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A FOLLOW-UP STUDY OF CHILDREN SELECTED BY THE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION IN RELATION TO THEIR SUCCESS OR FAILURE IN READING AND ARITHMETIC AT THE END OF SECOND GRADE

A DISSERTATION

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BY

HARRY LEE FULLWOOD

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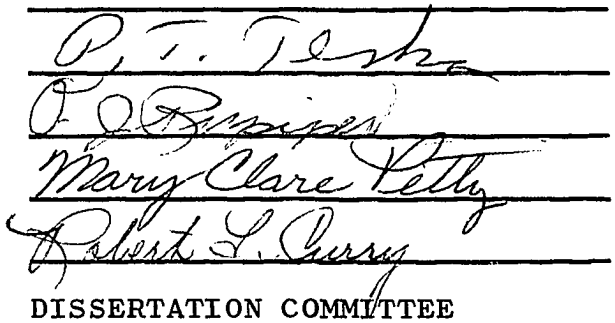
A FOLLOW-UP STUDY OF CHILDREN SELECTED BY THE FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION IN RELATION TO THEIR SUCCESS OR FAILURE IN READING AND ARITHMETIC AT THE END OF SECOND GRADE

APPROVED BY



DISSERTATION COMMITTEE

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CHAPTER I

INTRODUCTION

Learning processes are centered within the heart of school experiences today and have become the concern of teachers, administrators, and educational researchers alike. Educators and psychologists attempt to understand the nature of learning and to account for specific learning disabilities among children. These personages also show interest in diagnoses and prevention of learning disorders, but few seem directed toward specific means of identifying such disorders.

During the past few years, attention has been focused upon a unique group of school children labeled as having "learning disabilities" or "learning disorders." A member of this particular group may possess average to above average intellect, yet have difficulty achieving satisfactorily in school learning, following directions, or recalling

familiar stimuli. In many instances, the classroom teacher may believe the child to be mentally deficient and request that an individual evaluation be made by the psychologist. This evaluation process may reveal the presence of a specific learning disability rather than retarded mental ability. Limited research seems to support the belief that a significant number of learning disorder cases can be attributed to poor development of auditory or visual perception.

Frostig is but one of many educators becoming concerned with the role played by faulty visual perception in children with learning disturbances. Frostig's efforts related to understanding visual-perceptual learning disorders are becoming known and are influencing others in education to consider the nature of such deficiencies. For consideration of this influence, a study by Ferguson will serve as example. Ferguson[1] found, in a longitudinal study of first grade children with high and low visual-perceptual abilities, that the children with high visual perception achieved on a higher order in reading and arithmetic than did the children with low visual perception. A follow-up study based on Ferguson's[2] findings seemed indicated. It

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[1]Nelda Unterkircher Ferguson, "The Frostig- An Instrument for Predicting Total Academic Readiness and Reading and Arithmetic Achievement in First Grade" (unpublished Ph.D. dissertation, University of Oklahoma, 1967), p. 28.

[2]Ibid., p. 35.

was, therefore, the major objective of this research study to determine if Ferguson's[3] high perceptual ability group might still be achieving on a higher order in reading and arithmetic than her low perceptual ability group at the end of second grade.

Review of Literature

Research Related to Visual Perception and Learning

Kephart[4] described perception as a process involving five distinct and equally important events: (1) The stimuli are perceived as neural impulses by the optic mechanism and fired to the sensory projection area of the cortex (Input); (2) there they are synthesized with all other sensory inputs of the organism and related to past and present experiences (Integration); (3) this synthesized pattern of impulses is then translated into a motor output pattern via a scanning mechanism (Scanning); (4) as a result of this scanning operation, an output pattern is sent to motor neurons and a physical reaction occurs (Output); (5) this reaction is judged for appropriateness and alterations are made by a control input process (Feedback). Thus, a circular operation is formed and continues until the feedback matches

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[3] Ibid., p. 16.

[4] Newell C. Kephart, The Slow Learner in the Classroom (Columbus, Ohio: Charles E. Merrill Books, 1960), pp. 55-69.

the input exactly. The perceptual process is not a static affair, but a continued event that remains active until the proper response is made.

In forming an operational definition of perception, Ittelson[5] suggested that the ability to perceive becomes a crucial process directly associated with effective functioning of the individual. He offered a summation of perception in stating:

> Perceiving is that part of the process of living by which each one of us from his own particular point of view creates for himself the world in which he has his life's experiences and through which he strives to gain his satisfaction.[6]

Frostig[7] seemed to be in accord with Ittelson when she identified visual perception as a necessary condition to effective life functioning. She described the perceptually impaired child as being unable to cope with everyday experiences or new life situations that often arise. Imperfection in visual-perceptual development was also offered as a possible cause for learning disability.

FitzGerald[8] defined perception as a process

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[5]William H. Ittelson, Visual Space Perception (New York: Springer Publishing Co., 1960), pp. 9-23.

[6]Ibid., p. 19.

[7]Marianne Frostig, "Visual Perception in the Brain-Injured Child," The American Journal of Orthopsychiatry, XXXIII (July, 1963), pp. 665-671.

[8]Agnes D. FitzGerald, "Perception Skills and Beginning Reading," Elementary English, XL (April, 1963), pp. 415-427.

beginning with gross motor awareness and including finite discriminations of space, form, and laterality. Perceptive ability involves comparing, relating, and integrating; this is a continuing process that changes in direct relation to present and past experiences.

English and English offered a behavioral definition of perception as:

> A hypothetical internal event controlled primarily by stimulation of sense receptors but influenced also by habit and drive state. Perception is inferred from the nature of the physical stimulus and from the behavior the stimulus apparently elicits. It is taken to be the direct or indirect controller of all behavior.[9]

In an effort to offer a succinct delineation of perception, Ferguson stated:

> 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.[10]

Cruickshank[11] suggested that children with visual-perceptual problems often could not see the forest, but could see only the trees. In many instances, this distortion took the form of inappropriate gestalt interpretation or disorganized background-foreground associations. What appeared to be a stimulus object or foreground component

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[9]Horace B. English and Ava C. English, A Comprehensive Dictionary of Psychological and Psychoanalytical Terms (New York: David McKay Co., 1958), p. 378.

