FERGUSON, Nelda Unterkircher, 1925-
THE FROSTIG--AN INSTRUMENT FOR PREDICTING TOTAL ACADEMIC READINESS AND READING AND ARITHMETICAL ACHIEVEMENT IN FIRST GRADE.

The University of Oklahoma, Ph.D., 1967
Education, psychology

University Microfilms, Inc., Ann Arbor, Michigan

THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE FROSTIG - AN INSTRUMENT FOR PREDICTING TOTAL ACADEMIC READINESS AND READING AND ARITHMETICAL ACHIEVEMENT IN FIRST GRADE

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

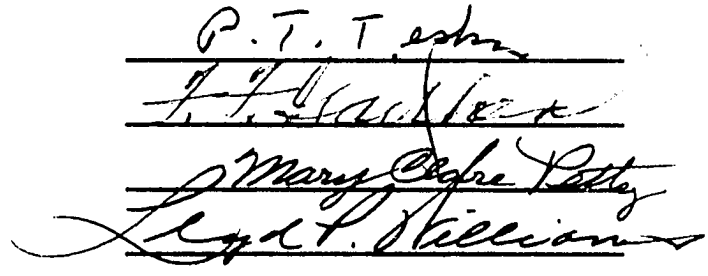
NELDA UNTERKIRCHER FERGUSON

Norman, Oklahoma

1967

THE FROSTIG - AN INSTRUMENT FOR PREDICTING TOTAL ACADEMIC READINESS AND READING AND ARITHMETICAL ACHIEVEMENT IN FIRST GRADE

APPROVED BY



DISSERTATION COMMITTEE

ACKNOWLEDGEMENTS

The writer feels a deep sense of gratitude and wishes to express her sincere appreciation to some of the many people whose assistance made this study possible. Deep and sincere appreciation is extended to Dr. P. T. Teska, her advisor, for his patient and capable direction and faith in the writer.

Particular appreciation is extended to other members of the writer's committee who made helpful suggestions and showed profound interest in her graduate program: Dr. F. F. Gaither, Dr. Mary C. Petty, Dr. W. B. Ragan, and Dr. Lloyd P. Williams.

A special recognition is given to Dr. Gladys Hiner, Dr. Nancy Bess Farley, Dr. Kenneth Dick, and Dr. Gerald D. Kidd for their encouragement and support throughout the graduate program.

The writer further extends appreciation to Ruth Davis for her editorial advise, to Dr. O. J. Rupiper and George Letchworth for statistical counsel, and to Janet Phillips for help and encouragement.

Deepest appreciation is extended to the principals and visiting counselors in Oklahoma City Schools who assisted the writer in making the pupils available for this research.

Finally, my love to Johnel, Jerry, and Jan, whose patience and understanding were vital to the success of this study.

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CHAPTER I

INTRODUCTION

Psychologists have attempted to analyze the learning process to discover how learning actually takes place. Educators have been investigating and are seeking to provide experiences through which children learn. Today, much is being written about learning disabilities and why they occur. The diagnosing and preventing of learning disabilities have been major topics of discussion for the past few years in educational, psychological, and medical circles; however, the literature suggests that very little has been done to predict learning disabilities before they occur in children of average intelligence.

While coordinating the individual testing program for the Oklahoma City Schools, the author became extremely interested in an area of research dealing with diagnosing predicted learning problems in children of above or average intelligence while they were still in kindergarten. Over 50% of the children referred for individual testing by teachers were those of average or above average intelligence who appeared to have severe learning problems. These children were usually not refer-

red until they had experienced much failure and were in the third or fourth grade. By this time, much emotional overlay had developed. Most of these children were thought to be mentally retarded by the average classroom teacher. In general, the referrals indicated persistent learning disabilities that had been evident since kindergarten and first grade. These observations, along with a close association with the Child Study Center and a trip to Dr. Frostig's School of Educational Therapy, led the author to an interest in this area which has resulted in this research.

The Marianne Frostig Center of Educational Therapy is a nonprofit institution which was begun in 1948 in Los Angeles, California. Dr. Frostig has researched diligently and applied imaginatively numerous research results from the fields of biology, psychiatry, psychology, and sociology. She has produced a rich and fruitful blending of the best from many related disciplines. All of this knowledge has been directed toward better and more effective ways to rehabilitate children who cannot progress optimally in learning. Dr. Frostig is a Clinical Professor of Education at the University of Southern California. Her school has become a laboratory for the Special Education Department of the University of Southern California. She began her work in sensory motor training in a Viennese school for children with emotional disturbances and behavior disorders, and later used the same sensory motor training at a psychiatric hospital in Poland with equal success. The years of the First World War saw the occurence in Europe of encephalitis epidemics, which left many children and adults with symptoms typical of

brain damage. While in Vienna, Dr. Frostig's observations of post-encephalitic children indicated that such children might have perceptual disturbances and she concluded that they, too, might be benefically affected by training in sensory motor functions and development of body image. Unfortunately, no standardized instruments were available to measure either a child's perceptual efficiency or the nature and degree of his improvement after training.

The Marianne Frostig Developmental Test of Visual Perception was developed for the purpose of serving as a basis for the differential training of visual-perceptual abilities in either a preventive or a remedial program. It was designed for children from pre-school to eight or nine years of age, but can also be used at later ages with children with learning disturbances, when their lack of development in perception is severe enough to keep their level of performance below the nine year level.

Immature visual perception in the young child is a strong indicator that he will have a learning disability beginning in the first grade. Learning disabilities in first grade can be predicted and, in most instances, preventive training begun before a child has been hindered from using his basic potential for learning. The author believed that, regardless of the etiology of the visual-perceptual disability, children of above or average intelligence who had below average visual-perceptual ability as measured by the Frostig (A Developmental Test Of Visual Perception, 1963) would show total academic readiness deficiency for first grade work at the beginning of first grade, and would not be performing up to the expected level of work by the end of first grade

in reading and arithmetic.

Frostig (1961) feels that a peak perceptual development occurs in the pre-school years and, reasoning from this hypothesis, has stated that perceptual testing can and should be done at an early age.

It was, therefore, the plan of the author to identify two groups of children for this longitudinal study. The two groups were identified at the beginning of first grade and followed until the end of first grade of the 1966-67 school year.

