A VISUAL-MOTOR TEST AND A PERCEPTUAL-REASONING TEST AS DISCRIMINATORS OF ACADEMIC ACHIEVEMENT

by

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ABSTRACT

This study was designed to explore the effects of visual perceptual abilities as determinants of school achievement and to provide some information about two tests in this area. Other aspects of achievement were also examined.

The Bender Gestalt Test and the Raven Progressive Matrices (1947) were administered to two hundred and fifty-six children in kindergarten, grade one and grade two. One hundred and twenty-two children were classified as low achievers and one hundred and thirty-four as average achievers. The effects of achievement level, grade level, age within grade, and sex, upon the children's visual perceptual performance scores were studied. The two achievement groups were examined to note similarities or differences in the children's date of birth, age within grade and sex.

The results indicate that both the Bender Gestalt Test and the Raven Progressive Matrices discriminate significantly between children in the three grade levels and between children in the two achievement levels. Neither test significantly discriminated between male and female or between young and old within the grades. Birthdate (May to August) did not relate significantly to achievement. Birthdate (September to January) did relate significantly to achievement as did age within grade. The sex of the children was also found to be significantly related to achievement level.

These results were discussed and implications for further research in the area of predictive visual perceptual screening devices were advanced. Implications for the study of the effects of sex, birthdate and age within grade on school achievement were also discussed.

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CHAPTER I

INTRODUCTION

> "The magnitude of the reading problem and the shattering impact of reading disability on personal and vocational adjustment should accord proposals for its correction a major position in mental hygiene programs." (Eisenberg).

The enormous number of children who, as a result of severe reading, writing and spelling disabilities, are unable to realize their intellectual and educational potentials is one of the major social problems of our time. Incidence of reading difficulty has been reported to be as high as thirty per cent of the school population (Regents', 1962; Roswell, 1964) but more conservative estimates put the figure between five to fifteen per cent (Hawke, 1958; Rabinovitch, 1959). According to the National Council of Teachers of English (Smith, 1962) this would mean at least four million elementary school children in the United States are disabled readers.

Many children become social and emotional casualties as a result of early reading failure (Harris, 1961). Arthur Gates (1941) notes that seventy-five per cent of the youngsters with "specific" reading disturbances develop marked signs of maladjustment. In her study of the personality patterns of children with severe reading difficulties Gladys Natchez (1959) speaks of their intense anxiety and concludes that concerted efforts will have to be

directed toward prevention. De Hirsch et al (1966) also note that adverse emotional reactions to reading failure appear very early in the elementary grades and complicate primary difficulties with verbal symbolic functioning.

This study represents an attempt to meet, at least partially, the need for instruments that will permit an initial screening of children who will experience failure when introduced to formal education.

CHAPTER II

BACKGROUND OF THE PROBLEM

Possibly the greatest single contribution which can be made toward guaranteeing that each individual child will get the most possible out of his school experience is to make certain that he starts at what is for him the "right" time. This should be the time when the child is truly ready rather than a time arbitrarily determined by custom or law. Many teachers of reading believe that the need for remedial help could be greatly lessened if children were not forced to start reading before they were ready (Ames, 1964).

Current school entrance practice assumes a five-year-old level of behavior to be necessary before a child can effectively carry out the work expected of a kindergartener in most schools; a six-year-old level of behavior necessary before a child can do first grade work. Disagreement may be found in the implied assumption that a

chronological age of five guarantees five-year-old behavior. It would seem more appropriate to reckon five-year-oldness in terms of behavior rather than in terms of age in years. Thus regardless of age in years, a child's general performance needs to be at a five-year-old level before he enters first grade. Piagets' (1952) and Gesell's (1940) assumption that chronological age reflects maturation is a fairly workable predictor of subsequent performance but using chronological age as a criterion misses those who suffer from maturational lags and who therefore present a high risk of academic failure. For these children chronological age is misleading as a predictor (De Hirsch, 1966).

The necessity for a minimum mental age is stressed by many, and most surveys of the field quote the report of the pioneer experimental work of Morphett and Washburne (1931) in which a mental age of six-and-one-half years was stated to be the "minimum for probable success" in reading. The writers advise that by postponing the teaching until children reach this age, teachers can greatly decrease the chances of failure and discouragement, and can correspondingly increase their efficiency.

> "The consensus of results from educational research indicates that for normal pupils the more formal approach to reading should not begin before a mental age of six is reached."

> "Many pupils five to six chronologically, but only four to five mentally, have been doomed to failure by a too early start with the more formal aspects of reading." (Schonell, 1949).

According to Gates (1937) the necessary mental age for profitable reading instruction was not constant, but varied with the learning situation in which the child was placed. A higher mental age was required as the effectiveness of the teaching approach decreased. Gates did not reject the idea of determining a mental age level for a successful beginning in reading but he felt it was necessary to relate the requisite mental age to the particular programme of reading instruction the child would follow.

More recently, Holmes (1962) surveyed the scattered investigations in which children were successfully taught to read before the age of six years, and concluded, like Gates, that the necessary mental age for beginning to read is relative to the conditions under which the child must work at his task.

Vance Hall (1963) reported that almost three times as many boys as girls are held back in the elementary grades. The preponderance of boys among children with difficulties in reading and related language skills has been discussed by many researchers and has been interpreted in the light of the particular theoretical position of each. For example, Jerome Kagan (1964) believes that boys do not find activities in the primary grades to be congruent with their masculine

role. On the other hand, J.M. Tanner's (1961) observation that, around the age of six, males lag twelve months behind females in skeletal age points to important physiological reasons for the inferior academic performance of boys. Bentzen (1963) states that learning problems in boys may be the response of the immature organism to the demands of a society which fails to make appropriate provision for the biological age differential between girls and boys. Emmett Betts (1936) and Bryant (1962) both speak of boys' lesser capacity to mature smoothly.

A typical finding is that of Durrell (1940), who showed that among eleven hundred and thirty children aged twelve to thirteen years, twenty per cent of the boys and ten per cent of the girls were backward in reading. Alden, Sullivan and Durrell (1941) in another study of six thousand children aged seven to eleven years, nineteen per cent of the boys were classified as backward in reading, as against ten per cent of the girls. Macmeeken (1939) found, among three hundred and ninety-two Scottish children aged seven-and-one-half years, that twelve per cent of the boys and six per cent of the girls were retarded in reading. In Schonell's group of fifteen thousand London school children (1942), about five per cent of the boys were retarded by one-and-one-half years or more, as against two-and-one-half per cent of the girls. In the Ministry of Education report

(1950), it was also stated that there were about twice as many boys as girls in the lowest, illiterate, grade.

Even more striking differences have been demonstrated in cases referred to clinics. Monroe (1932) had approximately eighty-six per cent of boys among her cases of reading disability, and Blanchard (1936) had the same proportion of boys among seventy-three clinic cases. Of Hallgren's (1950) one hundred and sixteen cases from schools and clinics, seventy-seven per cent were boys. However, among the parents and sibs of these cases, there was no significant difference between the number of male and female backward readers. Hallgren concluded that though specific reading disability appeared to be more frequent in the male sex, it was not a sex-linked characteristic.

Non-readers among boys create more trouble in school than do non-readers among girls; or at least they bring their disability more forcibly to the teacher's notice, whereas girls suffer in silence. It is also possible that parents take a more serious view of the inability of a boy to read than a girl. This may account for the excess of boys among the more severe cases of reading disability referred to clinics. Perhaps the most likely explanation is that the reading disability cases in boys often have emotional disorders in addition, and these are frequently aggressive disorders. Thus the boys are referred to clinics because these disorders, rather than the disability, have brought them to the not

of teachers and parents (Vernon, 1958).

The influence of children's date of birth on their educational progress has recently been studied more closely (Jackson, 1964; Jinks, 1964; Johns, 1962; Williams, 1964). It was found that, generally speaking, a larger proportion of the lower achieving stream children tended to be born during the period May to August, i.e., towards the end of the scholastic year.

Freyman (1965) states that the evidence accumulated can leave no doubt about the educational, social and psychological disadvantages of a large number of children born during the period May to August. Behavioral and perceptual immaturity, necessitating a return to the starting point of learning basic skills were characteristic features of these children, almost all of whom were members of the lower achieving groups. Secondary psychological symptoms such as lack of confidence and emotional maladjustment were often displayed as well.

While the possibility may exist that children born during the warmer summer months obtain slightly higher scores on "intelligence" tests, there is little doubt that the advantages gained by these children are small compared with the disadvantages conferred on them by being born at the "wrong" end of the school year. The evidence from research demonstrates clearly that the younger children in any school year group are at a disadvantage compared with the older

children (Pidgeon, 1965).

Schonell (1942) states that school achievement appears to be relatively stable during the first few years of school attendance. The grade averages and achievement test scores of first grade pupils were found to be significantly correlated with third grade and sixth grade achievement. The correlations obtained were .61 and .71 respectively. It may be expected therefore that a test which is related to first grade achievement would be able to predict school achievement in the subsequent years of elementary school (Koppitz, 1964).

It is hazardous to predict performance and behavior from data collected at a time when the organism is in physiological and psychological flux but the findings of De Hirsch et al (1966) suggest that it is possible to predict end-of-second-grade achievement on the basis of kindergarten functioning. These workers have shown that children mature physiologically and psychologically along forseeable lines and that those children who lag severely in over-all maturation can be predicted to fail academically. They also demonstrated that valid predictions of reading, spelling and writing achievement can be made by evaluating children's perceptual, motor and language behavior at early ages. It is recommended that a predictive index be administered to all children during the second half of their kindergarten

year and that the decision as to first grade entrance be based by and large on the child's score on this index.

In Sweden, prompt identification and remediation has led to a drastic reduction of reading disabilities (Malmquist, 1963). Preventive steps are being taken in Belgium (Masson, 1963) and have strongly been recommended by Borel-Maisonny (1959) and a group of educational psychologists in France (Simon, 1952).

A growing number of schools (Austin, 1963) assess children's readiness for formal education by one of three procedures - intelligence evaluations (usually of a group variety), reading readiness tests, and informal evaluation by the kindergarten teacher. While all three of these have proven their usefulness, each has certain limitations.

The use of intelligence tests for prediction has been challenged by Harrington (1955) on the ground that reading difficulties occur among children at virtually all intellectual levels. It is obvious that a child of very low intelligence is enormously handicapped in learning to read. It is difficult for him to perform the complexcognitive processes such as analyzing accurately the visual and auditory structures of words. Also his vocabulary is smaller than that of a child of normal intelligence, and therefore he may not know the meaning of the words he is trying to read. However, as Wall (1945, 1946) and others have shown, children

with I.Q.'s below 70 can learn to read. What is of greater importance is that there are considerable numbers of children of average intelligence who are nevertheless backward in reading. Schonell (1942) found that 1.3% of the backward children he tested had I.Q.'s below 70, as against 1.9% with reading quotients below 70.

It must be noted that in many studies the children were tested with verbal intelligence tests. It seems probable that linguistic ability is particularly retarded in dull and backward children and that this retardation affects both reading and verbal intelligence test performance. Moreover, group intelligence tests require the child to be able to read; thus it is not surprising that a close correlation between verbal intelligence test performance and reading performance is often obtained. Mellone (1942) found that the verbal I.Q.'s of children of eight years (tested on the Moray House Test) were significantly lower than their I.Q.'s on the Sleight Non-Verbal Intelligence Test. The differences were not significant after eight years of age.

Vernon states that it seems probable that at the beginning of reading, intelligence plays a major part with all children. However, as they grow older, and in most cases more skilled in reading, it becomes relatively less important. That is to say, the majority of children learn to read, though sometimes rather slowly, provided that they have a certain

minimum I.Q., whereas those who do not learn are characterized by some specific defect. Schonell (1942) found that the correlation between reading performance and intelligence decreased with increase in age.

Learning to read appears to depend more on mental age, that is to say, level of maturation, than upon intelligence as such; and specific reading disability cannot be directly attributed to sub-normality of intelligence. Downing (1963) states that it cannot be assumed that the mental abilities utilized by children who are learning to read are equivalent to those used in solving problems of those tests of general intelligence which are used for determining their mental age. It seems more likely that the specific problem-solving schemata which are important for learning to read represent only a part of the whole intellectual status measured by the more comprehensive tests of general intelligence.

