THE ROLE OF A DEVELOPMENTAL SCREENING IN KINDERGARTEN - FIRST GRADE PLACEMENT

DISSERTATION

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

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Denton, Texas
December, 1986

Sanders, Karen Nordberg, The Role of a Developmental Screening in Kindergarten - First Grade Placement. Doctor of Philosophy (Elementary Education), December, 1986. 99 pages, 8 tables, bibliography, 90 titles.

The purposes of this study were to determine if a kindergartener's developmental stage correlates with subsequent scholastic achievement, to determine whether developmentally younger children who repeat kindergarten attain higher academic achievement than developmentally younger children who do not repeat kindergarten, and to investigate the relationship between head circumference, developmental age, and achievement. Ninety-seven kindergarteners of various ethnicity and socio-economic status were administered the Gesell School Readiness Screening Test to determine developmental age and were followed academically for three years. Head circumference was noted periodically to measure brain growth.

The hypotheses predicted significant positive correlations between developmental age in kindergarten and scores on later achievement tests. Further, it was predicted that children below 5.3 years in developmental age who delayed entrance to first grade would score significantly higher on first grade achievement tests than match-paired promoted students. It was hypothesized that there would be significant correlations

between head circumference growth and (a) gains in achievement test scores and (b) developmental age at kindergarten.

The first hypothesis, tested by Pearson Product Moment Correlations, established the existence of significant correlations between developmental ages of test subjects and their scores on four academic achievement tests. The results indicated that developmental age was a better predictor of achievement test scores than chronological age.

Since only five children in this study were retained in kindergarten, hypothesis 2 was analyzed descriptively. Mean scores on first grade achievement tests were higher for the retainees than for the "at risk" non-retainees.

Hypothesis 3 was tested by stepwise multiple regression. At the first step, the linear trend between the independent variable, CTBS score, and the dependent variable, ITBS score, was calculated and found to be significant at the .001 level. The addition of head circumference growth to the equation did not add significantly to the prediction of ITBS scores from CTBS scores. There was a significant negative correlation between developmental age in kindergarten and head growth.

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CHAPTER I

INTRODUCTION

Background

"Where do they belong?" asks Dorothy Levenson (14) and others. Each year teachers and administrators conscientiously attempt to find the best placement for students. Social promotion has fallen into such disfavor that it has been banned in the state of Texas (23). Chronological age is now only one of the factors which educators examine when deciding whether to promote or retain a child in school. More and more schools turn to achievement-oriented standardized tests to determine placement, in spite of outcries against using standardized tests for this purpose (20, 22).

Most educators and parents agree that the best place to retain a child who lags behind his peers in school is as early as possible, before the student develops feelings of failure and frustration (2, 4, 5, 6, 7, 8, 10, 14, 15, 17, 19, 24). Some educators (2, 4, 5, 6, 7, 10, 14, 18, 24, 26) argue that readiness screening should include developmental testing. Butler and Marsh (6) found that the Sheppard School Entry Screening Test, a developmental screening device, was an accurate predictor of kindergarten pupils who would later be deficient in reading ability. The Gesell Institute (2, 3, 4, 5, 9, 12) has developed a battery of developmental tests and advocates using them to place children in school. Can these tests, which assign a developmental or behavioral age to each child, accurately predict student achievement? Might there be less student failure if more schools used developmental age as a primary criterion for placement of beginning school children? These are questions addressed in this study.

Statement of the Problem

The primary problem of this study was the correlation of children's performance on the Gesell School Readiness Screening Test with achievement in mathematics and reading/language arts in subsequent primary grades. A secondary problem was the correlation of brain growth spurts (as measured by head circumference) and increases in academic achievement.

Purposes of the Study

The purposes on this study were

1. To determine how a child's developmental stage during kindergarten correlates with his subsequent scholastic achievement;

2. To determine whether developmentally younger children who repeat kindergarten later attain higher academic achievement than developmentally younger children who enter first grade without repeating kindergarten; and

3. To investigate the relationship between head circumference, developmental screening, and academic achievement tests.

Hypotheses

To carry out the purposes of this study, the following hypotheses were tested.

1. There will be a significant positive correlation between the students' scores on the Gesell School Readiness Screening Test (GSRST) in kindergarten and his scores on the:

    a. Learner Based Accountability System (LBAS) mathematics test, administered in the spring of kindergarten.

    b. Comprehensive Test of Basic Skills (CTBS), administered in the spring of first grade.

    c. Learner Based Accountability System mathematics test, administered in the spring of first grade.

    d. Iowa Test of Basic Skills, administered in the spring of second grade.

2. Children identified by the Gesell School Readiness Screening Test as "high risk" who delay entrance to first grade will score significantly higher on achievement tests at the end of first grade than "high risk" children with comparable kindergarten readiness scores (developmental ages) who do not delay entrance to first grade.

3. There will be significant correlations between changes in head circumference and:

    a. Gains in achievement test scores.

    b. Developmental age at the beginning of kindergarten.

Significance of Study

Educators today face a placement dilemma. Social promotion has led to inadequately prepared graduates and has been outlawed in Texas (23). Retention of students after grade one is not supported by research (1, 13, 16, 21). Academic failure and retention may have contributed to the high drop-out rates of the 1940s and 1950s (16). Uphoff and Gilmore report that the long-term effects of overplacement can be the lack of a student working up to his full capacity and an increased probability of teen-age suicide (25).

In most states, children's school attendance by age five, six or seven (23) is mandated by law and the curriculum into which children are placed is becoming increasingly sophistocated (7). Elkind expresses the experience of numerous teachers.

> When school is looked upon as an assembly line, and children as empty vessels to be filled, there is a temptation to speed up the assembly line, to increase production. Why not put in as much at kindergarten as at first grade? (7, p. 48)

The children of legal school age may lag a year or two behind chronological peers in developmental age. Research indicates that children whose developmental pace is slower than average at age five of six will not experience an unusually large developmental growth spurt. They will remain at a developmental age lower than their chronological peers (2, 3, 4, 5, 6, 8, 9). Furthermore, these immature children benefit the most from proper placement early in their schooling (21).

Developmentalists (2, 3, 4, 5, 6, 10, 11, 14, 24) claim that developmental placement is a successful alternative to placement by chronological age with retention after failure. Developmental placement is not only beneficial to the students but should be cost-effective for the school. It enables dollars now spent on special education to be channeled to the truly disturbed or learning disabled child rather than helping push an unready child through an inappropriate curriculum (2, 10, 23). It is intended that this research might add depth and perspective to the important task of "preventive medicine" in education--proper school placement.

Definition of Terms

The following terms have restricted meaning and are operationally defined for this study.

Maturational Readiness. For this study the definition is the same as that used by Clyde Gillespie, Director of the National Institute of Child Development. It is measured by the developmental age score that a student obtained on the Gesell School Readiness Screening Test. Gillespie defines maturational readiness as:

> a state of neuromuscular development or maturation, [that] allows the execution of a task, so that a thought and manual action can be co-ordinated successfully. It allows one to hold the requirements of a task in the mind and plan a successful method of execution....At a given moment in the maturational process the child is functionally ready for one task but not yet ready for a more complex one (8, p. 3).

Developmental Readiness. In this study "developmental readiness" is synonymous with the term "maturational readiness" and is measured in the same way.

School Readiness. This study uses Gillespie's definition of school readiness:

> the ability to shut out extraneous visual and auditory stimuli which are constantly present in the classrooms, and concentrate on the learning at hand. It means putting up with bells, adjusting to different teachers, waiting turns in the lines, boarding the right bus, adhering to rules and schedules, organizing materials, sustaining a possible three to seven hour day, exhibiting emotional resilience, and generally operating in an entirely different space and time orientation from that of home. It means being self-confident, so that thinking energy isn't used up by worrying energy. (8, p. 4)

In this study, school readiness is measured by the *Gesell School Readiness Screening Test.*

High Risk. For this study, a kindergarten student is classified as "high risk" if his score on the *Gesell School Readiness Screening Test* indicates that his developmental age is below 5.3 years. The chronological age of 5.3 years is the minimal age requirement for kindergarteners at the time of the initial testing in this study. (In Texas, students are required to have had their fifth birthday before September 1 to be eligible for public kindergarten. The *Gesell School Readiness Screening Test* was administered in late November of 1983.)

Limitations

When comparing "high risk" students who delayed entrance to first grade with "high risk" kindergarteners who did not delay first grade entrance, every effort was made to match the students as closely as possible on the basis of chronological and developmental ages (obtained from scores on the Gesell School Readiness Screening Test), ethnicity, sex, and socio-economic status. However, there may have been other variables which could account for differences between the matched students. Matching was doubly complicated by the small size of the group which had been retained.

Students whose comprehension of English was too limited to follow test directions were eliminated from this study. Those students who understood English well enough to follow test directions, but not well enough to have developed a rich English vocabulary because English was their second language, were included in the study. The developmental ages of these students were determined by the non-vocabulary sections of the Gesell School Readiness Screening Test.

Every possible attempt was made to measure the heads of subjects accurately. However, because of changes in hair styles some inaccuracy may have occurred.

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CHAPTER II

SYNTHESIS OF RELATED LITERATURE

The philosophy of educators at the Gesell Institute is that "each child is as old as he acts" (2, p. 111). Ames and Gillespie (4, 5, 31, 35) believe that as many as half the children in elementary school today are in the wrong grade; most of these children are overplaced. They suggest to parents that they should be able to answer "yes" to each of the following questions if their child is developmentally ready to begin first grade:

1. Does kindergarten teacher recommend promotion?
2. Will child be fully six when first grade begins?
3. Does he seem as mature as other children his age?
4. Has the "good" behavior of a five-year-old begun to change into a rebellious six?
5. Can he copy a circle, counterclockwise and starting at the top?
6. Can he copy a triangle?
7. Can he copy a divided rectangle, angled line crossing the center line?
8. Does he have good two- or three-finger grip of pencil?
9. Can he print at least his first name?
10. Does he know upper and lower case letters?
11. Can he count to 30?
12. Can he write numbers to 20?
13. Does he know age and month of birthday?
14. Does he know left from right?
15. Can he throw a ball overhand?
16. Can he tie a shoelace?
17. Can he stand on one foot while you count to eight?
18. Can he repeat four numbers after hearing them once?
19. Can he add and subtract within 20? (4, pp. 111-112)

Stages of Development and Brain Growth

Piaget discussed developmental stages of cognitive growth (51). He observed that children from birth to eighteen months were in a "sensory-motor" period. From eighteen months to approximately seven years, the average child does not use logical operations in his thinking, and is in a "preoperational" stage. From seven to twelve years of age, children pass into the stage of "concrete operations," and enter the age of "formal operations" or propositional thinking after approximately age twelve. Piaget stressed that these frames are averages only, and may vary from child to child, and from culture to culture (51). Wadsworth indicates that Piaget views development as being on a continuum, and that educators invite failure by submitting all children to the same curriculum at identical ages (68).