It was the plan of the author to determine if Group I (high P. Q.) as measured by the Frostig would show a greater degree of total readiness for first grade work than Group II (low P. Q.) as measured by the Frostig. An accompaning and relevant objective was to determine if Group I would have greater academic achievement in reading and arithmetic at the end of the first grade than Group II.

VISUAL PERCEPTION
as it AFFECTS READINESS AND LEARNING
DEFINED AND LIMITED by RESEARCH

Perception is a process of the senses which normally occurs when an object is seen, a sound is heard, or when something is touched, tasted, or smelled accompanied by an understanding of the experience. Children who have poor visual perception often have difficulty understanding relationships of the parts to the whole, and thus, cannot grasp a scene or situation in it's entirety. Since these children tend to highlight irrelevant details, they are likely to have a distorted version of the perceived object. For example, on a printed page,

they may not perceive whole words, only parts. The letters of a word or strokes of a number may appear to be separate images to the child. It is important to emphasize that, because of a limited ability to generalize, the child with poor visual-perceptual development has difficulty coping with new experiences. He perceives things differently than other children, and is easily paralyzed into panic by threats from an environment that he does not understand. It cannot be taken for granted that the perceptually handicapped child will be able to understand and follow ordinary directions as normal children do.

Frostig's (1963, p. 671) findings all seem to confirm that the development of visual-perceptual processes is the major function of the growing child between the ages of three and seven, and that at this age level, perceptual development becomes a most sensitive indicator of the developmental status of the child as a whole. If a child with perceptual disabilities can be detected and specific perceptual training instituted, he might be expected to benefit "in toto" rather than in perception alone.

The child with disturbances in visual perception may be excluded from games because he is clumsey, derided because he seems ill-mannered at the dinner table, scolded because his writing is a mere scribble, or treated with visible worry or anger by his parents because he cannot read. Such a child soon feels himself excluded and rejected. He comes to regard himself as inadequate, and his disturbed self-concept results in aggressive or depressive reactions, which, in turn, provoke counter-aggression in persons in his environment. His "effective functioning," indeed, becomes disrupted. Frostig (1963, p. 666).

The Frostig Developmental Test of Visual Perception (1964) Standardization was preceded and accompanied by several years' observation of children referred to the Marianne Frostig School of Educational Therapy because of learning difficulties. Dr. Frostig attempted to construct a test to explore further the development in five areas of visual perception as follows: eye-hand coordination, figure-ground perception, form constancy, position in space, and spatial relationships. The basis for her work was developed from the experiences and findings of others, such as Thurstone (1944), Wedell (1960), and Cruickshank (1957). They postulated that each of the five abilities developed relatively independently of the others, and there should be specific relationships between them and a child's ability to learn and adjust.

Dr. Frostig (1965, p. 1) states that certain developmental tasks are learned in a definite sequence, and usually at certain age levels. The exact time at which many developmental abilities emerge is, in part, determined by individual differences and, in part, by a particular culture, but the sequence in which the abilities unfold is set and independent of this culture.

Perceptual problems are often handicapping. During the maximal perceptual development, they are likely to be reflected in all aspects of behavior. We found that kindergarten and first grade children who scored in the lowest quartile on a visual-perceptual test (The Frostig) were those most usually rated by their teachers as being maladjusted. They could adjust neither to the demands of the classroom nor of the

playground. Perceptual handicaps make academic learning difficult. Many research workers, such as Goins, Sprague, Bryan, and ourselves, have found that visual-perceptual problems correlate with beginning reading achievement on the order of between .4 and .5. (Maslow, 1965, p.1).

Research at the Frostig Center shows that between 10 to 25 per cent of the children entering public school have visual-perceptual deficits. Children with neurological dysfunctions, emotional disturbances, and with developmental lags of unknown cause, frequently have perceptual problems. Some research findings also indicate cultural deprivation. (Maslow, 1965, p. 2).

One of the major causes of perceptual disabilities in children is, undoubtedly, brain damage. An impressive correlation between perceptual disabilities and neurological handicaps has been shown in every study, whether, of children with confirmed brain damage (as in Cruickshank's study of cerebral palsied children (1957), or of children with so-called minimal brain damage (as in Prechtl's studies, in which diagnoses were made on the basis of behavioral disturbances, learning difficulties, and postural changes). There are disagreements among investigators, however, as to the exact proportion of brain-damaged children who show symptoms of perceptual disturbance, and indeed, we should not expect to find a single quantitative relationship, for there are many kinds and degrees of brain pathology, all of which may produce different effects. Even when brain injuries are known to be similar, psychological sequelae may vary with premorbid personality

and environment, as well as with the general constitutional make-up. Research also indicates that perceptual ability tends to be impaired in some cases of neurosis and schizophrenia. (Frostig, 1963, p. 666).

The well-studied area of visual perception presents some basic questions which have not been answered, or in some cases, studied. One of these is whether visual perception, itself, is an organic phenomenon which works well when the proper nerves are intact, and malfunctions when the nerves are damaged. It is also obvious that many inter-relationships of cause and effect are possible. For example, a perceptual handicap in the child with "cerebral dysfunction" may be a symptom of emotional problems that have resulted from years of frustrations with the tasks expected of him, as well as rejection by the people who are expecting him to perform well in these tasks. (Work and Holdane, 1966).

What is possibly the most frequent cause of learning disabilities is the least widely recognized of all. This is a disturbance of the child's <u>perceptual abilities</u> - either his visual perception, his auditory perception, or his kinesthetic perception (muscle sense). Perception means the recognition of the world around us. What we perceive by means of our senses is all we have to connect us with other human beings and with the inanimate objects in our daily lives. Without adequate perception, a child is isolated from his environment. (Frostig, 1962, p. 55).

Children's learning problems are often complicated by "specific" learning defects or disabilities. In essence, these are disturbances in the mechanics of learning, which the special educators have demon-

strated to be exceedingly complicated processes. Thus, there are difficulties with auditory or visual perception, or both, in which the brain functions inefficiently in apprehending patterns in what is heard or seen. There may be difficulty in associating these patterns, even if properly discriminated, with the spoken word or written symbols and, these in turn, with the concepts for which they stand. Very often, it is hard for these children to associate the originally acquired word sounds with their visual equivalents. Other scholastic areas may be involved also; for instance, in dealing with arithmetic, either alone or combined with reading and writing problems. (Laufer, 1964, p. 5).