Many teachers, particularly in the United States, administer the specially-devised reading readiness tests, which usually include sub-tests of visual discrimination and vocabulary, and many include motor tests, tests of relationships, and tests involving the following of instructions. Reading readiness being without exception group tests, are also open to the general objection that they are not suitable for children below the age of seven years. Moreover, although there is a correlation between scores on reading readiness

tests and measures of subsequent success in reading (Robertson and Hall, 1942) the correlation (a median value of .58, based upon analysis of data published up to 1941) does not seem sufficiently high to warrant exclusive reliance upon test results in the case of any individual child (Sanderson, 1963).

Existing reading readiness tests, according to Jeanne Chall and Florence Roswell (1965), do not lend themselves easily to the formulation of specific educational strategies. Most tests, moreover, do not predict performance in the areas of writing and spelling.

Finally, the individual kindergarten teacher's assessment of the child, although often remarkably accurate (Austin, 1963; Henig, 1949, Kermoian, 1962) represents an essentially subjective judgment, one that cannot readily be duplicated. Moreover, not all teachers possess the training, intuition, or experience that would enable them to make a reliable evaluation of a child's readiness.

In the investigation of the attitudes of teachers towards reading readiness, Morris (1959) reports: "the question of how it was assessed proved ... difficult ... The immediate response of teachers in most schools to this question was that the measurement of 'reading readiness' was a matter of 'instinct'. Observation of each child's desire to learn by his interest in and selection of a book, coupled with a request for and interest in words, was the most frequently mentioned method of assessing reading readiness."

It is interesting to note that practising teachers should rely so heavily upon signs of the child's wanting to learn to read. Other factors have been given greater prominence, but the child's desire to read remains as an important element in all considerations of reading readiness. It is the only factor which no test can measure, and has been comparatively neglected by research studies, mainly because investigation would involve very detailed and difficult classroom observations (Sanderson, 1963).

De Hirsch, Yansky and Langford (1966) produced a battery of tests for intelligent four and five-year-old youngsters who had been referred initially because of oral-language deficiency. This battery was designed to determine perceptual motor and linguistic status at kindergarten level. They found that performance on these tests combined with clinical evaluation of the children, did, in fact, prove to be effective in predicting reading and spelling difficulties in the group originally referred because of oral-language deficits.

A follow-up study by De Hirsch et al (1966) was designed to find whether the test scores alone would yield objective predictive indices. The principle aims of the study were threefold: to determine to what extent certain tests administered at kindergarten age to a sample from the general population predict reading, writing and spelling

achievement two-and-one-half years later at the end of the second grade; to abstract from the battery those tests found to be most effective for prediction; and finally, to combine the best predictors into an instrument that could be used for the identification of "high-risk" children.

The children were matched on familial language background, age, I.Q. (I.Q.'s of 84 to 116 measured on Form L of the Stanford-Binet Intelligence Scale 1937 revision), absence of sensory deficits and absence of psychopathology, as judged clinically. Thirty-seven tests were administered at kindergarten age and correlated with end-of-second-grade performance on silent and oral reading achievement.

The fact that intelligence did not basically account for the correlations between single perceptual motor and oral-language tests and second grade achievement, was one of the most interesting findings. It is true that while I.Q., treated as a single predictor, was significantly related to achievements two-and-one-half years later it nevertheless ranked only twelfth among the other predictive measures. Dyx coefficient of correlation of I.Q. with Overall Reading Performance was .31 ($.01 \leq P \leq .05$), with Writing was .05 ($P \geq .05$), and with Spelling was .19 ($P \geq .05$). The low correlation between spelling and I.Q. supports clinical experience that severe spelling disabilities are highly specific and cannot easily be compensated for by intelligence.

In De Hirsch's opinion the predictive efficacy of the tests depended not on the specific skills involved, but on the degree to which they measured integrative ability. Alan Ross (1955) defines integration as that function of the organism which combines and relates discrete clues and makes a unified response possible. Low ability at kindergarten age augurs poorly for reading and spelling at the end of second grade, since at that stage a relatively high level of integration is required. By the time a child has reached the eighth year of life, he must, according to Birch and Belmont (1965), be able to use information gained from both auditory and visual clues. They explored intermodal equivalence; the child's ability to integrate intersensory (auditory and visual) information. It was found that the capacity to make such equivalence judgments was positively correlated with reading test scores in first and second grades, and suggested that this competence is crucial for the acquisition of reading skills.

Past research has emphasized the predictive approach to studying various batteries of tests to determine their predictive reliability in screening school children. These studies have limited the types and numbers of tests which are effective predictors of subsequent school performance. Now is the time to study the ability of these tests to discriminate between low achieving and high achieving children with the purpose of refining the criterions with which to

predict subsequent performance. Cut-off scores on individual tests in different and in the same areas should be studied to determine whether the tests facilitate each other in prediction or whether they, in fact, are measuring the same ability.

Previous predictive studies have concentrated on long-term research. These studies entail the assessment, prediction and verification of extensive batteries of tests administered to well-defined samples of children. Results have shown that the predictive reliability of a test depends on the degree to which it measures integrative ability. Although this research has yielded important information, it would appear more expedient to study the competence of certain tests of integrative ability to discriminate between poor and average achieving children. If a test could reliably discriminate poor from average achieving children it would follow to undertake a longer-term study to establish its predictive reliability. An important consideration when establishing the predictive reliability of a test is to what sample it is applicable. If the reliability is established with a closely matched or controlled sample of children the applicability of the results is limited. A representative sample from the total population of school children would appear more practical in that the results could be applied to this population.

It would appear that there is need for more research on integrative abilities as determinants of school achievement

and on the competence of tests within this area to discriminate poor from average achievers in school. In the following chapter attention will be focussed on these factors, and more particularly on two instruments that might be of great value as predictive indices.

CHAPTER III

THE PROBLEM

Visual Perception

The concept of perception is fuzzy at the boundaries. It melts into the concept of sensation, on the one hand, and of concept formation or cognition, on the other. Among such modern schools of perception as the transactionists - Ittelson (1960), Ames (1955), Bentley (1957) and others - the perceptual processes are regarded as including a weighing action, a trial and check process. No attempt is made to differentiate perception from those mental processes called judgment or intelligence; while Bartley (1958), in a discussion of the relationship between perception and sensation, concludes that this distinction is also artificial.

Frostig (1963) states that her conclusion must be that the definition of perception, like that of intelligence, must at the present time be an operational one. Itellson (1960) states that whatever the exact definition of perception may be, it is undebatably "a crucial process intimately involved in the effective functioning of the individual".

According to Vernon (1958), in attempting to learn to read the child must begin by perceiving some kind of shape or pattern which constitutes the printed letter or word. It is difficult to be certain exactly what the young child does perceive - though in all probability he does not see just what the adult sees.

Before the child can perceive printed shapes, he must be capable of perceiving small "meaningless" shapes, containing a good deal of detail. It is therefore important to consider the evidence which has been obtained as to the development of this ability in children. Not many systematic investigations of the development of shape and pattern perception have been carried out; perhaps because the accurate perception of pattern is not very important to the child until he begins to try to read. The young child is concerned mainly with the perception of three-dimensional solid objects which can be touched and manipulated, as well as seen. He is eager to find out what they are like, what they do, and what he can do with them. His experience of two-dimensional form comes mainly through looking at pictures in books, and through drawing or scribbling. It does seem possible that he establishes a certain association between the shapes which he sees in pictures, and the movements, and images of movements, he makes in drawing them. It has been stated that children tend to draw from their ideas about objects, rather than by

copying from pictures, or from their own imagery - though Gesell, Ilg and Bullis (1949) consider that the five-year-old likes to trace and copy pictures. But it cannot be assumed that the child has much previous experience of a kind relevant to the establishment of an association between reading and writing the shapes of letters and words. It is doubtful how soon the child is able to perceive two-dimensional shapes without representational meaning. Gellerman (1933) has shown that very simple shapes, such as triangles, squaresand circles, can be differentiated from one another at two years and that these shapes can be remembered and recognized in different settings, colours and spatial positions. In the Terman-Merrill test, the average child of four years is expected to match eight out of ten simple outlined geometrical shapes. Piaget and Inhelder (1948) found that in copying figures the five-year-old could differentiate between a square and a rectangle, a circle and an ellipse, a horizontal-vertical and a diagonal cross.

More complex figures are not fully grasped till later. Thus in copying figures such as a circle within a triangle, each shape was correctly reproduced by the five-year-old child, but their relationship to each other was not accurately reproduced. It appeared that the child's perceptions were fragmented, and that he could not combine them into a coherent whole (Piaget and Inhelder, 1948). Line (1931) also

noted that, when at four years the child began to differentiate detail within an outline, the details were at first seen as quite unrelated to the outline.

The most complete study of the ability of children at various ages to copy moderately complex figures is that of Bender (1938). She showed, as had Piaget and Inhelder, that younger children appeared to have some awareness of the details within a figure, but could not reproduce them accurately. Thus the directions of lines, other than horizontal were not copied correctly; vertical lines were approximately correct at five to six years, but oblique lines not till nine to ten years. When the figure consisted of two parts, these were not accurately related to one another by the younger children.

Vernon (1958) concludes from the studies of form and word perception in young children that below a certain age they are too immature to perceive and remember small details of shape with great accuracy. In particular, they do not realize which details are significant and which comparatively irrelevant in defining the essential structure of a shape; nor do they understand the relationship of parts to the whole. They are also ignorant of the importance of orientation of shapes in space. Thus they may be capable of perceiving and recognizing rather unsystematically certain letters and certain words by means of their general shape or

from some of their letters. But they have not acquired the ability to understand the importance of particular details in letter shapes, their spatial position, and their relationship to one another within the total word shape. Even if they can perceive these details, they do not remember their significance. However, in the normal child this ability seems to develop and mature rapidly at the age of five to six years, or at an earlier age in highly intelligent children, though recognition of the importance of correct order of letters in the word may come considerably later. The teaching of reading assists the development of these abilities, but cannot force it to proceed beyond a certain rate.

CHAPTER IV

EXPERIMENTAL DESIGN

Tests

(1) Bender-Gestalt Test (Bender, 1946)

The Bender Gestalt Test consists of nine figures which are presented one at a time and which the subject is asked to copy on a blank piece of paper. Wertheimer (1923) had used the designs originally in order to demonstrate the principles of Gestalt Psychology as related to perception. Bender adapted these figures and used them as a visual motor test. In doing so she applied the theory of Gestalt Psychology to the study of personality and to clinical practice. Bender (1938) points out that the perception and

the reproduction of the Gestalt figures are determined by biological principles of sensory motor action and vary depending on (a) the growth pattern and maturation level of an individual and (b) his pathological state either functionally or organically induced.

Bender's work is mainly devoted to the clinical application of the Gestalt Test to various types of adult patients including those suffering from organic brain disease, schizophrenia, depressive psychosis, psychoneurosis and mental retardation. Bender uses a developmental approach in analyzing children's protocols and clinical evaluation in the assessment of test protocols of adult patients. Bender does not provide an objective scoring system for the test.

In addition to the developmental and clinical approach suggested by Bender, Hutt (1950, 1960) introduced another mode of analyzing Bender Test protocols. Hutt and his followers use the Bender Test as a projective test and interpret the drawings of Bender designs in accordance with psychoanalytic theory. This type of interpretation presupposes that the individual making the drawing has the ability to copy the Bender figures correctly and would do so if no emotional interference were present. Thus its usefulness is limited to older children and to adults whose visual-motor perception has fully matured.

Koppitz (1964) states that about three-fourths of all publications on the Bender deal with its usefulness in

differential diagnosis for adult psychiatric patients. A few additional studies are devoted to the diagnosis of brain pathology and to mental retardation in adult subjects. Approximately one-fifth of all publications on the Bender Test are exclusively concerned with children. Most of these studies were published since 1955 showing the growing awareness of the value the Bender Test for this age group.