Sylwester (62) and Patterson (48), however, believe that the stages of growth identified by Jean Piaget roughly parallel brain growth which has been researched by Herman Epstein (15, 16). Epstein discovered that brain growth is by no means continuous but occurs in four year cycles in which two years of growth are followed by two years of slower integration. According to Patterson (48), brain growth spurts occur between one to ten months, two to four years, six to eight years, ten to fourteen years and sixteen-plus years. (Arlin, 6, identified this fifth stage.) Each growth spurt occurs in a different section of the brain, and fosters rapid learning of new cognitive functions (58, 62). For example, during the onset of speech, a two-year-old child may move from isolated cries and words to complicated sentence structures. This articulate speech can be achieved only after neural extensions that connect speech centers, have developed (58, 62).

Maturation of nerve fibers begins in the brain at age two and is called myelination. Sinatra describes its importance.

> The development of a fatty sheath is around the nerve fibers, particularly the nerve axons. The axons conduct impulses from the cell body to threadlike projections called dendrites which transmit the coded message to adjoining cell bodies. The myelin sheath acts to facilitate electrical transmission through the neuron, since its axonal fiber is insulated just as an electrical cord is insulated for the transmission of electricity....Then, the corpus callosum and other commissures between the two hemispheres (of the brain) myelinate rapidly from about two until seven years of age, while the fibers from the reticular formation to the hemispheres myelinate rather rapidly from two until twelve and continue maturing until old age. (59, p. 54)

According to Sinatra, myelination and growth rate harmonize. Myelination does not occur at the same time, or at the same developmental rate in various individuals. This fact may help to explain developmental "lags" in reading and writing acquisition (59). Sinatra believes that the physiological myelin stages may correspond with Piaget's stages of cognitive development. He further believes that it is, "extremely critical for educators of young children [to include] visuo-spatial, manipulative activities [that] stimulate myelin growth thereby forcing nonverbal/verbal integration between the hemispheres" (59, p. 55). He recommends a curriculum rich in drawing, painting, body movement, music, sculpture, pictures, maps, flowcharts, and other concrete experience typical of an appropriate kindergarten curriculum. It bears little resemblance to a formalized workbook-oriented elementary school. Sinatra suggests changes in curriculum.

> Educators should disabuse themselves of the notion they're wasting students' time if they don't focus totally on the 3R's. For beginning learners, laying the groundwork for later literacy through varied sensory and motor experiences is the best soil for academic growth. (59, p. 35)

Epstein (16) speculates that Operation Head Start might have experienced more success if it had intervened at a brain growth period, such as age two or six, rather than during a plateau period, age four. Curriculum should match the period of the child's development, regardless of the level of the child's I.Q. Webb (69) found that, although the rate of maturation to a new stage was dependent upon I.Q., children with high I.Q.'s did not tend to reach these stages at a lower age than normal I.Q. children.

Sylwester (62) points out that the average six-year-old child's brain is in an important growth spurt involving an area of the left hemisphere named the angular gyrus. The angular gyrus combines and interprets sensory data received from the brain lobes that process touch, vision, and hearing. Sylwester describes what stimulates growth in this area.

> Reading, writing, speaking, and problem-solving involve activity in the angular gyrus--as do show-and-tell time, manipulative arithmetic, field trips, and other activities that involve the combining of sensory data. [The angular gyrus] is the probable source of intelligent thought. (62, p. 94)

While Herman and Erika Epstein's earliest research was done on cadavers, using brain weight as the measurement of growth, they acknowledge that brain weight is proportional to the cube of the circumference of the head from birth to brain maturation at approximately eighteen years. They consider head circumference to be, "a reasonable means of estimating brain weights...of children" (17, p. 471).

According to Sylwester, significant normative sex differences exist in brain growth patterns (62). For example, six-year-old girls are more apt to be entering a period of brain growth than are six-year-old boys, who usually have this growth spurt about six months later than girls. Sylwester believes that the school's concept of readiness needs to be reconsidered. He also recommends more research in the areas of brain development (62).

McQueen (43) argues against the idea of brain growth spurts and dislikes the assumption that children cannot learn new material at certain ages. Charging that, "Epstein's best data sources do not support his brain growth periodization notion," and Epstein's "careless and misleading" use of data (43, p. 67), he cites Piagetian disclaimers to Epstein's theories:

> Barbel Inhelder has told me that Piaget did **not** believe that Epstein's findings provided a biological basis for the Piagetian stages. In fact, no Piagetian scholar I have contacted (among dozens, including all I could find who were in any way associated with Epstein's work) take that position. And most are very alarmed at the potential implications concerning children's learning capabilities at certain ages. (43, p. 69)

McQueen's arguments against the idea of brain growth spurts are supported by a recent cross-sectional research by Bhulpat (7) who found no evidence of brain growth spurts or of sexual differences in brain growth patterns of elementary school students. She did note that boys' head measurements tended to be larger than girls of the same chronological age.

Fischer and Lazerson (19) cite research in support of Epstein's growth spurt theories, while warning against the automatic assumption that this additional knowledge about the brain is immediately applicable to the classroom. According to Fischer and Lazerson, Epstein used an electroencephalograph (EEG) to measure brain-waves. Brain-waves are affected by cognitive activities such as thinking and problem solving. In studies of brain-wave development, spurts occurred at approximately the same ages as head growth changes and the inconsistencies that arose with the head-growth data seemed to be absent from the brain-wave results (19, p. 70). Fisher and Lazerson conclude:

> In investigations of large groups of subjects, some broad characteristics of the brain do change in spurts during the ages when new periods are beginning. Also, individual children do seem to grow in spurts, and some of the spurts coincide with the start of a Piagetian period. Spurts in head growth for individual children, however, do not appear to coincide with spurts in their cognitive development. Clearly, conclusions about how schools should educate children are not warranted from these findings. They suggest that there is only a broad nonspecific relation between brain development and Piagetian periods. They do not support the argument that children cannot learn new skills during times when their brains are growing slowly. (19, p. 70)

Whether the existence of brain growth spurts is ultimately proved, modified, or disproved, brain researchers are suggesting that educators need to carefully examine a child's readiness for academics. Research on the brain, whether it is pro- or anti-growth spurt theory, does support the beliefs of Gillespie and Piaget that children cannot be "pushed" into the next developmental level. Growth comes from inside the child. Soares and Soares agree with Epstein that "Children exposed to intellectual pressures and inputs for which they have not the proper circuitry may learn to reject such inputs; such a rejection might even result in an inability to take in such inputs later when the circuitry has developed" (16; 60, p. 10). Toepfer (63) urges educators to look closely at early childhood education and children's developmental readiness for specific learning and skill development. If decisions on curriculum and placement, says Toepfer, "are made without the careful study of when young children are ready for experience of cognitive and total learning and growth, we shall have doomed our schools at the middle and secondary grades to the remediation and solution of problems which we ourselves may well have created for children" (63, p. 38). Toepfer attributes the fact that high school boys require remedial reading by as much as six to one more than girls to the fact that girls experience eye muscle development ten to eighteen months earlier than boys during the four to six year period, and yet we force boys to attempt reading as early as girls (63, p. 15).

We know that children can be frustrated when forced to attempt things for which they have no readiness. Elkind (13) cites examples of the joylessness of children who have been forced into formal reading programs too early. His book, The Hurried Child, is one of many current best sellers on childhood stress or threatened loss of childhood (13, 45, 53, 74). Elkind warns, "Hurried children...may not show serious symptoms in childhood but may carry with them patterns of emotional response that can lead to serious adult illness... producing patterns of stress reaction that stay with the young person throughout life" (13, p. 170). It appears that pushing youngsters into a formal curriculum too soon can produce negative emotional, psychological, and physical ramifications without evidence of increased learning (2, 4, 5, 10, 11, 13, 16, 19, 21, 24, 27, 31, 34, 35, 45, 46, 53, 54, 55, 59, 63, 64, 66, 72, 74). The cause of these negative effects may well have a physical, as well as an emotional, basis (4, 11, 13, 15, 16, 20, 36, 51, 53, 55, 58, 59, 60, 62, 63, 66).

Developmental Screening and Placement

Since many educators (2, 3, 4, 5, 10, 11, 13, 15, 18, 20, 21, 22, 23, 24, 25, 30, 31, 33, 34, 35, 44, 46, 48, 49, 51, 59, 63, 64, 65, 66, 72) acknowledge the importance of a child's developmental stage in his "readiness" for beginning school experience, recent attempts have been made to design developmental screening batteries for kindergarten children.

Robert Book (8) designed a predictive index which he hoped would be economical in terms of time and money. He tested 725 suburban kindergarteners with the Slosson Intelligence Test, the Bender-Gestalt and the Metropolitan Readiness Test to determine if there would be a significant correlation between performance on these tests and the reading performance of first and second grade children at the end of the year. Each child was assigned to a "diagnostic category" according to Book's predictive index. A significant correlation was found between the diagnostic category to which the child was assigned and his subsequent reading performance. It is not known, however, what progress these children would have made if they had not been assigned to programs tailored to fit their needs (8).

A five-year longitudinal study by Feshbach, Adelman, and Fuller (18) compared psychometric versus behavioral kindergarten predictors of reading performance and the effect on reading performance of particular school environments (18). Eight hundred fifty middle class children were given the de Hirsch psychometric battery (28, 33) along with a Student Rating Scale to be completed by teachers. The teacher checklist of forty-one classroom behaviors proved to be a better predictor than any of the other screening devices, including the Wechsler Scale of Intelligence. Data of this study indicate that the reading success of equally competent kindergarteners is strongly influenced by the school they attend (18).

Another study that used the de Hirsch battery was funded by the National Institute of Child Health and Human Development. Stevenson, Parker, et al (61) attempted to identify specific pre-kindergarten cognitive abilities which are associated with success in reading and arithmetic during the first three grades in elementary school, and to compare pre-kindergarten teachers' ratings as predictors of reading and arithmetic. Although the study revealed few significant differences between boys and girls on cognitive tasks, it found striking differences in the performance of boys and girls on psychometric tasks given before kindergarten, when girls scored higher than boys. After kindergarten the differences between boys and girls were less significant. Boys and girls made similar gains over the four years in scores on the Wide Range Achievement Test (WRAT) but the average score of boys was consistently below that of girls. These findings are consistent with Epstein's research (15, 16, 62, 63).

Stevenson and Parker (46) noted in the study above that there was stability in a child's level of achievement between the beginning of kindergarten and the end of third grade. This finding is in agreement with Ames and Gillespie (4), who argue that developmentally slower children do not "catch up" as they get older, but only progress in their development according to a normal growth pattern (4).

