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ABSTRACT

The effects of four different kinds of perceptual training programs on IQ and Reading Readiness in a population of lower socio-economic level kindergarten children were explored to provide useful information for curriculum planning. Data was gathered on 54 disadvantaged 5-year olds in an OEO day care center. During the afternoon session, children were randomly assigned to treatment groups for formal learning activities. The same general curriculum was followed in all treatment groups, but each treatment stressed a different kind of perceptual training: Treatment 1 stressed "general readiness," non-alphabet, and visual skills; Treatment 2 stressed alphabet perceptual skills in a primarily visual mode; Treatment 3 stressed alphabet perceptual skills in a primarily auditory mode; and Treatment 4 placed equal stress on auditory and visual alphabet perceptual skills. At the end of the treatment period (35 days), all four groups improved one or more stanine points on reading readiness measures. Group 4 scored significantly better than the other three groups pooled in terms of IQ gain, and significantly better than the auditory group on reading readiness in subtests measuring visual perceptual abilities. Data is reported and analyzed in complete detail. (Author/PR)

EFFECTS OF FOUR DIFFERENT PERCEPTUAL TRAINING PROGRAMS ON IQ AND READING READINESS IN THE LOWER SOCIO-ECONOMIC LEVEL KINDERGARTEN CHILD

by

Marilyn Segal

A wide variety of reading readiness programs for the lower socio-economic level (SEL I) black child have been developed in recent years. These programs vary in methodology, content and focus, and reflect divergent opinions as to the need priorities of the SEL I black child. Programs giving the same priority to perceptual training, differ both as to the level of perceptual skills they focus on, and to the relative importance assigned to auditory and visual modality training. The present study is concerned with the evaluation of four different perceptual training programs for the SEL I kindergarten child. It explores the effects of these programs on IQ change and reading readiness measures and provides information that can be used as the basis of a curriculum decision.

The poor performance of the SEL I child on perceptual tasks (Spache, 1967; Harris, 1969) and the importance of perceptual skills in early reading performance (Rudnick, 1967; Ashlock, 1967) is well documented. There is, however, a lack of agreement as to the type of reading readiness experience that will have the highest probability of enabling the SEL I child to acquire the skills that are important for early reading performance.

Many educational theorists concerned with reading readiness stress the importance of developing a cluster of general readiness perceptual skills (Rudnick, 1947; Frostig, 1966). According to this school of thought, general readiness non-alphabet skills must be mastered before the child can be successful with the higher-order alphabet skills directly involved in decoding. Non-alphabet perceptual skills associated with reading performance include visual motor skills, visual and auditory perception skills, seriation and auditory visual integration.

Visual-Motor Skills. The relationship of visual-motor skills to reading performance has not been clearly defined. Delacato (1963), Getman and Hendrickson (1966), and Harris (1968) report significant correlations between visual-motor skills and reading performance. Grattan and Martin (1965), Kershner (1969), and Taylor and Nolde (1969) report no siginificant difference between measures of visual-motor proficiency and measures of reading performance. Jeralyn Plack (1968) reports highly significant relationships between reading and throw-and-catch and zigzag-run tests, but no relationship between reading, kicking, jumping, and reach tests.

Visual Skills. Marianne Frostig (Frostig and Horne, 1964) identifies six visual perception skills associated with reading performance: position in space, spatial relationship, figure ground perception, perceptual constancy, directionality, and hand-eye coordination. To measure these variables, Frostig developed a visual perception test. Correlation studies based on Frostig's test yield conflicting results. Quentin R. Bryan (1964) reports a study with first, second, and third grade children in which visual perception, as measured by the Frostig test, is a better predictor of first grade reading success than intelligence or reading readiness scores. In studies by both Jacobs (1968) and Weingart (1968), perceptual scores based on the Frostig test are not correlated with first grade reading performance. Frostig developed a reading readiness program designed to develop the six visual perception skills to which she assigns priority.