Primitive and poorly integrated Bender Gestalten were found by Silver (1950), de Hirsch (1952) and de Hirsch (1966) to be characteristic of children with reading disabilities. That the Bender Gestalt Test predicts reading achievement as adequately as do reading readiness tests has been demonstrated by other studies (Koppitz, 1964; Smith, 1962).

Keogh and Smith (1961) have demonstrated that the Bender Test can be administered successfully as a group test to school beginners. As a time saving device this is valuable, but there is a disadvantage in that it deprives the examiner of the opportunity to observe the individual child at close range, and to study his work habits. By asking the children to copy each Bender design on a separate sheet of paper and by controlling the speed of presenting the stimulus cards the examiner relinquishes the possibility of analyzing the child's organization of all nine Bender figures on a single sheet of paper and he cannot inquire into the child's ability to perceive his own errors. Furthermore he cannot examine

the child's use of time and space in executing the Bender Test. A Bender protocol can yield more than just a single test score. It is debatable whether it is in the long run more economical to administer the Bender Test to ten children in a group and to obtain less information from each one, or to administer the Bender to each child individually and to obtain maximum information from each test protocol.

Most established scoring systems for the Bender Test are not suitable for use with young children. As a result, investigators studying children have had to develop or adapt their own methods for the evaluation and scoring of Bender protocols. The result has been a variety of Bender scoring systems and rating schemes, most of which are based on a very limited normative population and are designed for a particular group of children only, e.g., retarded children, emotionally disturbed children, etc. It is very difficult to compare the findings in the various Bender studies with children because of the variety of methods used in analyzing the test records.

There is a great need to integrate all the research findings and to clarify objectively what level of performance can be expected from children at various ages. It is also essential to determine the significance of the different distortions and deviations on the Bender Test for children of different age levels.

Koppitz (1964) systematically studied Bender records of school children, kindergarten through fourth grade, to discover what was 'normal' and what was 'abnormal' for Bender drawings at a given age. She attempts to differentiate

between the distortions on the Bender which primarily reflect immaturity or perceptual malfunctioning, and those which are not related to age and perception but which reflect emotional factors and attitudes. The scoring methods are applicable to all children, age five to ten years, regardless of their intelligence or the type of problems they present. It can be used not only for screening school beginners but also for the prediction of long range school achievement, for the study of specific learning problems, as a rough measure of intelligence, as a diagnostic indicator of neurological impairment, and in the assessment of mental retardation.

Some children develop outstanding verbal skills early but are a little slower in their maturation of visual-motor perception. In these cases the Bender Test may underestimate the child's readiness. On the other hand the Bender Test is a good indicator of a child's maturity in visual-motor perception when immature speech or a serious speech defect may make him appear more immature than he actually is. At the beginning of elementary school, visual-motor perception seems to be more important for good school achievement than verbal skills unless the latter are outstanding, and exceptional motivation for learning is present (Koppitz, 1958 (b)).

It has been shown that the Bender Test alone appears to be a useful screening tool for school readiness, but its effectiveness could be greatly enhanced when it is used in

combination with one of the other standardized readiness tests. Especially when the developmental level of the child is not clear, the Bender can offer valuable information to supplement the regular group screening tests that are often routinely administered in schools. The agreement or discrepancy between the Bender and another screening test can often determine whether a child is still too immature in his perceptual development for school and formal learning or whether his behavior is primarily the result of social and emotional factors. The Bender Test would appear also to be of great value in the screening of children with the ability to profit from an enriched or accelerated program for school beginners (Koppitz, 1964).

A crossvalidation study on fifty-one young patients seen at a child guidance clinic was carried out on the Initial Bender Scoring System. All children were attending public school, grade one through four. Their age range was from six-years four-months to ten-years eight-months. The subjects were divided into two groups; one group included thirty-one children who were referred because of emotional problems and poor school achievement. The other group included twenty children whose school achievement was at least average. These children were referred primarily because of serious emotional disturbances. The Bender Test was administered to all subjects as part of a battery of psychological tests they were given during evaluation at the clinic.

All Bender protocols were scored according to the Initial Bender Scoring System. Thereafter the mean composite scores were determined for the first and second graders, the third and fourth graders, and for all subjects combined. Chi-squares were computed comparing the number of subjects with and without learning problems whose Bender scores were above or below the mean score for that particular grade level. All three chi-squares were statistically significant at the one per cent level.

Test score reliability was carried out by Koppitz. Immediate retesting with the Bender would show the result of practice; while a long time interval between test administration would reflect the effect of maturation in visual-motor perception in a young child. It was hoped that both practice effect and the effect of maturation had been minimized by selecting a time interval between the two test administrations that was neither very short nor very long. Each subject was retested with the Bender Test four months after the initial administration of the test.

Two kindergarten classes and two first grade classes served as subjects for the reliability study. One kindergarten class and one first grade were taken from a school in a lower socioeconomic area; the other two classes came from a middle class community. All subjects were tested in school by Koppitz. The Bender protocols were scored according to the

Developmental Bender Scoring System for Young Children. Kendall's Rank Correlation Coefficient was used to compute the reliability coefficient between the scores of the first and second administration of the Bender Test. All correlations were found to be statistically significant at the .001 level. Thus it appears that the Developmental Scoring System is reliable and can be used with considerable confidence.

On the basis of these findings it was decided to administer the Bender Test to each child individually and to use the Koppitz Scoring System as a standard approach for interpreting the resulting Bender records.

(2) Progressive Matrices (1947)

The other test selected was the Raven Progressive Matrices (1947), Sets A, Ab and B. It is not widely used in North America and has not the extensive normative data that the Bender Gestalt Test has. It was derived from Progressive Matrices (1938) which claims to provide a measure of a person's capacity to form comparisons, reason by analogy and develop a logical method of thinking regardless of previously acquired information (Westby, 1953).

Sixty well drawn 'matrices' or patterns are divided into 5 sets (A, B, C, D and E) of 12 problems each. Each matrix is a network of logical relations between simple and more complex visual forms, mainly of geometrical design; and each matrix has a 'gap' which has to be filled by indicating

on the printed score sheet the number of correct choice from the alternatives printed below the matrix. The relations within the matrix usually allow for more than one mode of analysis of the problem. The aim of the test designer was to produce five sets of items progressively graded in difficulty both between and within sets and of sufficient range of complexity to discriminate in a short testing time a sample of the general population in Raven's words "from infancy to maturity" (Westby, 1953).

Raven incorporates within the test design the objective of evaluating an adult's ability in terms of the percentage frequency with which a similar degree of ability is found to occur amongst people of the same age.

Progressive Matrices (1947), Sets A, Ab, B are constructed to give for children of 3 to 10 years of age, a wider dispersion of scores, to reduce the frequency of chance solutions, and to make the test more suitable for use with persons who are for any reason mentally sub-normal or impaired. For this purpose, a transitional set of 12 problems is placed between Sets A and B of the 1938 scale.

To attract and hold the attention of young children, each problem is printed on a brightly-coloured background. This makes the nature of the problem to be solved more obvious without in any way contributing to its solution. The order of the problems in each set provides the standard training in the method of working and the three sets together are arranged

to cover all the perceptual reasoning processes of which children under 10 years of age are usually capable. If the test is suitably presented, it is necessary only to show a person what to do, to let him work through the problems in the standard order and to learn from his own experience how to solve them. The test can be presented in the form of boards and movable pieces, or as illustrations printed in a book,without the intellectual processes required for success being essentially altered. In either form, the problems can be demonstrated quite satisfactorily without any verbal instructions at all. Conversation simply makes the test situation more natural.

In the form of boards, the test can be demonstrated satisfactorily to persons of almost any race speaking any language. It is also one of the few tests which can be used satisfactorily with people who are suffering from partial paralysis, deafness or defective speech and which will give a consistent, reliable and psychologically valid estimate of their present capacity for rational judgment regardless of their specific defects (Raven, 1947).

The Progressive Matrices indicates clearly whether a person is, or is not, capable of forming comparisons and reasoning by analogy and if not, to what extent, relative to other people, he is capable of organizing spatial perceptions into systematically related wholes.

Administration and scoring, either as an individual or group test, is simple. The test, however, is still experimental and too great a dependency cannot yet be placed upon the norms. The norms, given in the handbook accompanying the test are based only upon 608 Scottish children for the book form (age range 5 to 11, roughly 50 per 6 months age group), and on 291 Scottish children for the board form (age range 5 to 10, roughly 32 per 6 months age group). Reliability with young children is not high (test-retest .65 with children under seven). The author claims, however, a test-retest reliability of .90 over the whole range of development for which the test is constructed but states frankly that this is based on relatively small groups.

Subjects.

Two hundred and fifty-six kindergarten, grade one and grade two school children from School District Number 63, Saanich, British Columbia, were selected as subjects during May and June of 1967. Sixty-four kindergarten, one hundred grade one and ninety-two grade two children comprised the sample. They were selected from four kindergartens, ten first grades and ten second grades in eleven different schools. Their age range was from five years, five months to nine years, four months.

Each classroom teacher was asked to select from among her pupils all those who were poor achievers defined as those children who would not advance to the next level or grade

in school. The teachers were asked to randomly select from the average and outstanding achievers an equal number of children. Each teacher also wrote an evaluation of each child she selected.

In the total sample there were one hundred and twenty-two poor achievers and one hundred and thirty-four average achievers. Twelve poor achievers were discarded resulting from ambiguous reports from teachers.

Appendix A - distribution of children from each school

- distribution of children in each age range

Appendix B - examples of teachers' evaluations of both poor and average achievers

Procedure

All Ss were tested individually in an available quiet room in their school between 9 a.m. and 3 p.m. After rapport had been established each child was given the introductory instructions to the Bender Gestalt Test. All nine designs were presented with no time limit beginning with Figure A and ending with Figure 8. During each presentation the child copied to the best of his ability the design presented. When finished he would signify either verbally or non-verbally and be presented with the next figure in the sequence. While each child completed the sequence the examiner made notes on the child's test behavior. Such observations as speed of completion, concentration, quickness to grasp instructions, independent work habits, etc., were

recorded. Upon completion of the Bender Test each subject was told to rest a minute or to stretch, as he desired.

The instructions to the Raven Progressive Matrices (1947) followed. All thirty-six designs were presented in sequence in book form with no time limit. For every design each child indicated his choice and this was recorded on the appropriate score sheet by the examiner. The child could indicate verbally or non-verbally his choice. His final choice was entered. Again notes were made on the child's test behavior.

The approximate length of the testing procedure was twenty minutes. Ten minutes being taken by the Bender and ten minutes by the Raven on the average.

Appendix B - full instructions and administration procedure for Bender and Raven

CHAPTER V

HYPOTHESES

The following hypotheses are cast in the form of "null hypotheses":

(1) There exists no significant differences in Bender Gestalt scores between
   (a) poor and average achieving children
   (b) kindergarten, grade one and grade two children
   (c) male and female children
   (d) younger and older children with kindergarten, grade one and grade two

(2) There exist no significant differences in Raven Progressive Matrices Test scores between

(a) poor and average achieving children

(b) kindergarten, grade one and grade two children

(c) male and female children

(d) younger and older children within kindergarten, grade one and grade two

(3) Attempts at verification of previous research on low achieving children resulted in considerations the basis of which were discussed in Chapter II.

(a) The significance of month of birth: do the number of poor achieving children born during the period May to August significantly exceed the number of poor achieving children born during the other months of the same year as found by several researchers (e.g., Jackson, 1964; Jinks, 1964; Johns, 1962; Williams, 1964; Freyman, 1964)?

(b) The significance of the relative age within a grade: do the number of poor achieving children in the younger age levels within any grade significantly exceed the number of poor achieving children in the older age levels within the same grade (e.g., Pidgeon, 1965; Ames, 1964; Morphett and Washburne, 1931)?

(c) The significance of the sex of a child: do the number of poor achieving males significantly

exceed the number of poor achieving females in each grade (e.g., Hall, 1963; Betts, 1936; Bryant, 1962; Durrell, 1940; Alden, Sullivan and Durrell, 1941; Macmeeken, 1931; Schonell, 1942; Ministry of Education Report, 1950; Monroe, 1932; Blanchard, 1936; Hallgren, 1950)?