While the predictive value of several batteries above were high, it would be both expensive and time-consuming to test all kindergarten children routinely with so many interview-method tests. Satz and Friel (56) researched an "abbreviated screening battery" which consisted of eight tests selected from a larger standard battery. The screening battery included:

1. Finger localization
2. <u>Berry Developmental Test of Visual Motor Integration</u>
3. Recognition Discrimination
4. <u>Peabody Picture Vocabulary Test</u>
5. Dichotic Digit Recall
6. <u>Wepman Auditory Discrimination Test</u>
7. Alphabet Recognition
8. Socioeconomic Status

Satz and Friel (56) concluded that validity of the severe high-risk composite score was extremely high. It detected ninety per cent of the children who were in the severe group at the end of second grade. They noted a study by Austin and Morrison which showed that teachers labeled only nineteen per cent of the "high risk" children.

Another study was done by Perry, Guidebaldi, and Kehle (49) of Kent State University, who tried to determine which specific kindergarten competencies were valid predictors of third-grade classroom behavior and achievement. In addition to the <u>Stanford Binet</u> and the <u>Wide Range Achievement Test</u> (WRAT) they used the <u>Sells and Roff Scale of Peer Relations</u> (a measure of social competence) and the <u>Kohn Social Competence Scale</u>, which measures factors of interest and participation versus apathy and withdrawal, and cooperation and compliance versus anger and defiance. Dependency was the only behavior that was a significant predictor of WRAT scores. The authors conclude that high kindergarten academic and social competence is more highly associated with later school success than has been indicated previously. The study provides evidence that,

> prerequisite early academic skills and such social characteristics as initiative, assertiveness, and positive peer relations are associated with later rates of learning and an adaptive approach to learning.... The findings suggest that upon entry to school, a child's intrinsic motivation and peer relations may be of major importance for later success in school.
> (49, p. 450)

These findings coincide with Huebner's (29) assertions that noncognitive characteristics are most important to a child's development. Social competence is also an important part of a child's development.

A recent research on a kindergarten screening battery is the four-year longitudinal study by Butler and Marsh (9) which used the Sheppard School Entry Screening Test (SSEST) to predict reading performance. The SSEST relates to basic theories of child development derived from the work of Gesell, Piaget, Inhelder, Luria, and Vygotsky, all of whom have proposed that a child progresses through stages of development in perceptual, motoric, and linguistic domains (9). Tests were administered to 204 boys and 188 girls in Sydney, Australia. The study revealed that, for four of the five predictor variables, as well as total predictable variance, the relationships between kindergarten scores and second and third grade scores were substantially stronger than between kindergarten and first grade scores. In fact, the kindergarten scores were nearly as predictive of third grade reading level as actual reading performance at the end of first grade. Predictions were superior for students with the poorest reading ability. Again, the developmentally slower children did not catch up with their chronological peers, but lagged even farther behind them by the third grade. Butler and Marsh conclude:

> In summary, the findings of the present investigation demonstrate the validity of the SSEST as an early indicator of reading problems. This screening device provides good predictability across the entire range of reading ability and is particularly effective at forcasting the poorest readers. (9, p. 290)

Catherine Turley (64, 65) took a three-year sample of 97 per cent Anglo upper-socio-economic California pupils who had been identified as lacking developmental readiness for grade one by the Lafayette School District's <u>Primary Evaluation of Pupil Progress</u> (PEPP). The PEPP is a one hour interview battery that includes five out of six sections of the <u>Gesell School Readiness Screening Test</u>, plus parts of the <u>Wide-Range Achievement Test</u> (WRAT), the <u>Stanford Binet</u>, and the <u>Wechsler Intelligence Scale for Children</u> (WISC). Turley compared student achievement in reading and math in grade one. The students were divided into two groups, those who spent an extra year in kindergarten and those who were promoted to grade one after only one year despite recommendations to repeat kindergarten. An additional group of first-graders was randomly selected from the remaining pupils whose readiness for first grade had not been questioned. The group which was retained was, of necessity, older than the non-retained group at the time of grade one testing.

Dr. Turley reports her findings:

> In the total group of developmentally young kindergarteners the retained group was found to score a significant 8.7 months higher in reading in grade one after scores were adjusted for contributions of the covariates and 7.7 months higher in mathematics. While there were more boys than girls in the group, there were not significant differences between the scores of boys and girls. Scores in both reading and mathematics for the retained group were statistically equivalent to the scores of the other pupils whose readiness had not been questioned in kindergarten. Scores for the group for whom recommendation for retention was refused were significantly lower than for the group of other pupils....By the end of grade three, fifty-four percent of those pupils had repeated a grade. (65, p. 12)

Turley (64, p. 92) suggests that the one hour PEPP test could be shortened and still retain validity. Her findings indicate that the most highly predictive sections of the PEPP were those included in the <u>Gesell School Readiness Screening Test</u>, which takes only twenty minutes to administer. The present study seemed to be an appropriate follow-up to Turley's research.

Other differences between Turley's research and this study were:

1. This study used the twenty-minute <u>Gesell School Readiness Screening Test.</u> Turley used a composite one-hour technique.
2. Post-tests: Turley measured achievement in reading in grade one only by administering the <u>Stanford</u>

Achievement Test (SAT). This study used the Comprehensive Test of Basic Skills (CTBS) at the end of grade one, the Learner Based Accountability System mathematics tests in kindergarten and grade one, and the Iowa Test of Basic Skills (ITBS) in grade two.

3. Population: The minimal entry age for Texas children is three months older than for California children. This study was done in the Dallas/Fort Worth Metroplex. Whereas Turley studied upper socio-economic Anglo children from California, this study included lower socio-economic children, as well as children from diverse ethnic groups. Oakland (47) found that many academic readiness screening tests are inappropriate for lower-income or minority children. This study fulfilled a need for research using developmental screening with samples of children of varying race and affluence.

Louise Bates Ames (2) cites a research study done in Weston, Connecticut between 1957 and 1959. During this period the Gesell Behavior Exam was administered to kindergarteners. Thirty seven per cent were fully ready for promotion to first grade, twenty per cent were definitely not ready for promotion, and forty three per cent were only questionably ready for kindergarten and were not ready for first grade promotion at year end. Again, the Weston study, done prior to the current downward thrust of curriculum, showed that students who were not ready in kindergarten did not catch up in grades one or two. In every instance, the Gesell test was able to predict the greatest primary grade successes and the most acute primary grade failures at the beginning of kindergarten.

It is difficult to use the Gesell tests since evaluation is subjective (3). In an attempt to help with standardization, Wood, Powell, and Knight (72) examined the predictive validity of the Gesell School Readiness Screening Test. Test results obtained by certified examiners of eighty-four kindergarten-age children were compared with subsequent school success or "special needs" designations. The study suggested that the Gesell screening procedure which assigns a developmental age to subjects is effective for predicting success or failure in kindergarten. Wood continues:

> Furthermore, it demonstrates that the chronological age of children entering kindergarten within the range of four to six years is unrelated to eventual success or failure. Correct developmental placement would result in between one-third to on-half of all chronologically eligible kindergarten students being recommended developmentally unready for kindergarten. The exact critical age for recommended placement in kindergarten should be calculated locally because average developmental ages of children as well as the developmental level of kindergarten curricula vary across school districts. (72, p. 11)

As a result of research on developmental placement, some school districts in certain states, such as Florida, California, and Oklahoma, are piloting developmental placement programs. Yet these school districts are in the minority. We still hear politicians, educators, and parents saying, "Start the kids younger, keep them longer in school each day (or year), and give them more homework" (13, 52).

Not all research draws the conclusion that developmental placement aids successful scholastic achievement. May and Welch (42) recently completed a cross-sectional study of 223 white children who had been developmentally placed using the Gesell Screening Test. Those children who scored below their chronological peers in developmental age and who were retained a year in the early grades still had the lowest scores on academic achievement tests in reading and math, even though they were chronologically older at the time of testing. May and Welch found no academic reason for early grade retention or developmental placement of children. They did not investigate the social benefits of developmental placement.

Few public schools in Texas are using developmental placement, although some private schools have such programs. Yet House Bill 246 mandates curriculum on the assumption that kindergarteners are capable of behaviors typical of children between five and six years of age. These expectations extend throughout all grade levels. Is it not more important, as Ames (2, 3, 4) suggests, for a child to act like a six-year-old than for him to have a birthday before September 1? If a child has been placed in a curriculum for which he is developmentally unready, he is already unable to cope with the amount and type of school work thrust upon him. Adding more hours and days of inappropriate curriculum will only add to the younger child's frustrations (4, 13). Is developmental placement a sound answer to this problem? Most, but not all, research on the subject is favorable toward developmental placement. Research with specific local populations should answer questions for specific school districts.

In-Grade Retention

Jackson (32), in a review of research on academic retention, cited the main reasons for grade retention as low classroom achievement or poor personal social adjustment in school. He located only three studies that used an experimental design which he considered valid. All three valid studies were very old; the newest was done in 1941! These old studies favored social promotion over in-grade retention. However, they did not include representative samples of schools and may not reflect today's curriculum. Jackson concluded that the evidence of accumulated research is so poor that valid inferences cannot be drawn concerning the relative benefits of social promotion or in-grade retention of students who are below expected grade level performance in academics (32).

Jane Elliget and Thomas Tocco (14) report that recent studies in Pinellas County, Florida indicate that retention of students in early grades did improve school performance, and resulted in an improvement of median percentile rank, from the twenty-third percentile the first time through first grade, to the thirty-ninth percentile when these same students completed second grade. Students retained in earlier grades consistently made greater gains than did the children who were retained in later grades (14).

Lindelow of ERIC (40) also surveyed research on grade retention. His findings agreed with a study by Reinherz and Griffin (54) which showed that children characterized as immature made satisfactory achievement during the year they were retained, if retention occurred early in their school careers. Children retained for reasons other than immaturity were less often helped by repeating a grade of school. Perry (49) found that children with good peer relations and good emotional adjustment excelled more often than less well-adjusted children.

The ERIC survey (40) also described Lieberman's (38) decision-making model of 1980 for in-grade retention, which lists the following factors to consider before retaining a child: physical size, maturity, grade placement, age, self-concept, the child's attitude toward promotion, family factors, the attitudes of teachers and principals toward retention, and the availability of special education services (38). Light's Retention Scale (39) of 1977 is a similar list of nineteen factors that emphasizes a final score to be used as a guideline. Lindelow concludes that the grade placement of a failing student is less important than whether or not his needs as an individual are met wherever he is placed. He suggests "transitional maturity" classes, ungraded classes, and greater individualization in the classroom (40). The Gesell Institute and the National Institute of Child Development have helped school districts establish just such developmental programs and report that they are highly successful (35, 50).