Another possible cause of a reading difficulty is a disability of visual perception. A child with a visual perceptual deficit is handicapped in accurately perceiving written symbols or combinations of symbols. He, therefore, may fail to learn to write or spell, or to do arithmetic, or to read. His disability may cause him to be clumsy in his everyday tasks and inept at sports and games, so that he is likely to have experienced almost constant failure in competing with his peers and in meeting expectations of adults. In consequence, his condition may become complicated by an emotional disturbance leading to behavior disorders and to further decrease his ability to learn. (Sanis and Frostig, 1964, p. 156).

Sprague (1963) found that 40, or 36% of her sample of 111 children in the second semester of first grade had P. Q. scores of 90 or less on the Frostig (1962 Standardization). Of these, 28 or 70% fell below the mid-point in the reading achievement test.

Frostig (1963, p. 1) suggests that a large proportion of the children who show either learning difficulties and/or poor classroom adjustment at pre-school and lower grade levels are handicapped by disabilities in visual perception.

Simpson (1960, p. 61) conducted a study in Lafayette, Indiana Public Elementary schools. The author states: "According to statistical analysis of the data obtained in this study, there is relatively high correlation between ability to copy and success in reading at the first grade level."

The child who is perceptually handicapped has difficulty in the stage of development-concept formation. As Strauss (1947, p. 54) and his co-workers have pointed out, the learning of concepts in children involves the manipulation of relationships between percepts with the resulting emergence of unique elements.

Clements and Peters (1962, p. 17) state: "For many years, behavioral and learning deviations seen in children have been attributed almost exclusively to rearing patterns and inter-personal relationships. They believe that, when evaluating a disturbed child, a search among myriad possibilities of organic causation must be carefully done, as was done in the past, among inter-personal deprivation and stress factors. It is the contention of the author that a place should be reserved in our thinking for the inclusion of subtle deviations arising from genetic factors, brain insults, and illnesses, and injuries sustained during years critical for development and maturation of those parts of the nervous system having to do with perception, language, inhibition of impulses, and motor control."

In a study initieated May, 1962 at the University Elementary School, Los Angeles, California, under the direction of Edith Appleton, a group of 25 kindergarten children, was used in the study. The Frostig was administered in July, 1962 to all 25. Eight of the children were found to have visual-perceptual quotients of 90 or below. The author predicted that these children would not attempt to learn to read because of their difficulties. The prediction proved highly accurate. In October, 1962, none of the children with visual-perceptual quotients below 90 had begun to read. Only one child with a P. Q. above 90 showed reading difficulty. (Appleton, 1962).

CHAPTER II

STATEMENT OF THE PROBLEM

The possibility of early identification of visual-perceptual deficiency in first grade children of apparent average or above average intelligence is indeed a challenge to all educators concerned with developmental procedures that can increase these children's potential for academic success in the first grade in reading and arithmetic. The need is for a reliable instrument of high predictive capability that can help identify these children at the crucial age when the most effective steps can be taken to alleviate their visual-perceptual deficiencies.

The purpose of this study was to test the predictive value of the Frostig as a measure of total academic readiness at the beginning of first grade, and as a predictor of academic achievement in first grade in reading and arithmetic.

A secondary purpose of this study was to test the relationship of Frostig Subtest II, III, and IV with reading achievement at the end of first grade.

In order to determine the predictive value of the Frostig, the following hypotheses were tested:

1. That, at the beginning of the first grade, there is a significant statistical difference between the (mean) performance of Group I and Group II on the Metropolitan Readiness Test.
2. That there is a significant statistical difference between the (median) reading level performance of Group I and Group II as measured by the reading levels tool at the end of first grade.
3. That there is a significant statistical difference between the (median) arithmetical level performance of Group I and Group II as measured by the arithmetic levels tool at the end of first grade.
4. That there is a significant statistical difference between the (median) performance of Group I and Group II on Subtest VI of the Metropolitan Readiness Test.
5. That there is a statistically significant relationship within Group I in performance on the Frostig Subtest II and the reading level as measured by the reading levels tool at the end of first grade.
6. That there is a statistically significant relationship within Group II in performance on the Frostig Subtest II and reading level as measured by the reading levels tool at the end of first grade.
7. That there is a statistically significant relationship within Group I in performance on the Frostig Subtest III and reading level as measured by the reading levels tool at the end of first grade.

8. That there is a statistically significant relationship within Group II in performance on the Frostig Subtest III and reading level as measured by the reading levels tool at the end of first grade.

9. That there is a statistically significant relationship within Group I in performance on the Frostig Subtest IV and reading level as measured by the reading levels tool at the end of first grade.

10. That there is a statistically significant relationship within Group II in performance on the Frostig Subtest IV and reading level as measured by the reading levels tool at the end of first grade.

CHAPTER III

METHOD

DESIGN OF STUDY

Two groups of first grade children were identified during the first three weeks of first grade of the 1966-67 school year. They were matched as to age, sex, race, prior kindergarten training, and I. Q. as measured by the L. M. Form of the Stanford-Binet. The t. test on the two groups using I. Q.'s yielded a statistical difference of .09, which is acceptable at .05 level of confidence at the beginning and end of the study. The two groups were separated on the basis of the Frostig Developmental Test of Visual Perception, which yielded a Perceptual Quotient score which will be referred to as P. Q.

Group I was the beginning first graders with I. Q.'s ranging from 90 to 134, and with P. Q.'s above 90 as measured by the Frostig. (Appendix, Table V.)

Group II was the beginning first graders with I. Q.'s ranging from 91 to 135, and with P. Q.'s below 90 as measured by the Frostig. (Appendix, Table VI.)

The pupils were identified by the writer, and the results were not made available to any person in the school system. The students were in 23 different schools, with 30 different teachers in first grade classes in Oklahoma City schools. After testing and identifi-

cation, nothing more was done until the week of May 15-20. At this time, teachers were asked to give the writer the reading and arithmetical level at which each pupil in the study was working.

SUBJECTS

The subjects used in this study were children who had completed a full year in kindergarten in Oklahoma City Schools during the preceding school year. These students were all enrolled in first grade when the study was begun, and no child had been retained. In order to obtain 26 students in each group, 215 were administered the Metropolitan and Frostig tests. These students were white boys and girls whose chronological ages fell between 5-11 and 6-9, and whose intelligence fell into the normal range of 90 or above as measured by the L. M. Form of the Stanford-Binet. They were enrolled in 23 different schools in Oklahoma City during the 1966-67 school year in regular first grade classes; therefore, the author felt no teacher differential existed.