[10]Ferguson, loc. cit., p. 4.

[11]William M. Cruickshank, The Brain-Injured Child in Home, School, and Community (New York: Syracuse University Press, 1967), pp. 36-42.

frequently became background of the stimulus scene. Fixation often occurred on the white background of the page, rather than on the printed symbols. Individual elements perceived by the child were often grossly incorrect and slightly related to the actual object under attention. The child experienced difficulty in the learning and social processes of home and school life because of this limited perceptual ability. Within the child grew a constant fear of the unknown and misunderstood elements that constituted his environment; therefore, the perceptually handicapped youngster could not operate effectively under the same circumstances as did normal children. Efficiency of functioning was increased, in some cases, if the educational or environmental situation became appropriately regulated to the child's complex adjustment and learning needs.

Research findings by Frostig 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 level, perceptual development may be regarded as a most sensitive indicator of the developmental status of the child as a whole.[12] With the aid of her colleagues, a training program for perceptually handicapped children and a standardized test instrument for

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[12]Frostig, loc. cit., p. 666.

identification of members within this exceptional group have been developed by the prominent educator. In 1963, the third standardization was completed and is now in use throughout many educational clinics and school systems.

The Frostig Developmental Test of Visual Perception,[13] was designed for the purpose of identifying learning disabilities in young children. It was constructed after careful observation of children with learning difficulties, and can be utilized in early identification of perceptual problems. This instrument yields a perceptual quotient or P.Q. calculated in a matter similar to the Binet I.Q. The perceptual quotient is a deviation score obtained from the sum of the subtest scale scores after correction for age variation. For each age group, the P.Q. has a median of 100. The instrument has been particularly useful with children from pre-school to eight or nine years of age. It has also been suggested as a beneficial clinical tool for pinpointing learning disturbances in older children with perceptual development below the nine year level. Five areas of visual perception have been explored by this instrument as follows: (1) eye-hand coordination, (2) figure-ground perception, (3) form constancy, (4) position in space, and (5) spatial relationships. Frostig formed the opinion that each of these five abilities develop relatively independently

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[13]Marianne Frostig et. al., "The Marianne Frostig Developmental Test of Visual Perception, 1963 Standardization," Perceptual and Motor Skills, XIX (Monograph Supplement 2-v19, Southern Universities Press, 1964), pp. 463-499.

of the others and that specific relationships exist between them and a child's ability to learn and adjust. In relation to this basic premise she stated 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 a particular culture, but the sequence in which the abilities unfold is set and independent of culture.[14]

Frostig suggested that peak perceptual development occurs in the pre-school years and that perceptual testing should be done at an early age.[15]

Frostig[16] reported that a child with disturbances in visual perception is often excluded from games because of clumsiness, upset at home because he seems ill-mannered, scolded because he has difficulty with his writing, or frustrated by his parents' worry or anger because he cannot read. Reacting from these events, the youngster frequently begins to feel rejected and regards himself as inadequate. Effective life functioning becomes disrupted because of an inadequate self-concept and the child withdraws or becomes aggressive toward his environment.

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[14]Marianne Frostig, "Development of Psychological Functions," (Frostig School of Educational Therapy, Los Angeles, California, 1965), p. 1. (Mimeographed)

[15]Marianne Frostig, "A Developmental Test of Visual Perception for Evaluating Normal and Neurological Handicapped Children," Perceptual and Motor Skills, XII (1961), pp. 383-394.

[16]Marianne Frostig, The American Journal of Orthopsychiatry, XXXIII (July 1963), p. 666.

Approximately two per cent of the public school population have exhibited learning difficulties directly attributable to retardation of intellectual development.[17] Frostig[18] also reported that ten to fifteen per cent of all children have shown specific learning disorders of one kind or another without related mental inabilities. She stressed the importance of realizing that only a small proportion of these learning failures resulted from emotional disturbances. Inadequate motor coordination, retarded language development, and abnormal social and emotional development have been common causes of learning disabilities in school age children.

In regard to perceptual handicaps and school learning, Frostig stated:

> What is possibly the most frequent cause of learning difficulties is perhaps the least widely recognized of all. This is a disturbance of the child's perceptual abilities --- 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 in our daily lives. Without adequate perception a child is isolated from his environment.[19]

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[17]Marianne Frostig, "Education of Children with Learning Disabilities," Educating Children with Learning Disabilities, ed. Edward C. Frierson, and Walter B. Barbe (New York: Appleton-Century-Crofts, 1967), pp. 387-398.

[18]Ibid., p. 388.

[19]Ibid.

Strauss and Kephart,[20] in discussing visual-perceptual dysfunctions and learning, cited several important findings. They related that the perceptions of normal children became well established during the course of time. However, in some children, perceptual patterning was less well integrated and more easily subject to disturbance by external influences. Thus, the child was handicapped by a loose and fragile organization of the task he was engaged in or by extraneous stimuli which provoked disorder until satisfactorily identified and related to the total situation. Another factor related to learning ability of the perceptually handicapped child was reported as involving feedback or error controls. Normal children observed and corrected their errors through visual and kinesthetic comparisons. However, this process was virtually impossible if the feedback channel of visual perception became disturbed. Errors went uncorrected until visual perception again became effective or other channels such as kinesthetic ability were organized to a higher level of discrimination.

In an article concerning cerebral dysfunction in children, Work and Haldane[21] suggested that early identification of perceptual defects in school children may have

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[20]Alfred A. Strauss and Newell C. Kephart, Psychopathology and Education of the Brain-Injured Child (New York: Grune and Stratton, 1955), pp. 173-189.

