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A THREE YEAR LONGITUDINAL STUDY OF THE RELATIONSHIP OF PERCEPTUAL TRAINING AND READING ACHIEVEMENT.

THE OHIO STATE UNIVERSITY, PH.D., 1979

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A THREE YEAR LONGITUDINAL STUDY
OF THE RELATIONSHIP OF PERCEPTUAL TRAINING
AND READING ACHIEVEMENT

DISSERTATION

Presented in Partial Fulfillment of the Requirements for
the Degree Doctor of Philosophy in the Graduate
School of The Ohio State University

By
Irene G. Bandy, B.S., M.A.

* * * * *

The Ohio State University
1979

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No dissertation reaches finalization without the expertise of a typist. For meeting timelines, for accuracy, and for ongoing support, my thanks to Gayle Kitchton -- the best.

Most importantly, I wish to salute my son who thought this whole process was okay and told me to get busy as much as I told him to this year. My deepest appreciation also goes to my mother who has supported my every endeavor for 39 years, including this one.

Lastly, appreciative thoughts for my dad, who would be proud.
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I. INTRODUCTION

The 'back to basics' movement, extensive legislation to provide educational programs for all handicapped children, a renewal of the concept of individualized instruction, and the lowering of test scores in both reading and mathematics have resulted in the development of early identification and skill development programs in school systems across the nation.

Using the developmental theories of such experts as Piaget (1926), Gesell (1943), and Havighurst (1953), many programs have been established for the purpose of identifying, diagnosing, andremediating potential or actual learning problems. There is a "...strong suggestion in findings that a substantial number of high risk children can be correctly identified during early phases of kindergarten before formal reading instruction begins" (Satz and Friel, 1972, p. 3.).

In Ohio, early identification of handicapped children is emphasized now more than ever before through special education standards which state that school districts must locate and evaluate all handicapped children residing within the district. These programs include children as young as age three.

There are also, however, many children who are not classified as handicapped, but who have minor disabilities or beginning problems. If these are caught early, they might be eliminated or compensated for
before more serious problems develop. For this purpose, many school
districts in Ohio have developed kindergarten early identification pro-
grams followed by skill development activities or remediation programs.
These programs vary in the amount of program involvement with the chil-
dren. Some programs provide identification techniques and generate
reports. Other programs go much further and include an individualized
program of activities to work on the individual child's identified
problems.

The major thrust of early identification programs therefore can be
considered prevention. Not only are problem areas found early, but edu-
cators gain information which shows the variability of developmental
levels found in the entering group of children. Knowing the entry
level of each child allows for a developmental curriculum to be written
for the total class as well as for the individuals who need specific
help. In determining class and individual activities, the age of the
children needs to be considered. Because of differing rates of develop-
ment, it is also necessary to compare the data of boys with those of
girls (Dinkmeyer, 1965).

The Rationale

Ohlson (1978) states that "...instead of looking for the failure
of academic learning, the educator is directed to become aware of inadequate processing skills" (p. 11). One such skill which appears to have
an effect on learning is visual perception.
According to Saphier (1973, p. 63):

Kindergarten or before is a critical time to identify potential learning problems. Not only is remediation increasingly difficult thereafter, but the changing patterns of perceptual development make test results misleading at other ages. The predictive validity of any test or battery of tests must be established and criticized for a single age group only—and the most useful group to start with is kindergarten.

Many children come to kindergarten with poorly developed perceptual skills. Parents often do not provide enough experiences for this development. In other cases, the child may manifest a physical cause of delay or problems in perception. Often the early identification of the problem will allow teachers and parents to provide activities to strengthen perceptual development before pre-reading skills are taught.

If the development of perception is hampered by a physical problem, and teachers are made aware, they can teach the child through other modalities.

"While visual perception and, in particular, its relationship to school learning have received much attention in professional journals, the educational usefulness of this important theoretical construct has never been fully substantiated," (Larson and Hammill, 1975, p. 281). The de Hirsch, Jansky and Langford (1966) study assessed perceptual skills in kindergarten children and correlated the results with second grade reading scores. It is one of the few longitudinal studies providing information on the predictive ability of perceptual measures used in kindergarten.

There appear to be two differing positions concerning programs of remediation in visual perception as they relate to reading readiness.
Although many studies have yielded results which indicate no significant relationship between perceptual training and reading (Cohen, 1969; Ayres, 1968; Litchfield, 1971), those conducted by experts in the field of perception indicate a significant relationship (Goins, 1958; Alley and Others, 1968). The fact that few longitudinal studies have been conducted to determine the effect of perceptual training on later reading achievement leaves both sides needing substantiated evidence.

This research study will provide educators, such as elementary school counselors, longitudinal data concerning the relationship between visual perception and reading readiness. The role of the elementary school counselor in working with early identification programs is described in the Ohio Department of Education, Division of Guidance and Testing's publication, A Model Guidance Program for Ohio's Elementary Schools (1978).

Purpose of the Study

The major purpose of this study was to determine the relationship, over a three-year period, of a kindergarten perceptual training program with reading using children identified as having visual-perceptual problems at the kindergarten level. A series of checks were made on reading achievement through the second grade to determine if the children receiving a perceptual training remediation program in their kindergarten year made significantly greater gains than a group not receiving the program. There were two secondary purposes of this study: one was to investigate the relationship of each set of comparative scores in reading achievement to the variable of sex; and the other was to compare perceptual skills by age at entrance to kindergarten.
Research Questions for the Study

In evaluating the effectiveness of an early identification program, certain questions should be asked. The following research questions address both process variables and attribute variables. These research questions were tested in null form at the .05 level of significance.

1. Will those students identified as having visual-perceptual deficiencies and receiving remediation in the kindergarten year have significantly higher second grade reading scores than a similarly identified group receiving no formal program of remediation?

2. Will there be a significant difference between the second grade reading scores of boys and girls in the group receiving the kindergarten remediation programs?

3. Will age at entrance to kindergarten have a significant relationship to visual-perceptual deficiencies?

4. Will those students identified as having visual-perceptual deficiencies and receiving remediation in kindergarten show reading scores at the second grade level significantly closer to the total second grade class reading level than those students similarly identified but not receiving remediation in kindergarten?

Definitions of Terms

For the purposes of this study, the following key terms are defined for the reader:
1. **Early Identification Program** - The identification by school personnel of pre-kindergarten and/or kindergarten students who have potential learning problems such as perception, auditory and visual.

2. **Visual-Perceptual Processes** - Those brain operations which involve interpreting and organizing the physical elements of the stimulus rather than the symbolic aspects of the stimulus. The processes also are referred to as visual discrimination and/or spatial relationships as measured by the Matching and Copying subtests of the Metropolitan Readiness Tests.

3. **Visual-Perceptual Training Program** - A program of coordinated, sequential activities which were developed for each student identified as having perceptual problems and placed in the remediation program. Activities were utilized from the Santa Clara, the Rosner Perceptual Skills Curriculum, and locally developed materials. The terms remediation and perceptual training program will be used interchangeably throughout the study.

4. **Ocular Pursuit** - The use of an object for the child to track in order to observe eye movement and eye muscle control.

5. **Low Readiness Status** - The level of scores on the Metropolitan Readiness Tests which indicate below normal readiness, (in this study, 5 or below on the Matching subtest and 4 or below on the Copying subtest).

**Limitations of the Study**

There were several anticipated limitations to the study. First, existing data were used (tests and remedial program), and the subjects
were not randomly assigned to one of the two kindergarten treatment conditions (program and control). In addition, it was also difficult to know to what extent parents or others outside the school became involved in assisting their children with activities to strengthen visual perception.

For the purposes of this study only two subtests of the Metropolitan Readiness Tests related to perception, Matching and Copying, were used. Subtests are not as accurate as total scores on the Metropolitan Readiness Tests for predicting reading readiness.

Instrumentation could have been a limitation. It was necessary to determine if there was a significant correlation between the two instruments being used, the Metropolitan Readiness Test and the Gates-MacGinitie Reading Tests. Results of the study included the predictive validity of the Metropolitan Readiness Test; therefore, a significant correlation was important.

Another limitation of the study was that the subjects were identified as having perceptual problems. Students who have a handicap are compared with non-handicapped students on a norm-referenced test. The handicapped students begin and remain below the total group. Individual case studies utilizing criterion-referenced instruments may delineate the results more clearly.

Organization of the Study

This chapter includes an introduction, the rationale, the purpose of the study, research questions, definitions, and the limitations of the study. Chapter II will contain a review of the literature pertinent
to the study. Chapter III will present the method and design of the study and how the data is to be interpreted. Chapter IV will discuss the results and relate interpretive information. Chapter V will state conclusions, a summary, and recommendations.
II. REVIEW OF THE LITERATURE

A review of the professional literature was made to determine the scope of definition of perception and visual-perceptual skills. Secondly, the literature was reviewed for instruments, techniques, and research in the area of screening and diagnosing perceptual skills and deficiencies. A third focus of the literature review was made to examine the types of training and/or remediation techniques used with children who have been screened as having perceptual problems. The final purpose of the literature review was to examine the research studies conducted on the relationship of perception and reading.

Definitions of Perception and Visual-Perceptual Skills

There are many definitions of perception which range on a continuum from purely a receptive process to a distinction between sensation, perception, and cognition. In the latter case, "the processes which involve thinking, meaningful language, problem-solving, etc. are assigned to 'cognition', while those dealing with non-symbolic, non-abstract properties of the stimuli - e.g., size, color, shape, texture, sequence, etc. - are relegated to 'perception' " (Hammill, 1972, p. 553). Several definitions will be presented which represent the more advanced processes.
Joseph Wepman (1974), together with a study committee, defined learning disabilities in terms of perception. They indicated the disabilities are centered in the neurological system of the human organism.

"According to Piaget, the child's perceptual ability involves mental images or abstractions of space rather than simple organizations of sensory experience" (Friedland and Meisels, 1975, p. 29). Frostig (1964) defines perception as the ability to recognize stimuli including not only reception of the stimuli, but interpreting and identifying the stimuli through past experiences.

Delacato (1966, p. 46) states, "Perception is composed of sensations which are organized about an object, both in terms of time and space, resulting in the recognition of the object. Only when recognition takes place as a result of organization of the sensations, does perception take place."

Lewis (1977) defines perception as a linkage of the brain to environment. He sees two aspects of this process: 1) a detection of physical stimuli by one or more of the sense organs, and 2) the interception of the stimuli by the brain. The first aspect, detection and transmission is a physical process; while the second aspect, interception, is a mental process.

Ebersole, Kephart, and Ebersole (1968) recognize six general stages of learning in a sequential order as shown in Figure 1. They explain the perceptual stage as the time that "...the child manipulates one perception against another, without the necessity of motor intervention. The child notices that objects have perceptual similarities, and
is able, for example, to sort cardboard squares, circles, and triangles by simply looking at them; it is not necessary for him to feel them to differentiate. Perceptual discrimination can be practiced and learned" (p. 79).

Figure 1. Hierarchical Development Stages of Learning.

Medvedeff (1974, p. 1) discusses perception as the understanding of what is seen. He states that "...perception involves the ability to discriminate and differentiate figure ground relationships, comprehension of basic shapes, etc. and an ability to maintain the relationship between the elements of a form." Rosner (1975) also sees perceptual skills as the behavioral processes of analyzing and organizing raw sensory data into meaningful symbolic units.

In summary, although many definitions of perception exist, three commonalities can be noted: (1) Perception is a neurological function; (2) Perception is a factor within the lifelong developmental sequence from motor efficiency to cognition; and (3) Perception involves the receiving of stimuli and their interpretation.
Instruments and Techniques for Screening and Diagnosing Perceptual Skills

The review of the literature regarding screening and diagnosing perceptual skills yielded an extensive number of published, standardized instruments. Those instruments constructed and validated for use with children four through six were deemed most appropriate to this study; and, therefore, will be reviewed in more depth than the others.

It is important to note that some school districts have developed their own local screening devices by combining items from several existing instruments or writing their own instruments. These will not be discussed in this review because of the multiplicity and variety of such programs and the lack of adequate information about them.

With regard to the assessment of visual perception, it is necessary to discuss the relationship between visual perception and visual-motor integration. The rationale for measuring visual perception by using a test of visual-motor integration is reflected in a statement by Lauretta Bender: 'The motor behavior of the small child...adapts itself to resemble the stimulus perceived in the optic field'. This implies that the child's perception of a stimulus is reflected in his ability to copy it, Colarusso and Gill (1976, p. 158).

Kephart (1960), Berko (1954) and Gallahue (1968) all support this view. Colarusso and Gill (1976, p. 159) list considerations in the selection of appropriate tests for visual-perceptual assessments.

1. Can the test be administered to groups?
2. Is the standardization population similar to the subjects to be tested?
3. Is there appropriate normative data?
4. Is the test reliable for the age of the subjects to be tested?

5. Are the scoring procedures subjective or objective?

6. Does the test require sophisticated motor responses?

As with any test selection, the purpose for testing, the age and experience of those taking the test, and the use of the results should be considered.

**Bender Visual Motor Gestalt Test for Young Children (Bender)**

This instrument is probably the best known screening device. The results of the copied drawings can be interpreted two ways: "1) as a test of developmental maturity in visual-motor perception, and 2) as a test of emotional adjustment," (Koppitz, 1972, p. 1). The Bender is easy to administer, and scoring for young children can be interpreted objectively in relation to developmental age.

Labrentz, Linkenhoker, and Aaron (1976) utilized the Bender gestalt figures as a copying task in comparison with a multiple choice version of the test. Several age groups were studied including the kindergarten age of 5.4 years. The correlation coefficients between recognition in the multiple choice version and copying for the 5.4 year olds was .63, which was significant at the .01 level. Two years later these students as second graders were administered a reading achievement test. Correlation coefficients obtained between each Bender administration and the achievement test reached significance at the .05 level, $r = -.55$ for the multiple choice version and $r = -.51$ for the copying version.
Keogh (1965) and Keogh and Smith (1967) conducted longitudinal studies utilizing the Bender to determine later school achievement. Consistent statistically significant relationships (.51) between kindergarten Bender scores and later reading scores were obtained. The researchers cautioned, however, that individual cases need specific attention when making predictions. Wedell (1970) felt that only in severe disabilities can perceptual-motor problems predict later development. Others whose research support the predictability success of the Bender as a screening device include Chang and Chang (1967), Hammer (1967), Kelly and Amble (1970), Koppitz (1973), and Mlodnsky (1972).

**Developmental Test of Visual Perception**

Another well studied authority in visual perception is Frostig (1964). Her instrument includes five subtests which measure the abilities of: Visual-Motor Coordination; Figure-Ground Perception; Perceptual Constancy; Perception of Position in Space, and Perception of Spatial Relationships.