Abidin (1) studied the evidence on retention and noted that a higher proportion of lower-class children are retained than middle-class children of similar ability. He views retention as "discriminatory and noxious" as an educational policy (1, p. 410). Ames and Gillespie, however, explain the retention of lower-class children this way:

> If a bright, somewhat privileged, middle-class child has the misfortune to be overplaced in school or to be visually or perceptually handicapped--as so many are--he may still make it in school because of the advantages a stable, enriched home life can give. The same may not be true, however, of the ghetto child who has the hardship of experiencing any or all of the problems described plus the fact that home and neighborhood may not be able to offer the protection and support that he needs.
> (5, p. 37)

Ames and Gillespie (2, 3, 4, 5) believe that a majority of "failing" children need to be placed in a lower grade or special class, to be given glasses or perceptual training, to receive glandular help, or, in rare instances, psychotherapy. Like Lindelow, Ames and Gillespie suggest ungraded or transitional classes for children with developmental lags (5, 35).

Ames, Gillespie, and Streff (4) list the following indications of overplacement in school:

1. Does the child dislike school?
2. Does he complain that school is too hard?
3. Does he have great difficulty in completing work?
4. Does he seem fatigued after school?
5. Does he seem a "different child" in the summer?
6. Does he have terrible, daily trouble getting ready for school?
7. Has his health deteriorated since school began?
8. Is he sick to his stomach before school?
9. Have routines become worse since school began?
10. Has a normally "good" child become cranky?
11. Are his marks lower than he is "capable" of?
12. Does his teacher say, "He could do better if he tried?"

13. Does he have trouble socially?
14. Does he choose younger friends?
15. Is his teething considerably behind his classmates?
16. Does he find it difficult to behave in class?
17. Does he do desperate things in school, such as scribbling over papers?
18. Does he have trouble waiting his turn?
19. Does he daydream?
20. Has the teacher suggested a lower grade?
21. Does he seem "babyish"? (4, pp. 113-114)

Ames and Gillespie (2, 3, 4, 5) report that developmental screening and subsequent developmental placement result in less need for additional years in school due to student retentions. Developmental placement allows guidance counselors and special education teachers to focus on those truly in need of their services, rather than trying to remediate children who simply began school a year or two too soon (2, 4, 34, 73). Chip Wood's recent study reveals that in a demonstration school, where developmental screening and placement has been used for three years, "special needs" at the kindergarten and primary levels are almost nonexistent, except for clearly diagnosed physical handicaps or "true" learning disabilities (72, 73). It would follow that achievement test scores should rise if all children are optimumly placed at the beginning of their school careers (34, 64). Achievement tests typically assume that a child's developmental stage matches his chronological age--which is sometimes not the case (2, 4, 73). Wood explains his findings.

> In examining the. . ."birthdate effect". . .the present study indicates that chronological age, by itself, is unrelated to success or failure in kindergarten (F=1.28; df=1.82; p=.26n.s.) When considered together, developmental age and chronological age do not predict any better than developmental age alone. (73, p. 7)

To summarize, studies on grade retention are contradictory. Good experimental designs are difficult to find. Very recent studies (14) show that first graders who were retained made gains in academic achievement, while the gains of later retainees were less. Immature, or developmentally young children who had good emotional adjustment were the most apt to benefit from an extra year early in their school careers (24, 31, 38, 40, 54, 73). Lindelow (41) summarizes the beliefs of many developmentalists.

> The sorry truth about the retention/promotion debate is that it seems destined to continue without a clear solution--no matter how much comparative research with good controls is done--unless the graded educational system is significantly altered. The question of retention would not arise in an individualized educational system, and here may lie the key to solving the retention/promotion quandary: accomodating the present educational system to the special needs of low achieving students so they do not continue to fail wherever they are placed. (41, p. 3)

Meanwhile, since the effects of retention are so controversial, and since social promotion is no longer permitted in many schools, and since public schools seem to use less and less individualized education, it seems important to place a child correctly when he first enters school (13, 34).

School Entry Age

In many states public schools have a legal obligation to accept any child who is chronologically five years in kindergarten and any child who is six in first grade. Thus developmental placement at the early stages is hampered for school districts who offer only chronologically-grouped kindergartens and first grades. If such a school recommends placement for a child it may be legally required to provide that type of placement. Thus, school examiners may be instructed to share the results of screening tests cautiously with parents without making any firm recommendations. It is highly unlikely that any school personnel will tell a parent not to send his child to kindergarten, unless the school district provides a pre-kindergarten class. Furthermore, if the screening test measures intellectual age or academic development, rather than developmental age, the immature but bright child will be readily admitted to school, and may experience adjustment problems (4).

Some school districts are utilizing transitional classes and various intervention programs to customize the curriculum to the needs of individual chidren (23). Yet many schools do not recognize or fully understand the real differences in developmental readiness of children deemed legally ready for admission to school. For instance, the New York State Commissioner of Education proposes allowing four-year-olds to register for kindergarten (not pre-kindergarten!) and permitting five-year-olds to begin first grade, planning to graduate by age sixteen (52). Ross Perot, Chairman of the Governor's Select Committee on Education in Texas, supports public school classes for four-year-old children. Would the curriculum be properly adjusted?

Simner's report on three studies of five elementary schools in an urban lower socio-economic area points out that raising the entrance age for beginning school is likely to be less productive than beginning a psychometrically based screening program supplemented by remediation for the failure prone child (57). Wood and Turley recommend a developmental screening prior to school entry (64, 73).

Hedges (27) has done a comprehensive review of research on the entry age for first grade. He makes the following suggestions to legislators and the lay public to increase children's school success:

1. Limit kindergarten and first grade classes to twelve children.
2. Provide every child with a comprehensive physical exam.
3. Give each child a comprehensive developmental exam.
4. Use information for 2 and 3 to draw up a prescriptive program for each child.
5. Increase materials and equipment budgets for primary grades and kindergartens.
6. Free up a part of each kindergarten and primary teacher's work day to enable them to work with curriculum specialists and school psychologists.
7. Upgrade kindergarten and primary teacher preparation programs to six-year programs requiring extensive and intensive carefully supervised internships.
8. Use teacher input to tailor inservice programs.
9. Eliminate property tax as a base for school funding.
10. Make state and federal funding available for long-term research.
11. States need to establish policies on the cruciality of early years, mandating individualized developmental programs for five- to eight-year-olds.
12. Encourage parent participation in schools

(27, pp. 151-154)

Hedges agrees with Ames and Gillespie that the most important advice to parents is to enjoy your child as he is, wherever he is in his development, and don't push your child! (27)

Summary

In summary, research suggests that the developmental stage of a child is important to his success in school. In-grade retention may help some children succeed, particularly if it occurs at the kindergarten or first grade level. Retention beyond first grade is not supported by sufficient research at this time (32). Therefore, educators should make every effort to insure that children are developmentally ready to begin school before placing them in first grade or even kindergarten. Research indicates that certain skills which are unobtainable before developmental readiness is reached, are necessary for success in school (4, 13).

President Reagan is promoting better schools, which his National Commission for Excellence in Education seems to equate with more school days per year, longer school days, and more homework, regardless of the child's readiness for more "seat time" at school. Developmentalists, such as Ames and Gillespie (4) argue that often less school time, not more, is what the developmentally younger child needs.

Research on in-grade retention indicates that the practice of repeating a grade in school can be successful if it occurs very early in a child's school career. It is anticipated that this study will help generate interest among school districts in the much overlooked option of developmental placement. Developmental placement could become a cost-efficient, test-score-raising, and most importantly, child-saving alternative to overplacement, too-late retentions and special education for those who simply began formal schooling too young (34)! Let schools focus on preventing failure and promoting success in school, rather than on remediating what was inappropriately begun.

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CHAPTER III

METHODS AND PROCEDURES

This study was conducted in several phases. First, the pretest instrument, developmental screening, was selected. Second, the school district and specific kindergartens were selected from which to draw subjects for testing and follow-through. Third, the instrument for head measurement was selected. Fourth, the follow-up post-tests were selected to be administered in the spring semesters of kindergarten, first, and second grades. Fifth, pretesting and head measurement began. Sixth, the data from all three years of testing and measurement were recorded and analyzed to test the hypotheses of the study.

Instruments

Pretest

The instrument selected as a pretest for this study was a readiness screening battery, the Gesell School Readiness Screening Test (GSRST) (12). The Gesell Test is a twenty-minute interview style device taken from a larger battery. It requires that the test administrator have some training and experience in working with young children in order to administer and score the test effectively. The test can be scored quickly by a practiced examiner and explained to parents who accompany their child to the testing site.

The GSRST is highly subjective and, according to its authors, not readily subject to the usual standardization procedures. Extensive norming tables appear throughout the book School Readiness (12), and are summarized in the Gesell Developmental Schedules in the Gesell Preschool Test Manual (10, pp. 66-68). When the test has been administered to a child he is assigned an approximate developmental age according to his behaviors. In a letter dated February 21, 1983, Louis Bates Ames of the Gesell Institute made the following comments on the reliability and validity of the Gesell tests:

> Years ago, in a book titled Psychology of Early Growth, Gesell and Thomson did demonstrate that our tests were both valid and reliable. However, this demonstration was made for the infant tests only. . . .these early tests are extremely objective and thus easy to score. . . .
>
> As we move into the older tests, and as we know more about behavior, our evaluations of response become more than just that--evaluations and not scores as such. . . . Thus, our evaluation of test responses, nowadays, has become more a clinical judgment than a mere scoring. This represents new knowledge on our part and an advance in our understanding of behavior; but it has taken our evaluations into a realm where strict scoring is difficult. (1)

Official norms of the Gesell tests are quite old. Nadeen Kaufman, a reviewer for The Ninth Mental Measurement Yearbook, criticizes the lack of evidence of the GSRST's "internal consistency, reliability, stability over time, and empirical validity" (17, p. 607). She describes the normative sample for the Gesell.

> The sample is composed of 40 girls and 40 boys at each 6-month age level from 2 through 6 years, for a total sample of 320 girls and 320 boys. On the positive side, the sample is stratified on the basis of socioeconomic status (parental occupation) in accordance with 1960 census data. On the negative end, however, 'nearly all were Caucasians and all resided in the state of Connecticut.'
>
> (17, p. 607)

Jack Naglieri (17, pp. 608-609), assuming that normative guidelines for the Gesell are based on past experience rather than a carefully constructed standardization sample, fears that the lack of emphasis on psychometric attributes of the GSRST may lead to its misuse or misinterpretation. The Gesell Institute and the National Institute of Child Development offer potential examiners thorough training seminars. Neither institute advocates the administration of one of their tests by anyone who is not thoroughly trained in its techniques. The Gesell people are aware of the possible misuse of their screening materials. Many of the criticisms of the tests cited in the Buros Institute Mental Measurement Yearbooks (4, 17) are answered in the Gesell training sessions.

In the Ninth Mental Measurement Yearbook, Waters states, "According to the authors, it is highly desirable for users [of the GSRST] to develop local norms by accumulating data over several years" (17, p. 611). This study attempted to do this norming for its locality.