[21]Henry H. Work and June E. Haldane, "Cerebral Dysfunctions in Children," American Journal of Diseases of Children, CXI (June, 1966), pp. 573-580.

been made in order to avoid possible neurotic or psychotic overlay. They also identified an area in which little research has been done by questioning whether visual perception itself was a complete organic phenomenon or a learned skill resulting from experiences following birth. In either case, the authors related that many interrelationships of cause and effect are possible and often make a difficult task of sorting out perceptual damages in children.

Children with perceptual problems are handicapped in school. The child with a visual-perceptual problem is frequently unable to form an adequate understanding of part to whole relationships.[22] For example, a written word may be perceived as a group of unrelated elements rather than a complete totality. Disorganization of background-foreground elements also hinders this youngster in dealing with written material. The child's attention may be drawn to the white background of the page rather than to the printed symbols. Successful experiences in the academic areas of reading, writing, and arithmetic are negatively affected by these perceptual dysfunctions. Unfortunately, the classroom teacher often considers this child to be mentally deficient and unable to learn effectively. On the playground, the perceptually disturbed

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[22]Alfred A. Strauss and Laura E. Lehtinen, Psychopathology and Education of the Brain-Injured Child (New York: Grune and Stratton, 1950), p. 29.

child cannot compete with peers in sports and games.[23] In many cases the youngster is ridiculed for inappropriate behavior without knowing the reason for this injustice. From these experiences inadequate feelings toward the "self", and toward all other individuals within the child's environment may develop.[24] Healthy psychological functioning is possibly inhibited by the effects of continuous failure at home and school. Generally, the child with visual-perceptual disabilities has been unable to: (1) learn as easily as do other children, (2) function as efficiently as do those around him, or (3) enjoy the years of childhood as do many of his peers.

Research Related to Visual-Perceptual Disabilities and School Functioning

Educators have shown that auditory and visual-perceptual disturbances tend to effect the mechanics of learning. Laufer,[25] in investigating problems of cerebral dysfunction, reported difficulties with auditory or visual perception, or both, in which the brain functions inadequately in apprehending patterns of auditory or visual stimuli. He suggested that a child with perceptual problems

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[23] Frostig, loc. cit., p. 389.

[24] Ibid.

[25] Maurice W. Laufer, Problems of Cerebral Dysfunction (New York: New York Association for Brain-Injured Children, 1964), p. 5.

may have experienced difficulty in associating these patterns with the spoken word or written symbols and the concepts which they represent. Very often, such a child found associations between word sounds and their visual equivalents quite hard to accomplish. According to Laufer, school functioning has been negatively affected, especially in the areas of arithmetic, reading, and writing.

Perceptual handicaps often make achievement in academic areas quite difficult. Research completed through the Frostig Center indicated that ten to twenty-five per cent of beginning public school children have visual-perceptual defects. It was also reported that researchers such as Gains, Sprague, Bryan, and Maslow have found visual-perceptual problems to correlate with beginning reading achievement on the order of between .4 and .5.[26]

In discussing learning difficulties, Sands and Frostig gave faulty visual perception as a clear indication of cause for reading difficulties in school children. In relation to school functioning they stated:

> A child with any visual perceptual defect is handicapped in accurately perceiving written symbols. He therefore may fail to learn to write, spell or do arithmetic as well as read.[27]

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[26]Ferguson, op. cit., p. 7.

[27]Russell Sands and Marianne Frostig, "Educational Therapy in Learning Difficulties," American Journal of Diseases of Children, CVII (February, 1964), p. 92.

In 1962, Appleton initiated a unique research study at the University Elementary School, Los Angeles, California. Under her direction, The Frostig Developmental Test of Visual Perception was administered to twenty-five kindergarten children, eight of which were found to have visual-perceptual quotients of ninety or below. For a period of seven months, all the children were exposed to reading material but not forced to use it. The children that were interested were given training in word attack skills, phonics, context clue usage, and configuration. She predicted that the eight children with low perceptual ability would not attempt to learn to read because of their difficulties. This prediction proved to be highly accurate in that reading achievement rating showed:

> None of the children with a visual perceptual quotient below ninety had begun to read; of the two children with a perceptual quotient of ninety, one had learned to read very well, while the other had not. Only one of the children with a perceptual quotient above ninety showed reading difficulties.[28]

Sprague[29] found that thirty-six per cent, or

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[28]Marianne Frostig, "Teaching Reading to Children with Perceptual Disturbances," Reading Disorders: A Multidisciplinary Symposium, ed. Richard M. Flower, Helen F. Gofman, and Lucie I. Lawson (Philadelphia, Pa.: F. A. Davis Co., 1965), p. 116.

[29]Ruth H. Sprague, "Learning Difficulties of First Grade Children Diagnosed by the Frostig Visual Perceptual Test: A Factor Analytic Study" (unpublished Ph.D. Dissertation, Wayne University, 1963).

forty of her sample of one hundred and eleven children in the second semester of first grade earned perceptual quotients of ninety or below on the Frostig Developmental Test of Visual Perception, 1962 standardization. Of the forty, seventy per cent or twenty-eight students fell below the mid-point in the reading achievement test.

In a study investigating the importance of visual perception and intelligence in reading development, Bryan utilized four grade levels: twenty-three kindergarten children, twenty-five first grade children, twenty-two second grade children, and twenty-one third grade children. Tests in the area of visual perception, reading readiness, intelligence and reading achievement were administered. He presented some evidence concerning the effectiveness of the Frostig Developmental Test of Visual Perception in predicting reading readiness in kindergarten (.70), and in first grade (.46). Significant relationships were reported in first grade between the Frostig Developmental Test of Visual Perception, and the California Achievement Test: Vocabulary section .50 and Comprehension section .51. The correlations were significant at the .01 level of confidence. Bryan stated that "visual perception, as measured by the Frostig Developmental Test of Visual Perception, may be applied as a predictor of reading success."[30]

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[30]Quentin R. Bryan, "Relative Importance of Intelligence and Visual Perception in Predicting Reading Achievement," California Journal of Educational Research, XV (January, 1964), p. 47.