Frostig believes that each of these abilities has implications for academic achievement. "Visual-motor coordination is important because well directed eye movements are a prerequisite for reading--and good coordination of hand and eye is necessary for writing." Also related to reading is "the ability to distinguish figure from ground..for the analysis and synthesis of words, phrases and paragraphs...." (Frostig and Horne, 1964, pp. 10-11). Perceptual constancy, perception of position in space, and spatial relationships are also related to school achievement.
Frostig's standardization study established the ages of 3½ to 7½ as the time when visual perception becomes the child's major developmental task. This corresponds with Piaget's preoperational stage of development—approximately below age seven (Piaget and Inhelder, 1967). In Buros (1972), Kephart reviewed the Developmental Test of Visual Perception and stated that it is one of the best visual-perceptual tests available. According to Kephart, a low score generally indicates potential classroom problems.

Perceptual Skills Curriculum

Rosner's battery of tests includes visual-motor skills. This curriculum is based on two key principals for the development of a child's perceptual skills: 1) acquired motor skills develop from global activity to more differentiated activity (Espenschade and Eckert, 1967); and 2) the child's ability to perceive correctly develops from the need to use motor skills to the use of visual data without tactile-kinesthetic confirmation (Zinchenko, 1970).

The Perceptual Skills Curriculum has four guidelines for testing (Rosner, 1973, p. 43):

1. The tests provide a method for determining whether a specific subskill has been mastered.

2. The test criteria are to be treated fairly strictly.

3. The tests are all criterion-referenced.

4. Once placement has been completed and learning activities have been assigned, testing should be done as often as the child is able to demonstrate signs of having mastered the objective he has been working on.
Figure 2, page 17, illustrates the sequence of testing - teaching - testing to be followed in this curriculum.

Other researchers have suggested the concept of developmental sequence in perceptual and cognitive skills (Piaget, 1950; Wepman and Morency, 1971; and Kershner, 1975). In addition, there are standardized tests that contain subtests for visual-perceptual-motor skills.

**Santa Clara Inventory of Developmental Tasks (Santa Clara)**

The **Santa Clara Inventory of Developmental Tasks** consists of sixty tasks on a developmental scale for young children. As an assessment instrument it has two uses: prevention and strengthening skills through the regular curriculum.

The sixty tasks are distributed across eight skill areas and are sequenced by chronological age. The **Santa Clara** can be administered by the classroom teacher through general observation of the child during daily instruction or in a structured setting. Not all tasks need to be administered at one time, and some at the lower end of the scale may not be appropriate to begin testing the child who demonstrates basic skills in the testing areas.

The inventory results may be used to develop an individualized plan for students who need strengthening in certain skill areas and/or to communicate student development levels to parents and future teachers. Scoring is simple which lends to clear interpretation.

Two skill areas on the **Santa Clara Inventory of Developmental Tasks** directly relate to perception: Visual Motor Performance and Visual Perception. These subtests specifically measure copying and matching skills from the pre-school level to seven years old (see Table 1, p. 19).
START

Placement Test
to determine child's
position in a sequence
of objectives

Assign learning
activities for next
objectives in the
sequence

Posttest

Pass?

Pretest next objective
in the sequence

Pass?

assign additional
learning activities

no

yes

no

yes

Figure 2. Flow Diagram of Testing - Teaching - Testing Process (Rosner, 1973, p. 42)
Remediation activities within the Santa Clara materials will be discussed in the section of this chapter entitled, Training and/or Remediation Techniques for Children.

**Child Kit**

Another total early identification program is Medvedeff and Dearth's Child Kit (1974). Two subtests, The Perceptual Organization Screening Inventory and The Fine Visual-Motor Screening Inventory, screen for conceptualizing shapes from partial drawings and copying respectively. Children are observed for handedness and the directions in which they make their drawings. Medvedeff (1974) emphasizes the importance of left to right, top to bottom, and counterclockwise orientations as prerequisites for reading and writing. Scoring, therefore, is two-fold: product (the completed copied figure) and process (the directions in which parts of the figure are drawn).

Results of the screening can be utilized in prescribing a program of remediation activities which are a part of the Child Kit. Tutors or aides can assist the child in working through the prescribed program.

**Metropolitan Readiness Tests (Metropolitan)**

The Metropolitan Readiness Tests include two subtests which relate to perception, Matching and Copying. Much research has been done utilizing the total score as well as the subtest scores. The Matching Subtest involves the recognition of similarities and the Copying Subtest measures perception in relation to motor control.

Hildreth, McGauvran, and Griffiths (1969, p. 2) state that the "Metropolitan Readiness Tests were devised to measure the extent to
### Table 1: Developmental Profile - Santa Clara Inventory of Developmental Tasks

<table>
<thead>
<tr>
<th>Name</th>
<th>Birthdate</th>
<th>School</th>
<th>Teacher</th>
<th>Grade</th>
</tr>
</thead>
</table>

**Testing Dates:**
- C.D.
- L.D.
- A.M.
- A.P.
- V.M.
- V.M.P.
- M.C.

**Scoring:**
- 0 - Almost never
- 1 - Some of the time
- 2 - Most of the time

**Conceptual Development**
- Analyze number value
- Identify first, last, top, and bottom
- Tell hour 2 items are alike
- Use object, 2 ways

**Language Development**
- Give personal information
- Describe simple objects
- Describe words and pictures
- Define words
- Language usage

**Auditory Memory**
- Repeat 1 sequence
- Repeat 2 sequences
- Repeat 3 sequences
- Recall story facts
- Repeat 5 numbers

**Auditory Perception**
- Recognize sound sources
- Identify common sounds
- Discriminate between sound images
- Match beginning sounds
- Hear fluctuating sounds
- Match ending sounds

**Visual Memory**
- Recall animal pictures
- Name objects from memory
- Recall a 3-color sequence
- Recall items in a sequence
- Recall 3 items in a sequence
- Recall part design
- Recall word forms

**Visual Perception**
- Match color objects
- Match form objects
- Match size objects
- Match size and form on paper
- Match letters
- Match direction on design
- Observe visual images
- Match words

**Visual Motor Performance**
- Follow target with eyes
- String beads
- Copy a circle
- Copy a square
cut with scissors
- Copy letters
- Copy a rectangle
- Copy a diamond

**Motor Coordination**
- Creep
- Walk
- Run
- Jump
- Hop
- Balance on one foot
- Use of hands and arms
- Ship
- Balance on walking beam
- Jump rope
- Swim

<table>
<thead>
<tr>
<th>Tasks</th>
<th>0-3 Yrs.</th>
<th>3-5 Yrs.</th>
<th>5-6 Yrs.</th>
<th>6-8 Yrs.</th>
<th>7-9 Yrs.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PREFE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
which school beginners have developed in the several skills and abilities that contribute to readiness for first grade instruction." The authors also state that subtest scores falling in the low normal and low ranges may indicate the areas in which the child needs further readiness development. Kindergarten teachers can determine activities for children needing additional skills.

Purdue Perceptual-Motor Survey

The Purdue Perceptual-Motor Survey (Roach and Kephart, 1966) measures perceptual-motor development for ages 6 through 11. Bannatyne (1971) found the survey easy to administer and that the results correlated with other similar instruments. Jamison (1972), on the other hand, questions whether the skills as measured by this instrument have been shown to be necessary for academic learning.

Ayers, Rohr, and Ayers (1974) administered, among other instruments, the Metropolitan Readiness Tests and the Purdue Perceptual-Motor Survey to 38 kindergarten and 56 first grade students. The highest correlation (.43) found was between the Purdue Survey scores and the Copying Subtest of the Metropolitan.

Developmental Test of Visual-Motor Integration

Beery and Buktenica (1967) designed the Developmental Test of Visual-Motor Integration for ages 2 through 18. A correlation of .89 was found between chronological age (2-15) and test scores.

Illinois Test of Psycholinguistic Abilities

Two subtests of the Illinois Test of Psycholinguistic Abilities, Visual Closure and Visual Sequential Memory, are tests of perceptual
skills which can be used with ages 2 through 10. Examiners must be trained to administer this test.

**CIRCUS: Comprehensive Assessment in Nursery School and Kindergarten**

This instrument has been reviewed by Anderson (1973) and Jungeblut (1973), particularly the perceptual skills subtests, Look-alikes and Copy What You See. Jungeblut (1973, p. 26) states that the "Look-alikes instrument samples the child's ability to match to a standard" and the Copy What You See instrument assesses the preschool child's ability "...to reproduce or copy from a visually presented form in a controlled manner".

McCandless (1973, p. 39) states that, "CIRCUS is based on the difference, not deficit, hypothesis of children's development and learning." He further points out that the instruments focus on sequential activities for success rather than the children's chronological age.

**Summary**

It is evident, when looking at instruments and techniques for screening and diagnosing perceptual skills, that specific objectives must be determined before appropriate selection can take place. Table 2 gives a summary of selected perceptual tests. As has been discussed, the selection of the instrument might be based upon the following objectives:

1. **Special class placement** - The Bender Visual-Motor Gestalt Test would be an instrument to meet this objective;

2. **Remedial program development** - The Rosner Perceptual Skills Curriculum would provide both a measurement and remediation activities; and
Table 2. Summary of Descriptions of Certain Perceptual Tests.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Group or Individual</th>
<th>Ages for Administration</th>
<th>No. of Items</th>
<th>Specific Skill Measured</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bender Visual-Motor Gestalt Test</td>
<td>Individual</td>
<td>4-11 yrs.</td>
<td>9</td>
<td>Visual-Motor Integration</td>
</tr>
<tr>
<td>Developmental Test of Visual Perception (Frostig)</td>
<td>Group and/or Individual</td>
<td>4-8 yrs.</td>
<td>72</td>
<td>Visual-Motor Integration and Visual Perception (by 5 sub-tests)</td>
</tr>
<tr>
<td>Medvedeff Fine Visual-Motor Screening Inventory</td>
<td>Individual</td>
<td>5-8 yrs.</td>
<td>10</td>
<td>Visual-Motor Integration</td>
</tr>
<tr>
<td>Medvedeff Perceptual Organization Screening Inventory</td>
<td>Individual</td>
<td>5-8 yrs.</td>
<td>10</td>
<td>Perceptual Organization and Visual-Perceptual Configuration</td>
</tr>
<tr>
<td>Metropolitan Readiness Test</td>
<td>Group</td>
<td>5-6 yrs.</td>
<td>14</td>
<td>Visual Discrimination</td>
</tr>
<tr>
<td>Matching</td>
<td></td>
<td></td>
<td>14</td>
<td>Visual-Motor Integration</td>
</tr>
<tr>
<td>Copying</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Hildreth, Griffiths, and Hildreth)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rosner Perceptual Skills</td>
<td>Individual</td>
<td>Preschool-7</td>
<td>24</td>
<td>Visual Analysis and Spatial Organization</td>
</tr>
<tr>
<td>Visual-Motor Skills</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Clara Inventory of Developmental Tasks</td>
<td>Individual</td>
<td>Preschool-7</td>
<td>10</td>
<td>Visual-Motor Integration</td>
</tr>
<tr>
<td>Visual Motor Performance</td>
<td></td>
<td></td>
<td>9</td>
<td>Visual Discrimination</td>
</tr>
<tr>
<td>Visual Perception</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Gaining student information - The Santa Clara Inventory of Developmental Tasks indicates the level of development on several tasks including two perceptual areas.

Training and/or Remediation Techniques for Children

Many of the screening programs for perceptual problems include activities to develop skills and/or remediate problems. Several programs are built around instruments which identify the problem areas. Activities are also presented to remediate or develop the skills shown to be deficient by the particular screening instrument. Programs developed utilizing both screening instruments and remediation programs include: Frostig's Program for the Development of Visual Perception; Rosner's Perceptual Skills Curriculum; the Santa Clara Inventory of Developmental Tasks; and Medvedeff's Child Kit. Other training programs are based solely upon perceptual deficiencies as screened by a variety of instruments including Kephart's Perceptual Training Program.

The Frostig Program for the Development of Visual Perception

The Frostig program includes student workbooks through which specific activities are designed to focus on specific skills. Once children have been screened with the Frostig Developmental Test of Visual Perception placement in the workbook is made at the point where the child can begin strengthening the deficiencies which have emerged.

Much research on the effectiveness of the Frostig program has been conducted. Although Frostig, herself, contends that perceptual training can be very beneficial as a part of the total instructional program,
and research by Goins (1958) indicates a correlation (.519, p<.01) between visual perception and reading achievement in first grade, a wealth of research casts doubts on the effectiveness of the Frostig-Horne Program, as related to improved reading. Goodstein, Whitney and Cawley (1970), found the Frostig perception subtest did not correlate significantly with reading (.12). O'Connor (1958); Wiederholt and Hammill (1971), and Buckland and Balow (1973) found similar results.

In terms of improvement on readiness tests, research on the Frostig-Horne Program is mixed. Some researchers found the program beneficial in readiness programs (Alley and Others, 1968 and Cowles, 1966), while others found no correlation (McBeath, 1966; Wiederholt and Hammill, 1973).

Church (1974) studied visual perception improvement under two conditions: formally, utilizing the Frostig program; and informally, with gamelike materials designed for developing perceptual skills. The Frostig Developmental Test of Visual Perception was given as a pretest and posttest and the Metropolitan was administered after the program ended. Both groups made significant posttest gains on the Frostig, p<.001 level. No significant difference at the .05 level was found between the two groups on the Metropolitan. Church concluded that the formal and informal perceptual training programs appear to be equal at the kindergarten level. Perhaps one of the more indepth Frostig studies was conducted by Wiederholt and Hammill (1971) who concluded that support could not be given to the use of the Frostig-Horne Program as a remedial method. They worked with 105 kindergarten and first grade students who were administered the Metropolitan, the Developmental
Test of Visual Perception and the Slossen Intelligence Test. Of the 105 subjects, 130 completed 100 or more Frostig worksheets. These students' test results were studied further. None of the t ratios were significant at the .05 level for posttest differences between experimental and control groups.

Perceptual-Motor Training Program

Kephart's Perceptual-Motor Training Program (1968) is based on the theory that "...the individual passes through stages of development characterized by motor performance, perceptual-motor match, perceptual integration, and concept formation" (p. 11). His program activities are designed to strengthen such areas as posture and balance, laterality, directionality, and body image.

Research studying the effects of Kephart's program upon reading has yielded conflicting results. Gould (1964) and Rice (1962) worked with kindergarten and first grade students and found significant gains in reading readiness and reading achievement following the implementation of Kephart's perceptual-motor program. On the other hand, Falik (1969), working with an experimental and control group of kindergarten children found no significant difference (t = 1.02) between the groups in reading readiness or in later reading ability in the second grade (t = -.30). In looking at the effect of perceptual-motor training as a supplement to the regular reading program, Getman and Kane (1964) and Halliwell and Solan (1972) found significantly higher performance in reading comprehension.
Other studies utilizing Kephart's Program looked at effects on special groups of children. For example, Fisher and Turner (1972) implemented the program with culturally disadvantaged kindergarten children and concluded that the program did effect reading readiness positively. Pre- to posttest differences were significant at the .01 level of confidence. Hammill, Goodman and Wiederholt (1974) studied Kephart's program with orthopedically handicapped preschool children and found no evidence of effectiveness for the experimental group.