CHAPTER VI

RESULTS

Statistical Treatment

The study consisted of a 3x2x2x2 factorial design with three grade levels and two achievement groups. The data were further divided into two age levels within each grade as well as male and female. The two age levels were the younger children and the older children within each grade. The cut-off ages for young and old were the age levels above which and below which one half of the children in each grade fell. Grade level, achievement level, age and sex were independent variables while performance scores on the Bender Gestalt Test and the Raven Progressive Matrices were the dependent variables.

To test hypotheses 1(a) to 2(d) the data were analysed using an analysis of variance model. An unweighted means analysis (Myers, p. 104-109) was selected to fit the unequal and disproportionate cell frequencies. This occurred as a result of the subjects being selected by grade and achievement level. The poor achieving children were a total

population and the average achieving children a random sample, therefore no controls for matching sex and age were instigated. The latter variables were also subject to comparison between the two achievement levels disregarding Bender Gestalt and Raven Progressive Matrices Test performance scores.

Multiple comparisons of the means were carried out on all significant and near significant main and interactional effects. The Tukey (a) test (Winer, p. 96-104), adjusted for unequal cell frequencies, was administered to the data in these cases.

To test hypotheses 3, (a) to (c) the data were analysed to determine the correlations of sex and age with achievement level. Chi squares corrected for continuity (Edwards, 1954, p. 283-284) for all comparisons were computed. Phi coefficients were determined for each chi square according to Edwards (1954, p. 282-283). Phi measures the degree of association or relationship between two variables when each variable is a dichotomy. The hypotheses tested deal with sex (male or female), age (young or old) and month of birth (May to August or other) and their relationship to achievement level (poor or average).

Bender Gestalt Test

The first body of data reported pertains to hypotheses 1, (a) to (d). Hypothesis (a) was not confirmed by the data (d.f. 1 and 232, $F=93.988$, $p < .01$). In Table I the mean scores are presented and Table II presents the

summary of the analysis of variance.

Table I

Mean Bender Gestalt Error Scores

of Poor and Average Achieving Children

Poor	Average
10.127	5.989

These results indicate that the Bender Gestalt Test can discriminate significantly between poor and average achieving children.* Those children performing poorly in school make significantly more errors on the Bender Gestalt Test than do those children performing at an average level in school.

Hypothesis (b) was not confirmed by the data (d.f. 2 and 232, $F=106.331$, $p<.01$). In Table II the summary of the analysis of variance is presented and Table III presents the mean scores. Figure 1 illustrates the trend of the means.

* All references to children are applicable only to the population studied.

Table II

Summary of Analysis of Variance of

Bender Gestalt Test Scores

Source	SS	d.f.	MS	F	P
Ach	86.845	1	86.845	93.988	<.01
G	196.501	2	98.250	106.331	<.01
S	1.983	1	1.983	2.146	n.s.
A	3.134	1	3.134	3.392	<.10
A x Ach.	3.233	1	3.233	3.499	<.10
A x S	.017	1	.017	.018	n.s.
A x G	4.292	2	2.146	2.322	n.s.
Ach. x S	.528	1	.528	.571	n.s.
Ach. x G	1.189	2	.594	.643	n.s.
S x G	7.348	2	3.674	3.976	<.05
A x Ach. x S	.577	1	.577	.624	n.s.
A x S x G	.005	2	.002	.003	n.s.
A x G x Ach.	1.080	2	.540	.584	n.s.
Ach. x S x G	3.020	2	1.510	1.634	n.s.
A x G x S x Ach.	2.389	2	1.195	1.293	n.s.
*S/A x G x S x Ach.	214.409	232	.924		

Code: Ach. - Achievement

G - Grade

S - Sex

A - Age

* adjusted sum of squares error

Table III

Mean Bender Gestalt Error Scores of

Kindergarten, Grade One and Grade Two Children

Kindergarten	Grade One	Grade Two
12.208	7.149	4.187

These results indicate that the Bender Gestalt Test can discriminate significantly between kindergarten, grade one and grade two children. Kindergarten children make significantly more errors on the Bender Gestalt Test than do grade one and grade two children. Grade one children make significantly more errors than do the grade two children.

The data confirmed hypotheses (c) (d.f. 1 and 232, $F=2.146$, $p < .10$). In Table II the summary of the analysis of variance is presented and Table IV presents the mean scores.

Table IV

Mean Bender Gestalt Error Scores

of Male and Female Children

Young	Old
8.177	7.604

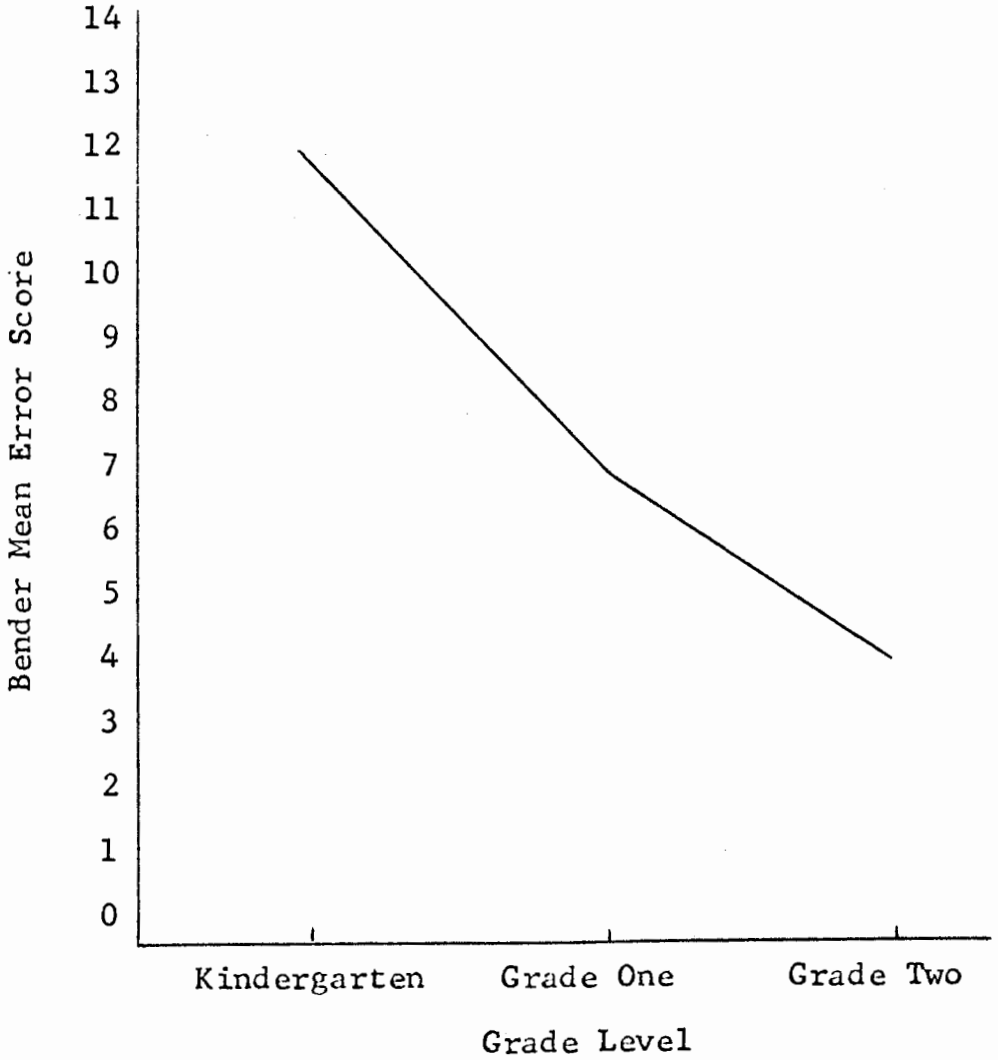

Figure 1. Mean Bender Gestalt Error Scores of Kindergarten, Grade One and Grade Two Children

These results indicate that the Bender Gestalt Test does not significantly discriminate between male and female children. Males do not make significantly more errors on the Bender Gestalt Test than females.

Hypothesis (d) was confirmed by the data (d.f. 1 and 232, $F=3.393$, $p < .10$). In Table II the summary of the analysis of variance is presented and Table V presents the mean scores.

Table V

Mean Bender Gestalt Error Scores

of Young and Old Children

Young	Old
8.253	7.531

These results indicate that the Bender Gestalt Test does not significantly discriminate between young and old children in kindergarten, grade one and grade two. Young children in these grades do not make significantly more errors on the Bender Gestalt Test than older children within these grades.

The interactional effect of sex x grade was significant (d.f. 2 and 232, $F=3.976$, $p < .05$). In Table II the summary of the analysis of variance is presented and Table VI presents the mean scores. Figure 2 illustrates the trend of the means.

Table VI

Mean Bender Gestalt Error Scores of

Male and Female Children at Three Grade Levels

	Male	Female
Kindergarten	12.721	10.694
Grade One	6.821	7.479
Grade Two	4.996	4.639

Multiple Comparisons of mean error scores for this interaction (Table VII) reveal that the Bender Gestalt Test significantly discriminates between male and female children in kindergarten only. Males in kindergarten make significantly more errors on the Bender Gestalt Test than do females in kindergarten. Males and females at grade one and two do not score significantly different.

Although no other interactions reached significance age x achievement approached significance (d.f. 1 and 232, F-3.499, p .10). In Table II the summary of the analysis of variance is presented and Table VIII presents the mean scores. Figure 3 illustrates the trend of the means.

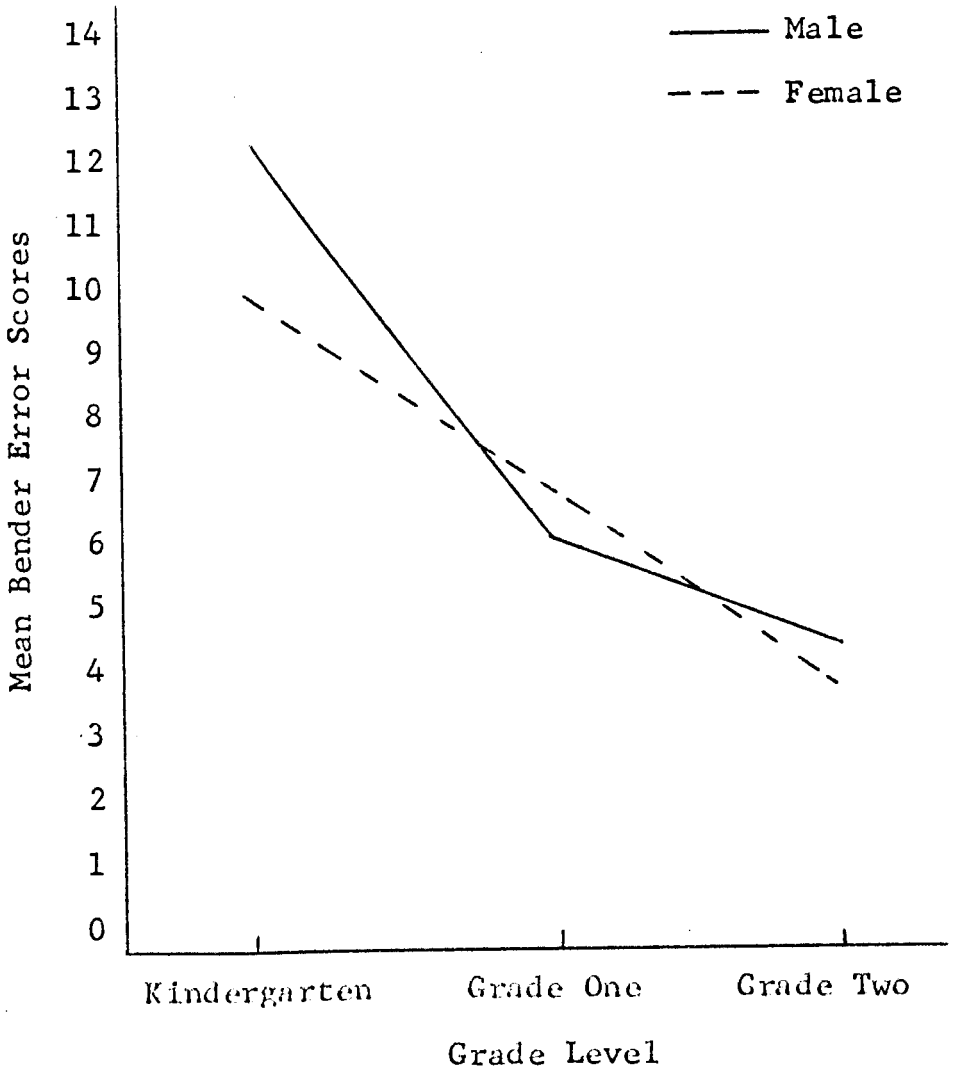

Figure 2. Mean Bender Gestalt Error Scores of Male and Female Children at the Three Grade Levels.

