alone.

CHAPTER THREE

Methods and Procedures

The subjects in this study, the instruments used, and
the procedures followed are described in this chapter.

Subjects

The population for this study was drawn from the 317
students enrolled in the Cedar Falls school district
kindergarten class during the 1981-82 school year. Thirty-
two of these students were retained in grade in their
academic careers in the district. Ninety students were not
included in the study because they did not receive their
entire schooling (kindergarten through fourth grade) within
the Cedar Falls district. Also, parochial and private school
students and students in self-contained special education
classes were not included in the study.

The 227 students were divided into four age groups.
There were 44 students in the overage group (27 males and 17
females), including 17 males and 2 females who were retained
in a grade in school; there were 76 students (38 males and 38
females) in the older group; there were 61 students (26 males
and 35 females) in the middle group; and there were 46
students (18 males and 28 females) in the younger group.

Instruments

Iowa Tests of Basic Skills. The Iowa Tests of Basic Skills (ITBS) is a norm-referenced and criterion-referenced test designed to assess broad general functioning rather than specific facts and content. The ITBS measures skills in reading, language, work study, and mathematics in grades kindergarten through ninth. The tests were normed in the fall of 1977 on 12,000 to 18,000 pupils per grade. School districts were stratified by size, region, and community socio-economic status. A total of 165 school districts were sampled. Subsamples of about 3,000 students per grade were retested to provide spring norms. The norming sample was large and representative of both majority and minority pupils. Raw scores on the ITBS are converted to either developmental scores (grade equivalent scores, age equivalent scores, standard scores) or status scores (percentile ranks, normal curve equivalents, stanines). The grade equivalent of a given raw score on a test indicates the grade level at which the typical pupil makes the raw score. The grade equivalent score indicates the approximate grade level competence of a typical pupil.

The within-grade K-R 20 reliabilities of the eleven subtests and total scores are high, generally greater than .85, with many exceeding .90. The K-R 20 reliability of the composite score for each level of the test is .98. The ITBS

is considered to be one of the most carefully constructed achievement tests available (Mitchell, 1985).

Cognitive Abilities Test (CAT). The Cognitive Abilities Test is a revision and extension of the Lorge-Thorndike Intelligence Tests. A single score is provided for the two most elementary levels of the test, Primary I and Primary II. Item selection for the Primary Battery involved administering questions to 250-300 students in each of grades Kindergarten , 1, 2, and 3. The standardization of the CAT occurred in 1977 and 1978 and was done concurrently with the ITBS and Tests of Achievement and Proficiency (TAP). Considerable care was exercised in the norming process. Three major stratification variables were used in the selection of the sample (size of enrollment of school districts, geographic region, and community socio-economic status, determined from the 1970 census). An effort was also made to ensure that the racial-ethnic composition of the standardization sample was representative of the racial-ethnic composition in the country.

The raw score for each pupil was converted into a "Universal Scale Score" following a prescribed procedure and these scores in turn can be transformed into standard age scores (SAS). These are normalized standard scores with a mean of 100 and standard deviation of 16.

The K-R 20 reliability estimates for both the Primary Batteries and the multi-level edition range from .89 to .96. Construct validity was reported by determining correlations of the CAT multi-level batteries with the Stanford-Binet for 550 individuals tested in the 1971-72 school year. Correlations were .65 through . 75. The predictive validity coefficients for mid-year CAT subtests with end-of-year teachers' marks show correlations from .50 through .60 (Mitchell, 1985).

Procedures

Each student who was a fourth grade student in the Cedar Falls school district in the 1985-86 school year was considered for this study. Of the 317 fourth grade students, 90 had not attended the Cedar Falls school district for the full kindergarten through fourth grade academic years and 32 had been retained at one grade. The remaining 227 students were divided into four groups according to their beginning school age. The overage group was over 6 years old when they began school. The older group was over 5 years, 9 months. The middle group was over 5 years, 5 months, and the younger group was younger than 5 years , 5 months, but at least 5 years old before entering kindergarten. Mean IQ's for each group were obtained from the CAT given to each student in the first grade.

The Iowa Tests of Basic Skills scores were also obtained in reading, math and composite grade equivalents. Iowa norms were used and scores were reported for the second and fourth grades. The ITBS was teacher-administered in October of each school year.