Perceptual Skills Curriculum

Rosner's Perceptual Skills Curriculum is characterized by six descriptors (Rosner, 1973):

1. It is a developmental program arranged by skill levels rather than age-level norms.
2. It is complete with tests and activities to develop perceptual skills.
3. It is an integrated program of sequential activities which have shown transfer effects to reading.
4. It is manageable and can be utilized by the classroom teacher.
5. It is comprehensive and related to abilities rather than isolated skills.
6. It is a validated program and has been field tested utilizing classroom teachers, parents, remedial education specialists and clinicians.

Relating beginning-of-year perceptual data to end-of-year achievement scores after kindergarten and first grade students had gone through the perceptual training program resulted in the substantiation of the proposition that strengthened perceptual skills affect reading achievement (Rosner and Cooley, 1971). However, no data has been found
utilizing Rosner's program in a controlled study. Rosner (1972) studied perception and intelligence as predictors for achievement utilizing the Visual Analyses Test and several intelligence measurements. He found significant correlations between perceptual skills and vocabulary (.55) and paragraph meaning (.68) subtests of the Stanford Achievement Test.

Utilizing the end-of-year Metropolitan Achievement Test scores, Rosner (1974) computed correlation coefficients with beginning-of-year perceptual skills. Results were highly significant for total reading at .79 (significant at the .001 level). When comparing perceptual skills with the Stanford Achievement Test, results for word meaning were significant at .68 which was at the .005 level of confidence.

Remediating diagnosed needs of children can be accomplished by many methods. Several methods which have been discussed are group programs which involve regular individual assessment. These programs can be further supplemented by individual activities such as the following programs in a tutoring setting. Table 3 summarizes selected remediation programs.

**Child Kit**

The Child Kit (Medvedeff and Dearth, 1974) has remediation activities built into the total program. Once the screening test results have been interpreted, an individualized prescription is written to meet each child's identified needs. In the area of perceptual organization, such activities as connect the dots, using broken figures as stimuli for copying, figure rotations, and finger tracing are used to assist the child to develop that skill.

In the area of visual-motor development, activities include: chalkboard finger tracing, visual tracking, reproducing shapes, and
Table 3. Summary of Selected Programs for the Development and/or Remediation of Perceptual Skills.

<table>
<thead>
<tr>
<th>Program</th>
<th>Technique of Instruction</th>
<th>Individual or Group</th>
<th>Brief Description of Perceptual Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosner's Perceptual Skills Curriculum</td>
<td>Testing-Teaching-Testing Process. Student works through activities at own pace.</td>
<td>Individual</td>
<td>350 learning activities are in the visual-motor skills section including: bead patterns, matching block patterns, mazes, finger tracing and copying.</td>
</tr>
<tr>
<td>Santa Clara Inventory of Developmental Tasks</td>
<td>Student worksheets and group activities.</td>
<td>Individual and Group</td>
<td>Activities related to visual-motor performance and perception include: matching, copying, cutting, and tracking.</td>
</tr>
<tr>
<td>Medvedeff's The Child Kit</td>
<td>Workbooks with plastic overlays for individual student use.</td>
<td>Individual</td>
<td>Perceptual activities include: finger tracing, two-handed tracing, connecting dots, reproducing shapes and tracking.</td>
</tr>
<tr>
<td>Frostig's Program for the Development of Visual Perception</td>
<td>Student worksheets</td>
<td>Individual and Group</td>
<td>Student worksheets include such activities as: finding shapes in pictures, coloring within lines, matching pictures or objects and tracing.</td>
</tr>
</tbody>
</table>
two-handed tracing. In both cases, tutors or aides work individually with the child. Observations are made in regard to directionality, handedness, and approach to the task. Activities are repeated on a regular daily schedule until each is mastered. At mastery, the child moves on to the next developmental level of the task.

Retesting is done on a regular basis and prescriptions are changed as needed. In addition to utilizing the specific perceptual skills development activities, the tutor works daily on related areas such as ocular pursuit and gross motor skills.

Santa Clara Inventory of Developmental Tasks

Another program discussed earlier for its screening capacity that has remediation activities built into it is the Santa Clara Inventory of Developmental Tasks. The activities are organized by the tasks that are used for testing. Each task, for which the child needs assistance, has a section of specific activities to develop the skill. For example, if a child has difficulty on the task of visual perception, the teacher or tutor may work on such things as matching objects from a group of different sizes of the same object, matching directions on a design, or matching objects by color.

If the problem area is visual-motor performance, then activities might include: tracking, stringing beads, cutting with scissors, copying figures, and tying shoes. The activities are such that they can be integrated into the regular curriculum for reinforcement of the skills for all students, while being developmental for those having difficulty.

When the children having difficulty develop the task given to them, they are moved on to the next level. This sequential development
strengthens the area of need until the child demonstrates mastery at the correct level. At that time, the program may be terminated or reduced to a sporadic check to determine continuation of mastery.

Summary

Remediation programs which are either group or individually oriented have been described. In all cases, the activities are prescribed on the basis of diagnosed needs through a screening program. Because the general purpose is to develop skills which are lacking, activities are sequenced to meet specific needs. Mastery at one level moves the child to the next level of activities.

Perceptual Skills and Training
Related to Reading

Jenkins, M.D. states in the foreword of Medvedeff's *New Dimensions in Learning* that, "Unless problems related to learning are diagnosed accurately and early, the child will not be able to develop basic skills which are so important for academic growth and development" (Medvedeff, 1969, p. x). According to Wepman and Morency (1971) perceptual skills must be enhanced by the end of third grade when they believe that these abilities crest.

In relation to the need for early identification, the area of perception as it relates to reading has undergone careful scrutiny. Delacato (1966, p. 10) explains "reading is a perceptual process" and "perception is a function of the human brain." He therefore concludes that children having difficulty with reading may be dealing with inadequate neurological organization.
Satz and Friel (1972) studied the concept of a readiness profile which had predictive value for identifying later reading failures. They found that kindergarten assessment of developmental and neurological activity could predict first grade reading achievement levels.

There is still much controversy over the relationship of perception to reading. As has been indicated in studies cited earlier, some researchers feel strongly that there is a definite relationship (Kephart, 1961; Frostig, 1964; and Rosner, 1973), while others question the relationship (Hammill and Wiederholt, 1971; and Buckland and Balow, 1973).

Specific research in the relationship of perception and reading will be reviewed in this section. Studies which indicate a predictive relationship between visual discrimination and beginning reading include Bryan (1964), King (1964), and Whisler (1972).

Hammill (1972) surveyed studies of the relationship between visual perception and reading which generated correlational data. He utilized several criteria to limit the survey. Those criteria which were important to this study included: the use of reading comprehension scores, the limitation to first and second graders, and the application of statistical analyses. Twelve of 42 studies met Hammill's criteria and, of the twelve, eight reported no statistically significant relationship between perception and reading.

Kershner (1975) studied the use of the Frostig Test as it relates to reading. His objectives included determining if 20 seven-year-old children (second graders) with poor visual-perceptual skills had adequate reading achievement. He used the Frostig Developmental Test of
Visual Perception to measure perception and his own Conservation of Multiple Space Relations Test to measure the cognitive visual-spatial ability. Children were divided into groups according to their perception and conservation scores, low or high.

Kershner administered the Gates-MacGinitie Test of Reading Comprehension as his reading measurement for comparison with perception and conservation results. His findings included: no significant difference between the high and low group means on reading ($t = .46$) when grouped by perception; and no significant difference in intelligence ($t = 1.72$ and $.89$) between the two groups. His results suggest that prevention at an early level, rather than remediation, should be the emphasis of perceptual-motor training.

Utilizing the Frostig Developmental Test of Visual Perception and the Gates-MacGinitie Reading Survey Tests with 163 first graders, DuBois and Brown (1973) studied the tests' relationship in terms of predictive ability. All subtests correlated with either the Gates Vocabulary or Comprehension Subtest at or below $.38$.

Larson and Hammill (1975), reviewing several researchers, reported median coefficients of the relationship between visual-perceptual and academic abilities. Using several instruments, including the Matching Subtest of the Metropolitan for visual discrimination and the Copying Subtest for spatial relations, they found correlations of $.26$ and $.29$ respectively, both of which were significant at the $.05$ level. When looking at selected visual perception tests as predictors of reading abilities, the Matching Subtest correlation was $.21$. All of these results showed very small relationships.
In terms of prediction, Bryan (1964, p. 46) found that "for second graders visual perception had the highest correlation with reading comprehension (.53), while intelligence scores had the highest correlations (.005 level of confidence) between kindergarten perceptual skills as measured by a seriation test and second grade reading success. Correlations between total seriation scores and California Achievement Test Reading scores were higher for girls (.61) than boys (.54), significant at the .005 level.

Many studies utilizing the Metropolitan have been conducted. Kottmeyer (1947) studied the relationship between the Metropolitan Readiness Tests and the Gates Primary Reading Test and found a correlation of .46. Johnson (1969) found correlations of .43 between the total Metropolitan and the Gates Vocabulary Subtest and .47 with the Gates Comprehension Subtest.

Goodstein, Whitney and Cawley (1970) studied reading scores for good versus poor readers and low versus high IQ's. They found the Metropolitan Readiness Test total score adequately discriminated between failing and average readers. They believe that the subtests contribute to this factor. Lessler and Bridges (1973) compared the Metropolitan Readiness Tests, Lee-Clark, Peabody, and Bender as predictors of academic success for 196 second grade rural children. The Metropolitan was found to be the single best predictor, .70 with the combined criteria, .76 with the Lee-Clark Achievement Tests and .58 with teacher ratings.

Feldhusen et. al. (1970) found the Metropolitan indicated higher predictions for girls (.62) than boys (.44) for reading comprehension.
Word knowledge and word discrimination results also indicated higher predictions for girls.

Elenbogen and Simmons (1973) designed a reading remediation program for 57 children identified at the end of kindergarten as having potential problems by the Metropolitan Readiness Test and teacher observation. At the end of second grade, the remaining 24 students were rescreened and given an achievement test. Significant differences were found for visual-motor skills (p<.001) from pretest to posttest.

Engin (1974) studied end-of-kindergarten Metropolitan subtest scores with reading (Gates-MacGinitie Reading Test) achievement. She found the Metropolitan a better predictor for mathematics than reading.

Georgia Pitcher-Baker (1973, p. 58) stated that "reading demands a high-level development of perceptual conceptual organization." She stresses individualized perceptual programs over group programs. In a response to Pitcher-Baker, Johnson (1974) questions the amount of time, energy and resources spent on perceptual training to improve reading.

Summary

Most of the research involves group remediation programs. Individualized programs such as Medvedeff's, Rosner's, and the Santa Clara are developed, but extensive research on the predictive use of these newer programs is not readily available. There appeared to be many studies relating perceptual skills to reading. The majority were one-time studies of subjects at kindergarten and one future level. The
longitudinal studies were limited and gave conflicting results, thus the controversy related to perception and reading remains.

Summary

Chapter II discussed the review of the literature in four areas: defining perception, screening for perceptual problems, remediating perceptual problems, and relating perception to reading. Three commonalities were noted in the definitions of perception: (1) it is a neurological function; (2) it is a factor within the lifelong developmental sequence from motor efficiency to cognition; and (3) it involves receiving and interpreting stimuli.

Because of the variety of definitions of perception, there are many approaches to diagnosing and remediating perceptual problems. In the section which described screening and diagnosing instruments, some were mentioned which are administered to groups, while others are administered to individuals. Research indicated both support and non-support for each instrument discussed. The selection of an effective instrument appeared to be dependent mainly upon the objective of the screening program.

Remediation programs also can be either group or individually oriented. Generally speaking, needs that have been identified through screening and diagnosing are met by specific activities in a remediation program. Often, classroom activities, particularly at the kindergarten level, also are geared toward the development of perceptual and pre-reading skills. The combination of a structured, individualized prescription and general curriculum activities helps the child, identified
as having perceptual problems, develop necessary skills for future learning.

There continues to be a controversy as to whether or not perceptual training is related to reading achievement. In reviewing the literature, it appeared that those researchers who have developed perceptual training programs have conducted research which validates their work. On the other hand, many others who work with young children have conducted studies which do not yield significant differences, when utilizing a control, on the effect of perceptual skills development on future academic success.
III. METHODOLOGY

The purpose of this research was to determine the relationship, over a three-year period, of a kindergarten perceptual training program with reading using kindergarten children identified as having visual-perceptual deficiencies. These children were followed through the second grade specifically in relation to reading readiness and reading achievement.

Research Setting

The research setting for this study was the Boardman Local School District located directly south of Youngstown, Ohio. The population included 42,000 middle to upper-middle class residents including both professional and skilled workers. The school district includes one high school, two middle schools and four elementary schools which serve 5,976 kindergarten through grade twelve students. There are 311 teachers and over 58 percent of them hold Masters Degrees or beyond. There continues to be a strong commitment within the school district's staff and board of education, both philosophically and financially, to the early identification of potential learning problems and the follow-through programs necessary to remediate the problem or develop the needed skills.

All four elementary schools in Boardman were involved in the early identification program which was funded through Title I (federal monies).
The district-wide program was coordinated by a project teacher-coordinator and implemented through paid tutors and volunteers who were trained by the coordinator. This gave continuity to the program even though each elementary school had unique goals and programs.

The early identification program included a spring pre-kindergarten clinic. The purpose of the clinic was to screen the children for perceptual, auditory, visual, and social problems. Parents had a part in the clinic and were given activity sheets to work with their children on problem areas.

In the 1975-76 school year, when the subjects were in kindergarten, Boardman's four elementary school principals reported their accomplishments in a district-wide report. Some of the information in the reports related to reading as well as the overall school program for each school's kindergarten through fourth grade students.

At Market Street Elementary School, the staff conducted inservice programs related to a new reading program with a new basal reader. There was additional supervision on the new reading program as well, which put reading as a focal point. Word attack skills at all grade levels had the emphasis in 1975-76, while comprehension was emphasized in 1976-77. The Metropolitan Readiness Tests (Metropolitan), administered to kindergarteners in 1975-76, indicated scores which increased 38 percentile points from pretest to posttest. Today, Market Street Elementary School has a philosophy based upon individualized instruction. Staff have implemented the concepts of individual guided education (IGE)
in mathematics and a curriculum management system in reading. There were 18 staff members for 554 students at Market Street in 1975-76.

Robinwood Lane Elementary School reported curriculum development in reading as their most significant improvement for 1975-76. The new reading series was also supervised closely at this school. Metropolitan scores increased 29 percentile points from pre- to posttest for Robinwood's kindergarten students. The next year, 1976-77, an enrichment program in reading and a principal's story-telling time were implemented. Robinwood Lane was the smallest of Boardman's elementary schools. Its staff, 14 members, combined individual learning experiences and multi-level materials for effective basic skills development for their 391 students.

A reading laboratory was in operation during 1975-76 at Stadium Drive Elementary School. Mathematics had the greatest focus of time and effort. The kindergarten Metropolitan scores increased 17 percentile points from fall to spring administration. Stadium Drive was the largest of the elementary schools with 625 students and 20 teachers. The staff's commitment to continuous educational progress has been renewed through a recent self-study which emphasized the development of appropriate learning experiences for each student.