The subjects were randomly selected from elementary schools in the Oklahoma City Public School System from all socio-economic levels. Testing was done at the schools. The Metropolitan Readiness and Frostig tests were administered in groups of 10-15. The L. M. Form of the Stanford-Binet was administered individually by the author to each student selected for the study. All testing was done by the end of the third week of beginning first grade, before any formal teaching of reading and arithmetic had begun.

TEST INSTRUMENTS

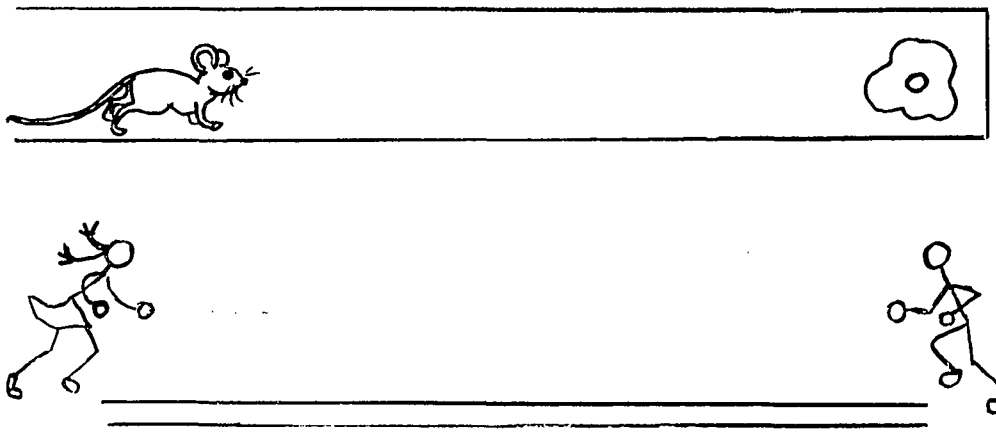
INSTRUMENT I

The Frostig Developmental Test of Visual Perception (1963) was used to determine the two groups used in the study. This test, standardized in 1963, was designed to be administered to groups as well as individuals. From a child's test results, his perceptual quotient (P. Q.) and perceptual age equivalent were obtained in a manner similar to that used in determining mental ages and intelligence quotients.

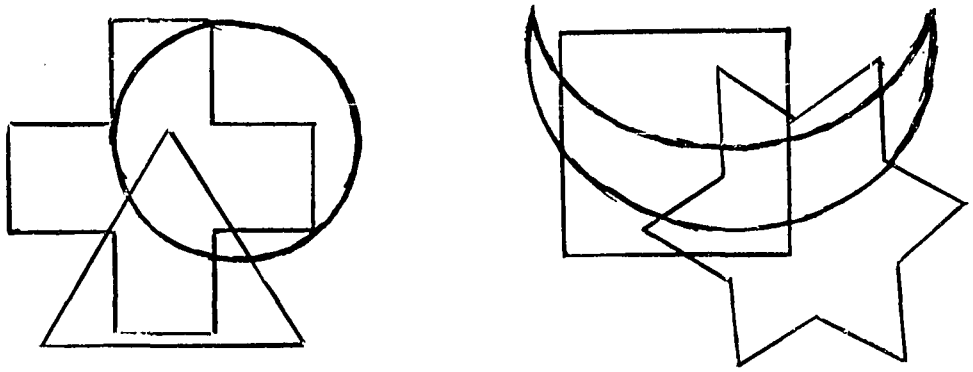
Dr. Frostig found the perceptual quotient to be a better prognostic indicator than the perceptual age; therefore, the author chose to use the P. Q. score in this study. The perceptual quotient is a deviation score obtained from the sum of the sub-test scale scores after correcting for age variation. For each age group, the P. Q. has a median of 100. The author chose to divide the two groups in the study on the basis of 90 P. Q. as a cut-off point below which Dr. Frostig (1963) says a child should have special perceptual training. It was never believed that these five visual perceptual abilities were the only ones involved in the total process of visual perception, but they were conceived to be important parts of the process, appeared to have particular relevance to school performance, and were, therefore, studied.

In this test, the child is required to attempt carefully-graded tasks in five areas of visual perception. These five areas were chosen because defects in these abilities were observed in clinical work with children with learning disabilities. The following is a summation of the test areas, (as published by Frostig, 1964):

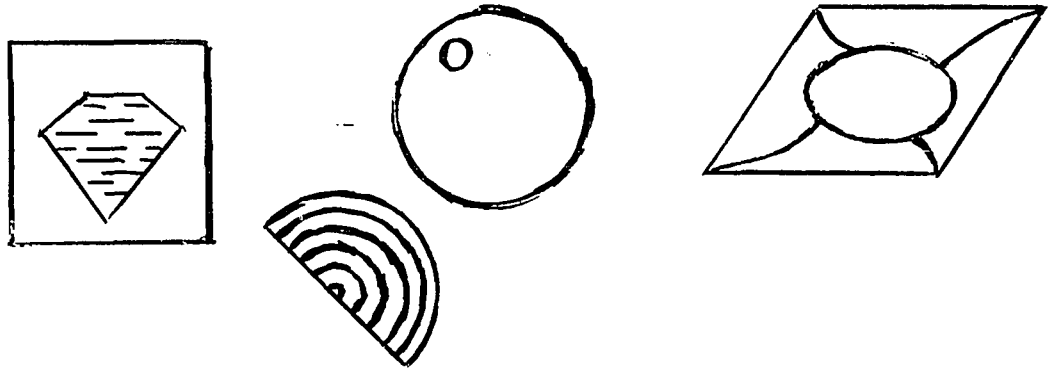
1. Eye-hand Coordination: The child is to draw straight lines between increasingly narrow boundaries, curved and oblique lines, and straight lines from one point to another without guidance. Children who have difficulty in writing are usually handicapped by poor eye-hand coordination.



2. Figure-ground Perception: The child is to outline intersecting figures and to find and outline hidden, embedded figures. Children who cannot recognize words often have disturbances in figure-ground perception.