Jean Goins (1958) administered sixteen different visual perception measures to 120 first grade students. Using factor analysis, she identified two factors which clarify the intercorrelation patterns of the sixteen

measures. The first factor is labeled flexibility of closure, and described as facilitating the making of a closure in an unorganized field. The second factor is labeled by Goins as strength of closure, and described as facilitating the retention of a figure in a discriminating field. Reading achievement, according to Goins, loads on factor 2, but not on factor 1. Of all the variables measured, pattern copying loads out heaviest on factor 2 and correlates .519 with first grade reading achievement. Goins concluded that factor 2, measuring some sort of strength of closure, represents the ability to retain the pattern of a written word, which is an important skill at the first grade level.

Auditory Skills. C. Ann Brickner (1967), defining auditory discrimination as the degree to which an individual is capable of categorizing sound stimuli meaningfully and responding to them, developed two taped sequences of auditory materials; one of non-verbal sound stimuli and the other of narrative material. Her results showed consistent significant differences in listening ability favoring children trained with the narrative material.

Seriation. Inhelder and Piaget (1964) define seriation as the ordering of objects by size and orientation, and suggest a highly interactive relationship between seriation and classification or language functioning. In line with Piaget's conceptualization, Scott (1968) suggests that "deficiencies in perceptual skills may be key elements in the irreversible language deficiencies of many disadvantaged children " (p. 36), and that "the child must attain the basic skills in processing auditory and visual information before he makes the critical shift to a

predominantly visual approach with the advent of formal reading," (p. 37). Using an experimental seriation test with 365 Kindergarten subjects, Scott reported a significant (.58) Pearson product correlation between the California Seriation and Reading Achievement Test Scores. Hershoren (1969) and Hurley (1968) corroborate Scott's findings. Using the visual-motor sequencing sub-test (VMS) of the Illinois Test of Psycholinguistic Abilities, Hershoren reports a correlation of .61 between VMS and second grade reading comprehension. Using the same sequencing measure, Hurley reports that VMS scores discriminated between adequate and inadequate readers with a population of second grade readers taught by a phonics approach. On the other hand, Sterritt, et al, (1968) report no significance between reading success and visual-motor sequencing in a population of second grade readers.

Auditory-Visual Integration. The role of auditory-visual integration in the decoding process has received considerable attention in several studies. In a study by Raab, Deutsch, and Freedman (1960), more difficulty in shifting modalities was reported for poor readers than for good readers. Birch and Belmont (1964), correlating auditory-visual integration task scores of Kindergarten children with first and second grade reading performance, report an r of .70 with grade one reading and an r of .42 with second grade reading. Hurd (1967), on the other hand, discounts the importance of auditory-visual shifting. Using a specifically designed perceptual apparatus to measure a reaction time, Hurd reports r's of .969 and .970 between the ability to shift from auditory to visual, and the ability to respond to stimuli in the same channel. On the basis of these high coefficients, Hurd concludes that

shifting behavior is not independent of the ability to respond to stimuli in a single channel. Furthermore, coefficients computed between auditory-visual shifting and reading achievement were not significant at the .05 level. On the basis of these findings, Hurd suggests that only "random" relationships exist between sense modality shifting and reading achievement. Sterritt, et al (1968), in a study of six sub-processes involved in decoding, test the hypothesis that more errors would be made by a group of Kindergarten children on perceptual sub-tests involving modality transfer than on perceptual subtests that do not involve a transfer. In line with the findings of Hurd, this hypothesis was not supported.

Despite the body of research that relates general readiness perceptual skills to reading performance, many investigators challenge the assumption that competency in underlying perceptual skills is a prerequisite for successful decoding. They question the automatic transfer of acquired general perceptual skills to the decoding process. Harris (1969), in discussing the effect of perceptual training on performance, asserts that, "transfer of what is learned during perceptual training to the art of reading is not automatic, and sometimes does not take place." Muehl (1960) compares the performance on word list learning of children trained with a word list matching task with children trained with a geometric forms matching task. The children trained with the word list performed significantly better, In an effort to minimize the problem of transfer, many investigators, in seeking out reliable predictors of reading success, have focused on perceptual variables directly associated with decoding behaviors.