West Elementary School also added a basal reader in 1975-76, and the staff felt that this gave new depth to the reading program. Improvement in problem solving was also indicated. The 1975-76 Metropolitan scores of the kindergarten students increased 33 percentile points from pretest to posttest. West had programs into which the 22 teachers place basic skills as a high priority. Because of a wide variety of
instructional techniques, West Elementary's 613 students had many opportunities to develop mastery in reading, writing, and computing.

All four buildings were provided with guidance services from a certified counselor on a half-time basis beginning in 1976-77 when the subjects were in first grade. Assistance was given to teachers in the areas of group guidance, testing, and student counseling. Students were given assistance in the areas of self-concept, social skills, and personal counseling.

Sample

Specifically, the subjects were primary level students from Boardman's four elementary schools. The potential population included 502 entering kindergarten children in September, 1975. Most of the students participated in an early identification screening program. Some students had ratings on the Winter Haven Perceptual Copy Forms during the pre-kindergarten screening clinic, but these were not used in selection since not all children were screened.

From the results of the local school district's early identification program, 102 students met the program criteria of falling at or below the 33rd percentile on the Metropolitan total score. Parent conferences were held concerning 64 of the students. The school coordinator placed 61 students (the maximum due to budgetary considerations) into the openings within the remediation perceptual program on a non-random basis, while 41 were not placed into any formal remedial program. Students in the remedial perceptual program were spread across the four
elementary schools and the parents of each student had participated in a conference with the coordinator.

The researcher further delineated the remedial program group by utilizing two Metropolitan subtests related to perception, Copying and Matching. All 61 students in the remediation program had scores of five and below and/or four and below on the Matching and Copying subtests respectively, which met the low normal readiness status criteria for the study. However, only 29 of these subjects were selected as the rest were eliminated due to the unavailability of first and second grade test data.

The control group (n=24) was selected from the 41 students who met criteria similar to the program group: 1) Metropolitan scores at or below the 33rd percentile, 2) parent conferences held for 33 of the students, and 3) the availability of test scores over a three-year period, kindergarten through grade 2.

For the purposes of this study, the researcher named the group of students who received the remediation perceptual treatment the program group and those who received no program treatment the control group. The program group consisted of 15 boys and 14 girls, while the control group consisted of 17 boys and 7 girls. The total sample stayed in regular kindergarten classes in each of the four elementary buildings as summarized in Table 4.

Instruments

The study included three instruments. The Metropolitan was used for selecting subjects; the Gates-MacGinitie Reading Test (Gates) was
used to measure reading achievement; and the Primary Mental Abilities Test was used to determine the intelligence of the subjects. Each instrument will be described below.

Table 4. Kindergarten Subjects by School and Treatment Group

<table>
<thead>
<tr>
<th>School</th>
<th>Enrollment</th>
<th>Program Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td>158</td>
<td>6</td>
<td>5</td>
</tr>
<tr>
<td>Robinwood Lane</td>
<td>83</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>Stadium Drive</td>
<td>127</td>
<td>4</td>
<td>6</td>
</tr>
<tr>
<td>West Boulevard</td>
<td>134</td>
<td>11</td>
<td>9</td>
</tr>
<tr>
<td>Totals</td>
<td>502</td>
<td>29</td>
<td>24</td>
</tr>
</tbody>
</table>

Metropolitan Readiness Test (Metropolitan)

Selection of subjects was accomplished by using the Metropolitan Form A and Form B, of Level 1. The instrument is described below.

Description. The test consists of six subtests: Word Meaning, Listening, Matching, Alphabet, Numbers, and Copying. For the purpose of this study the subtests Matching and Copying were used.

Hildreth, Griffiths and Hildreth (1969, p. 11) have studied and identified characteristics which affect success in first grade:

1. Comprehension and use of oral language.
2. Visual perception and discrimination.
4. Richness of verbal concepts.
5. General mental ability; capacity to infer and to reason.
6. Knowledge of numerical and quantitative relationships.

7. Sensory-motor abilities of the kind required in handwriting, writing of numerals and drawing.

8. Adequate attentiveness; the ability to sit quietly, to listen to and follow directions.

Visual perception and discrimination were the characteristics focused on in this study. The description of the two subtests are:

Subtest 3, Matching, seeks to get at visual-perceptual skills akin to those involved in discriminating word forms in beginning reading. This test has consistently correlated well with beginning reading skills. (Manual of Directions, Metropolitan Readiness Tests, 1969, p. 16). This subtest consists of 14 items.

Subtest 6, Copying, is a test in which the child manifests a combination of visual perception and motor control similar to what is called for in learning handwriting. (Manual of Directions, Metropolitan Readiness Tests, 1969, p. 16). This subtest consists of 14 items.

Validity. The Metropolitan has been correlated with other readiness tests as well as intelligence tests. High correlation exists on a consistent basis with such instruments as the Pintner-Cunningham Primary Mental Ability Test (.76), Lee-Clark Reading Readiness Test (.70), Otis-Lennon Mental Ability Test (.70) and the California Test of Mental Maturity (.65).

Many studies have been conducted to determine the predictive validity of the Metropolitan. Some studies included the total score, while others included only subtests. "An overall estimate would place the prediction at a level of at least .60, a value that must be considered as very good for test results for five- and six-year old children...." (Hildreth, Griffiths, and McGauvran, 1969, p. 23).
Reliability. Reliability data is available for kindergarten children on Form B but not on Form A. Total score split-half reliability data indicated a coefficient of .92. The Matching Subtest has a median split-half reliability value of .82, while the Copying Subtest is .81. It was concluded that the reliability was good particularly considering the young age and test taking immaturity of kindergarten children.

Scoring. Scoring is accomplished by using a Scoring Key with the student responses. Total scores are converted into letter ratings, percentile ranks, and stanines. Each subtest is also rated by letter and readiness status (see Table 5). The ratings for Subtest 3, Matching, are the same for both Form A and Form B; while for Subtest 6, Copying, the ratings differ between the two forms.

Table 5. Scoring Levels for Metropolitan Readiness Tests Subtests, Matching and Copying

<table>
<thead>
<tr>
<th>Letter Rating/ Readiness Status</th>
<th>Subtest 3 Matching (Form A or B)</th>
<th>Subtest 6 Copying (Form A)</th>
<th>Subtest 6 Copying (Form B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A/Superior</td>
<td>14</td>
<td>13-14</td>
<td>13-14</td>
</tr>
<tr>
<td>B/High Normal</td>
<td>11-13</td>
<td>10-12</td>
<td>9-12</td>
</tr>
<tr>
<td>C/Average</td>
<td>6-10</td>
<td>5-9</td>
<td>5-8</td>
</tr>
<tr>
<td>D/Low Normal</td>
<td>1-5</td>
<td>1-4</td>
<td>1-4</td>
</tr>
<tr>
<td>E/Low</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Specific directions are given for scoring the Copying Subtest. Such things as omitting parts of the item, reversals, and changing order are scored as wrong. The reproduction is scored correct if it is similar to the model.
Because the Copying Subtest requires some subjective scoring, it is recommended that at least two individuals score the results independently. If there is total disagreement a third person should score the Copying Subtest and all three scorers should discuss the results. The authors state that generally the scoring which is agreed upon by at least two of the scorers is used, (Hildreth, Griffiths, and McGavran, 1965).

**Gates-MacGinitie Reading Tests (Gates)**

The Primary A - Forms 1 and 2 (Grade 1) and Primary B - Forms 1 and 2 (Grade 2) were used for collecting the longitudinal reading achievement data. A description of the instrument is provided below.

**Description.** The Gates consists of two subtests, Vocabulary and Comprehension, and is available for all levels, kindergarten through grade twelve. For the purpose of this study, the Primary A Level, Forms 1 and 2 and the Primary B Level, Forms 1 and 2 were used. The tests may be given in October, February, and May with national norms available for all testing times.

**Validity.** The tests were selected by the school district because they appear to measure the major skills and concepts within the reading program in Boardman's elementary schools. No specific data on validity were found for Primary A and B. However, the authors suggest that the items of the Gates be examined to determine the extent to which the test items sample the reading skills being taught (Gates and MacGinitie, 1972).
Reliability. Both alternate form and split-half reliability coefficients were computed by Gates and MacGinitie (1964-65) for Primary A in January, 1965 and Primary B in October, 1964, (see Table 6). The nationwide sample included 40,000 students in 37 communities in grades one to six.

Table 6. Alternate and Split-half Reliability Coefficients for the Gates-MacGinitie Reading Tests, Primary A and B.

<table>
<thead>
<tr>
<th>Test</th>
<th>Subtest</th>
<th>Alternate Form</th>
<th>Split-half</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary A</td>
<td>Vocabulary</td>
<td>.86</td>
<td>.91</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>.83</td>
<td>.94</td>
</tr>
<tr>
<td>Primary B</td>
<td>Vocabulary</td>
<td>.87</td>
<td>.93</td>
</tr>
<tr>
<td></td>
<td>Comprehension</td>
<td>.81</td>
<td>.93</td>
</tr>
</tbody>
</table>

Scoring. The raw scores on both the Vocabulary and Comprehension subtests consist of the total number of items correctly answered. The total number of items equals 82, with Vocabulary having 48 items and Comprehension having 34 items. The raw score can be converted into a standard score, percentile rank, or grade equivalent. Standard scores were used in this study.

The average of Primary A, Form 1 and Form 2, were obtained at the first grade level and the average of Primary B, Form 1 and Form 2, were obtained at the second grade level. The authors of the test relate that "...if a child is given two Forms of Primary A, the average of... scores on the two Forms is more reliable than...on only one of the Forms" (Gates and MacGinitie, 1965, p. 6).
Perceptual Training Program

Remediation Program

The perceptual training given to the program group included activities from two published programs plus materials made by each elementary school staff. The published programs are Rosner's *Perceptual Skills Curriculum* and the *Santa Clara* (see Chapter II). Using their knowledge and training, teachers and supervisors in the school system developed materials to reinforce perceptual development. These learning units were designed for uniformity across the program schools, for ease of handling, and student motivation.

The local school coordinator of Boardman's remediation program developed a training schedule for the children selected for the program group who experienced two special sessions a day, one in individual tutoring and the other in small group activities. The program subjects received a minimum of 75 minutes in small group instruction and 100 minutes in individual instruction each week.

Work stations were established in hallways where students met with their tutors. The child's activities were determined from the results of the *Metropolitan*, the *Santa Clara*, and teacher observation. The tutors worked with the children, and the project coordinator worked with the tutors to assure that the children were receiving accurate tutoring. Reassessment was done on a regular basis by the coordinator to determine the need for the inclusion of new developmental activities.
Perceptual activities from the Santa Clara materials included (see Table 1, p. 19):

- cutting out pictures,
- copying geometric figures,
- tying shoes,
- stringing beads, and
- matching pictures.

The Rosner Perceptual Skills Curriculum developed perceptual skills by:

- using pinboards and rubber bands to construct patterns as seen in drawings,
- stacking blocks,
- asking students to trace a direction out of a maze, and
- copying patterns.

Materials made within the district supplemented the activities from the published materials and reinforced the program objectives. Additional activities included coloring within lines and matching pictures, forms and objects.

Regular Curriculum

While the program group received the concentrated training program, all subjects in the two treatment groups (program and control) remained in their regular kindergarten classes in the four elementary schools.

The kindergarten curriculum in the Boardman School District included:

1. an awareness of phonics;
2. an emphasis on learning the alphabet;
3. a play time for motor skills development;
4. art; and
5. music.

Pre-reading skills were developed through chalkboard and worksheet activities.

The regular first grade curriculum included:

1. implementation of the beginning stages of reading and mathematics;
2. an emphasis on
phonics; and 3) an introduction of elementary science and social studies. First graders were given the opportunity to use their reading skills in these new curriculum areas.

Second graders were provided a language arts curriculum which expanded reading to the areas of grammar and spelling. Other curricular areas were further developed including social studies, science, art and music.

In the discussion of the research setting earlier in this chapter, it was indicated that a new reading program had been adopted with in-service training as a part of the implementation. The subjects of the study benefitted from this reading emphasis during their first three years of school.

**Procedures**

It is important to note that the data for this study exist in the permanent records of third grade students in Boardman's elementary schools. The testing took place from fall 1975 through spring 1978.

The following procedures were included in this study:

1. A school district was identified that had an early screening program including visual-perception and perception training as a part of a kindergarten remediation program. The program was funded through Title I Federal Funds and monitored by the Ohio Department of Education. There was a full-time coordinator working with the four elementary schools involved.

2. The school coordinator utilized scores (33rdile or below on total score) from the Metropolitan Readiness Tests and results of parent conferences to place students into existing openings of the perceptual training program on a non-random basis.
3. For the purposes of this study, subjects were identified by their scores on the pretest of the Kindergarten Metropolitan Readiness Test, Form A, Subtests Matching (5 or less) and/or Copying (4 or less) by the researcher. These scores indicated low normal readiness status on the subtests related to perception.

4. The researcher designated subjects who were participants in the perceptual training program as the program group, and those not in the formal program as the control group.

5. The program group received special perceptual training activities in kindergarten, while the control group did not.

6. Subjects were given the Metropolitan Readiness Test, Form B, at the end of kindergarten (1976) as a posttest within the existing testing program.

7. The program group received follow-through activities at the beginning of first grade. The control group did not.

8. Forms 1 and 2 of the Gates-MacGinitie Reading Test, Primary A, were administered in February and May, 1976-77 to all subjects in the study in first grade as a part of the regular testing program.

9. Forms 1 and 2 of the Gates-MacGinitie Reading Test, Primary B, were administered in October and May, 1977-78 as a part of the regular testing program.

10. Intelligence scores were computed on the Primary Mental Abilities Test to correct for differences between the treatment groups.

Statistical Analysis

Table 7 shows the sequence of testing for perception and reading. The tests were administered to all students at the appropriate grade levels in the four Boardman elementary schools. Subjects in both treatment groups were distributed across the schools.
Table 7. Instruments by Grade Level, Treatment Group, and Sequence.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>Metropolitan Readiness (Kindergarten)</th>
<th>Gates-MacGinitie Primary A (1st Grade)</th>
<th>Gates-MacGinitie Primary B (2nd Grade)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre</td>
<td>Form 1</td>
<td>Form 2</td>
</tr>
<tr>
<td>Program</td>
<td>(1.1)</td>
<td>(1.5)</td>
<td>(1.9)</td>
</tr>
<tr>
<td>Control</td>
<td>(1.3)</td>
<td>(1.7)</td>
<td>(1.11)</td>
</tr>
</tbody>
</table>

Referring to Table 7, comparisons were made as follows:

1.1 with 1.2  1.2 with 1.5 + 1.6  1.2 with 1.9 + 1.10
1.3 with 1.4  1.4 with 1.7 + 1.8  1.4 with 1.11 + 1.12
1.2 with 1.4  1.6 with 1.8         1.10 with 1.12

The means and standard deviations for the Matching and Copying Subtests of both Form A (Pretest) and Form B (Posttest) were calculated for the two treatment groups. Also Form 1 and 2 scores on both the Primary A and Primary B levels of the Gates were averaged for Vocabulary and Comprehension for each subject.