Other recent studies which affirm the predictive validity of the Gesell screening program are those of Olson (19), Wood (22) and Turley (21). Both Wood and Olson found that chronological age was unrelated to school success; however developmental age was related to success or failure in school (19, 21, 22, 23).

Developmental screening should not be confused with readiness testing. Developmental screening focuses on a child's growth in areas such as language development, large and small muscle control, eye-hand coordination, and reasoning and number skills. In contrast, a readiness test focuses on current skill achievement rather than on developmental potential (9, 16). According to Gauvin, "When developmental screening is included as a part of a comprehensive system of evaluative and programmatic options, it should contribute to reducing the number of children who experience failure and who need special services in later years" (9, p. 62).

In particular, the <u>Gesell School Readiness Screening Test</u>, a developmental screening instrument, contains these sections:

1. Initial interview
2. Cubes (free play and copying designs)
3. Writing name (or letters) and numbers
4. Copy forms (shape reproduction)
5. Incomplete man drawing
6. Comments by the examiner on testing behaviors

The researcher/examiner in this study has been trained and classified a "qualified examiner" for the GSRST. Training included one full-day workshop, one three-day workshop, and practice testing and grading many tests on children aged three through seven. Special attention was given to noticing small but developmentally significant behaviors of children, such as activity level, what the child did with the nondominant hand, mouth movements, and how the child approached or avoided a task.

Head Measurement

The instrument selected for head measurement to assess brain growth of subjects was a fiberglass measuring tape. The examiner followed the same guidelines as Bhulpat (2) for measuring students' head circumferences, "by placing the tape on the supra-orbital margins and carrying it horizontally around the most prominent part of the occiput" (2, pp. 70, 97).

Post-Tests

Post-tests used in this study were the Comprehensive Test of Basic Skills (CTBS), Form U, Level C, for spring of first grade, the Learner Based Accountability System (LBAS) mathematics tests for spring of kindergarten and first grades, and the Iowa Test of Basic Skills (ITBS), Form G, Level 8, for grades 2.7 to 3.5, complete battery.

Form U of the CTBS received good reviews in the Ninth Mental Measurements Yearbook (17) of the Buros Institute. It was normed on a combined sample of approximately 250,000 students. While they do not quote specific numbers, the reviewers in Buros consider that the reliability and validity of the CTBS is "well established" (17, pp. 381-389). Lorrie Shepard states:

> The developers of the CTBS-U have done the hard work of surveying state and local curriculum guides and textbook

> series to determine which objectives are most often taught at each grade level. . . .CTBS-U is an improvement over the previous form S. . . .A commendable effort has been made to reduce the effect of reading performance in other content areas. . . .For the youngest children, every trick of effective test administration has been included. . . .CTBS-U is one of the best developed standardized achievement test batteries available. . . .The traditional technical features are excellent; multi-level tests, twice a year national standardization samples, and a co-normed aptitude measure represent best measurement practice. . . . (17, pp. 386-389)

According to the CTBS Examiner's Manual, special attention was given to "questions of ethnic, age, and gender bias" during the development and piloting of the test (6, p. 4).

Likewise the Ninth Mental Measurements Yearbook ranks the Iowa Test of Basic Skills (ITBS) as, "overall. . .one of the best standardized achievement test batteries available" (17, p. 720). It was normed in the fall of 1977 on 12,000 to 18,000 pupils per grade. One hundred sixty five districts were sampled; stratified by size, region, and community socio-economic status. Three thousand students per grade took the ITBS again in the spring. The within-grade Kuder-Richardson 20 reliabilities for the eleven subtests and total scores are high, generally greater than .85, many exceeding .90. The K-R 20 reliability of the composite score for each level is .98 (17, p. 719). The test reviewers are somewhat critical of the construct validity of the ITBS, questioning whether the test measures ability or achievement (17, p. 720).

The Learner Based Accountability System (LBAS) tests were developed by school district teachers and consultants. The objectives for mathematics included those mandated by Texas House Bill 246, plus related objectives selected by teachers. Thus, the LBAS tests examined children on the curriculum taught in their classrooms. They were criterion-referenced tests of a minimal proficiency nature. If a child were thoroughly competent in the curriculum tested by the LBAS, he would have been expected to pass all skill areas taught.

Procedures for the Collection of Data

Permission was obtained from a large suburban school district to work for three academic years with approximately 100 children attending three of its elementary schools. The school district was located in the Dallas-Fort Worth Metroplex and included students of mixed ethnic groups. Schools were selected to represent three different socio-economic groups and an ethnic mix of students. Information about the populations of the three schools was obtained by reading the school district's sociometric descriptions of each school (24), and by conversations with teachers, counselors and administrators at each school site. The researcher had formerly taught first grade at two of the schools and therefore was knowledgeable through experience about their student populations. All three schools had half-day kindergartens at the time the Gesell School Readiness Screening Test was administered.

<u>School Populations</u>

School I was a magnet school in a black neighborhood. All twenty-five kindergarteners tested at this school were black. Later they shared classrooms with children of other ethnic groups as "volunteers" were bused from other neighborhoods for grades one through six. According to the 1980 census data on the community of School I, 76 per cent of the residents of this community lived in single family homes while 24 per cent lived in multi-family dwellings. The examiner has seen both types of homes. The single-family homes are small, three bedroom frame homes that were built during the 1950s. Many of the original owners still live there, in spite of the fact that commercial interests have inflated property values in recent years. Apartments are small, crowded, and of a low-rent variety. Census data reported that the median number of persons per household in this neighborhood was 3.2 The maximum level of education attained by adult residents was: elementary school, 17 per cent; high school, 42 per cent; one to three years of college, 22 per cent; and four years of college, 19 per cent. The census listed the following types of households:

(1) Married, with children present, 28%
(2) Married, with no children present, 34%
(3) Male householder/no spouse, children present, 1%
(4) Male householder/no spouse, no children present, 1%
(5) Female householder/no spouse, children present, 11%
(6) Female householder/no spouse, no children, 6%
(7) Non-family household, 19% (24)

The 1986 real estate estimates of average annual income required to buy one of the scarce **single family** residences in this area were in the $20,000 to $40,000 per year range (25). The school district did not report an estimate of annual income for its various communities, but instead listed an economic index for the neighborhood, with the average for the district being 1.0 The economic index of School Community I was .58; its "mobility index", a measure of how frequently people move in and out of the neighborhood, was .51. Both factors were below the district average of 1.00 (24).

The total school population of School I remained stable at about 600, 300 of which were non-white, by integration court order. Of these 300 non-white children who were typical of the kindergarteners included in this study, 37 were eligible for the "free lunch" services in 1985-86. According to informal interviews with school personnel, some neighborhood students at School I had teen-age parents. Some children were raised by a grandmother or other relative. During the language section of the Gesell, one child in this school referred repeatedly to her "daddy" being in jail.

School II was in a neighborhood that was very diverse both ethnically and economically. It included luxury homes with acreage and high-priced condominiums, as well as simple frame homes, similar to those in Community I. Apartments in this neighborhood were adequate but not luxurious. The school had three low-income students on "free lunch" in 1985-86.

Of the twenty-nine kindergarteners tested at this school, fourteen were black, five were Oriental (Chinese, Vietnamese, Korean, and Malaysian), two were from the Middle East, two were Hispanic, and six were white. According to school records, 30 per cent of the families attending this school were headed by a single parent; 70 per cent lived with two parents, 78 per cent lived in single-family residences; and 22 per cent lived in apartments. Real estate estimates of incomes for home-buyers, excluding those renting apartments, in this area ranged from $20,000 to $70,000. The school district listed its economic index at .63 and its mobility index at .69 (24).

According to 1980 census data for the community surrounding School II, 11 per cent of the adults had completed elementary school, 40 per cent finished high school, 24 per cent completed one to three years of college, and 26 per cent had earned college degrees. The following types of households were listed:

(1) Married couple, children present, 31%
(2) Married couple, no children present, 22%
(3) Male householder/no spouse, children present, 1%
(4) Male householder/no spouse, no children present, 2%
(5) Female householder/no spouse, children present, 7%
(6) Female householder/no spouse, no children present, 2%
(7) Non-family household, 35%

The median number of persons per household in 1980 was 2.9 (24).

School III was located in the highest socio-economic area of the three schools in this study. The school district gave it an economic index of .69, which was below district average. The median number of persons per household at the time of the

1980 census was 3.6 The homes in this neighborhood were built between 1974 and 1985. They were considerably larger than the homes in Community I, and not nearly as diverse as the homes in Community II. All homes were built using bricks. Seventy-seven per cent of the residences in this community were for single-family and 23 per cent were for multi-family. According to school records, 9 per cent of the children in this neighborhood attendance area resided with the mother, zero per cent resided with the father, 87 per cent resided with both parents, three per cent resided with a mother and step-father, and one per cent resided with father/guardian/grandparent. Fifty-two of the school's 542 students were "transfers" from outside the attendance area; only 56 per cent of the transfer students lived with both parents (24).

Most of the parents of students in Community III were upwardly mobile professionals. Real Estate estimates of average annual income required to buy a single-family residence in this neighborhood were in the $40,000 to $70,000 range (25). It would be extremely rare for any child in this school to need "free lunch" services. Of the forty three students tested at this school, forty-one were white, one was Oriental, and one was Hispanic. No student was eligible for "free lunch" during 1985-86. The 1980 census data reported that two per cent of the adults in this community had completed only elementary school, 29 per cent had completed high school, 25 per cent had had one to three years of college, and 43 per cent had college degrees (24).

Thus, breaking down the ethnic make-up of the ninety-seven kindergarteners tested, forty seven were white, thirty-nine were black, six were Oriental, two were Middle Eastern, and three were Hispanic. While it was more difficult to judge the exact financial status of their families, data based on 1980 census information from the school district and real estate estimates, suggested that School I (twenty-five children) had a school population with a lower socio-economic average than School II (twenty-nine children). School II had a school population with a lower socio-economic average than School II. Schools I and II were below the school district average in economic index (.58 and .63 on an average district index of 1.0) and School III was slightly above the district economic index average at 1.04. The educational levels of the three communities ranked in the same order as their economic levels (24). The ninety-seven subjects included fifty-one boys and forty-six girls.

Parental permission was obtained from 97 out of a potential 121 children before testing began. Every child who returned his permission slip (Appendix B) was screened with the <u>Gesell School Readiness Screeing Test,</u> including a few children in the English as a Second Language Program. All children tested understood enough English to follow test instructions. For the few subjects with a limited English vocabulary, the examiner used only the non-vocabulary sections of the GSRST to determine that child's developmental age.