Cumulative records were also examined to determine those children who were retained in a grade and those children who were receiving special education resource room help.

Research Hypotheses

1) There is no significant difference in achievement scores in reading, math or composite on the ITBS taken during the second grade among the younger, middle, older or overage groups of students when IQ has been held constant.

2) There is no significant difference in achievement scores in reading, math or composite on the ITBS taken during the second grade among boys and girls when IQ has been held constant.

3) There is no significant interaction between gender and age on the achievement scores in reading, math or composite on the ITBS taken during the second grade when IQ has been held constant.

4) There is no significant difference in achievement scores in reading, math or composite on the ITBS taken during the fourth grade among the younger, middle, older or overage group of students when IQ has been held constant.

5)   There is no significant difference in achievement scores in reading, math or composite on the ITBS taken during the fourth grade between boys and girls when IQ has been held constant.

6)   There was no significant interaction between gender and age on the achievement scores in reading, math or composite on the ITBS taken during the fourth grade when IQ has been held constant.

7)   There is no relationship between retention and the age at which a child began school.

Data Analysis

The first six questions were answered by a two-way analysis of covariance with gender and age group of the child as independent variables and ITBS second and fourth grade scores (grade equivalents) as dependent variables. Intelligence as measured by the CAT was the constant.

Analysis of main effects for gender and age provide answers to hypotheses 1, 2, 4, and 5. Analysis of the interaction of gender and age provide answers to hypotheses 3 and 6. The significance level for this study was $p < .05$.

The question of whether young children were retained more often was analyzed using a frequency count.

CHAPTER FOUR

Results and Discussion

The achievement of the youngest, middle, oldest, and
overage groups of children within a class are compared in
second and fourth grades. At each grade level, the effects
of age, gender, and the interaction between age and gender on
achievement are described. Information on those students
retained in grade is also reported and discussed in this
chapter.

Effect of Age and Gender on Achievement

Second Grade Iowa Tests of Basic Skills Scores.
Hypothesis 1 states that there is no significant difference
in achievement scores in reading, math, or composite on the
ITBS taken during the second grade among the younger, middle,
older, or overage groups of students when IQ is held
constant. The analysis of variance indicated that there were
significant differences among the age groups, F (3,182) =
5.29, $p < .05$ in second grade reading.

A table of means and standard deviations by age is
presented in Table 1. The Scheffe post hoc test shows that
students in the older age group scored significantly higher
than either the middle or younger group in second grade

Table 1

Mean Grade Equivalents and Standard Deviations of Groups of

Different Aged Students on the ITBS-Reading in the 2nd Grade

	n	Unadjusted Means	S.D.	Adjusted Means
Overage	12	2.43	.39	2.53
Older	72	2.67	.68	2.71
Middle	60	2.38	.54	2.38
Younger	47	2.46	.69	2.37

reading. The older age group also scored higher than the

overage group, but not by a statistically significant amount.

Table 2 presented below presents means and standard

deviations by age group for scores in 2nd grade math. There

were no statistically significant differences among age

groups on this measure.

Table 3 presented below presents means and standard

deviations by age group for composite scores in the 2nd

grade. The analysis of variance indicated significant

differences in composite second grade scores, F (3,182 -

4.85, p < .05.

Once again, the older group of students scored

significantly higher than the middle and younger groups.

Table 2

Mean Grade Equivalents and Standard Deviations of Groups of
Different Aged Students on the ITBS-Math in the 2nd Grade

	n	Unadjusted Means	S.D.	Adjusted Means
Overage	12	2.10	.45	2.38
Older	72	2.82	.97	2.87
Middle	60	2.75	.94	2.73
Younger	47	2.65	.75	2.52

Table 3

Mean Grade Equivalents and Standard Deviations of Groups of
Different Aged Students on the ITBS-Composite in the 2nd
Grade

	n	Unadjusted Mean	S.D.	Adjusted Means
Overage	12	2.24	.55	2.46
Older	72	2.74	.80	2.79
Middle	60	2.51	.69	2.50
Younger	47	2.53	.71	2.41

They also scored higher than the overage group but not by a statistically significant amount.