Olson[31] attempted to determine the value of the Frostig Developmental Test of Visual Perception as a predictor of general second grade achievement and specific reading abilities. Several different reading tests and an achievement test were administered to seventy-one second grade children. Means and standard deviations for the group on each of the measures were calculated along with product-moment intercorrelations. The Frostig Developmental Test of Visual Perception total score correlated with each section of the California Achievement Test as follows: Vocabulary .44, Comprehension .35, Arithmetic Reasoning .51, Arithmetic Fundamentals .53, English .40, and Spelling .32. Each correlation was found to be significant at the .01 level of confidence. Olson concluded that the Frostig Developmental Test of Visual Perception had some value as a predictor of general achievement in the second grade. He reported that four subtests of the Frostig Developmental Test of Visual Perception, with the exception of form constancy, showed significant relationships with specific reading abilities.

In an investigation concerned with the effectiveness of visual perception, intelligence, and reading understanding in predicting reading achievement, Fuller and Ende

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[31]Arthur V. Olson, "Relation of Achievement Test Scores and Specific Reading Abilities to the Frostig Developmental Test of Visual Perception," Perceptual and Motor Skills, XX (February, 1966), pp. 179-184.

utilized 347 junior high school students. Tests in the areas of visual perception, intelligence, and reading understanding were given to the students and correlation coefficients between the results and reading achievement were computed. The multiple correlation of coefficient was found to be .87 and the test of significance for that multiple correlation was significant beyond the .001 level of confidence. The results indicated that the correlation between reading achievement and a combination of the three predictor variables was related. In summarizing the study, the authors stated:

> That seventy-six per cent of reading achievement is attributable to the relation of reading achievement to visual perception, intelligence, and reading for understanding.[32]

Researchers seemed to agree that visual perception plays a significant part in the learning process. Disturbances in the visual-perceptual area often have had a negative influence upon school achievement and personality development. If these disabilities could be identified early enough, the child might be offered proper corrective educational measures; however, early diagnoses requires a valid and well established instrument of perceptual measurement. The Frostig Developmental Test of Visual Perception has been offered as an effective test of visual perception for young school children.

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[32]Gerald Fuller and Russell Ende, "The Effectiveness of Visual Perception, Intelligence, and Reading Understanding in Predicting Reading Achievement in Junior High School Children," The Journal of Educational Research, LX (February, 1967), p. 282.

CHAPTER II

PROBLEM

Background of the Problem

In a study concerning achievement in reading and arithmetic, Ferguson[33] utilized 52 first grade children from the Oklahoma City Schools. The subjects were matched as to age, sex, race, prior kindergarten training, and I.Q. as measured by the L-M Form of the Stanford-Binet Intelligence Test. Out of 215 first grade children given the Metropolitan Readiness Test and the Frostig Developmental Test of Visual Perception, Ferguson[34] selected two groups of subjects, one having high visual-perceptual ability as measured by the Frostig Developmental Test of Visual Perception and the other group having low visual-perceptual ability as measured by the same instrument. Formation of the groups was based on 90 P.Q. as a cut off point below which Frostig suggested a child should have special perceptual training.[35] The first of these groups, Group I, contained 26 beginning first

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[33]Ferguson, op. cit., p. 16.

[34]Ibid.

[35]Frostig, Perceptual and Motor Skills, XIX, p. 479.

graders with I.Q.'s ranging from 90 to 134, and with P.Q.'s above 90. The second group, Group II, contained 26 beginning first graders with I.Q.'s ranging from 90 to 135, and with P.Q.'s below 90. During the second week in May, 1967, Ferguson[36] gathered data concerning achievement levels from the teachers on each of the subjects. Through statistical comparison of these levels, she found that the children in Group I (High P.Q.) achieved on a higher order in reading and arithmetic than did the children in Group II (Low P.Q.).

The 52 children utilized in Ferguson's[37] investigation were enrolled in nongraded primary schools. Children begin school with ranging degrees of ability and varying levels of maturity.[38] The nongraded school provides an opportunity for immature children to eventually achieve in academic areas without experiencing failure. Each child may grow as rapidly as his rate of development permits.[39] In the nongraded classroom, youngsters may work at their own level and according to their specific limitations. The slower child may achieve at his own rate with little

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[36]Ferguson, op. cit., p. 16.

[37]Ibid.

[38]John I. Goodlad and Robert H. Anderson, The Nongraded Elementary School, ed. Willard B. Spalding (New York: Harcourt, Brace and Company, 1959), p. 6.

[39]William B. Ragan, Modern Elementary Curriculum (New York: Holt, Rinehart and Winston, Inc., 1966), p. 138.

of the frustration experienced in competing with children of more superior capacities. Even though a child may not achieve adequately in reading or arithmetic during the first year, successful experiences in the nongraded school may allow him to progress satisfactorily before the end of the third year.

Statement of the Problem

The purpose of this study was to follow-up children selected by the Frostig Developmental Test of Visual Perception in relation to their success or failure in reading and arithmetic at the end of second grade. In order to investigate success or failure in reading and arithmetic, the following hypotheses were tested:

1. The (Median) reading level performance of Group I (High P.Q.) is statistically higher than the (Median) reading level performance of Group II (Low P.Q.) as measured by the Achievement Levels Tool at the end of the second grade.

2. The (Median) arithmetic level performance of Group I (High P.Q.) is statistically higher than the (Median) arithmetic level performance of Group II (Low P.Q.) as measured by the Achievement Levels Tool at the end of the second grade.