This study covered a span of two and a half years, or nearly three academic years. The GSRST was administered in November, when the youngest kindergarteners in the class were 5.3 years of (chronological) age. Any child whose developmental age (DA) was below 5.3 was classified as "high risk" for school success. One learning disabled child in School II scored only 3.4 DA. His score was dropped from the averages to prevent skewing the results. Developmental age scores of the other kindergarten children ranged from 4.3 to 6.2 years at the time of testing. The mean developmental age for children in School I was 5.06 while the mean chronological age in School I was 5.52. In School II, the mean developmental age, excluding the one learning disabled child, was 5.11, while the mean chronological age was 5.73. In School III, the mean developmental age was 5.51 while the mean chronological age was 5.72. The children from lower socio-economic families tended to be lower in both chronological and developmental ages. Fewer children from higher income homes were "at risk." Forty-two children scored below 5.3 years in DA. At School I, 74 per cent were "at risk," 45 per cent at School II and 8 per cent at School III were "at risk."

Head measurements were done at the time of the <u>Gesell</u> testing during the kindergarten year and once each fall and again each spring thereafter for two years. Classroom teachers administered the LBAS mathematics tests to kindergarten and first grade students in the spring. The examiner administered the CTBS to all subjects in the first grade spring. Second grade classroom teachers administered the ITBS.

Retainees

Only five subjects were retained in kindergarten. Two more subjects were placed in a full-time special education calss, thus retaining the grade level designation of their peers without the same curricular requirements. The examiner of this study tested the retained kindergarteners using the first grade LBAS mathematics test and the first grade level CTBS was administered a year later than the other subjects of this study when the retained students were belatedly promoted to first grade. Since there were only five retained kindergarteners, their comparison with "at risk" children who had been promoted is described as a case study. The group was too small for statistical analysis.

Students who moved or who were unavailable to take any of the tests, even after efforts to schedule make-up sessions, were of necessity eliminated from those portions of the research. Of the original ninety-seven students tests in 1983, by the end of second grade in 1986, eighteen remained at School I, seventeen at School II, and thirty at School III, for a grand total of sixty-five remaining in the study by spring of 1986. The two "specially placed" students and the five students retained in kindergarten (plus one more retained at the first grade level) did not take the second grade ITBS. All sixty-five children did complete testing at the first grade level. Of the original ninety-seven students, thirty-one had moved out of the school district and one died. Four students moved into one of the other schools included in this study and were kept as subjects.

Research Design

This longitudinal study was designed to determine the correlation between scores (developmental ages) on the *Gesell School Readiness Screening Test* (GSRST) and academic achievement, as tested by the *Comprehensive Test of Basic Skills* (CTBS), Form U, Level C, the *Learner Based Accountability System* (LBAS) mathematics tests for kindergarten and first grades, and the *Iowa Test of Basic Skills* (ITBS), Form G., Level 8. Guidelines for correlational research were taken from Borg and Gall, Chapter 14 (3, pp. 474-518). Of the ninety-seven subjects who began this study, sixty-five completed it.

Two groups of "high risk" kindergarteners were identified as those children whose scores (developmental ages) were below 5.3 on the GSRST. Group 1 was composed of children with developmental ages below 5.3, classified "at risk," who were retained in kindergarten. Group 2 was composed of "at risk" children who were promoted with their chronological peers. Since only five children were retained, group 1 was too small for statistical analysis. Therefore, the "at risk" are anonymously described in a case study format.

The examiner measured the head circumference to the nearest one/thirty-second of an inch of each subject five times during the course of this longitudinal study. Regression was used to determine whether or not changes in head circumference significantly increased the predictability of ITBS scores from CTBS scores.

Procedures for Analysis of Data

Statistical analysis involved Pearson Product Moment Correlations to test hypotheses 1. Stepwise multiple regression was used to test hypothesis 3. The computer packages used to tabulate and calculate data were an SPSS package (18, 20) and Lotus 123 (14). Since the number of children in sub-group 1 of hypothesis 2 dropped below 10, this part of the research was analyzed as a descriptive study.

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CHAPTER IV

PRESENTATION AND ANALYSIS OF DATA

The purposes of this study were to determine how a child's developmental stage during kindergarten correlates with his subsequent scholastic achievement, to determine whether developmentally younger children who repeat kindergarten later attain higher academic achievement than developmentally younger children who enter first grade without repeating kindergarten, and to investigate the relationship between head circumference, developmental screening, and academic achievement tests. To carry out these purposes, the following hypotheses were tested.

1. There will be a significant positive correlation between the student's scores on the Gesell School Readiness Screening Test (GSRST) in kindergarten and his scores on the:
   a. Learner Based Accountability System (LBAS) mathematics test, administered in the spring of kindergarten.
   b. Comprehensive Test of Basic Skills (CTBS), administered in the spring of first grade.
   c. Learner Based Accountability System (LBAS) mathematics test, administered in the spring of first grade.
   d. Iowa Test of Basic Skills (ITBS), administered in the spring of second grade.

2. Children identified by the Gesell School Readiness Screening Test as "high risk" who delay entrance to first grade will score significantly higher on achievement tests at the end of first grade than "high risk" children with comparable kindergarten readiness scores (developmental ages) who do not delay entrance to first grade.

3. There will be significant correlations between changes in head circumference and:

a. Gains in achievement test scores.

b. Developmental ages (scores on the GSRST) in kindergarten.

The first hypothesis was tested using the Pearson Product Moment Correlations between the developmental ages, scores on the GSRST, and chronological ages of the test subjects at the beginning of the study, and each of the achievement tests administered over the three-year period. The ages represented the independent variables and the test scores the dependent variables. Results are in Table I.

TABLE I

CORRELATIONS BETWEEN DEVELOPMENTAL AND CHRONOLOGICAL AGES AND ACHIEVEMENT TEST SCORES

		Total Group LBASK84	Retainees LBASK85	Non-Retainees LBAS185	Retainees LBAS186	Total Group CTBS	Non-Retainees ITBS
Dev. Age	R:	.3339		.1324	.8418	.6690	.6895
	N:	97	5	80	5	68	57
	P:	.001		.121	.037	.001	.001
Chr. Age	R:	.0359		.0682	.1846	.2165	.2255
	N:	97	5	80	5	68	57
	P:	.364		.274	.383	.038	.046

Dev. Age= Developmental Age (scores on the GSRST in 11/83); Chr. Age= Chronological Age at 11/83; K84, 185, etc. indicate the grade level and year in which the test was administered; CTBS and ITBS indicate total battery scores. R= Pearson Correlation; N= number of subjects; P = 1-tailed significance level.

According to the data reported in Table I, developmental age, as indicated by a score on the GSRST, was a significant predictor of achievement on each of the achievement tests except the kindergarten-level LBAS for the five retainees (LBASK85) and the first grade LBAS for the non-retainees (LBAS185). Using the data calculated on correlations between developmental age and ITBS scores, the probability that a correlation coefficient of at least 0.69 was obtained when there was no linear association between developmental age and the ITBS scores was less than .001. The kindergarten LBAS test contained only nine categories to be mastered; most of the children in the study mastered eight or nine categories. With the combination of a nine item test and only five subjects, it proved to be impossible to compute a reliable correlation between LBASK85 and the developmental ages of the five retainees. However, since the first grade LBAS had 21 items, it was possible to calculate a correlation between the developmental age and four of the five retainees that was significant at the .037 level. There was a significant correlation between developmental age and four of the achievement tests: (1) the kindergarten LBAS84 mathematics test, administered to all subjects, (2) the total score on the complete battery of the first grade CTBS, (3) the total score on the complete battery of the second grade ITBS, and (4) the LBAS186 mathematics test administered only to retainees. There was not a significant correlation between develmental age and the first grade LBAS for non-retainees (LBAS185).

There were significant correlations (P=<.05) between chronological ages and scores on the CTBS and ITBS tests, although these correlations were lower than for the developmental ages. There were no significant correlations between the chronological ages and LBAS scores. In all cases, correlations between developmental age and test scores were higher than those between chronological age and test scores. Hypothesis one, parts a, b, and d stated that there would be a significant positive correlation between student scores on the GSRST in kindergarten and scores on the kindergarten LBAS, the first grade CTBS, and the second grade ITBS. Based on the data in Table I, parts a, b, and d of hypothesis one were supported. Hypothesis one, part c stated that there would be a significant positive correlation between scores on the GSRST and the first grade LBAS. Based on data in Table I, hypothesis one, part c was rejected.

Since only five children included in this study were retained in kindergarten, hypothesis 2, involving retained versus non-retained kindergarteners, was analyzed descriptively. For each of the five retained kindergarteners, two kindergarteners who were not retained were selected with identical or very similar developmental and chronological ages, ethnicity, sex, and socio-economic group. All children in both matched groups had been considered "at risk" for success in first and second grades based on their scores on the Gesell School Readiness Screening Test. All developmental ages were below 5.3 years. Chronological ages varied for the non-retained children to the same degree that they varied for the retained children. The mean developmental age for the retained group was 4.85 years. The mean developmental age for the non-retained matched group was 4.86 years. This procedure resulted in the "at risk" retainees taking the CTBS and the first grade LBAS tests one year later than the "at risk" promoted group. A summary of mean scores for both "at risk" groups is reported in Table II.

TABLE II

MEAN SCORES ON FIRST GRADE ACHIEVEMENT TESTS
RETAINED AND NON-RETAINED "AT RISK" STUDENTS

	CTBS MEAN SCORES			**LBAS** (MATH)
	TOTAL	LANGUAGE	MATH	MEAN SCORES
Retained in Kindergarten	102.0	66.4	35.6	18.4
Not Retained in Kindergarten	87.6	57.2	30.4	17.0

The mean score on the first grade CTBS for retained "at risk" students was 102 while the mean score for the non-retained "at risk" group was 87.6. The mean number of concepts "mastered" on the first grade LBAS tests by the retained-in-kindergarten group was 18.4 while the mean number of LBAS math concepts mastered by the non-retained "at risk" group was 17 out of 21. One of the "at risk" students who was not retained in kindergarten did repeat first grade. Five out of ten promoted students in the match-paired group were given regular assistance by special education teachers and two out of five of the retained students attended some special education classes.

Hypothesis 3, involving head circumference, achievement, and developmental age, was tested by stepwise multiple regression.

At the first step, the linear trend between the independent variable, the CTBS total battery score, and the dependent variable, the ITBS total battery score, was calculated and found to be significant at the .001 level. Table III reports the calculations at step one of the linear regression.

TABLE III

STEP 1: DEPENDENT VARIABLE: ITBS; INDEPENDENT VARIABLE: CTBS

Multiple R	.88014
R Square	.77465
Adjusted R Square	.76953
Standard Error	34.05273

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
Regression	1	175391.26635	175391.26635
Residual	44	51021.88583	1159.58831

F= 151.25305 P=< .001

VARIABLES IN THE EQUATION

VARIABLE	b	SE b	t	Sig t
CTBS	2.574342	.209322	12.298	.001
(Constant)	53.176609	24.207058	2.197	.033

Step 2 was calculated to determine if adding growth of head circumference to the CTBS scores would increase the predictability of the ITBS scores obtained one year later. Step 2 calculations are reported in Table IV. The head circumference growth figures used in the calculations were the total growth between the fall of 1983 and the spring of 1986. The growth in head circumference is listed in Appendix F.