Table VII

Multiple Comparisons of Mean Bender Gestalt Error Scores for Sex x Grade Interaction+

		Fem. II	Male II	Male I	Fem. I	Fem. K	Male K
		4.639	4.996	6.821	7.479	10.694	12.721
Female - II*	4.639	-	.357∞	2.182	2.840	6.055	8.082
Male - II	4.996		-	1.825	2.483	5.698	7.725
Male - I*	6.821			-	.658∞	3.873	5.900
Female - I	7.479				-	3.215	5.242
Female - K*	10.694					-	2.027
Male - K	12.721						-

Code *I - Grade One

K - Kindergarten

II - Grade Two

\+ - all mean differences significant ($p < .01$) except those noted ∞

note: $\sqrt{MSe/_{\tilde{m}}} = .153$

Table VIII

Mean Bender Gestalt Error Scores of Young and Old Children at the Two Achievement Levels

	Young	Old
Poor	10.522	9.095
Average	5.984	5.995

Multiple Comparisons of mean error scores for this interaction (Table IX) reveal that the Bender Gestalt Test significantly discriminates between young and old children (as previously defined) when they are poor achievers. Young children who are poor achievers make significantly more errors on the Bender Gestalt Test than older children who are also poor achievers. There is no significant difference for young and old children who were average achievers.

Table IX

Multiple Comparisons of Mean Bender Gestalt Error Scores for Age x Achievement Interaction+

		Young Av. 5.984	Old Av. 5.995	Old Poor 9.095	Young Poor 10.522
Young - Av.*	5.984	-	.011∞	3.111	4.538
Old - Av.	5.995		-	3.100	4.527
Old - Poor*	9.095			-	1.427
Young - Poor	10.522				-

Code * Av. - Average

\+ - all mean differences significant ($p < .01$) except those noted ∞

note: $\sqrt{MSe/_n} = .123$

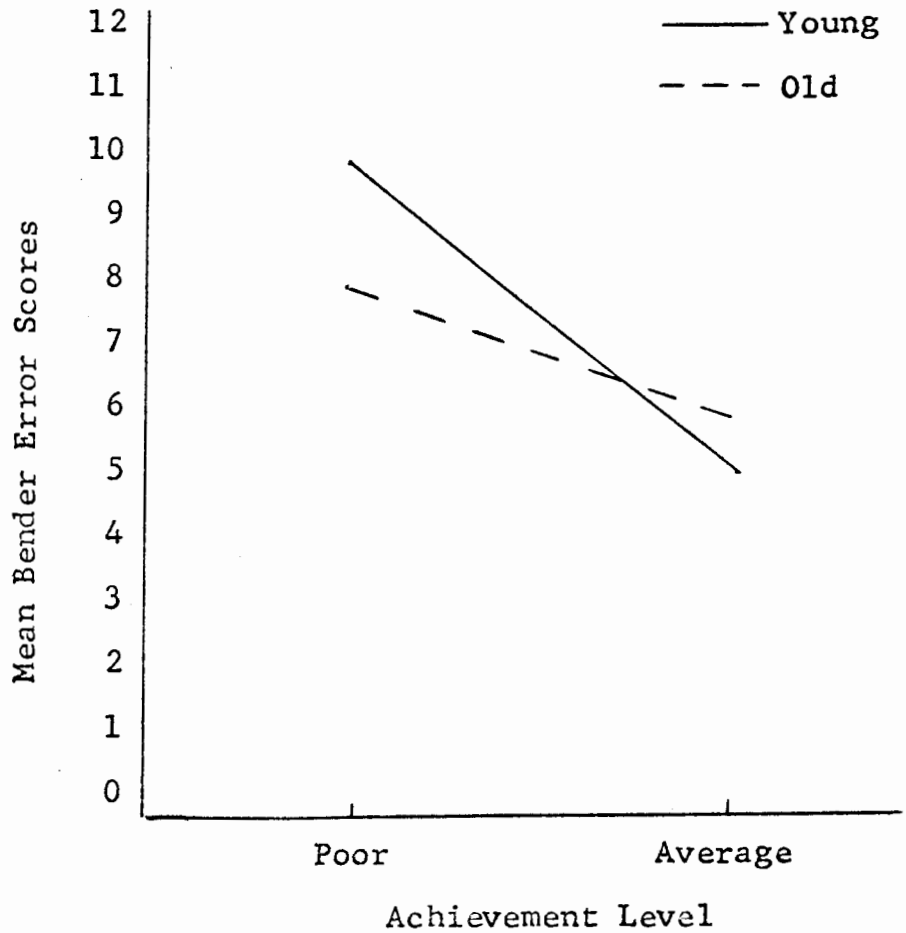

Figure 3. Mean Bender Gestalt Error Scores of Young and Old Children at the Two Achievement Levels.

Raven Progressive Matrices

The second body of data reported pertains to hypotheses 2, (a) to (d). Hypothesis (a) was not confirmed by the data (d.f. 1 and 232, $F=116.921$, $p < .01$). In Table X the mean scores are presented and Table XI presents the summary of the analysis of variance.

Table X

Mean Progressive Matrices Performance Scores of Poor and Average Achieving Children

Poor	Average
16.112	22.048

These results indicate that the Progressive Matrices Test can discriminate significantly between poor and average achieving children. Those children performing poorly in school make significantly more errors on the Progressive Matrices Test than children performing at an average level in school.

Hypothesis (b) was not confirmed by the data (d.f. 2 and 232, $F=68.103$, $p < .01$). In Table XI the summary of the analysis of variance is presented and Table XII presents the mean scores. Figure 4 illustrates the trend of the means.

Table XI

Summary of Analysis of Variance of

Progressive Matrices Test Scores

Source	SS	d.f.	MS	F	P
Ach.	211.393	1	211.393	116.921	$<.01$
G	246.260	2	123.130	68.103	$<.01$
S	.013	1	.013	.007	n.s.
A	2.711	1	2.711	1.499	n.s.
A x Ach.	1.447	1	1.447	.800	n.s.
A x S	1.665	1	1.665	.921	n.s.
A x G	11.696	2	5.848	3.234	n.s.
Ach. x S	15.283	1	15.283	8.453	$<.01$
Ach. x G	4.999	2	2.499	1.382	n.s.
S x G	4.072	2	2.040	1.128	n.s.
A x Ach. x S	1.583	1	1.583	.875	n.s.
A x S x G	4.854	2	2.427	1.342	n.s.
A x G x Ach.	2.042	2	1.021	.565	n.s.
Ach. x S x G	13.894	2	6.947	3.842	$<.10$
A x S x G x Ach.	.2586	2	.129	.071	n.s.
*S/A x G x S x Ach.	419.536	232	1.808		

Code: Ach. - Achievement

G - Grade

S - Sex

A - Age

* - adjusted sum of squares error

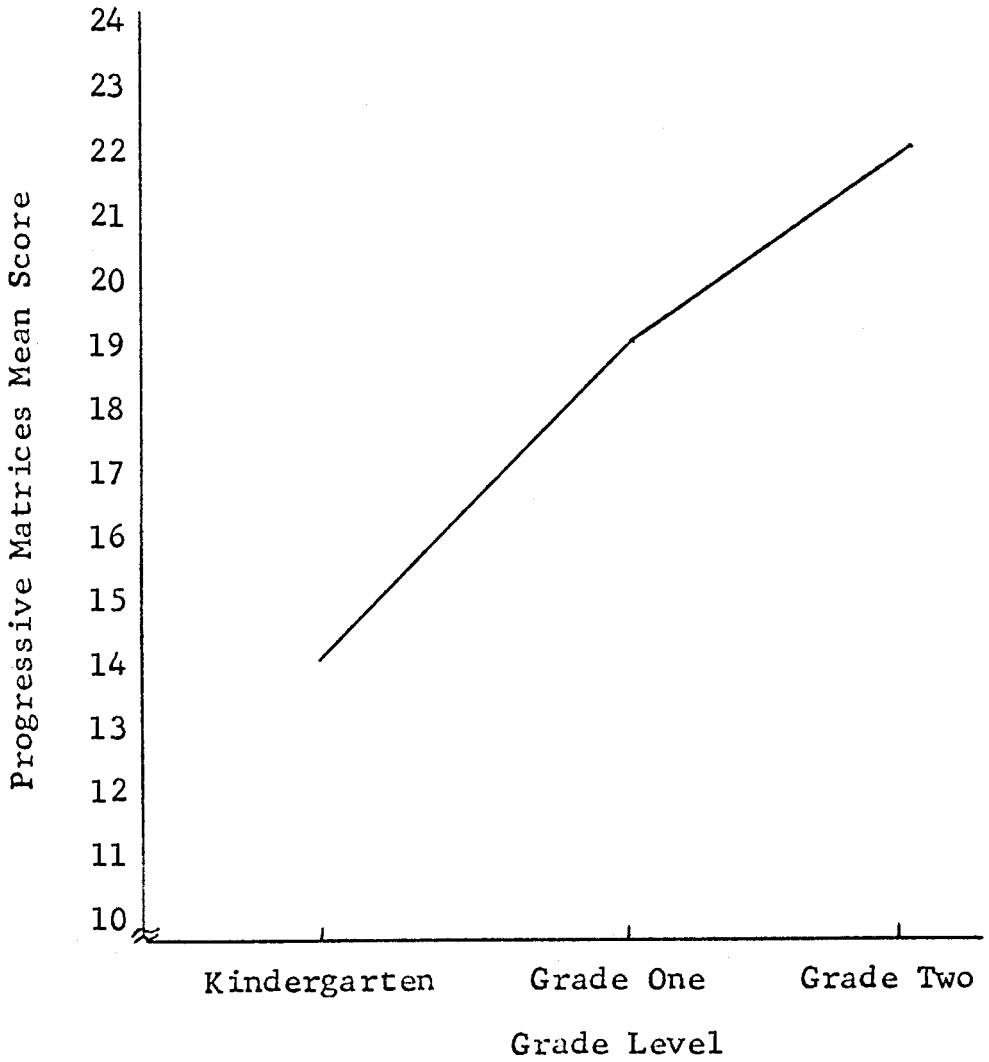

Figure 4. Mean Progressive Matrices Performance Scores of Kindergarten, Grade One and Grade Two Children

Table XII

Mean Progressive Matrices Performance Scores of Kindergarten, Grade One and Grade Two Children

Kindergarten	Grade One	Grade Two
14.816	19.889	22.546

These results indicate that the Progressive Matrices Test does discriminate significantly between kindergarten, grade one and grade two children. Kindergarten children make significantly more errors on the Progressive Matrices Test than do grade one and grade two children. Grade one children make significantly more errors than do the grade two children.

Hypothesis (c) was confirmed by the data (d.f. 1 and 232, $F=.007$, $p < .10$). In Table XI the summary of the analysis of variance is presented and Table XIII presents the mean scores.

Table XIII

Mean Progressive Matrices Performance Scores of Male and Female Children

Male	Female
19.103	19.057

These results indicate that the Progressive Matrices Test does not significantly discriminate between male and female children. Males do not make significantly more errors on the Progressive Matrices Test than females.

Hypothesis (d) was confirmed by the data (d.f. 1 and 232, $F=1.499$, $p > .10$). In Table XI the summary of the analysis of variance is presented and Table XIV presents the mean scores.