Hypothesis 2 states that there is no significant difference in achievement scores in reading, math, or composite on the ITBS taken during the second grade between boys and girls when IQ is held constant. Results of the analysis of variance showed that gender significantly influenced achievement in second grade math, F (1,182) = 8.83, p < .05. Girls also scored significantly higher than boys in second grade composite scores, F (1,182) = 4.80, p < .05.

Hypothesis 3 states that there is no significant interaction between gender and age on the achievement scores in reading, math, or composite on the ITBS taken during the second grade when IQ is held constant. The analysis of variance indicated no significant interaction between gender and age group on achievement in reading, math, or composite in the second grade.

Therefore, the 1st and 2nd null hypotheses were rejected at p < .05 for reading, math, and composite scores on the second grade ITBS. The 3rd null hypotheses was not rejected. Age did influence achievement in reading and composite on the second grade ITBS and gender influenced achievement in math and composite scores, in favor of girls, on the second grade ITBS.

<u>Fourth Grade Iowa Tests of Basic Skills Scores</u>.

Hypothesis 4 states that there is no significant difference in achievement scores in reading, math, or composite on the <u>ITBS</u> taken during the fourth grade among the younger, middle, older, or overage group of students when IQ is held constant. The analysis of variance indicated that there were significant differences among the age groups, F (3,186) = 4.89, p < .05 in reading scores. A table of means and standard deviations by age is presented in table 4 below.

Table 4 shows that older students scored significantly higher in fourth grade reading than did younger students. Older students also scored higher than middle or overage students, but not significantly higher.

The analysis of variance indicated no significant differences by age group for fourth grade math scores. Table 5 presented below shows means and standard deviations by age group for fourth grade math.

The analysis of variance indicated that in fourth grade composite scores there was a significant difference by age group, F (3,186) = 3.36, p < .05. Table 6 below presents means and standard deviations by age group for this test and shows that the older students scored significantly higher than the younger group. The older group also scored higher than the middle or overage groups, but not by a statistically significant amount.

Table 4

Mean Grade Equivalents and Standard Deviations of Groups of
Different Aged Students on the ITBS-Reading in the 4th Grade

	n	Unadjusted Means	S.D.	Adjusted Means
Overage	12	4.23	.91	4.39
Older	76	4.73	.87	4.77
Middle	60	4.48	.74	4.48
Younger	47	4.43	.90	4.32

Table 5

Mean Grade Equivalents and Standard Deviations of Groups of
Different Aged Students on the ITBS-Math in the 4th Grade

	n	Unadjusted Means	S.D.	Adjusted Means
Overage	12	4.21	.67	4.52
Older	76	4.78	1.19	4.83
Middle	60	4.67	.98	4.67
Younger	47	4.60	1.22	4.44

Table 6

Mean Grade Equivalents and Standard Deviations of Groups of
Different Aged Students on the ITBS-Composite in the 4th
Grade

	n	Unadjusted Means	S.D.	Adjusted Means
Overage	12	4.00	.40	4.25
Older	76	4.33	1.05	4.38
Middle	60	4.10	.88	4.10
Younger	47	4.11	1.01	3.95

Hypothesis 5 states that there is no significant
difference in achievement scores in reading, math, or
composite on the ITBS taken during the fourth grade between
boys and girls when IQ is held constant. The analysis of
variance indicated that there were no significant differences
by gender at fourth grade in reading, math, or composite.

Hypothesis 6 states that there is no significant
interaction between gender and age on achievement scores in
reading, math, or composite on the ITBS taken during the
fourth grade when IQ is held constant. The analysis of
variance indicated that there was no significant interaction

between gender and age on achievement in reading, math, or composite at this grade level.

Therefore, age did significantly influence reading and composite achievement on the ITBS in the fourth grade, so the 4th null hypothesis was rejected, but gender did not significantly influence achievement nor were there significant interactions between gender and age on achievement in reading, math, or composite at the fourth grade level. Thus, the 5th and 6th null hypothesis were not rejected.

Effect of Age on Retention

Hypothesis 7 states that there is no relationship between retention and the age at which a child began school.