TABLE IV

**STEP 2: DEPENDENT VARIABLE: ITBS;
INDEPENDENT VARIABLES: CTBS + HEAD GROWTH BETWEEN 1983 & 1986**

Multiple R	.88310
R Square	.77987
Adjusted R Square	.76963
Standard Error	34.04525

ANALYSIS OF VARIANCE

	DF	SUM OF SQUARES	MEAN SQUARE
Regression	2	176572.76176	88286.38088
Residual	43	49840.39041	1159.07885

F= 76.16943 P=< .001

VARIABLES IN THE EQUATION

VARIABLE	b	SE b	t	Sig t
CTBS	2.580073	.209353	12.324	.001
Head Growth	-11.317170	11.209295	-1.010	.318
(Constant)	63.766711	26.377010	2.418	.020

While the linear trends between the CTBS and the ITBS total battery test scores, as well as the CTBS plus head circumference growth and the ITBS, were both significant at the .001 level, the addition of the independent variable, head growth, did not add significantly to that linear trend. Therefore, hypothesis 3-a, which stated that there would be a correlation between head growth and growth in achievement test scores, was rejected. The significant t of only .32 indicated that growth of head circumference plus CTBS scores were not significantly better at predicting ITBS scores than were CTBS scores alone.

As predicted in hypothesis 3-b, however, there was a significant negative correlation at the .05 level between developmental age and total growth in head circumference. These findings are reported in Table V.

TABLE V

CORRELATIONS BETWEEN DEVELOPMENTAL AND CHRONOLOGICAL AGE AND HEAD CIRCUMFERENCE GROWTH

	Head Circumference Growth 1983-86
Developmental Age	R= -.2160
Number	(59)
Significance	P= .050
Chronological Age	R= -.1425
Number	(59)
Significance	P= .141

On the basis of data in Table V, hypothesis 3-b, which stated that there would be a significant correlation between growth in head circumference and developmental age, was supported. There was not a significant correlation between chronological age and growth in head circumference.

CHAPTER V

SUMMARY, FINDINGS, IMPLICATIONS, CONCLUSION, AND RECOMMENDATIONS

Summary

The purposes of this study were to determine (1) how a child's developmental stage during kindergarten correlates with his subsequent scholastic achievement, and (2) whether developmentally younger children who repeat kindergarten later attain higher academic achievement than developmentally younger children who enter first grade without repeating kindergarten, and (3) to investigate the relationship between head circumference, developmental screening, and academic achievement tests. Ninety-seven kindergarteners from three different schools located in neighborhoods with different sociometric attributes were given the Gesell School Readiness Screening Test (GSRST) (10) and then followed by the examiner for three academic years. During these three years, students were tested with two Learner Based Accountability System (LBAS) criterion-referenced mathematic tests (12), the first-grade level of the Comprehensive Test of Basic Skills (CTBS) (5), and the second-grade level of the Iowa Test of Basic Skills (ITBS) (11). To measure brain growth, each child's head circumference was measured five times during the study. Academic progress of "at risk" children who repeated kindergarten were descriptively compared to progress of "at risk" students who were promoted on schedule. Pearson Product Moment Correlations were used to test for correlation between scores on the GSRST (developmental ages) and the academic achievement tests. A stepwise test for linear regression was used to test for a linear trend between head growth and achievement test scores.

The results of the study are discussed in terms of the investigation's three purposes. Suggestions for further research conclude the chapter.

Correlation Between Developmental Age and Academic Achievement

Findings

Results of this study (Table I, page 63) indicated that there was a significant correlation between developmental age and student scores on the first grade level of the Comprehensive Test of Basic Skills (CTBS), the Iowa Test of Basic Skills (ITBS), the kindergarten level of the Learner Based Accountability System (LBAS) mathematics test and the first grade level LBAS mathematics test (retained group). Correlations between chronological ages and test scores were not statistically significant for the kindergarten or first grade LBAS tests. While there was a significant correlation at the .05 level between chronological age and standardized test scores, the correlation coefficients of only .22 and .23 "show a very slight relationship between the variables [and are] of no value in prediction" (Borg and Gall, 3, p. 513). The correlation coefficients above .65 for developmental age "make possible group predictions that are accurate enough for most purposes"(3, p. 514). We can see that developmental age has the more useful correlation.

Interpretation

This study reaffirmed the predictive validity of the Gesell School Readiness Screening Test as it related to future academic achievement test scores. This was true for children from a variety of ethnic and socioeconomic groups. Thus, this study supported the research on the GSRST by Turley (16) and Wood (18). If the greater correlation coefficient of the GSRST (Table I) is considered, then developmental age was a better predictor of achievement than chronological age. Based on later academic achievement, developmental age appears to be a better guide for beginning school placement than chronological age.

Comparison of Retained "At Risk" Children with Promoted "At Risk" Children

Findings

All children whose developmental age, as determined by the GSRST score, was below 5.3 in November, 1983, were considered "at risk" for school success. Seventeen of the twenty-three kindergarteners in School I were "at risk;" at School II, fourteen out of thirty-one were "at risk;" and at School III, twelve out of forty-three were "at risk." The total number of "at risk" kindergarteners was forty-three out of ninety-seven. These figures lend credence to claims by Ames and Gillespie that up to one half of school children may be over-placed (1). Only five of these children were retained in kindergarten, three at School I and two at School III. Mean scores on first grade achievement tests were higher for retainees than for non-retainees.

Interpretation

It is impossible to make long-range, global inferences on the retention of immature kindergarteners while studying only five children. In order to compare first grade achievement of both "at risk" groups more accurately, national percentile ranks were examined. These rankings are reported in Table VI.

TABLE VI

COMPARISON OF PERCENTILE RANKS FOR FIRST GRADE CTBS "AT RISK" KINDERGARTEN RETAINEES VS. MATCH-PAIRED NON-RETAINEES

Retained Child	Non-Retained Child	Reading & Language	Math	Total Percentile Rank
1.		**73%**	**48%**	**61%**
	1a.	30%	64%	47%
	1b.	11%	30%	21%
2.		**9%**	**17%**	**13%**
	*2a.	5%	5%	5%
	2b.	24%	48%	36%
3.		**14%**	**42%**	**28%**
	3a.	38%	40%	39%
	3b.	27%	28%	28%
4.		**53%**	**83%**	**68%**
	4a.	59%	37%	48%
	4b.	18%	21%	20%
5.		**50%**	**79%**	**65%**
	5a.	54%	38%	46%
	5b.	50%	38%	44%

*This child was retained at the first grade level.

In Table VI, the two children who were matched with a retainee by sex, chronological age, developmental age, ethnicity, and socio-economic group directly follow the retained child with whom they were matched. It is evident from the data in Table VI that academic success, as measured by the CTBS, differed highly from child to child. Individual talents in reading and mathematics were evident, as well.

Examination of Table VI reveals that, in three out of five cases, the retained child attained a higher percentile rank than either of the non-retained "at risk" students with whom he was match-paired. In two cases the retainee scored higher than or the same as one non-retainee and lower than the other. In no case was the retained kindergartener below both of his matched non-retainees in total CTBS percentile rank. According to the CTBS Norms Book (6) any percentile rank below 41 per cent is considered "below average" while any percentile rank below 23 per cent is "well below average" and percentile ranks from 10 to 1 per cent are rated "low level." From 60 to 99 per cent is "above average to high." Based on these figures, three retainees were in the "above average" range while no non-retained members of the match-paired group scored that high. If these findings could be substantiated by studying larger numbers of kindergarten retainees of various ethnic and socio-economic groups, it might be implied that early retention of immature children may increase the probability that they will experience above average success in primary grades. One retainee was "below average," and one was "well below average even after repeating kindergarten. We have no way of knowing the scores on the CTBS had they not repeated kindergarten. Four out of ten of the non-retained members of the matched group achieved "average" range percentile ranks; three were "slightly below average," two were "well below average," and one, who was retained in first grade, scored at the lowest possible level.

Examination of the data recorded in Tables II and VI highlights the necessity of considering a variety of dimensions when deciding the children who should be retained in kindergarten and who should be promoted. Developmental age is one criterion that might be considered, but it is not the only dimension.

Correlation Between Growth in Head Circumference and (a) Achievement Test Scores and (b) Developmental Age

Findings

Examination of several relationships preceded the test for linear trend between growth in head circumference and achievement test scores. Stepwise regression established the existence of a significant linear trend between CTBS scores and ITBS scores. The addition of total head circumference growth to the equation which included CTBS scores did not add significantly to the predictability of ITBS scores from CTBS scores. (See Tables III and IV, pages 67 and 68.)

While there was a significant negative correlation between developmental age and total growth in head circumference (P=.05), the correlation between chronological age and head growth was not significant (P=.14). These findings are reported in Table V on page 69.

The negative correlation between developmental age and growth in head circumference showed that those children whose head circumference grew the most had the lowest developmental ages in kindergarten, and those students whose head circumference grew the least had the highest developmental ages in kindergarten. Looking at these figures from the poiont of view expressed by Herman Epstein (7, 8), the least mature children experienced the greatest growth in head circumference, or were probably in the brain growth spurt stage during much of this two- and one-half-year study. Likewise, the more behaviorally mature children experienced less head growth, interpreted by Epstein as brain growth (7), and it could be assumed that they were in a growth "plateau" period during at least a portion of this study.

TABLE VII

COMPARISON OF HEAD SIZE FOR "AT RISK" AND NOT "AT RISK" KINDERGARTENERS

	At Risk Group	Not At Risk Group
Mean Head	(N=41)	(N=55)
Circumference	20.19 inches	20.47 inches
Standard Deviation	11.25	9.68
Significance Level P= .026		

Table V shows a significant negative correlation between developmental age and total growth in head circumference (P=.05), while the correlation between chronological age and head growth was insignificant (P=.14). The correlation coefficient associated with developmental age was -.26, while the correlation coefficient associated with chronological age was -.14. According to Borg and Gall (3, p. 513), correlations ranging from .20 to .35 have limited meaning in exploratory research, but are of no value in prediction.

The negative correlation between developmental age and growth in head circumference showed that those children whose head circumference grew the most had the lowest developmental ages in kindergarten, and those students whose head circumference grew the least had the highest developmental ages in kindergarten. The least mature children experienced the greatest growth in head circumference during this two- and one-half-year study. Likewise, the more behaviorally mature children experienced less head growth.