CHAPTER III

METHOD

Design of the Study

This study incorporated data collected by Ferguson[40] during the 1966-67 school year with data collected during the last week of April and the first week of May of this 1967-68 school term. A substantial number of the two visual-perceptual ability groups identified by the Frostig Developmental Test of Visual Perception and used in Ferguson's[41] study were located once again within the Oklahoma City School System. Achievement levels in reading and arithmetic were gathered for each of the subjects located. These achievement levels were then compared statistically for differences in performance between Group I (High P.Q.) and Group II (Low P.Q.). The second grade levels were also combined with the first grade levels collected by Ferguson[42] in an attempt to identify any changes in achievement that might have occurred from one year to the next.

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[40] Ferguson, op. cit.

[41] Ibid., p. 17.

[42] Ibid., p. 16.

Subjects

The subjects utilized in this study were 43 of 52 children from Ferguson's 1966-67 selection.[43] Though not all of the members of the original two groups could be located, 21 children or 80 per cent of the 26 members of Group I (High P.Q.) and 22 children or 84 per cent of the 26 members of Group II (Low P.Q.) were found to be attending second grade in the Oklahoma City Schools. These students were white boys and girls whose chronological ages fell between seven years-six months and eight years-four months, and whose intelligence fell into the normal range of 90 or above as measured by the Stanford-Binet Intelligence Test administered in 1966. The subjects were enrolled in 21 different nongraded primary schools within Oklahoma City and under 24 different classroom teachers. The children were grouped again in relation to visual-perceptual ability as identified by the Frostig Developmental Test of Visual Perception scores obtained during the 1966-67 school year.

Group I was made up of 14 boys and 7 girls with I.Q.'s ranging from 90 to 134, with a mean I.Q. of 112.9. The P.Q. scores were above 90, ranging from 94 to 118, with a mean P.Q. of 106.5.

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[43] Ibid., p. 16.

Group II was made up of 14 boys and 8 girls with I.Q.'s ranging from 91 to 130, with a mean I.Q. of 108.7. The P.Q. scores were below 90, ranging from 70 to 89, with a mean P.Q. of 81.6.

Instrument

Achievement Levels Tool

The Achievement Levels Tool was developed from a survey of the basal textbooks adopted by the State of Oklahoma for the first three elementary grades. A committee of educational consultants from the Oklahoma City Board of Education selected the basic reading and arithmetic skills from these textbooks and incorporated them into the Achievement Levels Tool. This instrument was designed for use in evaluating the achievement levels of children in the non-graded primary program and was employed in this investigation.

Achievement Levels Tool[44]

Reading:

Level I.

1. Reads pictures.
2. Sees likenesses and differences (objects, shapes, and pictures).
3. Hears rhyming words.
4. Hears beginning consonant sounds.
5. Understands left to right progression.

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[44]"Achievement Levels Tool," Board of Education, Oklahoma City, Oklahoma. (Printed by vari-typing, Capital Hill High School.)

Level II.

6. Knows approximately 50 sight words.

7. Attaches meaning to spoken, printed word (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, in known words.

11. Understands top-to-bottom of page progression.

Level III.

12. Knows approximately 150 sight words.

13. Uses pictures 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. 1st year

17. Knows approximately 300 sight words.

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, sh.

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

Level V.	22.	Knows approximately 500 sight words.
	23.	Uses punctuation to read with understanding.
	24.	Anticipates outcomes.
	25.	Recognizes short and long vowel sounds: a, e, i, o.
	26.	Recognizes silent vowel in one syllable word (beat, gate); contractions with one letter missing.
	27.	Uses substitution of initial; final consonants.
Level VI. 2nd year	28.	Knows approximately 750 sight words.
	29.	Selects main idea of a paragraph.
	30.	Reads for detail.
	31.	Continues short, long vowels; adds u (short, long).
	32.	Recognizes variant sounds oo, ow, oi, oy, ou.
	33.	Has auditory perception of syllables, accent.
	34.	Recognizes words formed by adding ly, n, est, er.
	35.	Identifies root words in derived forms.
	36.	Recognizes vowel controllers r, l, w.
Level VII.	37.	Knows approximately 1100 sight words.
	38.	Distinguishes between fact and fancy.
	39.	Uses vowel principles in attacking two-syllable words.

40. Identifies root words.

41. Has visual auditory perception of consonant blends.

Arithmetic:

Level I.

1. Ability to match one-to-one.

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 (Addition) and S (Subtraction) in terms of sets.

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 place value.

11. Understands that numbers have many names.

12. Knows A (Addition) and S (Subtraction) facts through sums of 6.

Level III.

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 (Addition) and S (Subtraction) of numbers named by two-digit numerals (No re-grouping).

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. $3+4=7$, $4+3=7$, $7-4=3$, $7-3=4$.

22. Can identify common geometric shapes.

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

Level V.

24. Can distinguish between "equality" and "inequality."

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 addend-addend-sum relationship.

28. Is able to 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, weight).

30. Knows the meaning of the numeral 1/2.

Level VI. 2nd year	31.	Knows A (Addition) and S (Subtraction) facts through sums of 19.
	32.	Understands one-fourth (single objects).
	33.	Can write a mathematical sentence for a story problem (frames given).
	34.	Able to write three-digit numerals in expanded notation (through 540).
	35.	Is able to do simple multiplication such as 7 twos in terms of sets.
Level VII.	36.	Can use expanded notation in computing (Two-place numerals and regrouping).
	37.	Knows that numbers have many names (1/2 and 2/4 name the same number; Roman numerals through XII).
	38.	Understands the law of order and the law of grouping.
	39.	Knows the meaning of and can use 1/2, 1/3, 1/4.
	40.	Understands the idea of subset.
	41.	Understands money equivalents (penny, nickel, dime, quarter, half-dollar, dollar).