Table XIV

Mean Progressive Matrices Performance Scores of Young and Old Children

Young	Old
18.744	19.416

These results indicate that the Progressive Matrices Test does not significantly discriminate between young and old children in kindergarten, grade one and grade two. Young children in these grades do not make significantly more errors on the Progressive Matrices Test than older children in these grades.

The interactional effect of sex x achievement was significant (d.f. 1 and 232, $F=8.453$, $p < .01$). In Table XI the summary of the analysis of variance is presented and Table XV presents the mean scores. Figure 5 illustrates the trend of the means.

Table XV

Mean Progressive Matrices Performance Scores of Male and Female Children at the Two Achievement Levels

	Male	Female
Poor	16.934	15.291
Average	21.273	22.823

Multiple comparisons of mean performance scores for the above interaction (Table XVI) reveal that the Progressive Matrices significantly discriminates between male and female children at both achievement levels. Poor achieving males make significantly less errors on the Progressive Matrices Test than poor achieving females. This difference is reversed for average achievers where females make significantly less errors than males.

Table XVI

Multiple Comparisons of Mean Progressive Matrices Performance Scores for Sex x Achievement Interaction+

		Poor Female 15.291	Poor Male 16.934	Av. Male 21.273	Av. Female 22.823
Poor - female	15.291	-	1.643	5.982	7.532
Poor - male	16.934		-	4.339	5.889
Av.* - male	21.273			-	1.550
Av. - Female	22.823				-

Code *Av. - Average

\+ - all mean differences significant ($p < .01$)

note: $\sqrt{MSe/n} = .130$

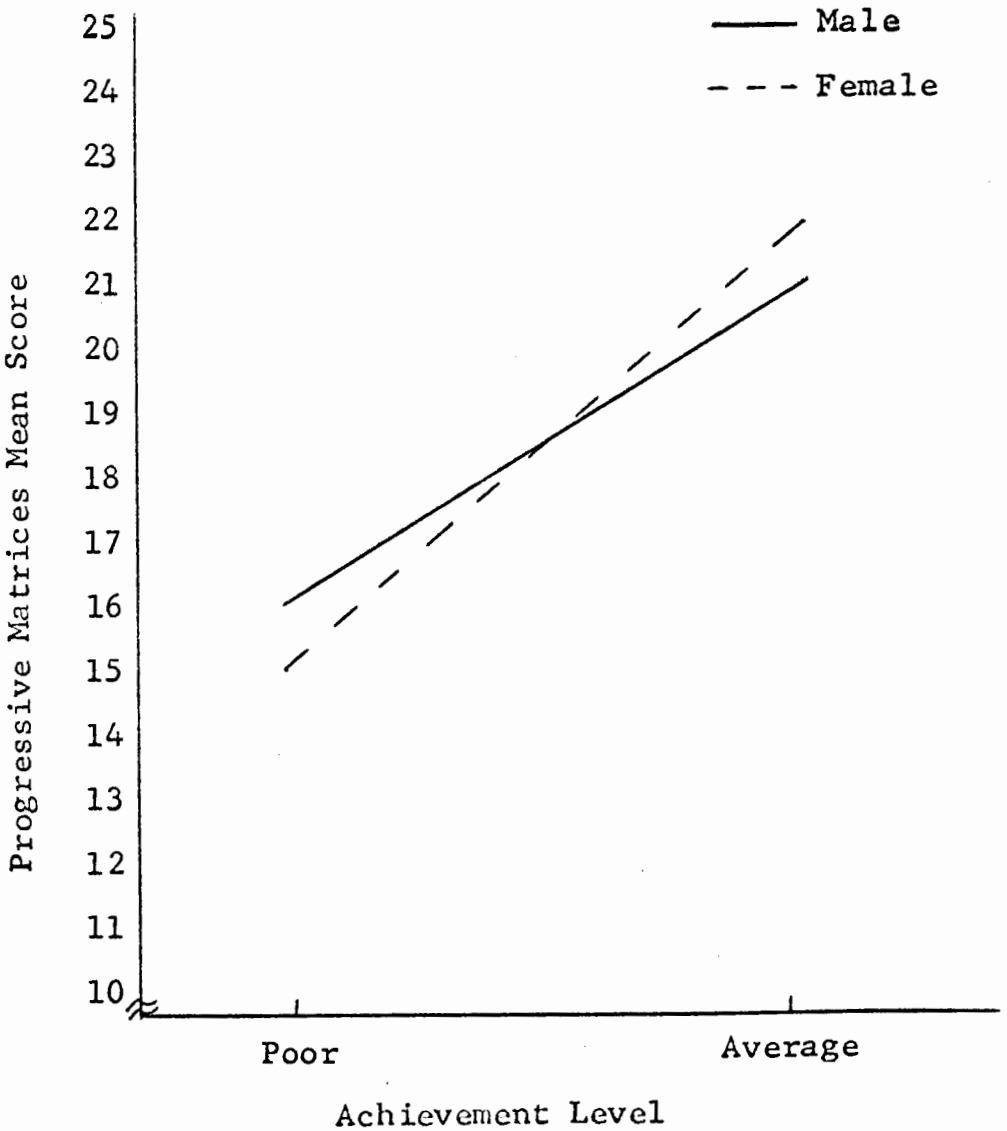

Figure 5. Mean Progressive Matrices Performance Scores of Male and Female Children at the Two Achievement Levels.

Although no other interactions reached significance, the three way interaction of achievement x sex x grade approached significance (d.f. 2 and 232, F-3.842, $p < .10$). In Table XI the summary of the analysis of variance is presented and Table XVII presents the mean scores. Figure 6 illustrates the trend of the means.

Table XVII

Mean Progressive Matrices Performance Scores of Male and Female Children at the Two Achievement Levels Within the Three Grades

	Male	Female
Poor - K*	12.65	11.75
Av.* - K	17.40	17.42
Poor - I*	17.60	14.96
Av. - I	21.07	14.96
Poor - II*	20.50	19.17
Av. - II	29.35	25.13

Code *K - Kindergarten
I - Grade One
II - Grade Two
Av. - Average

Multiple comparisons of mean performance scores for the above interaction (Table XVIII) reveal that the Progressive Matrices Test significantly discriminates between poor achieving male and female children at grade one only. Poor achieving males in grade one make significantly less errors on the Progressive Matrices Test than poor achieving females in grade one. At grade one and two the male-female difference is not significant. The Progressive Matrices Test also discriminates significantly between average achieving males and females at grade one and grade two but not at kindergarten. Average achieving females in grade one make significantly less errors on the Progressive Matrices Test than average achieving males in grade one. The reverse is true at grade two. Average achieving males in grade two make significantly less errors than average achieving females in grade two.

Considerations Pertaining to Previous Research

The third body of data reported pertains to statements 3, (a) to (c). Statement (a) was not confirmed by the data ($x^2 = 3.01$, $r_\phi = .108$, $p < .10$). In Table XIX is presented the summary of chi square and phi values.

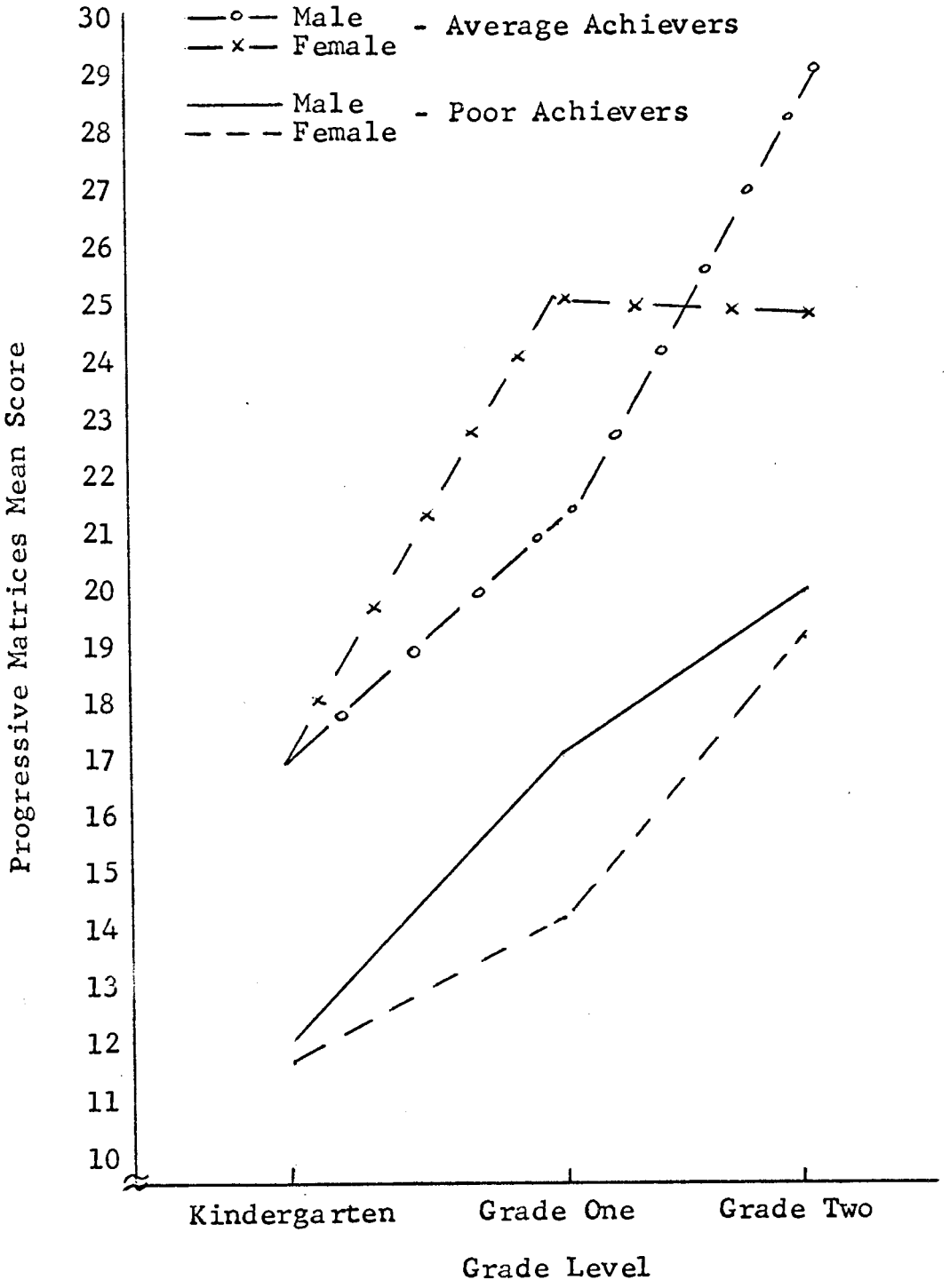

Figure 6. Mean Progressive Matrices Performance Scores of Males and Females at the Two Achievement Levels Within the Three Grade Levels

Table XVIII

Multiple Comparisons of Mean Progressive Matrices Performance Scores for Achievement x Sex x Grade Interaction+

		Poor Fem. K	Poor Male K	Poor Fem. I	Av. Male K	Av. Fem. K	Poor Male I	Poor Fem. II	Poor Male II	Av. Male I	Av. Fem. II	Av. Fem. I	Av. Male II
		11.75	12.65	14.96	17.40	17.42	17.60	19.17	20.50	21.07	25.13	25.93	29.35
Poor-Fem.-K*	11.75	-	.90∞	3.21	5.65	5.67	5.85	7.42	8.75	9.32	13.38	14.18	17.60
Poor-Male-K	12.65		-	2.31	4.75	4.77	4.95	6.52	7.85	8.42	12.85	13.28	16.70
Poor-Fem.-I*	14.96			-	2.44	2.46	2.64	4.21	5.54	6.11	10.17	10.97	14.39
Av.-Male-K	17.40				-	.02∞	.20	1.77	3.10	3.67	7.73	8.53	11.95
Av.-Fem.-K	17.42					-	.18∞	1.75	3.08	3.65	7.71	8.51	11.93
Poor-Male-I	17.60						-	1.57	2.90	3.47	7.53	8.33	11.75
Poor-Fem.-II*	19.17							-	1.33	1.90	5.96	6.76	10.18
Poor-Male-II	20.50								-	.57∞	4.63	5.43	8.85
Av.-Male-I	21.07									-	4.06	4.86	8.28
Av.-Fem.-II	25.13										-	.80∞	4.22
Av.-Fem.-I	25.93											-	3.42
Av.-Male-II	29.35												-

*K - Kindergarten; I - Grade One; II - Grade Two; Av. - Average; Fem. - Female Note $\sqrt{MSe/n}$ = .23

+ - all mean differences significant ($p < .01$) except those noted ∞

Table XIX

Summary of Chi-Square and Phi Values for Poor and Average Achieving Children Born May to August and those Born in the Other Months of the Same Year

	x^2	r_ϕ	P
Kindergarten	3.74	.238	$<.10$
Grade One	.055	.023	n.s.
Grade Two	2.45	.164	n.s.
All Children	3.01	.108	$<.10$

These results indicate that there is not a significantly greater number of poor achieving children born between the months of May and August. Examination of Table XX reveals that there are, in fact, more average achieving children born in the months May to August than poor achieving children.