Posttest total scores on the Metropolitan administered in May of the kindergarten year were correlated with the individual subject's scores on the Gates, Primary A, for the two treatment groups. A correlation coefficient (Garrett, 1964, p. 93) also was calculated between the Metropolitan and the Gates, Primary B. In order to obtain the correlation coefficient, the following formula was used:

\[ r = \frac{\sum xy}{\sqrt{\sum x^2 \cdot \sum y^2}} \]
where $\Sigma xy$ = the sum of the products of deviations $x$ and $y$
$\Sigma x^2$ = the sum of the squared deviations in $x$ and $M_x$
$\Sigma y^2$ = the sum of the squared deviations in $y$ and $M_y$

Comparison data were generated between the program group and the control group at three levels: (1) end of kindergarten; (2) end of first grade; and (3) end of second grade. Group means and standard deviations were figured. Standard deviation was found using the following formula (McNemar, 1962, p. 20).

$$\sigma = \sqrt{\frac{\Sigma x^2}{N}}$$

A regression equation was used to predict scores on the two groups from Form B of the Metropolitan to the Gates-MacGinitie, Primary B (Forms 1 and 2 averaged). The formula (Garrett, 1964, p. 101) to be used is:

$$Y \text{ pred.} = r \frac{\sigma_y}{\sigma_x} \cdot X - r \frac{\sigma_y}{\sigma_x} \cdot M_x + M_y$$

where $r$ = the correlation between $X$ and $Y$
$\sigma_y$ and $\sigma_x$ = the SD's of the $X$ and $Y$ scores
$X$ = the known score in test $X$
$M_x$ and $M_y$ = the means of the $X$ and $Y$ scores
$Y \text{ pred.}$ = the predicted score in test $Y$

It is widely accepted that intelligence is an important variable related to reading. Therefore, an analysis of covariance (McNemar, 1962, p. 362) may be used to correct differences in intelligence between the program group and the control group before the tests of significance are applied. Scores from the Primary Mental Abilities were used.
Two t-tests were used to analyze the data: (1) a t-test was employed to ascertain the significance between the means of two small samples; and (2) another was utilized to determine the significance between means obtained from the same group on two different occasions (Garrett, 1962).
IV. ANALYSIS OF RESULTS

The purposes of this study were to determine: (a) the relationship, over a three-year period, of a kindergarten perceptual training program with reading using children identified as having visual perceptual problems at the kindergarten level; b) the relationship of each set of scores in reading to the variable of sex, and c) perceptual problems as they relate to age at entrance to kindergarten.

The presentation of the results of this study is organized as follows: descriptive data of the treatment groups; findings reported by hypotheses; and a discussion of the results.

Descriptive Data of the Treatment Groups

There were two treatment groups in the study. The program group consisted of 29 subjects, 15 boys and 14 girls. The control group numbered 24 subjects, 17 boys and 7 girls. Table 8 shows the distribution of the subjects across the school district's four elementary buildings.

Forty-six (88%) of the 53 subjects had participated in a pre-kindergarten screening program in their school (including visual perception, ocular pursuit, vision, and social development). All participating subjects were diagnosed as having difficulty in perceptual tasks and eight were referred for more indepth vision testing.
Table 8. Subject Distribution by School and Sex.

<table>
<thead>
<tr>
<th>School</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market</td>
<td>4</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Robinwood Lane</td>
<td>6</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Stadium Drive</td>
<td>7</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>West Boulevard</td>
<td>15</td>
<td>5</td>
<td>20</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>32</td>
<td>21</td>
<td>53</td>
</tr>
</tbody>
</table>

Age

Table 9 gives a summary of the subjects by age at entrance to kindergarten. The range of ages was from 5.0 years to 6.0 years. Seventy-seven percent (77%) of the subjects fell between the ages of 5.0 and 5.6. Among the boys, 72 percent fell into this range, while 86 percent of the girls were in this range. Within the program group, 83 percent were between 5.0 and 5.6 compared to 71 percent of the control group.

Table 9. Summary of Treatment Groups by Age and Sex at Entrance to Kindergarten

<table>
<thead>
<tr>
<th>Age Ranges</th>
<th>Program</th>
<th>Control</th>
<th>Program</th>
<th>Control</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.0 - 5.2</td>
<td>9</td>
<td>5</td>
<td>6</td>
<td>3</td>
<td>23</td>
</tr>
<tr>
<td>5.3 - 5.4</td>
<td>2</td>
<td>2</td>
<td>3</td>
<td>0</td>
<td>7</td>
</tr>
<tr>
<td>5.5 - 5.6</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>5.7 - 5.8</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>5.9 - 5.10</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>5.11 - 6.0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>15</td>
<td>17</td>
<td>14</td>
<td>7</td>
<td>53</td>
</tr>
</tbody>
</table>
Table 10 shows the mean ages by sex and treatment group. The program group was 2.4 months younger than the control group in September of the kindergarten year. The boys' mean age was .05 months older than the girls' mean age.

Table 10. Mean Ages in Years and Months at Entrance to Kindergarten by Sex and Treatment Group

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Males</td>
<td>32</td>
<td>5.40</td>
</tr>
<tr>
<td>Total Females</td>
<td>21</td>
<td>5.35</td>
</tr>
<tr>
<td>Total Program Group</td>
<td>29</td>
<td>5.27</td>
</tr>
<tr>
<td>Total Control Group</td>
<td>24</td>
<td>5.51</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>5.38</td>
</tr>
</tbody>
</table>

Metropolitan Readiness Test (Metropolitan) - Pretest

Scores on subtests of the Metropolitan Readiness Test, administered in the fall of the 1975-76 school year, were used to determine the kindergarten subjects for the study. Cutoff scores on the subtests Matching and Copying used for selection were five and below and/or four and below respectively. Forty-eight of the 53 selected subjects fell below both cutoff scores. Of the remaining five subjects, four scored below the cutoff on Copying and one fell below on the Matching subtest.

Means and standard deviations for the treatment groups on the two subtests of the pretest Metropolitan are presented in Table 11. The range of scores was 0-5 for Matching and 0-4 for Copying. A t-test was conducted to determine the significance of the difference between the
two groups' mean scores for Matching (t = 1.00) and Copying (t = .81), neither of which was statistically significant at the .05 level of confidence.

Table 11. Means, Standard Deviations, and Ranges for the Pretest Metropolitan Readiness Tests Subtests, Matching and Copying, with a t Ratio.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>Actual Range</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program - Matching</td>
<td>25</td>
<td>0 - 5</td>
<td>3.04</td>
<td>1.69</td>
<td>1.00</td>
</tr>
<tr>
<td>Control - Matching</td>
<td>24</td>
<td>0 - 5</td>
<td>3.50</td>
<td>1.58</td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Program - Copying</td>
<td>28</td>
<td>0 - 4</td>
<td>1.64</td>
<td>1.39</td>
<td>.81</td>
</tr>
<tr>
<td>Control - Copying</td>
<td>24</td>
<td>0 - 4</td>
<td>1.87</td>
<td>1.20</td>
<td>p&gt;.05</td>
</tr>
</tbody>
</table>

The criteria for selection indicated that the student meet one or both cutoff scores on the subtests, (5 or below for Matching; 4 or below for Copying). The N for the Matching subtest was 25 for the program group. Four subjects' scores did not fall at 5 or below. One subject in the program group did not meet the cutoff criteria for the Copying subtest, therefore the N was 28. All 24 subjects in the control group met both cutoff criteria.

Metropolitan Readiness Test - Posttest

During the kindergarten year, the program group received a remedial perceptual training program during which its members met, both individually and in small groups, with a tutor. The control group received only the regular classroom curriculum.
At the end of kindergarten the Metropolitan was administered as a posttest. Table 12 shows the means and standard deviations by treatment group on the posttest Matching and Copying subtests respectively.

Table 12. Means, Standard Deviations, and Ranges for the Posttest Metropolitan Readiness Tests Subtests, Matching and Copying, with a t-Ratio.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program - Matching</td>
<td>25</td>
<td>3 - 13</td>
<td>9.64</td>
<td>3.01</td>
<td>.53</td>
</tr>
<tr>
<td>Control - Matching</td>
<td>24</td>
<td>6 - 14</td>
<td>10.04</td>
<td>2.05</td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Program - Copying</td>
<td>28</td>
<td>2 - 11</td>
<td>5.21</td>
<td>2.23</td>
<td>1.20</td>
</tr>
<tr>
<td>Control - Copying</td>
<td>24</td>
<td>0 - 12</td>
<td>6.04</td>
<td>2.59</td>
<td>p&gt;.05</td>
</tr>
</tbody>
</table>

A t-test was conducted to determine the significance of the differences between the subtest means. No significant differences were found between the treatment group means on the Matching subtest ($t = .53$) or the means on the Copying subtest ($t = 1.20$).

Primary Mental Abilities Test

At the beginning of the first grade (1976) all subjects took the Primary Mental Abilities Test which was administered to the total class. Mean scores and standard deviations were computed and a t-test conducted to determine the significance between the means of the two treatment groups. Table 13 summarizes the results.
Table 13. Means, Standard Deviations, and Ranges of the Primary Mental Abilities Test With a t Ratio.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>29</td>
<td>81 - 101</td>
<td>89.66</td>
<td>4.83</td>
<td>.76</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>82 - 99</td>
<td>88.58</td>
<td>4.52</td>
<td>p&gt;.05</td>
</tr>
</tbody>
</table>

The difference between the means was 1.10 points yielding a t of .76 which was not significant at the .05 level. Because of this non-significance, no analysis of covariance was needed to correct for the difference in intelligence between the treatment groups.

Findings Reported by Hypotheses

The remaining results will be presented according to the hypotheses stated in Chapter I. The hypotheses were tested in null form.

Gates-MacGinitie Reading Tests (Gates) - Second Grade

Hypothesis 1. There will be no significant difference at the .05 level in reading when utilizing second grade data from two groups of students identified in kindergarten as having visual-perceptual deficiencies, one receiving remediation and the other receiving no formal program of remediation.

Forms 1 and 2 of the Primary B Gates were administered to subjects in the second grade (1977-78). Treatment of the two forms included averaging the subtest scores. Table 14 summarizes the Vocabulary and Comprehension subtest data. Form 1 scores were not available for two subjects in the control group; therefore, a control group N of 22 was established for second grade data.
Table 14. Means of Two Forms of the Second Grade Gates-MacGinitie Reading Tests, Subtests Vocabulary and Comprehension, With Percentages of Subjects Who Gained or Stayed the Same and t Ratios.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>Form 1</th>
<th>Form 2</th>
<th>Means of the Percent Averages of Form 1 and 2 Subjects</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Vocabulary</td>
<td>29</td>
<td>52.62</td>
<td>53.90</td>
<td>53.30</td>
<td>62</td>
</tr>
<tr>
<td>Control Vocabulary</td>
<td>22</td>
<td>56.91</td>
<td>57.30</td>
<td>57.10</td>
<td>59</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Program Comprehension</td>
<td>29</td>
<td>50.60</td>
<td>53.41</td>
<td>52.00</td>
<td>66</td>
</tr>
<tr>
<td>Control Comprehension</td>
<td>22</td>
<td>53.81</td>
<td>55.72</td>
<td>54.90</td>
<td>50</td>
</tr>
</tbody>
</table>

The difference between the treatment group mean scores for the average of Forms 1 and 2 was 3.80 points for Vocabulary. Sixty-two percent of the program group stayed the same or gained points between the administration of Forms 1 and 2 as compared to 59 percent of the control group. Both treatment group mean scores gained from Form 1 to Form 2. The program group mean gained 1.28 points, while the control group mean gained .39.

The difference between the means of the average scores of Form 1 and 2 was 2.90 points for Comprehension. Sixty-six percent of the program group stayed the same or gained points between the administration of Form 1 and Form 2 as compared to 50 percent of the control group.
Both treatment groups' mean scores gained from Form 1 to Form 2. The program group gain was 2.81 points and the control group gain was 1.91 points.

A t-test was conducted to determine the significance of the differences between the means. No significant differences were found between the treatment group means on the Vocabulary subtest (t = 1.87) or the Comprehension subtest (t = 1.66).

Scores from the total posttest Metropolitan were correlated with the second grade Gates Vocabulary subtest scores. Table 15 shows the means, standard deviations, and ranges for these tests.

Table 15. Means, Standard Deviations, and Ranges of the Posttest Metropolitan Readiness Test and Second Grade Gates-MacGinitie Vocabulary Subtest.

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Metropolitan</th>
<th>Gates-MacGinitie</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Program</td>
<td>29</td>
<td>61.28</td>
</tr>
<tr>
<td>Control</td>
<td>22</td>
<td>66.87</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>63.81</td>
</tr>
</tbody>
</table>

Pearson product moment correlation coefficients were calculated for the Metropolitan and the Gates Vocabulary subtest. Table 16 provides this data showing correlations for both treatment groups (program .39 and control .43). The correlations for both groups were significant at or beyond the .05 level.
Table 16. Summary Table: Pearson Product Moment Correlation Coefficients for the Posttest Metropolitan Readiness Test and the Second Grade Gates-MacGinitie Vocabulary Subtest.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>r</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>29</td>
<td>.39</td>
<td>28</td>
<td>p&lt;.05</td>
</tr>
<tr>
<td>Control</td>
<td>22</td>
<td>.43</td>
<td>21</td>
<td>p&lt;.05</td>
</tr>
</tbody>
</table>

Similar information regarding the scores from the second grade Gates Comprehension subtest can be found in Table 17. Means, standard deviations and ranges for the Metropolitan are included.

Table 17. Means, Standard Deviations, and Ranges of the Posttest Metropolitan Readiness Test and Second Grade Gates-MacGinitie Comprehension Subtest.

<table>
<thead>
<tr>
<th></th>
<th>Metropolitan</th>
<th>Gates-MacGinitie</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Program</td>
<td>29</td>
<td>61.28</td>
</tr>
<tr>
<td>Control</td>
<td>22</td>
<td>66.72</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
<td>63.80</td>
</tr>
</tbody>
</table>

Pearson product moment correlation coefficients were computed for the Metropolitan posttest and the Gates Comprehension test. Table 18 summarizes the results which were significant at the .01 level or beyond for the program group, and not significant at the .05 level for the control group.
Table 18. Summary Table: Pearson Product Moment Correlation Coefficients for the Posttest Metropolitan Readiness Test and the Second Grade Gates-MacGinitie Comprehension Subtest.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>r</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>29</td>
<td>.67</td>
<td>28</td>
<td>p&lt;.01</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>.36</td>
<td>21</td>
<td>p&gt;.05</td>
</tr>
</tbody>
</table>

The Gates scores were reviewed in respect to growth and change between first and second grade by treatment group. Table 19 summarizes this data for the Vocabulary and Comprehension subtests.

Both treatment groups' standard score means dropped from first to second grade for Vocabulary. The program group decreased 1.35 points and the control group decreased .40. On the Comprehension subtest, the program group decreased .44 of a point, and the control group decreased 1.70 points.

Table 19. Means and Standard Deviations of First and Second Grade Gates-MacGinitie Vocabulary and Comprehension Subtest Scores With a t Ratio.