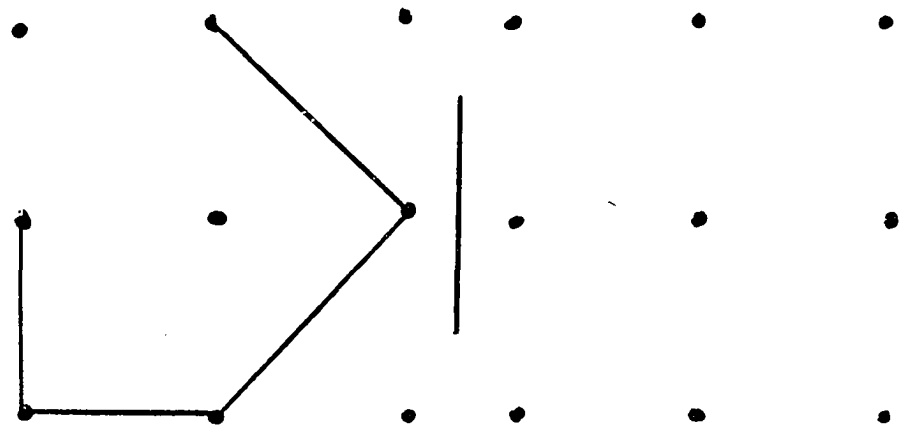


3. Perception of Form Constancy: The child is asked to discriminate between similar shapes of different sizes, patterning, and position. If a child is unable to recognize a letter or word when it is written in different sizes or colors, or when it is written in upper case print when they are accustomed to seeing it in lower case print, it is postulated that these children have poor form constancy.



4. Perception of Position in Space: This is tested by requiring the child to detect a reversed or rotated figure in a sequence.

5. Perception of Spatial Relations: The task of this test is to copy patterns by linking dots.



INSTRUMENT II

Form A of the 1965 revision of the Metropolitan Readiness Test was used as a measure of total academic readiness. As was previously indicated, subjects were administered the test in small groups. This test was developed by Hildreth and Griffiths (1965) to determine readiness of pupils to do first grade work, especially in reading and arithmetic.

Subtests I, II, III, and IV are considered as measures of reading readiness.

Subtest V is considered a number readiness test. This test is divided into six subtests measuring readiness in the following areas:

Test I. A measure of the pupil's range of verbal concepts - one aspect of linguistic maturity.

Test II. Listening - Sustained attention, capacity for inferences.

Test III. Matching - Measures visual perception involving the

recognition of similarities. The ability is necessary in discriminating word forms in beginning reading.

Test IV. Alphabet - Tests the ability to recognize lower case letters of the alphabet by name.

Test V. Numbers - Measures knowledge of number vocabulary, counting, interpreting number symbols, use of numbers in simple problems, and other aspects of number maturity.

Test VI. Copying - Measures a combination of visual perception and motor control such as is required for learning to write.

The test booklet consisted of pictures which each subject marked or copied according to instructions given orally by the examiner. To find total readiness, scores were combined from tests 1 - 6. The Metropolitan yielded a letter rating, percentile, and raw score. To do the necessary statistical computations, the author chose to use the raw subtest scores and the total raw score.

Achievement Levels Tool: The level of work that each child attained during the first year in reading and arithmetic was determined by each teacher. Evaluations were made by the teachers during the week of May 15-20, which was near the end of the first year of work for the students in this study.

In Oklahoma City schools, the following criteria was developed for reading and arithmetic levels in first grade, and was used by the teachers in this study:

Reading:

Level I.	1.	Reads pictures.
Readiness	2.	See likenesses and differences (objects, shapes, and pictures).
	3.	Hears rhyming words.
	4.	Hears beginning consonant sounds.
	5.	Understands left to right progression.
Level II.	6.	Knows - approximately 50 sight words.
Pre-primer.	7.	Attaches meaning to spoken, printed words. (manuscript).
	8.	Matches words.
	9.	Distinguishes capitals, small letters in words.
	10.	Has auditory perception of initial consonant sounds: d, j, s, p, t, f, l, m, b, r, c, (k), w, g, n, h, r, in known words.
	11.	Understands top-to-bottom of page progression.
Level III.	12.	Knows - approximately 150 sight words.
Primer.	13.	Uses picture and context clues.
	14.	Interprets what is read.
	15.	Recognizes words formed by adding s, 's; compound words made up of two known words.
	16.	Has visual auditory perception of initial consonants: f, b, m, c, w, s, t, r, h, g, y, n, k, l, d, j, in known words.
Level IV.	17.	Knows - approximately 300 sight words.

1st year. 18. Reads silently and orally with understanding.

19. Continues to use pictures and context clues.

20. Has visual auditory perception: ch, sh, th, wh; final consonants: s, n, p, t, d, m, l, ending ch and sh.

21. Recognizes words formed by adding s, 's, ed, and ing to known words.

Level V. 22. Knows - approximately 500 sight words.

Beginning 23. Uses punctuation to read with understanding.

2nd year. 24. Anticipates outcomes.

25. Recognizes short and long vowel sounds: a, e, i, and o.

26. Recognizes silent vowel in one syllable words: beat, gate, contractions with one letter missing.

27. Uses substitution of initials, final consonants.

Arithmetic:

Level I 1. Ability to match one-to-one.

Readiness 2. Understands greater than and less than.

3. Understands the meaning of numbers 1-10 as associated with sets.

4. Has an awareness of the difference between number and number name.

5. Reads and writes numerals 1-10.

Level II. 6. Understands the process of A and S in terms of sets.

Pre-primer. 7. Understands that zero is a number.

8. Can write and solve number sentences for picture

problems.

9. Reads and writes numerals 0-40.

10. Can write a numeral (two digit) in expanded form expressing a place value.

11. Understands that numbers have many names.

12. Knows A and S facts through sums of 6.

Level III. Primer. 13. Understands that only two numbers can be added. (Law of grouping.)

14. Knows the difference between more and most when using money up to 20 cents.

15. Has an understanding of place value in two digit numerals.

16. Can read and write 0-100.

17. Can use number line to verify addition facts.

Level IV. 1st year. 18. Understands A and S of numbers named by two digit numerals. (No regrouping.)

19. Can add three numbers named by numerals in vertical form.

20. Can complete an addition table with sums through 12.

21. Understands the related number facts idea: e.g. 3+4=7, 4+3=7, 7-4=3, and 7-3=4.

22. Can identify common geometric shapes.

23. Understands one-half (groups, single objects).

Level V. 24. Can distinguish between equality and inequality.