Levels of achievement in reading and arithmetic obtained at the end of first grade for Ferguson's[45] research and at the end of second grade for this study were determined by each child's teacher. The second grade teachers participating in this investigation were asked to complete

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[45]Ferguson, op. cit., p. 16.

the Achievement Levels Tool during the last week of April and the first week of May of the 1967-68 school term. Achievement at any particular level was operationally defined as requiring completion of all items within that particular level. Generally, a child should have completed level 4 by end of first grade and level 6 by end of second grade in both reading and arithmetic.

CHAPTER IV

THE RESULTS

Forty-three second grade children, 21 with high visual-perceptual ability (above 90 as measured by the Frostig Developmental Test of Visual Perception) and 22 with low visual-perceptual ability (below 90 as measured by the Frostig Developmental Test of Visual Perception) participated in this follow-up study. They were part of 52 first grade students originally separated into the visual-perceptual ability groups and matched as to age, sex, race, I.Q., and prior kindergarten training in 1966-67.[46]

The statistical technique chosen for treatment of the data in this investigation was the nonparametric Median Test. The required level of statistical significance was set at the .05 level.

To test for difference between Group I (High P.Q.) and Group II (Low P.Q.) in reading and arithmetic achievement at the end of second grade, the achievement levels were cast in a two-way design conducive to the Median Test. This test checks for differences in central tendencies by

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[46] Ibid., p. 15.

utilizing the median of a given distribution. The formula used for the Median Test is:[47]

$$\chi^2 = \frac{N\left(|AD-BC|-\frac{N}{2}\right)^2}{(A+B)(C+D)(A+C)(B+D)}$$

The raw data from which the statistical calculations were made appear in Appendix A and Appendix B.

TABLE 1

MEDIAN TEST FOR DIFFERENCE BETWEEN (MEDIAN) READING LEVEL PERFORMANCE OF GROUP I AND GROUP II AT END OF SECOND GRADE

HYPOTHESIS	Median Chi-Square	df	p
1	19.55	1	.05

The data in Table 1 reveal that the median reading level performance of Group I (High P.Q.) is statistically higher than the median reading level performance of Group II (Low P.Q.) at the end of second grade. The obtained chi-square of 19.55 was found to be significant at the .05 level. Hypothesis 1 stated that the (median) reading level performance of Group I is statistically higher than the

[47]Sidney Siegel, "The Median Test," Nonparametric Statistics for the Behavioral Sciences (New York: McGraw-Hill Book Co., 1956), p. 114.

(median) reading level performance of Group II as measured by the Achievement Levels Tool at the end of the second grade. Hypothesis 1, therefore, was supported and accepted by the chosen statistical treatment.

TABLE 2

MEDIAN TEST FOR DIFFERENCE BETWEEN (MEDIAN) ARITHMETIC LEVEL PERFORMANCE OF GROUP I AND GROUP II AT END OF SECOND GRADE

HYPOTHESIS	Median Chi-Square	df	p
2	25.32	1	.05

The data in Table 2 reveal that the median arithmetic level performance of Group I (High P.Q.) is statistically higher than the median arithmetic level performance of Group II (Low P.Q.) at the end of second grade. The obtained chi-square of 25.32 was found to be significant at the .05 level. Hypothesis 2 stated that the (median) arithmetic level performance of Group I is statistically higher than the (median) arithmetic level performance of Group II as measured by the Achievement Levels Tool at the end of second grade. Hypothesis 2, therefore was supported and accepted by the chosen statistical treatment.

The McNemar Test for the Significance of Changes[48] was attempted in order to test for observable changes that

[48] Ibid., pp. 63-67.

might have occurred in achievement from first through second grade. The achievement levels obtained at the end of first grade and at the end of second grade for each of the subjects utilized in this study were cast into a two-way design conducive to this nonparametric test. This casting revealed a number of zero cells within the two-by-two tables thus eliminating a chi-square test such as The McNemar Test for the Significance of Changes from use in this investigation.

Descriptive Results

The following results are of a descriptive nature and pertain to levels of achievement at, and above, or below the general achievement criterion set for this study. That criterion generally outlined that a child should be through level 4 by the end of first grade and through level 6 by the end of second grade in order to be achieving satisfactorily.

In reading achievement at the end of second grade as measured by the Achievement Levels Tool:

1. Fifteen subjects, or 71 per cent, of Group I had completed all the items through achievement level 6.
2. Six subjects, or 29 per cent, of Group I had not completed all the items through achievement level 6.
3. Three subjects, or 14 per cent, of Group II had completed all the items through achievement level 6.
4. Nineteen subjects, or 86 per cent, of Group II had not completed all the items through achievement level 6.

In arithmetic achievement at the end of second grade as measured by the Achievement Levels Tool:

1. Sixteen subjects, or 76 per cent, of Group I had completed all the items through achievement level 6.

2. Five subjects, or 24 per cent, of Group I had not completed all the items through achievement level 6.

3. Two subjects, or 9 per cent, of Group II had completed all the items through achievement level 6.

4. Twenty subjects, or 91 per cent, of Group II had not completed all the items through achievement level 6.

The same children achieved in the following manner at the end of first grade in reading achievement as measured by the Achievement Levels Tool:[49]

1. Sixteen subjects, or 76 per cent, of Group I had completed all the items through achievement level 4.

2. Five subjects, or 24 per cent, of Group I had not completed all the items through achievement level 4.

3. Three subjects, or 14 per cent, of Group II had completed all the items through achievement level 4.

4. Nineteen subjects, or 86 per cent, of Group II had not completed all the items through achievement level 4.

In arithmetic achievement at the end of first grade as measured by the Achievement Levels Tool:[50]

1. Fifteen subjects, or 71 per cent, of Group I had completed all the items through achievement level 4.

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[49] Ferguson, op. cit., pp. 43-48.

[50] Ibid.