Several auditory and visual alphabet sub-skills that relate to reading performance have been identified in the literature.

Specific Visual Skills. Letter naming is recognized throughout the literature as the best single predictor of first grade reading achievement. Jeanne Chall (1967) analyzes seven predictive studies that relate knowledge of letters or letter-sound relationships to reading achievement. These seven studies report correlation coefficients from .3 to .9 between letter naming and early reading. The strength of letter naming as a predictor of reading success has been substantiated in a series of studies postdating Chall, most notably in the Dykstra (1968) study, in which findings from twenty-seven separate reading studies were coordinated and summarized. Silberberg (1968) and Panther (1967) have also produced studies in which alphabet knowledge emerges as the single best predictor of early reading performance.

Visual Discrimination of Letters and Words. Several investigators have explored the strategies used by children to identify words or letters. In an attempt to clarify the sub-skill component crucial to alphabet knowledge, Gibson, Gibson, Pick, and Osser (1962) conducted an experimental study of letterlike forms by which they investigated the dimensions of difference that are critical for the differentiation of letters for children four through eight years old. Twelve letterlike forms were constructed as standards, and transformations were developed for each standard, including three degrees of change from line to curve or vice versa, five changes in orientation, two perspective transformations, and two topological transformations. Errors were classified according to type of transformation mistakenly identified with the standard. The

investigators found a difference in performance between children four through eight years old not only in terms of the amount of error, but also in terms of the type of error. An analysis of the differences in type of error committed confirmed the hypothesis that the child has to learn the critical features of letters, so that, "because of transfer from his already good ability to differentiate critical features of objects, he does not start out'cold'" (Gibson, Gibson, Pick, and Osser, 1962, 0.905). These authors suggest that children learn the distinctive features of letters by simply "looking repeatedly at many samples of letters containing varying and invariant features." In an investigation of the bases of word recognition, Marchbanks and Levin (1965) found that with first grade children, the first letter of a word is the most salient cue used in decoding. They related this dependency on letter cue to preliminary alphabet training.

C. A. Shea (1968) investigated word discrimination in early reading. In a test of the predictive validity of a word discrimination test, Shea reports that a combination of a Lorge-Thorndike test and a visual discrimination word test was a better predictor of readiness to read than the combination of Lorge-Thorndike and the Metropolitan Readiness battery, with a correlation coefficient of .65 between achievement on the visual discrimination test and achievement on the word recognition test.

Specific Auditory Skills. Several different auditory skills related to decoding have been pointed out in the literature. Walter MacGinitie (1967) stresses the importance of auditory perception of letter sounds in beginning reading acquisition, whether the child is taught reading by a linguistic or a looksay approach. Mortenson (1968), measuring the ability of a group of Kindergarten children to discriminate beginning,

middle, and final sounds, reports a significant difference in all three measures across socio-economic levels. Dykstra (1966), administering seven auditory discrimination sub-tests from a series of published reading readiness tests, reported correlation coefficients between the auditory discrimination measures and the reading tests ranging from .19 to .43. By combining all seven tests, Dykstra was able to account for 32 to 38 percent of the variance in reading achievement.

Auditory Blending and Segmenting. Jeanne Chall (1963) investigated the importance of auditory blending as a factor in reading success where blending is described as the ability to reproduce a word by synthesizing its component sounds. Durrell and Murhpy (1963) demonstrated the importance of a reverse ability - the ability to segment words into sounds that correspond in sequence to letters or letter groups.