There were 32 children who were retained in grade at least once out of the original population of 227. These retained students were not included in the previous analysis. Of the 32 retained children, 17 were boys and 15 were girls. Ten of the retained students (7 boys and 3 girls) were in the older age group, 11 (five boys and 6 girls) were in the middle age group, and 11 (5 boys and 6 girls) were in the youngest age group.

Discussion

Effect of Chronological Age on Achievement. Results of this study indicated that the age at which a child entered

school did affect achievement. At both second and fourth grades the older group of students scored significantly higher on the Iowa Tests of Basic Skills reading and composite tests than did the other three age groups. However, the overage group of students did not perform as well as the other groups when adjusted for IQ differences.

When compared with other studies using only three age groups of children, the present study's findings are in agreement with those of Hamalainen (1952) and Miller and Norris (1967). The results conflict with those of Gredler (1978), who found no significant advantage for the older students in the class or Dietz and Wilson (1985), who found no statistically significant difference among the three age groups studied in terms of achievement.

When only the overage groups are considered, the results of the present study are consistent with those of May and Welch (1984), who found that those students who had been delayed entrance to school by one year did not achieve as well as similar students who began school at the traditional chronological age. The achievement results for the four groups in this study are presented by rank at each subject and grade level in Table 7. Although the overage group did appear to make some gains when mean scores were adjusted for IQ differences, especially when compared with the younger age group, at no subject or grade level were the overage group

Table 7

Ranks of Different Age Groups on the ITBS

2nd Grade Reading		2nd Grade Math		2nd Grade Composite	
Unadj. Mean	Adj. Mean	Unadj. Mean	Adj. Mean	Unadj. Mean	Adj. Mean
older	older	older	older	older	older
younger	overage	middle	middle	middle	middle
overage	middle	younger	younger	younger	overage
middle	younger	overage	overage	overage	younger

4th Grade Reading		4th Grade Math		4th Grade Composite	
Unadj. Mean	Adj. Mean	Unadj. Mean	Adj. Mean	Unadj. Mean	Adj. Mean
older	older	older	older	older	older
middle	middle	middle	middle	younger	overage
younger	overage	younger	overage	middle	middle
overage	younger	overage	younger	overage	younger

the "best in the class." These results contradict the view of Ames and Chase (1974) that those children who are kept out of school for a year will achieve significantly better than their younger classmates.

Effect of Gender on Achievement. Results of this study
showed an effect on achievement by gender. Second grade math
and composite scores were significantly higher for girls than
for boys. However, by fourth grade this advantage
disappeared. These findings are consistent with Langer,
Kalk, and Searls (1984), who also showed the early advantage
for girls disappearing in the upper elementary grades. They
contrast with the results of Dietz and Wilson (1985) who
found that girls were better in second grade reading and
composite scores. These differences also became less
apparent by fourth grade.

Effect of Chronological Age and Gender on Retention in
Grade. This study indicated no difference which was
statistically significant for age group or gender in terms of
incidence of retention in grade. These findings are
consistent with Dietz and Wilson (1985), but conflict with
the findings of Langer, Kalk, and Searls (1984), who found
males more likely to be retained.

The results of this study were not consistent with
earlier studies by Bigelow (1934), Donofrio (1977) and
Langer, Kalk, and Searls (1984), which showed the younger
students in the class were more likely to be retained than
the older students. These results were consistent with the
findings of Dietz and Wilson (1985), which showed that

students in each of three age groups were as likely to be
retained.

CHAPTER FIVE

Summary and Conclusions

Summary

This study examined the effect of beginning school age
on academic achievement as well as differences between boys
and girls on academic achievement and the interaction of age
and gender on achievement. It also examined the relationship
between beginning school age and retention in grade.

The subjects for this study were 227 fourth grade·
students in the Cedar Falls, Iowa, school district in the
1985-86 school year. The students were divided into four
groups according to their beginning school age. The overage
group was over 6 years old when they began school. The older
group was over 5 years, 9 months. The middle group was over
5 years, 5 months, and the younger group was younger than 5
years, 5 months, but at least 5 years old before entering
kindergarten. Academic achievement information was obtained
from the students' cumulative records. Reading, math, and
composite grade equivalent scores on the second and fourth
grade <u>Iowa Tests of Basic Skills</u> tests were obtained.
Information on retention in grade was also obtained from the
students' cumulative records. An IQ measure was also
obtained for each student from the group administered
<u>Cognitive Abilities Test</u> taken during the first grade.