2. Six subjects, or 29 per cent, of Group I had not completed all the items through achievement level 4.

3. Three subjects, or 14 per cent, of Group II had completed all the items through achievement level 4.

4. Nineteen subjects, or 86 per cent, of Group II had not completed all the items through achievement level 4.

Four of the children utilized in this follow-up study deviated from the expected mode of achievement. Initials of the children shall be used in identification rather than proper names. In Group I (High P.Q.), three children failed to achieve through the desired level for first and second grade. The children were BRF, LOT, and BOT. In Group II (Low P.Q.), one child achieved through the desired level for first and second grade. That child was WAH.

CHAPTER V

DISCUSSION

This study was concerned with a follow-up of children selected by the Frostig Developmental Test of Visual Perception in relation to their success or failure in reading and arithmetic at the end of second grade. The children were originally identified by Ferguson in a similar study in 1966-67.[51] Approximately eighty per cent of the children utilized in Ferguson's study were relocated with the Oklahoma City Public School System and their reading and arithmetic levels were obtained for second grade. In accord with Ferguson's[52] findings, it was hypothesized that the (median) reading and arithmetic level performance of the high visual-perceptual group (Group I) would be significantly higher than the (median) reading and arithmetic performance of the low visual-perceptual group (Group II). Two hypotheses were treated with the Median Test and were supported and accepted at the .05 level of confidence. The chi-square values obtained for Hypotheses 1 and 2 were found to be 19.55 and 25.32 respectively.

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[51] Ibid., p. 16.

[52] Ibid., p. 28.

Generally, the results of this study indicate that, for a second academic year, the high visual-perceptual group achieved on a higher order in reading and arithmetic than did the low visual-perceptual group. The mean reading level of Group I was level 5.6, and that of Group II was level 4.2 at the end of second grade. The mean arithmetic achievement level attained by Group I was level 5.7 while Group II attained a mean arithmetic level of 4.1 at the end of second grade.

This investigation was also concerned with major changes in achievement that might have occurred between first and second grade. The descriptive results indicate that, in reading, 71 per cent of Group I had completed the desired achievement level (level 6) by the end of second grade while 86 per cent of Group II had not. The data obtained by Ferguson[53] in 1966-67 identified 76 per cent of Group I as having completed the desired achievement (level 4) by the end of first grade, while 86 per cent of Group II had not.

In arithmetic, 76 per cent of Group I had completed the desired achievement level (level 6) by the end of second grade, while 91 per cent of Group II had not. The data obtained by Ferguson[54] in 1966-67 identified 71

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[53] Ibid.

[54] Ibid.

per cent of Group I as having completed the desired achievement level (level 4) by the end of first grade, while 86 per cent of Group II had not.

From these findings, it would appear that the two groups achieved in a similar manner from one year to the next. The children that achieved in reading and arithmetic at the end of first grade also achieved in reading and arithmetic at the end of second grade. The children that failed to achieve in reading and arithmetic at the end of first grade also failed to achieve in reading and arithmetic at the end of second grade.

Four of the children utilized in this investigation deviated markedly from the expected mode of achievement for first and second grade. Each of the children failed to achieve in relation to the 1966-67 selection[55] based upon the Frostig Developmental Test of Visual Perception. In an effort to account for this deviation, the subject's classroom teachers were contacted and asked for information concerning the youngsters in question. The children shall be referred to in this discussion by their initials.

In Group I (High P.Q.) BRF, LOT, and BOT failed to obtain the desired level of achievement in reading and arithmetic for both 1966-67 and 1967-68 school years. Their teachers reported these children to be: (1) generally

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[55] Ibid., p. 16.

uninterested in school or school subjects; (2) difficult to control in the classroom and on the playground; (3) noticeably antisocial toward their peer group; and (4) particularly adversed to regular participation in games or free-play events. Although the three subjects had been identified as members of the high visual-perceptual group, they were unable to complete the necessary items required for satisfactory achievement by the end of first or second grade. Their teachers seemed to be in agreement in concluding that a lack of interest and cooperation could be offered as a probable cause for this achievement lag.

One child in Group II (Low P.Q.), WAH, obtained the desired level of achievement in reading and arithmetic for both school years. This subject, although identified as having low visual perception, experienced no difficulty in completing the items required for successful achievement in first and second grade. His teachers reported him to be: (1) extremely interested in school subjects and especially in the area of science and social studies; (2) easily controlled in the classroom and possibly their best behaved pupil; (3) verbal and expressive in relating stories or school experiences; (4) a leader in classroom and playground events; and (5) one of the children best liked and accepted by the other children in the school. The child's second grade teacher mentioned that he seemed bright and often "worked harder" than most of the children in her class.

Both teachers felt that this subject's above average mentality (I.Q. 130) coupled with a high interest level and a positive school attitude might be offered as an explanation for his satisfactory achievement.

While this study is investigating visual-perceptual factors as being fundamental to success or failure in first and second grades, it is not the claim that such factors are sole criteria for determining success or failure in first or second grade reading and arithmetic. Other variables such as intelligence, interest, maturity, social development, and school interest also affect a child's school performance. The four subjects discussed above serve as prime examples of this variability.

The subjects utilized in this follow-up study were completing their second year of attendance in nongraded primary schools. Even though the children that failed to achieve in reading and arithmetic at the end of first grade were not retained, the results of this investigation indicate that the same children failed to achieve in reading and arithmetic at the end of second grade. Generally, the gap between these children and children achieving satisfactorily in second grade reading and arithmetic did not narrow. This finding suggests that some unknown variable or variables may be interfering with the effectiveness of the nongraded program. A follow-up study in relation to third grade achievement seems to be indicated.

CHAPTER VI

SUMMARY

The purpose of this study was to follow-up children selected by the Frostig Developmental Test of Visual Perception in relation to their success or failure in reading and arithmetic at the end of second grade. This purpose would be accomplished by investigating two groups of children originally identified by Ferguson in a similar research study.