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>First Grade</th>
<th>Second Grade</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>Program Vocabulary</td>
<td>29</td>
<td>54.65</td>
<td>5.65</td>
</tr>
<tr>
<td>Control Vocabulary</td>
<td>24</td>
<td>57.50</td>
<td>7.09</td>
</tr>
<tr>
<td>Program Comprehension</td>
<td>29</td>
<td>52.44</td>
<td>7.44</td>
</tr>
<tr>
<td>Control Comprehension</td>
<td>24</td>
<td>56.60</td>
<td>5.94</td>
</tr>
</tbody>
</table>
In order to determine whether a significant difference existed between the means obtained by the same group on the two scores from the first and second grade Gates, differences were calculated between the scores of each subject. A mean of the differences was used to obtain a standard deviation and standard error which provided the statistical data to calculate a t-ratio. There was no significant difference at the .05 level for all four of the t-tests.

Predictive Ability of the Metropolitan Readiness Test

Garrett's formula (1962) for y prediction was used to determine the predictive value of the Metropolitan for the Gates, Primary B (second grade). In order to assure accurate interpretation of the prediction scores, the Standard Error of the Estimate was calculated by the formula (McNemar, 1962):

$$S_{x,y} = \text{the square root of} \frac{\sum(y-y')^2}{N}$$

Table 20 summarizes the results of the calculation of predictions determined from the means of the total group (N = 51).

Table 20. Results of Prediction of Gates-MacGinitie Reading Mean Scores from Posttest Metropolitan Readiness Test Scores With Standard Error of Estimate and Pearson Product Moment Correlation Coefficients.

<table>
<thead>
<tr>
<th>Gates-MacGinitie Subtest</th>
<th>Observed Scores Mean</th>
<th>Predicted Scores Mean</th>
<th>$S_{x,y}$</th>
<th>df</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>54.91</td>
<td>54.87</td>
<td>±6.50</td>
<td>49</td>
<td>.47</td>
<td>p&lt;.01</td>
</tr>
<tr>
<td>Comprehension</td>
<td>53.24</td>
<td>53.22</td>
<td>±5.19</td>
<td>49</td>
<td>.51</td>
<td>p&lt;.01</td>
</tr>
</tbody>
</table>
Correlations with the Metropolitan of .47 for the Gates Vocabulary subtest and .51 for the Comprehension subtest were found to be significant at or beyond the .01 level, when working with combined treatment group scores. Utilizing the mean of the predicted reading scores from Metropolitan scores, it can be determined for future predictions that 68.26 percent of the population would fall at 54.87 ± 6.5 for Vocabulary (see Figure 3).

![Figure 3. Distribution of Predicted Scores on a Normal Curve for Reading Vocabulary from the Metropolitan Readiness Test.](image)

A similar distribution curve indicates the data for Comprehension. Figure 4 indicates that 68.26 percent of the population would fall at 53.22 ± 5.19. The correlations of .47 and .51 in Table 20 provide approximately a 50 percent improvement over guessing.
Summary

The second grade data showed the control group means for Vocabulary and Comprehension were higher than the program group means; however, t-tests indicated no significant differences at the .05 level. Correlations of the Gates reading scores with the Metropolitan were calculated and all were significant at or beyond the .05 level except for the control group in Comprehension. It was determined that predictions of Gates reading scores from the Metropolitan provided correlations which indicate an average degree of improvement over guessing.

From the data provided on second grade test results, the null hypothesis 1 was accepted. No significant differences between the treatment groups were indicated at the .05 level.

Hypothesis 2. There will be no significant difference at the .05 level between program group males and females in reading.

Scores on all tests administered to the treatment groups were separated by sex for the program group.
Table 21 summarizes the **Primary Mental Abilities Test** of the program group scores by sex. A t-test was conducted to determine the significance of the difference of the means (male 90.80 and female 88.00). The difference was not significant at the .05 level.

Table 21. Means, Standard Deviations, and Ranges for the Primary Mental Abilities Test Scores by Sex With a t Ratio.

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>15</td>
<td>82-101</td>
<td>90.80</td>
<td>4.57</td>
<td>1.49</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>14</td>
<td>80-97</td>
<td>88.00</td>
<td>5.17</td>
<td>p&gt;.05</td>
<td></td>
</tr>
</tbody>
</table>

Scores on the first grade Gates, Vocabulary and Comprehension, were studied in relation to the variable sex. Means, standard deviations, and correlation coefficients with the posttest Metropolitan were calculated by sex. Table 22 provides the findings for the Vocabulary and Comprehension subtests. The correlation of .15 for males was not significant at the .05 level, while the correlation of .55 for females was significant at or beyond the .05 level for Vocabulary.

Table 22. Summary Table: First Grade Gates-MacGinitie Vocabulary and Comprehension Means, Standard Deviations, and Ranges With a Pearson Product Moment Correlation With the Metropolitan Readiness Tests by Sex.

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td>Vocabulary</td>
<td>15</td>
<td>46.0-70.5</td>
<td>55.50</td>
<td>6.67</td>
<td>.71</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>Vocabulary</td>
<td>14</td>
<td>46.0-64.5</td>
<td>53.75</td>
<td>5.73</td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Male</td>
<td></td>
<td>Comprehension</td>
<td>15</td>
<td>43.5-68.5</td>
<td>52.27</td>
<td>7.61</td>
<td>.40</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>Comprehension</td>
<td>14</td>
<td>41.0-65.5</td>
<td>53.35</td>
<td>6.77</td>
<td>p&gt;.05</td>
</tr>
</tbody>
</table>
Similar calculations were made for the first grade Comprehension subtest. The correlations for males (.59) and females (.58) were significant at or beyond the .05 level.

Second grade scores on the Gates were subjected to the same statistical treatment as the first grade scores when divided by sex. The results, found in Table 23 for the Vocabulary and Comprehension subtests, indicate a correlation of .34 for males (not significant at the .05 level) and .58 for females (significant at or beyond the .05 level) for Vocabulary.

Table 23. Summary Table: Second Grade Gates-MacGinitie Vocabulary and Comprehension Score Means, Standard Deviations, and Ranges With a Pearson Product Moment Correlation Coefficient With the Metropolitan Readiness Test by Sex.

<table>
<thead>
<tr>
<th>Sex</th>
<th>N</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male Vocabulary</td>
<td>15</td>
<td>42.0 - 68.5</td>
<td>53.63</td>
<td>7.57</td>
<td>.28</td>
<td>.34</td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Female Vocabulary</td>
<td>14</td>
<td>42.5 - 60.0</td>
<td>52.85</td>
<td>4.89</td>
<td>p&gt;.05</td>
<td>.58</td>
<td>p&lt;.05</td>
</tr>
<tr>
<td>Male Comprehension</td>
<td>15</td>
<td>42.0 - 64.5</td>
<td>51.00</td>
<td>5.91</td>
<td>.88</td>
<td>.64</td>
<td>p&lt;.01</td>
</tr>
<tr>
<td>Female Comprehension</td>
<td>14</td>
<td>39.5 - 60.5</td>
<td>53.35</td>
<td>5.88</td>
<td>p&gt;.05</td>
<td>.69</td>
<td>p&lt;.01</td>
</tr>
</tbody>
</table>

The results of the computations from the second grade Comprehension subtest also are found in Table 23. Both male and female correlations, .64 and .69 respectively, were significant at or beyond the .01 level.

A t-test was conducted to determine if the differences between the means were significant when studied by sex. None of the four t-tests
were significant at the .05 level. Therefore, hypothesis two was accepted.

Hypothesis 3. There will be no significant difference at the .05 level occurring according to the age at entrance to kindergarten as it relates to visual-perceptual deficiencies.

Scores from the pretest Metropolitan were analyzed according to the subjects' age at entrance to kindergarten. In the 1975-76 kindergarten class there were 35 students aged 5.0 at entrance to kindergarten; 40 students aged 5.6 and nine aged 6.0. These three ages were chosen for study since they represent the two extremes and the middle age of the treatment groups. Table 24 summarizes the mean scores on the pretest Metropolitan subtests, Matching and Copying, for the total class members at each age level and the number of subjects at those age levels.

Table 24. Mean Scores by Specific Age Levels of the Total Kindergarten Class and Subjects on Metropolitan Readiness Tests Subtests, Matching and Copying, with t Ratios.

<table>
<thead>
<tr>
<th>Age Levels</th>
<th>N</th>
<th>Matching</th>
<th>t</th>
<th>Copying</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 5.0</td>
<td>35</td>
<td>5.77</td>
<td>2.00</td>
<td>4.54</td>
<td>2.21</td>
</tr>
<tr>
<td>Subjects 5.0</td>
<td>8</td>
<td>4.00</td>
<td>p &lt; .05</td>
<td>1.75</td>
<td>p &lt; .05</td>
</tr>
<tr>
<td>Class 5.6</td>
<td>40</td>
<td>6.58</td>
<td>2.84</td>
<td>4.24</td>
<td>2.91</td>
</tr>
<tr>
<td>Subjects 5.6</td>
<td>9</td>
<td>3.66</td>
<td>p &lt; .01</td>
<td>1.66</td>
<td>p &lt; .01</td>
</tr>
<tr>
<td>Class 6.0</td>
<td>9</td>
<td>5.88</td>
<td>.71</td>
<td>4.40</td>
<td>1.55</td>
</tr>
<tr>
<td>Subjects 6.0</td>
<td>1</td>
<td>3.00</td>
<td>p &lt; .05</td>
<td>0.00</td>
<td>p &gt; .05</td>
</tr>
</tbody>
</table>

A t-test was conducted to determine whether a significant difference existed between the means of the total age group and the subjects in the same age groups in both Matching and Copying. Significance at the .05 level and .01 level and beyond was indicated at ages 5.0 and
5.6, respectively, while no significant difference at the .05 level was found at the 6.0 age for both subtests.

Figure 5 shows the subtest means of the total class and treatment group at three ages. In both subtests, the treatment group means are lower than the class means at each age level studied. The treatment group means decrease as the age increases. This is not true for the total class means. There is no main effect for age. In other words, perceptual skills were not more developed for students as they became older.

![Figure 5. Mean Scores by Selected Age Groups of the Pretest Metropolitan Readiness Tests Subtests, Matching and Copying](image-url)
Hypothesis 3 was not accepted. Significance at .05 level or beyond was found when examining the data related to age at entrance to kindergarten, particularly ages 5.0 and 5.6.

Hypothesis 4. There will be no significant difference at the .05 level between the program group means and the control group means in reading when compared to the total second grade class.

Mean scores from the treatment groups were compared for Vocabulary and Comprehension with total second grade mean scores. Table 25 indicates the comparison data between the total second grade and both treatment groups. T-tests were calculated to determine the significance between the mean of the total second grade class (63.59) and each treatment group mean (program, 53.26 and control, 57.09). A t of 4.72, significant at or beyond the .001 level, was indicated between the total class and the program group for the Vocabulary subtest, while a t of 2.58, significant at or beyond the .001 level, was found for the control group. Mean scores on the Comprehension subtest indicated a t of 4.43, significant at or beyond the .001 level, for the program group and a t of 2.69, significant at or beyond the .01 level, for the control group when compared with the total class mean.

Table 25. Means and Standard Deviations of the Second Grade Gates-MacGinitie Reading Tests by Treatment Group and Total Class With t Ratios.

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Vocabulary</th>
<th>SD</th>
<th>t</th>
<th>Comprehension</th>
<th>SD</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total 2nd Grade</td>
<td>405</td>
<td>63.59</td>
<td>11.58</td>
<td>4.72</td>
<td>61.69</td>
<td>11.70</td>
<td>4.43</td>
</tr>
<tr>
<td>Program</td>
<td>29</td>
<td>53.26</td>
<td>6.43</td>
<td>p&lt;.001</td>
<td>51.98</td>
<td>6.06</td>
<td>p&lt;.001</td>
</tr>
<tr>
<td>Control</td>
<td>22</td>
<td>57.09</td>
<td>7.78</td>
<td>2.58</td>
<td>54.89</td>
<td>6.05</td>
<td>2.69</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&lt;.001</td>
<td></td>
<td></td>
<td></td>
<td>p&lt;.01</td>
</tr>
</tbody>
</table>
Hypothesis 4 was not accepted. There were significant differences beyond the .01 level for both treatment groups when compared to the total second grade class in reading achievement.

Gates-MacGinitie Reading Test - First Grade

In the process of gathering longitudinal data on the subjects, an additional hypothesis was generated. First grade data were available to the same extent as second grade data and it was deemed important to determine student reading development one year after the training program. Hypothesis 5 is stated as follows:

There will be no significant difference at the .05 level when utilizing first grade reading data from two groups of students identified in kindergarten as having visual-perceptual deficiencies, one receiving remediation and the other receiving no formal program of remediation.

Forms 1 and 2 of the Primary A Gates were administered in February and May 1977, respectively, during the subjects' first grade. Subtest scores (Vocabulary and Comprehension) for the two forms were converted into standard scores. The two Vocabulary standard scores were averaged and the two Comprehension scores were averaged to obtain one score on each subtest for each first grade subject. Table 26 shows the results for the Vocabulary and Comprehension subtests by treatment group. The program group mean (54.65) was 2.80 standard score points lower than the control group (57.50); however, 48 percent of the program group stayed the same or gained from Form 1 to Form 2 as compared to 35 percent of the control group.
Table 26. Means of Two Forms of the First Grade Gates-MacGinitie Reading Tests, Subtests Vocabulary and Comprehension, With Percentages of Subjects Who Gained or Stayed the Same and t Ratios.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>Form 1</th>
<th>Form 2</th>
<th>Mean of Averages of Form 1 and 2</th>
<th>Percent of Subjects</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program Vocabulary</td>
<td>29</td>
<td>55.10</td>
<td>54.24</td>
<td>54.65</td>
<td>48</td>
<td>1.57</td>
</tr>
<tr>
<td>Control Vocabulary</td>
<td>24</td>
<td>58.90</td>
<td>56.10</td>
<td>57.50</td>
<td>35 p&gt;.05</td>
<td></td>
</tr>
<tr>
<td>Program Comprehension</td>
<td>29</td>
<td>53.50</td>
<td>51.50</td>
<td>52.44</td>
<td>38</td>
<td>2.15</td>
</tr>
<tr>
<td>Control Comprehension</td>
<td>24</td>
<td>58.33</td>
<td>54.92</td>
<td>56.60</td>
<td>35 p&lt;.05</td>
<td></td>
</tr>
</tbody>
</table>

There is a 4.10 standard score difference between the treatment group means for the Comprehension subtest. Thirty-eight percent of the program group stayed the same or gained between the administration of Form 1 and Form 2 compared to 35 percent of the control group. A t-test was conducted and no significant difference was found between the Vocabulary means at the .05 level; however, there was significant difference at the .05 level or beyond between Comprehension means.

In both subtests, the treatment groups dropped in mean scores from Form 1 to Form 2. The program group mean dropped 0.86 and the control group mean dropped 2.80 on the Vocabulary subtest; while on the Comprehension subtest, the program mean dropped 2.00 points and the control group mean dropped 3.41 points.
First grade Gates Vocabulary subtest scores were correlated with the total score of the posttest Metropolitan. Table 27 summarizes the means, standard deviations, and ranges of scores for these tests.