Data were analyzed to determine if age or gender or the interaction between age and gender influences achievement in school. Results indicated that age did affect achievement in the second and fourth grade and that gender affected achievement in the second but not the fourth grade. There was no interaction between gender and age that influenced achievement at any grade level. Achievement differences between boys and girls were significant in math and composite scores at only the second grade level, with girls scoring higher than boys in both areas. The older age group of students scored significantly higher than any of the other three age groups in second grade reading and composite and in fourth grade reading and composite. The overage group did not do as well as the other three groups of students in reading and composite scores at the fourth grade level. Of the 32 children who had been retained in grade, 10 were in the older age group, 11 were in the middle age group, and 11 were in the younger age group.

Conclusions

Results of this study indicated that age did influence academic achievement with the older students consistently performing better than younger children. These results contrast with those obtained by Dietz and Wilson (1985), but in the present study the data were adjusted for IQ. It would appear from the data on retention, however, that younger

children do well enough in school so that they are not considered for retention in grade any more often than their older classmates.

The data on the overage group of students, those who were kept out of school for a year, were the most revealing in the study. Although the overage group did not do significantly more poorly in terms of achievement than any of the other groups, they never were first among the groups in terms of ranking. If one of the reasons given by parents and administrators for redshirting is to give the student a competitive advantage, it would appear, from the results of this study, that this aim has not been achieved.

The apparent inconsistencies between the performance of the age groups points up the need for multiple measures of readiness for kindergarten. Basing entrance on chronological age alone, or on some combination of age and gender, does not appear to be an effective approach to determining how successful students will be in their later academic careers.

There also was no advantage to be realized, from the results of this study, from parents keeping their children out of school for a year.

REFERENCES

Ames, L. B., & Chase, J. A. (1974). Don't push your preschooler. New York: Harper & Row.

Bigelow, E. B. (1934). School progress of under-age children. Elementary School Journal, 25, 186-192.

Birch, J. W. (1954). Early school admission for mentally advanced children. Exceptional Children, 21, 84-87.

Braga, J. L. (1971). Early admission: Opinion versus evidence. Elementary School Journal, 72, 35-46.

Carroll, M. L. (1963). Academic achievement and adjustment of underage and overage third graders. Journal of Educational Research, 56, 415-419.

Carter, L. B. (1956). The effect of early school entrance on the scholastic achievement of elementary school children in the Austin Public Schools. Journal of Educational Research, 50, 91-103.

Cominsky, K. R. (1957). Accent on youth. National Elementary Principal, 36, 24-25.

Davis, B. G., Trimble, C. S., & Vincent, D. R. (1980). Does the age of entrance affect school achievement? The Elementary School Journal, 80 (3), 133-143.

Diamond, G. H. (1983). The birthdate effect: A maturational effect. Journal of Learning Disabilities, 16 (5), 161-164.

Dietz, C. H., & Wilson, B. J. (1985). Beginning school age
    and academic achievement. Psychology in the Schools,
    22, 93-94.

DiPasquale, G. W., Moule, A. D., & Flewelling, R. W. (1980).
    The birthdate effect. Journal of Learning Disabilities,
    13 (5), 4-8.

Dobbs, V., & Neville, D. (1967). The effect of nonpromotion
    on the achievement of groups matched from retained first
    graders and promoted second graders. The Journal of
    Educational Research, 60, 472-475.

Donofrio, A. F. (1977). Grade repetition: Therapy of
    choice. Journal of Learning Disabilities, 10, 348-351.

Gates, A. I. (1937). The necessary mental age for beginning
    reading. Elementary School Journal, 37, 497-507.

Gordon, J. J. (1982). "Readiness" in H. Mitzel (Ed.).
    Encyclopedia of Educational Research. Fifth Edition.
    Macmillan & Free Press, New York. p. 1532.

Gredler, G. R. (1978). A look at some important factors in
    assessing readiness for school. Journal of Learning
    Disabilities, 11 (5), 284-290.