Ferguson utilized two visual-perceptual groups, Group I containing 26 children with P.Q. scores above 90 as measured by the Frostig Developmental Test of Visual Perception, and Group II containing 26 children with P.Q. scores below 90 as measured by this same instrument. The subjects were first grade pupils in the Oklahoma City Public School System. She matched the subjects as to age, sex, race, I.Q., and prior kindergarten training, and completed her identification during the first two weeks of the 1966-67 school term. Nothing more was done until the second week of May, 1967, at which time the achievement levels in reading and arithmetic were obtained. The results of this

research indicated that children of average or above average intelligence, who have P.Q. scores of below 90 as measured by the Frostig Developmental Test of Visual Perception, were not working up to grade level in reading and arithmetic by the end of first grade.

In an attempt to further investigate the achievement of the two groups identified by Ferguson, approximately 80 per cent of the subjects in the original visual perceptual groups were relocated within second grade classes in the Oklahoma City School System and regrouped according to their P.Q. scores obtained in 1966-67. Group I now contained 21 second graders with I.Q.'s ranging from 90 to 134 and P.Q.'s all above 90. Group II contained 22 second graders with I.Q.'s ranging from 91 to 130 and P.Q.'s all below 90. The subjects were located in 21 different nongraded primary schools with 24 different classroom teachers.

During the last week of April and the first week of May, 1968, the achievement levels in reading and arithmetic were obtained from each child's teacher. As in Ferguson's study, an Achievement Levels Tool designed by the Oklahoma City Public School System was employed.

The levels of achievement were treated statistically with a Median Test and the results indicated that the (median) reading and arithmetic level performance of Group I was significantly higher than the (median) reading and arithmetic level performance of Group II at the end of

second grade. In accord with Ferguson's findings and for a second academic year, Group I performed statistically better than Group II in reading and arithmetic achievement.

Descriptive results were reported in an attempt to examine any major changes that might have occurred in achievement from one year to the next. This evaluation revealed that both groups appeared to achieve in a similar manner from first through second grade.

Four children utilized in this investigation were reported as deviating from the expected mode of achievement for both school terms. Teacher evaluations concerning these subjects were offered in conjunction with suggested possible causes for this deviation.

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APPENDIX

APPENDIX A

TABLE 3

DISTRIBUTION OF STUDENTS IN GROUP I (HIGH P.Q.) ACCORDING TO SCORES OBTAINED FROM STANFORD-BINET, FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION, AND ACHIEVEMENT LEVELS TOOLS

Initials	Binet I.Q.	Frostig P.Q.	Achievement 1st. Grade Reading	& Arithmetic	Achievement 2nd. Grade Reading	& Arithmetic
DRB	134	111	4	4	6	6
MAH	126	116	5	5	6	6
PAT	126	96	4	4	6	6*
MLH	124	113	4	4	6	6*
STT	119	102	5	4	6	6
DAL	118	102	4	3	6	6
GRH	118	118	4	4	5	6
DAK	118	113	4	4	6	6
CAW	118	104	4	4	6	6*
JOM	117	111	4	4	6	5
LYH	115	113	4	4	5	6
STB	112	103	4	4	6	6

TABLE 3—Continued

Initials	Binet I.Q.	Frostig P.Q.	Achievement 1st. Grade Reading	& Arithmetic	Achievement 2nd. Grade Reading	& Arithmetic
SUL	110	94	3	3	6	6*
CUS	109	100	4	4	5	5
WAK	109	110	3	4	6	6
BEH	106	118	4	4	6	6*
BRF	106	100	3	3	5	5
KAK	102	98	4	4	7	6
LOT	100	94	2	3	2	4
BOT	94	105	3	3	5	5
MEA	90	116	4	3	6	6*

I.Q.....Intelligence Quotient (1966)
P.Q.....Perceptual Quotient (1966)
R.A.....Reading Achievement Tool (Grade 1, 1966-67)(Grade 2, 1967-68)
A.A.....Arithmetic Achievement Tool (Grade 1, 1966-67)(Grade 2, 1967-68)
*.....Girls

APPENDIX B

TABLE 4

DISTRIBUTION OF STUDENTS IN GROUP II (LOW P.Q.) ACCORDING TO SCORES OBTAINED FROM STANFORD-BINET, FROSTIG DEVELOPMENTAL TEST OF VISUAL PERCEPTION, AND ACHIEVEMENT LEVELS TOOLS

Initials	Binet I.Q.	Frostig P.Q.	Achievement 1st. Grade Reading	& Arithmetic	Achievement 2nd. Grade Reading	& Arithmetic
WAH	130	87	4	4	6	6
ROL	122	76	3	3	4	4
TOW	121	89	2	2	3	3
CLC	119	77	3	3	6	4
KEM	118	70	2	2	3	3*
ALJ	117	89	3	3	5	4
CYC	114	87	3	3	6	6*
SHS	113	87	3	3	5	6
MIL	113	85	4	4	5	5
DOT	112	89	3	3	4	4*
CHC	111	80	3	3	3	3
DOM	110	67	2	2	3	2
JEE	109	87	4	4	5	4

TABLE 4—Continued

Initials	Binet I.Q.	Frostig P.Q.	Achievement 1st. Grade Reading	& Arithmetic	Achievement 2nd. Grade Reading	& Arithmetic
MIT	107	89	3	3	4	5
GEE	106	85	3	3	4	5
MIM	104	87	3	3	5	5*
JEM	99	78	3	3	4	5*
TEH	96	67	3	3	5	4*
ANG	95	89	3	3	5	5*
MAD	93	77	2	2	2	3
RAL	93	85	3	2	3	2*
DAF	91	70	2	2	3	3

I.Q.....Intelligence Quotient (1966)
P.Q.....Perceptual Quotient (1966)
R.A.....Reading Achievement Tool (Grade 1, 1966-67) (Grade 2, 1967-68)
A.A.....Arithmetic Achievement Tool (Grade 1, 1966-67) (Grade 2, 1967-68)
*.....Girls