Table 27. Means, Standard Deviations, and Ranges of the Posttest Metropolitan Readiness Test and First Grade Gates-MacGinitie Vocabulary Subtest.

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Metropolitan</th>
<th>Gates-MacGinitie</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
</tr>
<tr>
<td>Program</td>
<td>29</td>
<td>61.28</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>66.87</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>63.81</td>
</tr>
</tbody>
</table>

Table 28 indicates the correlation coefficients between the Metropolitan total posttest score and the Gates Vocabulary score. The program group scores were significant at or beyond the .01 level, while the control group scores were significant at or beyond the .05 level.

Table 28. Summary Table: Pearson Product Moment Correlation Coefficients for the Posttest Metropolitan Readiness Test and the First Grade Gates-MacGinitie Vocabulary Subtest.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>r</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>29</td>
<td>.64</td>
<td>27</td>
<td>p&lt;.01</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>.51</td>
<td>22</td>
<td>p&lt;.05</td>
</tr>
</tbody>
</table>

Similar information regarding the posttest Metropolitan and the Gates Comprehension scores is provided in Table 29.
Table 29. Means, Standard Deviations, and Ranges of the Posttest Metropolitan Readiness Test and First Grade Gates-MacGinitie Comprehension Subtest.

<table>
<thead>
<tr>
<th>Treatment Groups</th>
<th>Metropolitan</th>
<th></th>
<th></th>
<th>Gates-MacGinitie</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean</td>
<td>SD</td>
<td>Score</td>
<td>Range</td>
<td>Mean</td>
</tr>
<tr>
<td>Program</td>
<td>29</td>
<td>61.28</td>
<td>6.88</td>
<td>47-73</td>
<td></td>
<td>52.44</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>66.72</td>
<td>5.65</td>
<td>57-76</td>
<td></td>
<td>56.60</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>63.62</td>
<td>6.35</td>
<td>47-76</td>
<td></td>
<td>54.28</td>
</tr>
</tbody>
</table>

Table 30 shows the correlation coefficients of the Metropolitan posttest and the Gates Comprehension scores. No significant difference at the .05 level was found for the program group, while the control group scores were significant at or beyond the .01 level.

Table 30. Summary Table: Pearson Product Moment Correlation Coefficients for the Posttest Metropolitan Readiness Test and the First Grade Gates-MacGinitie Comprehension Subtest.

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>N</th>
<th>r</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>29</td>
<td>.33</td>
<td>27</td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Control</td>
<td>24</td>
<td>.56</td>
<td>22</td>
<td>p&lt;.01</td>
</tr>
</tbody>
</table>

Data generated from the first grade Gates were mixed. There was no significance at the .05 level for Vocabulary; however, significance at or beyond the .01 level was indicated for the control group on Comprehension. Therefore, hypothesis five was not accepted.
Discussion

Status of Treatment Groups at the Beginning of Study

The subjects in this study were in kindergarten during the 1975-76 school year. The data used for statistical analysis were gathered from school records. Because existing data were used, the researcher did not control certain aspects of the program:

1. Subjects were not randomly assigned to the treatment groups.
2. The instruments used were those selected by the Boardman School District to measure the effects of the total curriculum.
3. The remedial perceptual program was intact. The district had chosen the perceptual development activities which would be used with the program group.

Subjects were selected for the study according to their pretest Metropolitan Readiness Test (Metropolitan) scores on the Matching and Copying subtests and available first and second grade data. Some of these subjects had participated in a kindergarten perceptual training program and were designated by the researcher as the program group. Those subjects selected who had not received a formal program were designated the control group. Since no random assignment to treatment groups was made, it was necessary to examine the subjects as to their similarities at the beginning of the study.

Similarities which existed included:

1. All subjects scored in the 33rd percentile or lower on the total Metropolitan pretest.
2. Utilizing the pretest Matching Subtest of the Metropolitan, a difference of .46 in the means of the treatment groups was not significant at the .05 level \((t = 1.00)\).

3. The Copying Subtest of the Metropolitan yielded a mean score difference of .23 between treatment groups, not significant at the .05 level \((t = .31)\).

4. Intelligence scores from the first grade Primary Mental Abilities Test provided a 1.1 mean difference between treatment groups. The \(t\) of .76 was not significant at the .05 level. Fifty-eight percent of the control group scored between 80 and 89 on the intelligence test, while 59 percent of the program group scored in that range.

5. All 24 subjects in the control group and 83 percent of the program group participated in a pre-kindergarten screening program. Forty-six of these 48 subjects were identified as having perceptual visual-motor problems.

Differences between the two groups included:

1. The program group was 2.4 months younger than the control group.

2. The program group included 51 percent females as compared to 29 percent in the control group.

It can be stated then, that the two groups were not significantly different at the beginning of the study in the areas pertinent to the research (i.e., in perceptual subtests of the Metropolitan, intelligence).

Status of Treatment Groups - End of Kindergarten

The posttest Metropolitan was administered at the end of kindergarten. The program group had undergone a concentrated program of individual and small group perceptual activities. These skill building
activities included the tasks from the (1) Santa Clara materials (1974), (2) the Rosner Perceptual Skills Curriculum (1973), and (3) locally developed materials.

All four elementary buildings had access to the same materials daily. Students worked individually with tutors for no less than 100 minutes a week on such activities as matching objects, tracing, copying, likes and differences, and other fine and gross motor skills. In small groups, the program subjects were involved 75 minutes per week in activities such as throwing and catching a ball, playing skipping and hopping games, and working at the chalkboard.

Both treatment groups were mixed into the regular kindergarten classes within the four schools. In general, basic activities in all kindergarten classes involved some perceptual training. Learning to color within lines, cut with scissors, pile blocks, and identify and copy shapes are pre-reading activities. Both treatment groups had the benefit of these regular curriculum activities.

In comparing the treatment groups in the pretest and posttest Metropolitan Matching subtest, a gain was found for the program group from $M = 3.04$ to $M = 9.64$ or 6.60 points. The control group gained 6.54 points from $M = 3.50$ to $M = 10.04$. On the Copying subtest, the program group gained 3.57 points from $M = 1.64$ to $M = 5.21$; while the control group went from $M = 1.87$ to $M = 6.04$ for a gain of 4.17 points.

The t-tests indicated no significant differences between the treatment group posttest means, therefore, the concentrated perceptual training program did not significantly improve the program group over the
control group in perceptual tasks as measured by the Metropolitan. Similar results were found by Kershner (1975) and Church (1974). A possible explanation for this somewhat even gain for both groups might be maturation. The control group members, being 2.4 months older, may have developed their perceptual skills through natural maturation. This also could be true of the program group. If the subjects scored poorly on the perceptual pretests because of immaturity in their perceptual development, exposure to regular kindergarten activities may have allowed for maturation of these skills.

Status of Treatment Groups - First Grade

The results of the first grade Gates-MacGinitie Reading Tests (Gates) were analyzed by subtest, Vocabulary and Comprehension. The program group did experience some follow-up activities conducted by the program coordinator at the beginning of the first grade. This contact was brief and its main purpose was to gain information for the first grade teachers concerning the achievement levels of the program subjects so that classroom activities could be designated which would allow these students continued reinforcement.

The first administration of the Gates (Form 1) occurred in February of the first grade, and Form 2 was administered in May, three months later. Although the mean scores of the averages of Forms 1 and 2 were higher for the control group, the differences between the program group means and the control group means became smaller from Form 1 to Form 2 and the number of subjects having the same standard score or a higher one on Form 2 was greater in the program group. This was true for both the Vocabulary and Comprehension scores. Because the differences
between the averaged Form 1 and 2 means were not significant, it can be concluded that the treatment groups were progressing fairly equally. Basically, no additional program activities were conducted with the program group during the first grade. Since this was the case, both treatment groups had exposure to the same curriculum in their regular classrooms. Differences at the end of kindergarten were not significant and this trend continued at the end of first grade.

The Pearson product moment correlation coefficients calculated between the posttest Metropolitan and the averaged Gates Vocabulary subtest produced a correlation of .64 which was significant at or beyond the .01 level for the program group and a correlation of .51 which was significant at or beyond the .05 level for the control group. For the Comprehension subtest, the correlations were .33 (not significant at the .05 level), and .56 (significant at or beyond the .05 level) for the program and control group respectively.

In order to study longitudinal data utilizing several instruments, it is necessary to determine if there is a correlation between the instruments. Therefore a correlation coefficient was computed for the combined group of subjects. The total Vocabulary subtest correlation with the Metropolitan was .47, which is significant at or beyond the .01 level, and for the Comprehension subtest was .51 which is also significant at or beyond the .01 level. Similar correlations between the Metropolitan and reading instruments were found by Scott (1968) and Goodstein et. al. (1970). They concluded that the Metropolitan was a good predictor of future reading achievement.
Hypothesis 1 stated that no significant difference at the .05 level would occur between the program group and control group in reading at the end of second grade. Data found in Table 15 indicates that the control group's mean score on the Vocabulary subtest was higher than the program group's mean score. Table 17 indicates similar results for Comprehension. In both instances, there were no significant differences between treatment group means.

The control group showed higher means on the reading tests beginning in first grade. At no time were their mean scores less than the program group's means. During both first and second grades, however, the program group gained more between Forms 1 and 2 of the Gates, and more subjects in the program group gained or stayed the same on both subtests.

In both the first and second grade, scores on the Vocabulary subtest correlated significantly at or beyond the .05 level with the Metropolitan. This was not the case with the Comprehension subtest scores. In the first grade, the control group scores were significant at or beyond the .01 level while the program group scores were not significant at the .05 level. The opposite held true on the second grade Comprehension subtest.

The fact that there was a higher correlation between the Metropolitan and the Vocabulary subtest than the Comprehension subtest may indicate that the total battery of Metropolitan subtests is a good indicator of future Vocabulary achievement. As the scores increased on the Metropolitan, so did the scores on the Vocabulary subtest of the Gates. This linear correlation only held true for the control group on the
Comprehension subtest in first grade and the program group in second grade. Since comprehension is a more complex reading skill than vocabulary, it is possible that readiness tests do not measure reading comprehension to the degree that they do vocabulary.

Since linear correlations were computed it was deemed important to study the use of the posttest Metropolitan total score as a predictor of Vocabulary and Comprehension achievement scores as measured by the Gates Primary B (second grade). Predictions were made utilizing correlations for the total N. A correlation of .47 was found for Vocabulary and .51 for Comprehension and both were significant at or beyond the .01 level. According to Garrett (1962) these correlations may be considered substantial which allows the assumption to be made that a score on the posttest Metropolitan (X) can indicate a predicted score on the Gates subtests (Y) -- knowing the score on X, scores for Y can be predicted.

It should be noted, however, that an N of 51 limits the gross generalizations of prediction than if N were larger.

Figures 3 and 4 indicate the normal curve distribution of predicted scores on the Gates. For Vocabulary, the range of scores falling within ± three standard deviations is 35.37 to 74.37. For Comprehension, the range is 37.65 to 68.79. Scores for all subjects fell within these ranges.

As indicated by the above discussion, hypothesis 1 was accepted. Although the program group gained more from pretest to posttest in every instance except Metropolitan Copying subtest scores, the gains were not significantly greater than those of the control group. Research reviewed in the literature yielded similar results regarding the relationship
of perceptual skills and reading. Kershner (1975), Wiederholt and Hammill (1971), and Falik (1969) studied this relationship and found non-significant correlations ($p > .05$). The fact that no regression occurred, however, is important. In other words the program did not negatively effect perceptual and reading development as compared to the control group. These same factors relate to hypothesis 5 which was generated to focus on the first grade data.

The study was conducted with intact groups and existing test data. In addition, all instruments used in the study were norm-referenced. Since the subjects began with an identified problem (below average perceptual skills), it is important to realize that they could have started below the norm. Since the tests were given at the same intervals and to the same students, the subjects could continue to stay behind at the same rate. Therefore, their growth could be minimized by the norm-referenced instruments. This possible dynamic highlights the need to utilize criterion-referenced instruments or case study approaches with these populations.

### Status of Program by Sex

Hypothesis 2 addressed the relationship of program group reading scores when analyzed by sex and was accepted. In the longitudinal study of Gates subtest reading scores, it was found that males had means of 55.50 and 52.30 on first grade Vocabulary and Comprehension subtests respectively, while females had means of 53.75 and 53.35 for the same tests. Second grade scores were 53.63 and 51.00 for males and 52.85 and 53.35 for females on Vocabulary and Comprehension respectively. A $t$-test was calculated for each set of means to determine the significance
of the differences between male and female mean scores. None of the four t-tests were significant at the .05 level.

Because intelligence is generally felt to be closely related to reading, the Primary Mental Abilities Test scores were studied by sex. A 2.80 point difference was found with males scoring higher than females. A t-test of 1.49 was not significant at the .05 level.

No significant differences were found between males and females on reading scores. This finding is similar to other research studies. Feldhusen (1970) reported no significant differences between first grade boys and girls in reading achievement. Although it is generally believed that girls are ahead of boys at the kindergarten level in some areas, by second grade these differences lessen.

Status of the Treatment Groups by Age at Entrance to Kindergarten

Hypothesis 3 stated that no significant difference at the .05 level would be found between age at entrance to kindergarten and visual-perceptual problems and was not accepted. To test this hypothesis, pretest Metropolitan Matching and Copying subtest scores were analyzed by age (the youngest age found in the treatment group - 5.0, the oldest age - 6.0, and a third age of 5.6 which was midway between the two extremes).

In examining the treatment group data, mean scores on both subtests decreased as subjects' ages increased. It is important to note that only one subject was 6.0. To determine if this relationship held true with the total kindergarten class to which the treatment groups belonged, scores were examined for the same age levels. The mean score for Matching (6.6) at age 5.6 (N = 40) was the highest when compared to the total class. This did not hold true with the treatment groups whose highest
mean was at age 5.0. For Copying, the means of the total class also did not appear in a rank order similar to the treatment group. In all instances the treatment group mean scores were lower than the total class mean scores of the same age. This could reflect a sampling error. In other words, the researcher could have selected different ages to study and found other results.

It was determined that those students who score low on perceptual subtests of the Metropolitan score lower the older they are at entrance to kindergarten. It is possible that children who have problems are kept from entering school by parents who hope the children will mature further before entrance to kindergarten. However, this maturation still may be behind at entrance to school.

Another interesting observation concerning this data is that the cutoff scores for the treatment groups were five and below for Matching and/or four and below for Copying. Except for age 5.6 under Matching, the total class means were only slightly higher than the cutoff scores. This may indicate that the two Metropolitan subtests used to test perceptual skills, Matching and Copying, indicate immaturity in perceptual skills for all entering kindergarteners.

Frostig (1964), Kephart (1968) and Bender (1938) all view perception as a developmental process, therefore age would be a factor. The problems diagnosed in the treatment group subjects could be related to immaturity, slower neurological development, or visual disorders; all of which might account for the lower scores.
Status of Treatment Groups in Relation to Total Second Grade

Hypothesis 4 addressed the relationship of total second grade class reading levels with those of the treatment groups. Highly significant differences were found between the total class and each treatment group. The program group means showed a greater significant difference (p<.001) with the means of the total class than did the control group (p<.01).