Gredler, G. R. (1980). The birthdate effect: Fact or
    artifact. Journal of Learning Disabilities, 13, 239-
    242.

Green, D. R., & Simmons, S. V. (1962). Chronological age
    and school entrance. Elementary School Journal, 63, 41-
    47.

Hall, R. V. (1963). Does entrance age affect achievement?
Elementary School Journal, 63 (7), 391-396.

Halliwell, J. W. (1966). Reviewing the reviews on entrance
age and school success. Journal of Educational
Research, 59, 395-401.

Hamalainen, A. E. (1952). Kindergarten-primary entrance age
in relation to later school adjustment. Elementary
School Journal, 52, 406-411.

Hedges, W. D. (1977). At what age should children enter
first grade: A comprehensive review of the research.
Florida Educational Research and Development Council.
University Microfilms International.

Hobson, J. R. (1948). Mental age as a workable criterion
for school admission. Elementary School Journal, 48,
312-321.

Ilg, F. L., Ames, L. B., Haines, J., & Gillespie, C. (1978).
School readiness: Behavior tests used at the Gesell
Institute. New York: Harper & Row.

Jackson, G. B. (1975). The research evidence on the effects
of grade retention. Review of Educational Research, 45,
613-635.

Jones, L. D., & Sutherland, H. (1984). Academic
redshirting: A positive approach to grade retention.
Education, 102, 173-175.

Katz, L. G., Raths, J. D., & Torres, R. T. (1985). A place called kindergarten. Report to the School Board of the West Des Moines Community School District.

King, I. B. (1955). Effect of age of entrance into grade one upon achievement in elementary school. Elementary School Journal, 55, 331-336.

Langer, P., Kalk, J. M., & Searls, D. T. (1984). Age of admission and trends in achievement: A comparison of blacks and Caucasians. American Educational Research Journal, 21, 61-78.

Lichtenstein, R., & Ireton, H. (1984). Preschool screening: Identifying young children with developmental and educational problems. Orlando, FL: Grune & Stratton.

May, D. C., & Welch, E. L. (1984). The effects of developmental placement and early retention on children's later scores on standardized tests. Psychology in the Schools, 21 (3), 381-385.

Miller, W. D., & Norris, R. C. (1967). Entrance age and school success. Journal of School Psychology, 6, 47-60.

Mitchell, J. V., Jr. (Ed.) (1985). The Ninth Mental Measurements Yearbook. The University of Nebraska Press.

Moore, D. S., & Moore, D. N. (1975). Better late than early: A new approach to your child's education. New York: Reader's Digest Press. (Distributed by E. P. Dutton & Co., Inc.).

Morphett, M. V., & Washburn, C. (1931). When should children begin to read? Elementary School Journal, 31, 496-503.

Pauly, F. R. (1951). Sex differences and legal school entrance age. Journal of Educational Research, 45, 1-9.

Partington, H. M. (1937). The relationship between first grade entrance age and success in the first six grades. National Elementary Principal, 16, 298-302.

Rose, J. S., Medway, F. J., Cantrell, V. L., & Marus, S. H. (1983). A fresh look at the retention-promotion controversy. Journal of School Psychology, 21, 201-211.

Spillman, C. V., & Lutz, J. P. (1985). Criteria for successful experiences in kindergarten. Contemporary Education, 56 (2), 109-113.

Uphoff, J. K., & Gilmore, J. (1985). Pupil age at school entrance: How many are ready for success? Educational Leadership, 24, 86-90.

Vail, R. J., & Price, G. G. (1984). The relation of kindergarten entrance age to subsequent achievement in the primary grades. Paper presented at Session 26.01 of the American Educational Research Association, New Orleans, LA.

Zeitlin, S. (1976). Kindergarten screening: Early identification of potential high risk learners. Springfield, IL: Charles G. Thomas.

APPENDIX

Mean CAT Scores

Age Group	n	Boys	n	Girls	N	Total
Overage	10	104.6	2	103.5	12	104.4
Older	37	108.0	39	107.6	76	107.8
Middle	25	103.9	35	112.1	60	108.7
Younger	20	112.5	27	111.3	47	111.9
Totals	92	107.5	103	110.9	195	108.9