Beginning 2nd year.

25. Can use the basic properties in learning new addition and subtraction facts. (Commutative and associative).
26. Can write and solve number sentences from part pictures, part verbal problems.
27. Has understanding of the adden-addend-sum relationship.
28. Is able to add and subtract numbers named by two-digit numerals when sum is greater than 100.
29. Has an awareness of the idea of standard units of measurement: (Time, liquid, linear, temperature, and weight).
30. Knows the meaning of the numeral ½.

STATISTICAL TECHNIQUES

The statistical techniques chosen for the treatment of data in this study were as follows: (Siegel)

..... The mean I. Q.'s of Group I and Group II were not significantly different at the .05 level of confidence. A one-tailed t. test was used to test the statistical significance of the two groups.

..... Hypothesis I was tested with a Two Sample t. test using 50 degrees of freedom.

..... Hypotheses II, III, and IV were tested with Chi-Square Median Test.

..... Hypotheses V, VI, VII, VIII, IX, and X were tested

with Kendall's Tau.

CHAPTER IV

RESULTS

Fifty-two first grade boys and girls participated in this study. Two groups of beginning first graders were identified through testing during the first three weeks of the 1966-67 school year. The two groups were matched for age, sex, race, I. Q., and prior kindergarten training. These students came from all socio-economic levels. The groups were separated on the basis of their scores on the Frostig Developmental Test of Visual Percpetion.

Group I was made up of sixteen boys and ten girls with I. Q.'s ranging from 90 to 134 as measured by the 1960 L. M. Form of the Stanford-Binet, with a mean I. Q. of 112.92. This group had Frostig perceptual scores ranging from 92 to 118, with a mean P. Q. of 105.85.

Group II was made up of sixteen boys and ten girls with I. Q.'s ranging from 91 to 135, as measured by the 1960 L. M. Form of the Stanford-Binet, with a mean I. Q. of 110.15. The Frostig P. Q. scores were below 90, ranging from 67 to 89, with a mean P. Q. of 81.

This study was longitudinal in nature, with testing being done during the first three weeks of first grade, and the final data being collected the week of May 5-10 of the 1966-67 school term. All of the students who began the study remained in Oklahoma City Schools; therefore, the population of the groups remained the same throughout the study.

In Hypothesis Number I, it is stated that there is a significant statistical difference between the mean performance of Group I and Group II on the Metropolitan Readiness Test at the beginning of first grade. Table I reveals that the results are statistically significant. This is significant at the .05 level of confidence; thus, Hypothesis I is supported and accepted, with a t. score of 3.8.

In Hypothesis II, it is stated that there is a significant statistical difference between the median reading level performance of Group I and Group II as measured by the reading levels tool at the end of first grade. Table II, a. indicates that the results were statistically significant; therefore, Hypothesis II is supported and accepted with a median Chi-Square Test of 23.99.

In Hypothesis III, it is stated that there is a significant statistical difference between the median arithmetical level performance of Group I and Group II as measured by the arithmetic levels tool at the end of first grade. Table II, b. reveals that the results are statistically significant; likewise, Hypothesis III is supported and accepted with a median Chi-Square Test of 17.22 significant at the .05 level of confidence.

In Hypothesis IV, it is stated that there is a significant statistical difference between the median performance of Group I and Group II on Subtest VI of the Metropolitan Readiness Test. In Table III, it is revealed that the results are statistically significant; therefore, Hypothesis IV is accepted and supported with a Chi-Square Test of 7.98 significant at the .05 level of confidence.

In Hypothesis V, it is stated that there is a statistically significant relationship within Group I between the performance on the Frostig Subtest II and the reading level as measured by the reading levels tool at the end of first grade. Table IV, a. reveals that a significant Tau correlation of +3.68 exists at the .004 level of confidence; therefore, the hypothesis is supported and confirmed.

In Hypothesis VI, it is stated that there is a statistically significant relationship within Group II in performance on the Frostig Subtest II and reading level as measured by the reading levels tool at the end of first grade. Table IV, b. reveals that a significant correlation does not exist; therefore, the hypothesis is rejected.

Hypothesis VII states that there is a statistically significant relationship within Group I in perfromance on the Frostig Subtest III and reading level as measured by the reading levels tool at the end of first grade. Table IV, c. indicates that a significant correlation does not exist; therefore, the hypothesis is rejected.

Hypothesis VIII states that there is a statistically significant correlation within Group II on the Frostig Subtest III and reading level as measured by the reading levels tool at the end of first grade. Table IV, d. indicates that a significant correlation does not exist; therefore, the hypothesis is rejected.

In Hypothesis IX, it is stated that there is a statistically significant relationship within Group I in performance on the Frostig Subtest IV and reading level as measured by the reading levels tool at the end of first grade. Table IV, e. indicates that a significant correlation does not exist; therefore, the hypothesis is rejected.

Hypothesis X states that a statistically significant relationship exists within Group II in performance on the Frostig Subtest IV and reading level as measured by the reading levels tool at the end of first grade.

Table IV, f. reveals that a significant correlation does not exist; therefore, the hypothesis is rejected.

TABLE I

Comparison of Group I (high P. Q.) with Group II (low P. Q.) on Metropolitan Readiness Test at Beginning of First Grade

	Hypothesis	Compare	df	t	p
I	Readiness	Group I v/s Group II	50	3.8	.05

TABLE II

Comparison of Group I (high P. Q.) with Group II (low P. Q.) on Academic Achievement at End of First Grade in Reading and Arithmetic

Hypotheses			Compare	X^2 Median Chi Square	df	p
a.	II	Reading	Group I v/s Group II	23.99	1	.05
b.	III	Arithmetic	Group I v/s Group II	17.72	1	.05

TABLE III

Comparison of Group I (high P. Q.) with Group II (low P. Q.) on Performance of the Metropolitan Readiness Subtest VI

	Hypothesis	Compare	X^2 Median Chi-Square	df	p
IV	Metropolitan Subtest VI	Group I v/s Group II	7.98	1	.05

TABLE IV

Comparison of Reading Levels Attained at the End of First Grade in Group I and Group II with Frostig Subtests II, III, and IV

	Hypotheses	Compare	N	t Kendall's Tau	p
a.	V	Group I Reading Level v/s Frostig Subtest II	26	+.368	.004
b.	VI	Group II Reading Level v/s Frostig Subtest II	26	-.183	.09
c.	VII	Group I Reading Level v/s Frostig Subtest III	26	-.09	.26
d.	VIII	Group II Reading Level v/s Frostig Subtest III	26	+.208	.06
e.	IX	Group I Reading Level v/s Frostig Subtest IV	26	+.14	.15
f.	X	Group II Reading Level v/s Frostig Subtest IV	26	+.15	.14

CHAPTER V

SUMMARY AND CONCLUSION

In general, an account has been given of the Frostig, a test which can be used to measure visual perception. Research indicated that this test had a .4 and .5 correlation between visual perception and reading achievement scores. The author desired to further test the Frostig as a predictor of total academic readiness, and also as a predictor of reading and arithmetical achievement in first grade.