TABLE VII

COMPARISON OF HEAD SIZE FOR "AT RISK" AND NOT "AT RISK" KINDERGARTENERS

	At Risk Group	Not At Risk Group
Mean Head	(N=41)	(N=55)
Circumference	20.19 inches	20.47 inches
Standard Deviation	11.25	9.68
Significance Level P= .026		

It is interesting to see from Table VII that when the original head measurements were taken in kindergarten, children considered "at risk" on the basis of their GSRST scores had significantly smaller head size than children not "at risk" (P=.026). The "at risk" group had a mean head circumference of 20.19 inches while the mean head circumference for those not "at risk" was 20.47 inches. One learning disabled child was removed from the "at risk" group figures because he had an unusually large head size and an unusually low behavioral age. This was done to prevent skewing the calculations. It seems that the least mature kindergarteners were not yet in a brain growth period, from Epstein's point of view (8, 9).

Implications of Total Study

Hypothesis I

Based on the significant correlation between kindergarteners' developmental ages and academic achievement in grades one and two, it is reasonable to assume that a developmental screening has a valid role in beginning school placement. This study reconfirmed with a mixed student population what was confirmed with homogeneous populations by Turley (16), Wood (18), and Butler and Marsh (4). The Gesell School Readiness Screening Test is a more reliable predictor of future achievement than chronological age.

Hypothesis II

It is more difficult to find valid interpretations of the findings in hypothesis two, academic achievement of "at risk" retainees versus non-retainees. Evidence in this study is that each child's placement and promotion must be made on an individual basis. The five retainees, as a group, scored slightly higher on the first grade level achievement tests than did the "at risk" non-retainees. However, when we examine individual scores in each match-paired group, there are a wide variety of achievement levels. Also, it is impossible to determine how well the retainees would have scored had they been promoted on schedule and taken the tests a year earlier, or how the non-retainees would have scored had they repeated kindergarten and taken the tests a year later. Turley's study (16) supports the retention of developmentally slower kindergarteners, while the study of May and Welch (13) arrives at the opposite conclusion. This study tended to support Turley, but had too few retainees to add significant credence to either point of view.

Hypothesis III

It proved to be very difficult to determine whether growth in head circumference had any relationship to growth in academic achievement. It was difficult to measure academic growth, because each year the children were tested with different instruments. This situation was beyond the control of the researcher. The changes were made by the participating school district on an annual basis. The researcher was not notified in advance of any of the impending changes. It was unfortunate that this study was in progress during a period of acedemic change in the State of Texas. The criterion-referenced instruments were short in length and children scored with a high level of mastery. The CTBS was highly correlated to the ITBS. It was difficult to add any factor to this high correlation that might increase the predictability of the equation. The addition of growth in head circumference to this equation did not increase the predictability of ITBS scores. Therefore, no data in this study supports using head growth to predict scores on achievement tests.

This researcher did find a significant but small correlation between developmental age and head growth. This raises the question of whether or not Bhulpat's study (2) might have revealed growth spurts and plateau periods had it included each child's developmental age, rather than his chronological age.

Conclusion

This study reaffirms the studies of Turley (16) and Wood (18) that showed a significant positive correlation between developmental age, scores on the _Gesell School Readiness_

Screening Test, and subsequent academic achievement. Upon examination of these studies, plus reports of Uphoff and Gilmore (17) on long-range negative effects of beginning a child's formal education before he is developmentally ready to handle the challenges of school, it would appear to be safer to place beginning school children conservatively, rather than risk advancing them too quickly. Developmental readiness for formal learning tasks and school routines must be a consideration for placement. This study supports long and short term research (1, 4, 7, 15, 16, 17, 18) which concludes that chronological age, I. Q., and reading readiness scores without data on a child's developmental stage, are insufficient criteria for placement of children.

The study by May and Welch (13) found that children retained on the basis of developmental age scored lower on academic achievement tests than promoted "at risk" children. While the sample size in this study does not support generalizations, the tendency appears to be in the opposite direction to that found by May and Welch.

Recommendations for Further Research

In light of the results of this study, research in the following areas is recommended:

1. Further testing of the Gesell School Readiness Screening Test using a greater diversity of children is recommended. The initial stages of this study revealed that children of

lower socio-economic groups, as defined by census data and school personnel and real estate descriptions about each school neighborhood, scored lower on the Gesell School Readiness Screening Test than those from higher socio-economic groups. This finding could be due to different nutritional habits of the child and/or the child's mother before birth, different language patterns, stimulating versus non-stimulating home environments or a host of other reasons. Or, it could be that the GSRST, which was developed for and has been used most widely with middle-class anglo children, contains ethnic or socio-economic biases. The examiner did notice that some areas of the language section in the GSRST had to be reworded to fit some of the children in this study. For example, the question, "What does your Daddy do?" is inappropriate for a child who has never seen his father. The word "sails" was misinterpreted by black children with southern accents as "sells;" and children born in the Orient who were generally mature did not know their birthdays as frequently as black or anglo children. An examiner can improvise appropriate changes to these language differences, but some rewriting of the Gesell test would facilitate its administration to a variety of children.

2. It would be interesting to follow the children in this study through their school careers to determine whether or not the developmentally delayed children eventually "catch up" with their chronological peers, or whether they lag further and further behind, as indicated by Butler and Marsh (4).

3. A researcher could repeat developmental assessment of the subjects in this study at later stages in their lives, using higher level developmental tests. It would be valuable to learn whether their gaps in developmental age remain the same, narrow, become broader, or change in sequence.

4. A comparative examination of ethnically mixed older children is suggested. Using higher levels of the Gesell developmental tests, a researcher might be able to determine if certain types of children have lower developmental ages in kindergarten, but develop more rapidly than others as they grow older. Do children of all ethnic groups develop at the same pace and in the same pattern?

5. It is recommended that a cross-sectional study similar to the one by Bhulpat (2) be conducted, testing each child for developmental age at the time of head measurement, and classifying the children according to developmental, rather than chronological age, and then testing for a linear trend between developmental age and head circumference.

6. The predictive validity of the Gesell School Readiness Screening Test could be improved if more kindergarten retainees within the same school district as this study were developmentally screened and then post-tested periodically for academic progress.

7. The kindergarteners in this study were participants in a half-day program. Any preschool programs in which they may have participated would have been financed by their parents. Therefore, the children from upper socio-economic families might have had more school experience as well as a more stimulating home environment than the children from lower-income families. It would be useful to know if children who have participated in all-day kindergarten programs and/or child development programs for three- and four-year-olds would score higher in developmental age than children without as much early school experience. How much does a stimulating environment environment that includes good nutrition and sensory-motor experience increase a child's readiness for elementary school?

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APPENDIX A

LETTER FROM SCHOOL DISTRICT

GRANTING PERMISSION TO CONDUCT RESEARCH

Richardson Independent School District

"EXCELLENCE IN EDUCATION – OUR GOAL"

October 20, 1983

Mrs. Karen Sanders
25 Shady Cove
Richardson, Texas 75080

Dear Mrs. Sanders:

Your request to conduct research in the Richardson Independent School District has been reviewed by the Research Advisory Committee and approved. This letter is your official notification to begin your study, "The Role of Developmental Screening in Kindergarten-First Grade Placement," with the understanding that the principals of the three schools proposed for participation have the option of participation or non-participation.

Please advise us when you have completed your study. We look forward to receiving a copy of your final report.

Thank you for your interest in the Richardson Independent School District.

Sincerely,

Rex A. Carr
Deputy Superintendent
Planning and Personnel

mm

400 S. Greenville Avenue Richardson, Texas 75081 214/238-8111

APPENDIX B

LETTER TO PARENTS OF STUDENTS IN STUDY

Jess Harben Elementary School
600 South Glenville
Richardson, Texas 75081

October, 1983

Dear R.I.S.D. Parent,

A long-term cooperative research project approved by North Texas State University and the Richardson Independent School District will begin this fall. The research consists of testing kindergarteners with the <u>Gesell School Readiness Screening Test</u> with consistent follow-up using RISD academic achievement tests. The purpose of the study is to predict academic achievement on the basis of readiness factors. Some physical characteristics, such as timing of tooth eruption and size of head circumference, will be noted.

The Gesell tests include brief, informal play activities, and will be scheduled in cooperation with your child's teacher to insure that regular instruction is not interrupted.

Anonymity of students will be maintained throughout the study and in the final report. Parents will be given information upon request.

Please sign the form below and return it promptly to your child's teacher. If you have questions, please contact me (home: 699-7388; school: 690-3261). Thank you for your cooperation.

Sincerely yours,

Karen Sanders

- -

I, ______________________________, agree to allow my child,

______________________________, to participate in the

developmental screening.

APPENDIX C

TABLE VII: DEVELOPMENTAL AND CHRONOLOGICAL AGES (1983)

AND TOTAL HEAD CIRCUMFERENCE GROWTH (1983-86)

TABLE VIII: DEVELOPMENTAL AND CHRONOLOGICAL AGES IN NOVEMBER 1983 COMPARED TO TOTAL GROWTH IN HEAD CIRCUMFERENCE 1983-1986

D. AGE (years)	C. AGE (months)	HEAD GROWTH (inches)	D. AGE (years)	C. AGE (months)	HEAD GROWTH (inches)
4.77	64	1.13	5.96	71	1.00
4.83	64	1.25	5.00	72	
4.95	65		5.42	71	
4.96	63	.38	5.00	70	.75
5.00	61		5.10	65	1.47
5.10	66	.25	5.20	72	1.75
5.17	66	.72	5.25	66	.69
5.46	69	2.31	5.30	66	
5.58	70		5.40	71	
4.30	63	.88	5.48	67	1.75
4.48	67	1.50	5.50	65	
4.50	63	.75	5.50	72	.94
4.70	66	1.50	5.50	71	1.00
4.92	66	1.81	5.67	65	.50
5.00	65	1.06	5.67	68	1.00
5.10	67	1.25	5.70	72	
5.15	67		5.90	64	1.00
5.20	63		5.96	73	.87
5.30	63		6.00	71	.88
5.44	74	.38	6.10	67	.66
5.50	65		4.88	65	1.41
5.50	77		5.10	72	
5.21	70		5.20	70	
3.43	67	1.88	5.27	64	
4.38	77	.50	5.30	71	.75
5.04	70		5.30	65	
5.19	64	2.06	5.30	79	
5.19	62		5.40	66	.69
5.25	64	.50	5.54	74	1.53
5.40	72		5.70	63	1.00
5.46	76	1.25	5.80	74	.75
5.50	73	.50	5.80	67	
5.31	69		5.85	67	.75
5.52	67		5.92	68	
5.64	79	1.06	6.20	72	1.07
5.65	65		4.70	70	
5.63	68	.62	5.20	65	
4.85	65		5.20	68	.88
4.92	71		5.25	65	
4.94	63	.75	5.30	65	
5.12	62	1.41	5.37	66	1.03
5.17	62	.75	5.46	76	.50
5.23	63	.50	5.60	64	.63
5.27	65		5.87	68	
5.30	69	1.12	6.00	74	.62
5.40	62	1.91	6.10	73	1.25
5.42	73	.60	5.80	73	
5.67	72	.50	5.95	80	
5.71	64	1.28			

(Note: No head growth means students moved before end of study.)

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