Table XX

Frequency of Poor and Average Achieving Children Born May to August and Those Born in the Other Months of the Same Year

	Poor	Average	Total
May - August	27	47	74
Others	95	87	182
Total	122	134	256

Statement (b) was confirmed by the data ($x^2 = 4.13$, $r_\phi = .127$, $p < .05$). In Table XXI is presented the summary of chi-square and phi values.

Table XXI

Summary of Chi-Square and Phi Values for Poor and Average Achieving Children Who are Young and Old Within Their Respective Grades

	x^2	r_ϕ	P
Kindergarten	5.07	.281	$<.05$
Grade One	1.96	.140	$<.10$
Grade Two	.0003	-	n.s.
All Children	4.13	.127	$p < .05$

These results reveal that there is a significant relationship between age and achievement. The younger children within a grade tend to be the poor achievers while the older children within the same grade tend to be the average achievers. At kindergarten this age split reaches significance but at grade one and two the chi-square values fall short of significance. Examination of Table XXII reveals that there are more young poor achieving children than young average achieving children. It can also be seen that there is a higher frequency of older average achieving children than older poor achieving children. This latter difference tends to make the largest contribution to the significant result.

Table XXII

Frequency of Poor and Average Achieving Children at Young and Old Age Levels

	Poor	Average	Total
Young	68	57	125
Old	54	77	131
Total	122	134	256

Since considerations 3 (a) and 3 (b) were not significant an added analysis on birthdate was undertaken. Children who were born during the months September to January (i.e. had not had a birthday before entering their grade) were compared with children in the same grade who had had a birthday for that year. These two groups of children were compared on achievement level. See Table XXIII for the summary of chi-square and phi values.

Table XXIII

Summary of Chi-Square and Phi Values of Poor and Average Achieving Children Born September - January and January - August

	x^2	r_ϕ	P
Kindergarten	7.34	.338	$<.01$
Grade One	2.98	.182	$<.10$
Grade Two	4.41	.247	$<.05$
All Children	15.20	.257	$<.01$

These results indicate there is a significant relationship between children born in the last four months of the year and poor achievement. It is more likely that a child born between September and January will be a poor achiever than an average achiever. Examination of Table XXIV reveals that there are significantly more September - January children who are poor achievers than January - August. There are also significantly more January - August children who are average achievers than September - January.

Table XXIV

Frequency of Poor and Average Achieving

Children Born September - January and January - August

	Poor	Average	Total
September - January	51	32	83
January - August	47	95	142
Total	98	127	225

Statement (c) was confirmed by the data ($x^2 = 20.4$, $r_\phi = .282$, $p < .01$). In Table XXV is presented the summary of chi-square and phi values.

Table XXV

Summary of Chi-Square and Phi Values for

Poor and Average Achieving Males and Females

	x^2	$r\phi$	P
Kindergarten	2.55	.199	n.s.
Grade One	6.98	.264	.01
Grade Two	9.75	.325	.01
All Children	20.40	.282	.01

These results indicate that there is a significant relationship between sex and achievement at grade one, grade two and for all children. Kindergarten was the exception which did not reach significance. Examination of Table XXVI reveals that there are significantly more males who are poor achievers than females. Also there are significantly more females who are average achievers than males.

Table XXVI

Frequency of Male and Female Poor and Average Achievers

	Poor	Average	Total
Male	92	63	155
Female	30	71	101
Total	134	122	256

CHAPTER VII

Discussion and Implications

A child's* maturational level in visual-motor perception and perceptual reasoning as measured by the Bender Gestalt and Raven Progressive Matrices Tests respectively, increases significantly as his chronological age increases and he advances from grade to grade. These tests both discriminate significantly between kindergarten, grade one and grade two children. Kindergarten children make significantly more errors in these areas than children in grade one and grade two. Grade one children make significantly more errors than grade two children.

Several researchers have emphasized the importance of a maturational approach to perceptual processes (e.g., Vernon, 1958; Piaget and Inhelder, 1948; Line, 1931; Bender, 1938). The results of the present study are congruent with these findings. At various age levels children can correctly copy different aspects of visual stimuli (i.e. vertical lines approximately correct at five to six years, but oblique lines not til nine to ten years). This also applies to analyzing logical relations between simple and more complex visual forms as well as the ability to perceive and remember small details of shape with great accuracy. Younger children have some awareness of details within a figure but cannot reproduce them accurately. As a child's chronological age increases

* All references to children are applicable only to the population studied.

his ability to analyze and integrate more complex visual figures also increases. Piaget and Inhelder (1948) and Line (1931) have found that the younger child can reproduce accurately his perceptions of individual forms but when these forms are related in space the relationship was not accurately reproduced.

The difference in mean scores, on both tests, between grade one and grade two children was approximately one-half the mean difference between kindergarten and grade one children. This greater difference from kindergarten to grade one in perceptual reasoning and visual-motor perception abilities may be accounted for by the fact that much time in grade one is spent helping children to recognize and to reproduce various forms and shapes. Such training serves to familiarize them with visual perceptual processes. This also occurs at an age when the child is able to take advantage of the training. Vernon (1958) suggests that by the age of five or six years a child's visual perceptual abilities have matured and developed rapidly. He has acquired the ability to understand the importance of particular details in letter shapes, their spatial position, and their relationship to one another within the total word shape. The teaching of reading assists the development of these abilities, but cannot force it to proceed beyond a certain rate.

Children in kindergarten may latently possess these

abilities as a result of maturation but they may not yet have been manifested by sufficient exposure to and training in these areas. At the end of grade one, children have experienced eight months of drills directly developing their visual perceptual abilities which would cause a significant increase in their scores on tasks involving these abilities. Although a maturational spurt at grade one would account for this greater difference from kindergarten than grade two, it appears more likely that the training in grade one develops the latent visual perceptual abilities of kindergarten children. This increase, as well as the normal maturational increase, will cause a larger difference in scores on tests in the visual perceptual areas. Once children in grade one have realized their present capacity in these areas the development would proceed at the maturational rate for each child, thus slowing down to a smoother rate by grade two.

Both the Bender Gestalt and Raven Progressive Matrices also significantly discriminated between poor and average achieving children. This finding confirms those of Silver (1950), De Hirsch (1952), De Hirsch (1966) and Koppitz (1958 (b)) who found that primitive and poorly integrated Bender Gestalten to be characteristic of children having difficulty in school, particularly in reading. Koppitz (1958 (b)) states that at the beginning of elementary school, visual-motor perception seems to be more important for good

school achievement than verbal skills unless the latter are outstanding, and exceptional motivation for learning is present.

The results indicate that children performing poorly in school make significantly more errors on visual-motor and perceptual reasoning tasks than do children achieving at an average level. These abilities, then, are integrally involved in academic progress at school and a child lacking in these areas likely will not maintain an adequate level of achievement.

Neither the Bender Gestalt nor the Raven Progressive Matrices Test significantly discriminated between male and female children. On these tests male and female children were maturationally at the same levels in visual motor perception and it would appear that the excess of males with reading disabilities reported by many researchers (e.g., Hall, 1963; Durrell, 1940; Alden, Sullivan and Durrell, 1941; Macmeeken, 1939; Schonell, 1942; Ministry of Education Report, 1950; Monroe, 1932; Blanchard, 1936; Hallgren, 1950) is not accounted for by a lack of visual perceptual abilities compared with females. Perhaps studies emphasizing other factors as contributing to the significantly greater number of males than females having difficulty with reading should be considered more closely (e.g. Kagan, 1964; Tanner, 1961; Bentzen, 1963; Vernon, 1958).

Further results of the present study do not confirm the finding that children born during the months of May to

August are at an educational, social and psychological disadvantage to children born during the other months of the same year (Jackson, 1964; Jinks, 1964; Johns, 1962; Williams, 1964; Freyman, 1965). These authors have found that a larger proportion of the low achieving stream of children are born during these months. This study reveals that approximately seventy-four per cent of the children born during these months were average achievers. They only accounted for twenty-two per cent of the total number of poor achievers.

Month of birth may be irrelevant to this problem. Youngness or oldness of a child within his grade would tend to have more of an effect on his achievement standing in comparison to the other children. As previously stated, an older child is capable of performing more complex tasks than a younger child.

Using the median age in each grade to designate oldness (those falling above this age) and youngness (those falling below this age) it was found that younger children do comprise a significant proportion of the poor achievement group. A closer look at individual grades reveals that the relationship of age and achievement group only reached significance in kindergarten. The greatest proportion of poor achievers at kindergarten are the younger children while at grade one and grade two there is no age effect. The overall result confirms the statements of Pidgeon (1965), Ames (1964 and Morphett and Washburne (1931). They, in effect, say that the younger children in any school year group are at a disadvantage compared with the older children by being born at the wrong end of the school year.

The relationship of birthdate to commencement of the school year was further examined by comparing the achievement level of children born after the commencement of the school year but who were still eligible to begin their respective grade with children born in other months. The younger children in this portion of the study were those born between September and January. The results reveal that these children born during the first four months of the school year comprise forty-eight per cent of the poor achieving group and only twenty-five per cent of the average achieving group. Of the total population studied these children made up thirty-seven per cent.

A child who has his birthday after the commencement of the school term, but within the eligible period to enter that grade, is at a disadvantage as previously stated, concerning month of birth. To confirm this finding children would have to be studied who began school at different months of the year than the above mentioned September commencement date.

Although male and female children did not score significantly differently on the Bender Gestalt Test or the Raven Progressive Matrices the number of males in the poor achieving group at grade one and grade two significantly exceeded the number of females. In the total population the males comprised sixty-nine per cent of the poor achievers and fifty-one per cent of the average achievers. The females

were divided seventy per cent in the average group and thirty per cent in the poor group. This finding is congruent with the numerous accounts of males comprising the greater proportion of lower stream achievement groups and remedial classes.

Since lower ability in perceptual reasoning and visual-motor perception does not account for this male-female difference other factors should be explored. Kagan (1964) believes that boys face a conflict with their masculine role in the more female-oriented play activities in the primary grades. Emphasis is put upon biological age difference between boys and girls by Tanner (1961) who feels that society demands too much from boys at the primary age levels. Vernon (1958) stresses that boys are more apt to act out in school and come to the teacher's and parents' notice as a result of learning difficulties. This may result in the boy being referred to a clinic or special class because of a behavior disorder rather than a specific learning disability.

It can be stated that achievement level and grade level do significantly affect a child's performance on the Bender Gestalt Test and the Raven Progressive Matrices Test. Grade-age level and sex do not significantly effect a child's performance on these tests.

In regard to the poor achieving children it can be stated that the sex of the child has a significant effect on

his subsequent achievement in school. Birthdate in relation to school commencement and not any month as such, has a significant effect upon the academic achievement of children.

The main weakness of the present study is that the criterion of each child's achievement level was the teacher's evaluation of his progress and academic standing in his class. These evaluations were often difficult to interpret due to ambiguous reports by the teacher. Also it may be supposed that all teachers used their own subjective criteria to evaluate each child's achievement level and that these criteria will not be consistent across all teachers.