Research on the Frostig Test of Visual Perception was reviewed in Chapter I. The test had been correlated to reading achievement in first grade, but no attempt had been made to use it as a predictor of total academic readiness or as a predictor of arithmetical achievement.

Two groups of beginning first graders were identified during the first three weeks of the 1966-67 school year and followed to the end of first grade.

FINDINGS

I. The author predicted that Group I (high P. Q.) would perform statistically better than Group II (low P. Q.) on the Metropolitan Readiness Test at the beginning of first grade. The results were significant with a t. score of 3.8, which is significant at

the .05 level of confidence. The results indicate that the Frostig is an instrument that could be used to predict total academic readiness prior to first grade. In Group I, twenty-two children were above the 50th percentile which is considered the national norm on this test, and four fell below. In Group II, ten children were above the 50th percentile, while sixteen fell below the national norm.

II. The author predicted that Group I (high P. Q.) would be reading at a significantly higher level than Group II (low P. Q.) at the end of first grade. Two different Chi-Square tests were run with significant results. A two-by-two Chi-Square test yielded a X^2= 22.55, significant at the .05 level of confidence. The median Chi-Square test was used which yielded a X^2=23.99, significant at the .05 level of confidence.

These results indicate that the Frostig P. Q. is a predictor of reading achievement in first grade. It can be predicted that beginning first grade students of average or above average intelligence, who have a Frostig P. Q. of below 90, will not be working up to first grade level in reading at the end of first grade. Using the reading levels tool previously described, the mean reading level of Group I was level 3.8, and that of Group II was level 2.7 at the end of first grade.

III. Another prediction was that Group I (high P. Q.) would be working on a significantly higher arithmetical level than Group II (low P. Q.) at the end of first grade. Two Chi-Square tests were again run

on the data. On the two-by-two Chi-Square, the data yielded a X^2=20.16, significant at the .05 level of confidence. On the median Chi-Square test, the data yielded a X^2=17.72, significant at the .05 level of confidence. These results indicate that the Frostig P. Q. is a predictor of arithmetical achievement in first grade. On the basis of this data, it can be predicted that first grade students of average or above average intelligence, who have a P. Q. score below 90, will not be working up to first grade level in arithmetic at the end of first grade. Using the arithmetic levels tool, the mean arithmetical level attained by Group I was level 3.7, while Group II attained a mean arithmetical level of 2.7 at the end of first grade.

IV. Another prediction was that Group I (high P. Q.) would perform statistically better on Metropolitan Subtest VI than Group II (low P. Q.). The data was tested with a two-by-three Chi-Square X^2= 6.136 with 2 df, significant at the .05 level of confidence. The median Chi-Square test was used which yielded a X^2=7.98, significant at the .05 level of confidence. If the Metropolitan test were administered, it could then be hypothesized that students who did well on Subtest VI would be those likely to have high P. Q. scores. There are 14 possible points on Subtest VI. Group I had a mean of 7, while Group II had a mean of 4.5.

V. There is a significant relationship between reading achievement of Group I (high P. Q.) and Frostig Subtest II. The data was tested using Kendall's Rank Correlation Coefficient Tau. The Tau

score was +.368, which is significant at .004.

VI. In Hypotheses VI, VII, VIII, IX, and X, there seems to be a trend operating between the reading level attained and Frostig Subtests I, II, and IV. The experimenter feels that significance was not obtained because of the small amount of variance in the Frostig Subtest scores for Group I and Group II.

In Group I (high P. Q.) when corrected for ties:

Subtest II had 7 categories out of a possible 26.

Subtest III had 8 categories out of a possible 26.

Subtest IV had 8 categories out of a possible 26.

In Group II (low P. Q.) when corrected for ties:

Subtest II had 7 categories out of a possible 26.

Subtest III had 9 categories out of a possible 26.

Subtest IV had 6 categories out of a possible 26.

DISCUSSION

The author fully realizes the limitations of this piece of research. As a result of this study and from a review of the literature available, the author believes that, at least at the first grade level, there is statistical justification for the use of the Frostig Developmental Test of Visual Perception as a predictor of total academic readiness, and as a predictor of achievement in reading and arithmetic.

In spite of the child's I. Q., if his visual perception is poor, he is likely to develop a learning disability in one or more areas of academic work.

In children where the earlier stages of perceptual development have been inadequate, operation on the higher levels, demanded by our educational methods, becomes almost impossible. To continue an attempt to teach such a child at higher stages than his development would warrant, sets up an impossible task.

The author believes that the results of this study suggest some of the relatively important relationships between perceptual skill and total academic readiness for first grade, and reading and arithmetical achievement at the first grade level.

Hopefully, kindergarten children who appear immature to the classroom teacher could be referred for a diagnostic battery of testing. The Frostig, used as a measure of visual perception, would be used, along

with other techniques for measuring the child's abilities and deficits. If these children who have deficits could be given an extended readiness program with an emphasis on perceptual development, prior to formal academic training, many of these children would not suffer failure by just "waiting".

When a child is slow to develop visual perception, he has difficulty recognizing the relationship of the visual symbols. As a result, he is seriously handicapped in learning to read, write, spell, or to do arithmetic. To wait until second or third grade, until a child develops a learning disability, is too expensive and too late.

The author feels that the results of the study further indicate the need for early detection of a visual perceptual lag in the young child.

It is sincerely hoped and strongly recommended that exploration of perceptual training and developmental possibilities be extended to kindergarten classrooms, rather than the "baby sitting" that is now being done so universally.