The program group scored consistently lower than the control group after the initial placement into treatment groups utilizing the Metropolitan subtest scores. The differences in scores of the treatment groups were not significant, therefore, the kindergarten perceptual training program for the program group did not have a significant relationship with reading achievement at the second grade level.

Although the results of the study indicate minimum significance between the means of the treatment groups, it is important to emphasize that individual changes occurred among the subjects. There were gains in scores between Form 1 and Form 2 administrations of the Gates in both first and second grade. More subjects in the program group gained or remained the same on all reading measures than the control group. This result is important for administrators of perceptual skills programs and other programs which evaluate results by group data rather than individualized data. Findings may differ when the data are studied by a case study method utilizing individual base line data versus the normative approach employed in this study.

There may be several explanations for the lack of a significant relationship between perception and reading within this study. First,
the subjects were not randomly assigned to treatment groups. Although the groups appeared similar at the beginning of the study, true randomization may have produced different results.

Another explanation may be that the teachers were aware of the subjects who were identified as having perceptual problems and low readiness scores, but who received no special program. Primary school teachers generally supplement their curriculum with perceptual activities, therefore, children having difficulty might have received additional assistance. This would have provided the program group three exposures to the activities, two within the special program and one within the regular class, while importantly, the control group would have had exposure to the class activities with possible extra assistance from their teachers.

A third factor to be addressed is outside variables, one of which is parent involvement. It was not possible to control this external variable. Since all children had the opportunity to be screened for perceptual problems during a pre-school clinic and all parents received the results of this clinic (many through the parent conferences), parents of students having deficiencies may have worked with their children at home.

All three factors may have been in effect during the three years of the study. If this was the case, differences between the treatment groups could be expected to be minimized.

In summary, it is clear that the perceptual training program in which the program group was involved made no significant difference in their reading scores when compared to a control group within a three-year period. Table 30 summarizes the hypotheses and their status.
Table 31. Hypotheses by Status

<table>
<thead>
<tr>
<th>Hypothesis</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. There will be no significant difference at the .05 level in reading when utilizing second grade data from two groups of students identified in kindergarten as having visual-perceptual deficiencies, one receiving remediation and the other receiving no formal program of remediation.</td>
<td>Accepted</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gates Subtest</th>
<th>Program</th>
<th>Control</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vocabulary</td>
<td>53.30</td>
<td>57.10</td>
<td>1.87</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Comprehension</td>
<td>52.00</td>
<td>54.90</td>
<td>1.66</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
</tbody>
</table>

2. There will be no significant difference in reading scores at the .05 level between program group males and females.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Males</th>
<th>Females</th>
<th>t</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Mental Abilities</td>
<td>90.80</td>
<td>88.00</td>
<td>1.49</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>1st Grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>55.00</td>
<td>53.75</td>
<td>.71</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Comprehension</td>
<td>52.27</td>
<td>53.35</td>
<td>.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>2nd Grade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vocabulary</td>
<td>53.63</td>
<td>52.85</td>
<td>.28</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Comprehension</td>
<td>51.00</td>
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<td></td>
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Table 31. (continued)

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<tr>
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<tr>
<td>3. There will be no significant difference at the .05 level occurring</td>
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</tr>
<tr>
<td>according to age at entrance to kindergarten as it relates to visual-</td>
<td></td>
</tr>
<tr>
<td>perceptual deficiencies.</td>
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</tr>
<tr>
<td><strong>Metropolitan Subtest</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td><strong>Matching</strong></td>
</tr>
<tr>
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</tr>
<tr>
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<td>3.70</td>
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<td>5.90</td>
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<tr>
<td>Subjects 6.0</td>
<td>3.00</td>
</tr>
</tbody>
</table>

| 4. There will be no significant difference at the .05 level between the    | Not Accepted |
| program group means and the control group means in reading when compared   |            |
| to the total second grade class means.                                    |            |
| **Gates Subtest**                                                         |            |
| **Total**                    | **Program** | **t**        |
| Vocabulary                   | 65.39       | 53.26        | 4.72  |
|                             |             |              | p<.001|
| Comprehension               | 61.69       | 51.98        | 2.58  |
|                             |             |              | p<.001|
| **Total**                   | **Control** | **t**        |
| Vocabulary                   | 65.39       | 57.09        | 4.43  |
|                             |             |              | p<.001|
| Comprehension               | 61.69       | 54.89        | 2.69  |
|                             |             |              | p<.01 |
Table 31. (continued)

<table>
<thead>
<tr>
<th>Hypothesis</th>
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<tbody>
<tr>
<td>5. There will be no significant difference at the .05 level when utilizing first grade data from two groups of students identified in kindergarten as having visual-perceptual deficiencies, one receiving remediation and the other receiving no formal program of remediation.</td>
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<table>
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<th>Gates Subtest</th>
<th>Program</th>
<th>Control</th>
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<td>2.15</td>
</tr>
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<td>p&lt;.05</td>
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</table>
V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

Introduction

Larson and Hammill (1975) maintain that the relationship between visual perception and reading needs further substantiation. Perception develops throughout life. At one age it is thought to have greater significance. Some see this occurring up to age seven (Piaget and Inhelder, 1967; Frostig, 1964). The literature contains much support for perceptual screening and remediation of perceptual problems at the kindergarten level (Satz and Friel, 1972; Saphier, 1973).

The infrequency of longitudinal studies in the area of perception and academic achievement stimulated the initiation of this study. An even greater motivation for the study was to determine whether perceptual skill remediation actually prevented or reduced later reading problems.

Purpose

The major purpose of this research was to determine the relationship, over a three-year period, of a kindergarten perceptual training program with reading using children identified as having visual-perceptual problems at the kindergarten level. Secondary purposes included: 1) investigating results, by sex, of the relationship between perception and reading; and 2) determining the relationship between perceptual problems and age at entrance to kindergarten.
Methodology

Research Setting. The study was conducted in the four elementary schools of the Boardman Local School District in Ohio. The school board, administrators, and teachers were involved in the planning and implementation of the screening, diagnosing, and remediating programs for kindergarten children in the areas of perception, vision, hearing and socialization.

Sample. Kindergarten students from the four elementary schools were selected by the school coordinator of the perceptual training program utilizing certain criteria: 33rd percentile or below on the Metropolitan Readiness Tests (Metropolitan); permission as a result of a parent conference; and available openings in a remedial perceptual program. Of the 61 students who were placed in the remedial program, 29 had a complete set of test scores over the three-year period in the study and were identified by the researcher as the program group. Students who met similar criteria, but received no formal remediation training, were named the control group (N=24).

All subjects participated in regular kindergarten classes across the four elementary schools. However, the program group was involved in a remedial perceptual training program while the control group was not. The training program began with additional diagnosis of the specific perceptual need areas for which plans of action were developed. Tutors worked with the students, both individually and in small groups, on a daily basis with activities prescribed mainly from the Rosner Perceptual Skills Curriculum and the Santa Clara Inventory
of Developmental Tasks. Supplemental activities were used from locally developed materials.

Instruments. Three instruments were used to collect data for this study. The Metropolitan was used as a pretest for subject selection and as a posttest for determining the extent of change in the treatment groups and as a predictor of reading achievement.

The Gates-MacGinitie Reading Tests (Gates) were used at two levels, Primary A for the first grade and Primary B for the second grade, for determining reading achievement scores. Two forms of each test were given each year providing data on subjects within a grade level and between grade levels.

A third instrument, the Primary Mental Abilities Test, was utilized to determine if any intelligence differences existed between the two treatment groups (program and control).

Procedures. Once the sample was determined, test scores were collected for the treatment groups from kindergarten through second grade (1975 to 1978). These test results were analyzed according to the five hypotheses generated for the study.

Relationships between reading and perception were studied for the two treatment groups at the end of kindergarten, first grade and second grade. Data were also studied regarding differences by sex and by age at entrance to kindergarten.
Findings

**Hypothesis 1.** There will be no significant difference at the .05 level in reading when utilizing second grade data from two groups of students identified in kindergarten as having visual-perceptual deficiencies, one receiving remediation and the other receiving no formal program of remediation. This hypothesis was accepted.

Both groups were similar at the beginning of the study according to pretest scores on the Matching and Copying subtests of the Metropolitan. First grade intelligence mean scores for the two treatment groups were within 1.1 points. Although gains were made during the years from which data were gathered, they were not significantly greater for the program group than the control group gains.

**Hypothesis 2.** There will be no significant difference in reading at the .05 level between program group males and females. This hypothesis was accepted. At no time during the three years of the study were the differences between the Gates or Metropolitan mean scores for boys and girls in the program group significant.

**Hypothesis 3.** There will be no significant difference at the .05 level according to age at entrance to kindergarten as it relates to visual-perceptual deficiencies. This hypothesis was not accepted.

When reviewing the subjects' test scores who were 5.0, 5.6, and 6.0 at entrance to kindergarten, the pretest Metropolitan Matching and Copying scores became lower with age. Therefore, for the children
identified as having perceptual problems, age at entrance to kindergarten was not necessarily a related factor.

**Hypothesis 4.** There will be no significant difference at the .05 level between the program group means and the control group means in reading when compared to the total second grade class means. This hypothesis was not accepted.

When comparing the treatment groups to the total second grade class, mean scores on the Gates were significantly different at the .05 level with a greater difference between the program group and the total second grade.

**Hypothesis 5.** There will be no significant difference at the .05 level when utilizing first grade data from two groups of students identified in kindergarten as having visual-perceptual deficiencies, one receiving remediation and the other receiving no formal program of remediation. This hypothesis was generated after data collection and was not accepted.

The results at the first grade level were similar to the findings related to hypothesis 1 which focused on second grade data. Non-significant data were generated in vocabulary, while there was a significant difference (p=<.05) between treatment groups in comprehension.

**Conclusions**

1. The end-of-kindergarten Metropolitan is a good predictor of second grade reading Vocabulary and Comprehension achievement as measured by the Gates. Larson and Hammill (1975), Kottmeyer (1947) and Johnson
(1969) found the Metropolitan a significant instrument for predicting first and second grade reading achievement.

It appears that the prediction of vocabulary achievement is accurate for the treatment groups. The prediction of the more complex reading skill, comprehension, is less accurate for the two treatment groups.

2. The remedial perceptual program did not provide differing data for boys and girls on reading achievement. It would appear that there is no need to conduct separate programs. Feldhusen (1970) also reported no reading achievement differences between boys and girls after a supplemental readiness program.

3. The remedial perceptual program did not bring students with below normal perceptual skills up to the mean reading level of the total second grade. Although gains were made, subjects ended the second grade significantly behind their peers. Schools with traditional grade levels must allow for the wide range of achievement through diversified curricula and materials. It would appear that ungraded primary schools could allow students to progress individually without grade level stigmas.

4. Age at entrance to kindergarten is dysfunctionally related to perceptual problems. Older students in the two treatment groups had lower measured perceptual skills. Subjects scored lower on Matching and Copying subtests as their age at entrance increased. This was not the case for the total kindergarten class with similar ages, although their perceptual subtests' mean scores were close to the cutoff scores.
It is possible that children who have perceptual problems are kept from entering kindergarten by their parents who assume the children will mature further. Their maturation still may be behind at entrance to school.

Frostig (1964), Kephart (1968), and Bender (1938) all view perception as a developmental process, therefore, age could be a factor. The problems diagnosed in the treatment group subjects could be related to immaturity, slower neurological development or visual disorders, all of which might account for the lower scores.

5. The use of norm-referenced instruments and a research design based on group data eliminated valuable individual information. When the study began, students had been identified as having below average perceptual skills. Therefore, it is important to realize that the subjects could have begun the program below the norm on the test. Since the tests were given at the same intervals and to the same students, the subjects could have continued to stay behind at the same rate. Although growth took place, in both treatment groups, the relationship to the norming group was minimized by the use of norm-referenced instruments. This possible dynamic highlights the need to utilize criterion-referenced instruments or case study approaches with these populations.

6. The remedial perceptual program did not make a difference in the perceptual subtest scores on the Metropolitan at the end of kindergarten when comparing the treatment groups. Other available data, however, indicated significant gains for both groups from pretest to posttest. In effect, both groups improved. It is important not to lose sight of the fact that this was a comparative study.
Recommendations

The investigation into the relationship between perception and reading has provided results which lead to recommendations. Recommendations will be presented in two categories: program and research.

Program Recommendations

1. The remedial perceptual training program should be limited to one remediation program to determine if results would be greater. Utilizing activities from several programs such as the Rosner materials and the Santa Clara materials may cause overlaps or gaps in the sequence of activities. If one program is followed sequentially, results may differ.

2. A specific visual-perceptual screening instrument should be used with all students at the beginning of kindergarten. This will ensure that perceptual test results are collected for all students rather than subtests of a readiness instrument. Those students identified as having perceptual problems should be rescreened at the end of kindergarten regardless if they received remediation. This information will allow classroom teachers to plan visual-perceptual activities throughout the curriculum.

3. Perceptual training programs should be established on a case study basis. Criterion-referenced measures and individual education plans should be utilized to gain pertinent information for maximizing individual student growth and development.
4. Consideration should be given to implementing ungraded primary schools, as not all students begin kindergarten at the developmental level necessary for pre-reading readiness activities. Students could enter, be diagnosed for readiness levels, and be placed in an individualized program to provide the opportunity for enhancing normal development.

Research Recommendations

1. The study should be repeated utilizing randomization of subjects to treatment groups.

2. This longitudinal study should be continued. Another comparison of the treatment groups in subsequent years will give additional information on the reading achievement of the subjects.

3. A study should be conducted with kindergarten students randomly placed into three treatment groups: a singular remediation program group; a multiple remediation group (such as the one in this study); and a control group. The additional treatment group would give data related to the effectiveness of one sequential program as opposed to a combination of approaches.

4. Because primary teachers include perceptual training in the regular curriculum as a group activity, research should be conducted comparing these classroom approaches to an individual tutor-pupil approach. If the classroom activity variable is controlled to the greatest possible extent, results may indicate which approach is most effective at the kindergarten level.

5. A comparison study should be conducted utilizing a classroom remediation program for perceptual training with teachers whose
strengths in teaching lie in different modalities. The tutors in this study utilized the visual modality in the concentrated remediation program. Teachers who teach through auditory or tactile modalities may find different results in visual-perceptual development. The implications of such a study may reach into the preservice education of kindergarten teachers.

6. Research should be conducted in a setting where the perceptual training program is continued for a second or third year. This may be particularly important in relation to the level of development of perceptual skills by age seven, or second grade. Continued strengthening of perceptual skills may allow for better development and use of these skills.

7. A study should be conducted to correlate the Metropolitan Matching and Copying subtests with the Gates subtests. Significant correlations were found utilizing total Metropolitan scores. It would be important to determine whether the perceptual-related subtests correlate higher or lower with the Gates than the total score.

8. A similar study should be conducted utilizing criterion-referenced instruments which focus on individualized data. This study was conducted with existing data collected from norm-referenced instruments. Group data was reported at the expense of individual growth data.
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