A weakness inherent in the statistical design of the study was the unequal cell frequencies. The children could not be matched on age within grade or sex since the average achieving children were a random sample.

The influence of the grade system made it difficult to establish the actual importance of birthdate as affecting achievement. The study was carried out in an area where there is only one starting date for school entrance. Thus the effect of month of birth was always influenced by its nearness or distance from the month of entrance. A school system which provided several starting dates within one year would have been more desirable to study in this regard.

The present study leads to further considerations regarding the effect of birthdate and sex on achievement. It

would appear that birthdate is important only in relation to the school system's commencement date. Studies are required to determine if the month of birth affects achievement or whether achievement is solely related to youngness or oldness within a grade. School systems which have several commencement dates within one year (e.g. Britain) would yield important information to this discussion. Hopefully it could be determined if the younger children comprise the majority of poor achievers or whether there are specific months of birth in the year which lead to inferior academic achievement.

Male children did not score significantly differently from female children on these two tests of visual perception but they did comprise the majority of poor achievers. This suggests that factors other than visual perceptual skills should be examined in this regard. Further study directed toward social, educational, psychological, genetic, physiological and parental factors as influencing male children entering the school systems present themselves as alternate directions of future research. For example, if classroom situations at the younger age levels do have a feminine bias, as suggested by Kagan (1964), male-female segregation at the early grades may have a significant effect. Males may need to be acclimatized to the required school adjustment whereas females, as a result of pre-school experience at more feminine behaviors, are more accustomed to the type of classroom procedures encountered.

The more relevant research considerations to the present study involve the identification of "high-risk" children by the Bender Gestalt Test and Raven Progressive Matrices Test. It has been shown that both tests discriminate between children in different grades and achievement levels. The data should be re-examined to establish cut-off scores for optimum discrimination of poor and average achieving children at each grade level. The present study suggests a very high significant difference between grade levels but it may also prove beneficial to look at the data in terms of age intervals within grade or disregarding grade. Cut-off scores determined for each grade would serve for approximately a twelve month spread of ages which may result in too gross a criterion, not applicable to the lower and higher age levels within a grade. It would also appear that the spread of scores on both tests at any grade level would warrant the establishment of several different cut-off scores appropriate to their age level.

The reliability of discrimination of each cut-off score for either a grade or age level would be determined by a correlation with the teacher evaluation of each child. Once the optimum cut-off scores had been established the reliability of discrimination could also be computed for each test. This data would reveal which test had the highest reliability of discrimination and the lowest percentage of

false positives and false negatives at each level. It is hoped that the percentage of false positives, which concerns us more than false negatives, would be sufficiently low to warrant the use of the test or tests as predictive tools.

As well as establishing the reliability of each test individually, the tests should be studied together to determine whether the reliability of discrimination increases. That is, when a child passes one and fails the other should he be designated a poor or average achiever? This procedure would determine the weight to be attached to each test when situations arise when a child does not pass or fail both tests.

Possible results of this re-examination would be that neither test, both tests, or only one test is a reliable discriminator of poor and average achieving children. They may or may not facilitate each other when used in combination.

If it was found that the tests either individually or in combination reliably discriminate between achievement levels, a further step would be to test a sample of children entering school. These children would have either one or both tests administered at the beginning of the school year. Their scores would be compared to the cut-off scores for their level and they would subsequently be designated as either "high-risk" children or not. This prediction would then be checked against the child's educational progress at various times during the following year and the predictive reliability

of the test or tests determined.

Further considerations arise at this point. Studies should be carried out to determine whether or not the teacher-pupil relationship is affected by the teacher having knowledge of the test results. Teachers may tend to teach a child according to the test results or they may tend to allow additional attention to those children designated as "high-risk"

Another aspect of this research to be studied is the reliability of the teacher's identification of potential poor achievers at the initial stages of school entrance. The question being asked is whether teachers can function effectively in screening "high-risk" children without the information from more objective test results.

It is hoped that from studies such as the above valuable information will be revealed which will influence and facilitate future research in this area of preditive screening devices.

As stated in Chapter I and II there is an urgent need for ways of identifying "high-risk" children before they enter the formal education system and possibly experience failure. The impact of failure is stressed by many authors (e.g. Eisenberg, 1961; Harris, 1961; Gates, 1941; Natchez, 1959; de Hirsch, 1966). They use terms such as "social and emotional casualties", "intense anxiety" and "adverse

emotional reactions" when describing children who have encountered specific reading disturbances. Gates (1941) quotes the figure of seventy-five per cent as the number of children with reading difficulties who develop marked signs of maladjustment. This information plus statements emphasizing that the need for remediation would be significantly lessened if children were not required to learn to read until they were ready, points out the growing importance of developing ways of identifying children not yet ready to enter formal education or specific aspects of it.

CHAPTER VIII

BIBLIOGRAPHY

BIBLIOGRAPHY

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APPENDIX A

Distribution of Children

from Each School and Grade Level

	Kindergarten(n)	Grade One(n)	Grade Two(n)	Total
Cordova Bay	15	20	20	55
Royal Oak	10	10	8	28
Depp Cove		4	4	8
Saanichton		8	8	16
Beaver Lake			8	8
Keating		8		8
Durrance		6	4	10
Prospect Lake		10	6	16
Sidney	21	20	20	61
Sansbury		4	4	8
Brentwood	18	10	10	38
Totals	64	100	92	256

Distribution of Children From

Each Age Level and Achievement Level

Age Level (years - months)	5-6 to 5-11	6-0 to 6-5	6-6 to 6-11	7-0 to 7-5	7-6 to 7-11	8-0 to 8-5	8-6 to 8-11	9-0 to 9-5	Total
Number of Children(n)	39	26	41	47	44	38	15	6	256
Sex - Male	23	14	26	26	30	22	10	4	155
- Female	16	12	15	21	14	16	5	2	101
Achievement Level - Average	16	19	15	31	23	26	4	0	134
- Poor	23	7	26	16	21	12	11	6	122

Distribution of Poor and Average

Achievers at Different Grade Levels

Grade Level	Poor Achievers	Average Achievers	N
Kindergarten	30	34	64
Grade One	50	50	100
Grade Two	42	50	92
Totals	122	134	256

APPENDIX B

Instructions for the Administration of the Bender Test

(from Koppitz, 1964)

Seat the child comfortably at an uncluttered table on which two sheets of paper, size 8½" by 11", and a #2 pencil with an eraser have been placed. After rapport has been established show the stack of Bender cards (Bender, 1946) to the child and say: "I have 9 cards here with designs on them for you to copy. Here is the first one. Now go ahead and make one just like it." After the child has adjusted the position of the paper to suit himself, place the first Bender card, Figure A, at the top of the blank paper in front of the child. No comments are made while observations and notes are made on the child's test behavior. There is no time limit for this test. When a child has finished drawing a figure, the card with the stimulus design is removed and the next card is put in front of him and so on. All nine cards are presented in this fashion in orderly sequence.

If a child asks questions concerning the number of dots or the size of the drawing, etc., he should be given a non-committal answer like: "Make it look as much like the picture on the card as you can." He should be neither encouraged nor discouraged from erasing or making several attempts at drawing a design. It has been found practical to discourage the counting of dots on Figure 5 since this requires much time and adds little new information. The children who

count dots on Figure 5 also tend to count dots and circles of Figures 1, 2 and 3. When a child begins counting dots on Figure 5 the examiner may say: "You do not have to count those dots, just make it look like the picture." If the child still persists in counting the dots, it then takes on diagnostic significance. The indications are that the child is most likely quite perfectionistic or compulsive. If the child has filled most of the sheet of paper and turns it sideways to fit Figure 8 into the remaining space, this should be noted on the protocol as this is not considered to be a rotation of design.

Each child is permitted to use as much or as little paper as he desires. If he asks for more than the two sheets of paper provided, he should be given additional paper without comment. Even though the test has no time limit, it is helpful to keep a record of the time needed to complete the test, as an extremely short or an unusually long period is diagnostically significant.

Care should be taken that the Bender Test is presented at the beginning of the testing session when the child is well rested as a fatigued child will not perform optimally. If it is felt that a child has been rather hasty in the execution of the test or if maximum performance has not been obtained, he may be asked to repeat the drawing of a Bender figure on another sheet of paper. If additional testing for maximum achievement seems indicated a notation

to this affect should be made on the protocol.

All Bender scoring items are scored as one or zero, that is, as "present" or "absent". Only clear cut deviations are scored. In case of doubt an item is not scored. Since the Scoring System is designed for young children with as yet immature fine motor control,minor deviations are ignored. All scoring points are added to a composite score upon which the normative data are based.

See Bender Scoring Items with Deviations and Scoring Examples in Koppitz, (1964).

Instructions for the Administration of the Progressive Matrices (1947) (Book Form)

During a preliminary conversation, the particulars of the person to be tested are filled in on the record form. The Examiner then opens the book to the first illustration, A.1, and says: "Look at this", (pointing to the upper figure), "it is a pattern with a piece taken out of it. Each of these pieces below" (he points to each in turn) "is the right shape to fit the space but only one of them is the right pattern." He explains why Nos. 1, 2 and 3 are wrong and why No. 6 is nearly right. He then says: "Point to the piece which is the right one." If the person does not point to the right piece, he continues his explanation until the nature of the problem to be solved is clearly grasped. The Examiner then

turns to Problem A.2 and says: "Point to the piece which came out of this pattern." If the person fails to do so, the Examiner can redemonstrate Problem A.1 and afterwards ask him to do A.2 again. If the problem is solved correctly, the Examiner turns to A.3 and proceeds as before. At any stage between Problems A.1 and A.5, the Examiner can use Problem A.1 to illustrate what the person should do, and then ask him to try again. If the person is unable to solve Problem 1 to 5 correctly and without difficulty, the Board Form of the test should be used. If they are solved fairly easily, the Examiner says: "You can see what to do. You have to point each time to the piece which is the right one to complete the pattern. Now go on at your own pace and see how many you can get right. Be careful. You can have as much time as you like. There is no need to hurry but remember that each time, only one piece is right. Be sure you have found the right one before you point to it." The Examiner records in the appropriate place on the record form the number of the piece pointed to in each test and sees that the pages are turned over one at a time. If necessary, before a person makes his choice, the Examiner can guide his attention to the pattern to be completed and can ask him to be careful to choose the piece which is right. As the person turns to the first problem of Set Ab, or when he begins Set B, the Examiner can point in turn to each of the three figures in the pattern and to the space, saying: "That, that, that - what will this one be?

Point to the right one to come here." At any stage of the test, before a person makes his choice, the Examiner can again point to the figures in the pattern and say: "Look carefully at the pattern and notice what happens. You see, that, that .... that - so what will this one be?" No other assistance or instructions may be given and as far as possible a person should be allowed to work quietly by himself from the beginning of Set A to the end of Set B without interruption or disturbance.

A "brighter" person can be asked to enter his choices on his own record form and can be allowed to work by himself. If he does, care must be taken to see that he does not turn over two pages at once and that he continues to enter his choices correctly on his form. In the present study all responses were recorded by the Examiner.

When the Book Form of the test is used, the piece a person points to as his final choice counts "right" or "wrong".

Examples of Teacher Evaluations

Poor Achievement Group

Subject A Cannot concentrate for any length of time. Very immature. Poor muscle control. Does not listen to instructions well. Discipline a problem.

Subject B Progress slow in reading. Does not appear to connect sounds with letters that represent them. Appears to have a poor memory. He grasps simple arithmetic concepts. He is slow but conscientious working to the best of his ability. He is a nervous little boy who sucks him thub and bites his nails.

Subject C Difficult to handle. No powers of concentration. Little control of pencil. Prone to temper tantrums. Cries at top of voice if can't have his own way. Worst in class.

Average Achievement Group

Subject X Very mature in speech, social development, manual skills. Produces exceptional art work, likes to organize games, but is not domineering. Shows a mature interest in other children.

Subject Y A child of high ability whose progress in all phases of the program is very good. She is mature and stable and has a good home environment.

Subject Z Good student. Applies self well. Little difficulty in Grade one or two.