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APPENDIX

TABLE V

DISTRIBUTION OF STUDENTS IN GROUP I (HIGH P. Q.) ACCORDING TO SCORES OBTAINED FROM BINET-FROSTIG, METROPOLITAN-READING, AND ARITHMETIC LEVELS TOOLS

Name	Binet I. Q.	Frostig P. Q.	M. R.	Reading Achievement	Arith. Achievement	M. R. VI	Frostig 2	Frostig 3	Frostig 4
Drew	134	111	82	4	4	13	11	11	10
Mark	126	116	82	5	5	8	11	10	15
Paula	126	96	57	4	4	5	9	6	7*
Susan	124	115	56	4	4	9	12	11	11*
Mary H.	124	113	65	4	4	4	14	9	10*
Robert	121	104	53	4	4	6	8	8	12
Steve T.	119	102	60	5	4	11	10	10	11
David	118	102	53	4	3	7	14	9	11
Gregory	118	118	72	4	4	10	14	12	15
Darin	118	113	65	4	4	10	10	13	11
Carmen	118	104	61	4	4	6	10	6	15*

TABLE V (Cont'd.)

DISTRIBUTION OF STUDENTS IN GROUP I (HIGH P.Q.) ACCORDING TO SCORES OBTAINED FROM BINET-FROSTIG, METROPOLITAN-READING, AND ARITHMETIC LEVELS TOOLS

Name	Binet I. Q.	Frostig P. Q.	M. R.	Reading Achievement	Arith. Achievement	M. R. VI	Frostig 2	Frostig 3	Frostig 4
John	117	111	94	4	4	14	10	7	13
John D.	111	110	65	4	4	8	11	10	10
Lyndal	115	113	73	4	4	8	14	8	12
Cynthia	114	92	60	4	4	4	8	9	10*
Stewart	112	103	58	4	4	11	10	9	9
Susie	110	94	54	3	3	6	10	8	9*
Curtis	109	100	49	4	4	5	13	7	10
Wade	109	110	54	3	4	5	9	8	15
Becky	106	118	63	4	4	7	14	11	15*
Bradly	106	100	71	3	3	6	8	8	14
Kay	102	98	63	4	4	5	10	9	8*

TABLE V (Cont'd.)

DISTRIBUTION OF STUDENTS IN GROUP I (HIGH P. Q.) ACCORDING TO SCORES OBTAINED FROM BINET-FROSTIG, METROPOLITAN-READING, AND ARITHMETIC LEVELS TOOLS

Name	Binet I. Q.	Frostig P. Q.	M. R.	Reading Achievement	Arith. Achievement	M. R. VI	Frostig 2	Frostig 3	Frostig 4
Lonnie	100	94	46	2	3	2	8	10	9
Adrian	95	94	32	3	3	2	9	10	8*
Boyd	94	105	36	3	3	3	9	11	15
Melanie	90	116	55	4	3	7	13	11	14*

I. Q..... Intelligence Quotient
P. Q..... Perceptual Quotient
M. R..... Metropolitan Readiness Test
R. A..... Reading Achievement Test
A. A..... Arithmetic Achievement Test
M. R. VI..... Metropolitan Readiness Subtest VI
Frostig..... Subtests II, III, and IV
*..... Girls

TABLE VI

DISTRIBUTION OF STUDENTS IN GROUP II (LOW P. Q.) ACCORDING TO SCORES OBTAINED FROM BINET-FROSTIG, METROPOLITAN-READING, AND ARITHMETIC LEVELS TOOLS

Name	Binet I. Q.	Frostig P. Q.	M. R.	Reading Achievement	Arith. Achievement	M. R. VI	Frostig 2	Frostig 3	Frostig 4
Simon	135	83	32	2	2	4	9	10	11
Wade	130	87	68	4	4	5	8	11	9
Robert	122	76	47	3	3	4	4	7	11
Tommy W.	121	89	40	2	2	4	10	6	8
Clint	119	77	42	3	3	1	7	5	9
Kari	118	70	39	2	2	4	8	4	6*
Alan	117	89	57	3	3	9	8	8	10
Tommy N.	116	87	56	2	2	6	13	7	9
Cynthia	114	87	60	3	3	4	8	9	10*
Shawn	113	87	58	3	3	4	8	8	13
Michael L.	113	85	51	4	4	3	5	6	9

TABLE VI (Cont'd.)

DISTRIBUTION OF STUDENTS IN GROUP II (LOW P. Q.) ACCORDING TO SCORES OBTAINED FROM BINET-FROSTIG, METROPOLITAN-READING, AND ARITHMETIC LEVELS TOOLS

Name	Binet I. Q.	Frostig P. Q.	M. R.	Reading Achievement	Arith. Achievement	M. R. VI	Frostig 2	Frostig 3	Frostig 4
Donna	112	89	63	3	3	9	8	8	10*
Charles	111	80	42	3	3	6	7	4	9
Pamela	111	70	47	2	2	4	10	0	8*
Donald	110	67	37	2	2	3	7	4	7
Tyler	109	77	59	2	3	9	6	7	9
Gerald	109	87	55	4	4	8	8	7	10
Mitchell	107	89	51	3	3	3	9	6	10
George	106	85	51	3	3	4	8	9	10
Michelle	104	87	56	3	3	6	10	7	8*
Jeannie	99	78	40	3	3	2	6	5	8*
Terri	96	67	45	3	3	7	7	4	8*

TABLE VI (Cont'd.)

DISTRIBUTION OF STUDENTS IN GROUP II (LOW P. Q.) ACCORDING TO SCORES OBTAINED FROM BINET-FROSTIG, METROPOLITAN-READING, AND ARITHMETIC LEVELS TOOLS

Name	Binet I. Q.	Frostig P. Q.	M. R.	Reading Achievement	Arith. Achievement	M. R. VI	Frostig 2	Frostig 3	Frostig 4
Ann	95	89	57	3	3	5	10	7	8*
Mark	93	77	31	2	2	1	9	8	8
Roxanne	93	85	32	3	2	0	8	9	9*
Darrell	91	70	32	2	2	3	7	6	8

I. Q..... Intelligence Quotient
P. Q..... Perceptual Quotient
M. R..... Metropolitan Readiness Test
R. A..... Reading Achievement Test
A. A..... Arithmetic Achievement Test
M. R. VI..... Metropolitan Readiness Subtest VI
Frostig..... Subtests II, III, and IV
*..... Girls