Educators who take the position that a reading readiness program for the SEL I child should have as an objective the development of these perceptual alphabet skills, disagree as to the relative importance of visual versus auditory training. Some educators, attributing reading difficulties to a lack of training in auditory skills, insist that top priority should be given to the training of auditory skills in the readiness stage (Chall, 1967; MacGinitie, 1967; Durrel, 1958). Other educators, taking the position that reading is a visual act, assign top priority to visual skill training (Scott, 1968; Frostig & Horne, 1964; Goins, 1958; Wheelock & Silvaroli, 1967; Bryan, 1964). Still another group insists that decoding involves an auditory-visual transformation, and that equal stress should be placed on auditory and visual training in the readiness stage (Balmuth, 1968; Connell, 1968; Mortenson, 1968). Balmuth, 1968, reviewing eight studies in which the use of one modality is compared with the

simultaneous use of more than one modality, reports the combination as superior in each instance.

In the present study, one investigator develops four perceptual training programs with each program reflecting a different point of view as to the kind of sub-skill training that will be most beneficial for the black SEL I Kindergarten child.

(1) GENERAL READINESS PROGRAM (GRP)

The rationale of the GRP program is that general readiness skills are the prerequisites for higher order alphabet skills, and should be taught first. This is particularly important with a population that is known to perform poorly on tests that measure perceptual sub-skills.

(2) VISUAL ALPHABET PERCEPTUAL PROGRAM (VAP)

The rationale of the VAP program is that reading is primarily a visual act. Pre-reading programs, therefore, should assign major priority to visual modality experiences. These experiences will be most valuable when they involve exposure to the same symbols that the child will use in decoding.

(3) AUDITORY ALPHABETH PROGRAM (AAP)

The rationale of the AAP program is that auditory skills are vital for successful decoding but are not acquired automatically. This is particularly true with the child whose ear is attuned to a different dialect or the child who has not been accustomed to attending to auditory input. Stress on auditory alphabet skill development will enable the child to discriminate and identify phonemes and will increase his probability of achieving success with early reading.

(4) AUDITORY-VISUAL ALPHABET PRECEPTION PROGRAM (AVAP)

The rationale of the AVAP program is that decoding involves an

auditory-visual transformation and that both auditory and visual skills are essential for successful performance. Perception is a learned behavior involving the interpretation of sensory input. When the sensory input of a pre-reading program includes letter forms and letter sounds, the child learns to attend to and interpret the same kind of stimuli to which he will be exposed in a reading program.

TOTAL PROGRAM

In the present study, these four perceptual programs are tests within the context of a total Kindergarten program. The overall program endorses the Piagetian learning model, which conceives of learning as the end result of interaction between the child and his environment. By keeping constant the overall educational experience to which the child is exposed, differences attributable to a perceptual treatment program can be identified.

HYPOTHESES

The present study tests five hypotheses relating to the effects of the four treatment programs.

Hypothesis I. There will be no significant difference in performance between AVAP and GRP on post-treatment measures of auditory and visual perception.

Rationale of Hypothesis I. In both the AVAP and GRP programs, there is equal emphasis on auditory and visual discrimination tasks, with the discrimination tasks in the general readiness program involving geometric shapes and non-verbal sounds, and the discrimination tasks in the AVAP program involving letter shapes and letter sounds. We would expect the GRP group to out-perform the AVAP group if perceptual skill development followed a hierarchical model in which successful performance of

general readiness tasks was the prerequisite for successful performance of discrimination tasks with letter sounds and shapes. The investigator assumes the position that the child who is placed on a program stressing alphabet perceptual skills will perform just as successfully on measures of auditory and visual perception as a child who is placed on a general readiness perceptual training program. Measures of auditory and visual perception will be used to test this hypothesis.

Hypothesis 2. AVAP will perform significantly better than GRP,VAP, and AAP taken as a pooled group -- on a post-treatment IQ measure.

Rationale of Hypothesis 2. Support of Hypothesis 2 would suggest that a task oriented skill building program where the input is both visual and auditory is more effective in improving general performance for the SEL-I child than a general readiness program emphasizing underlying perceptual skills, or a task-oriented skill building program in which only one modality is stressed.

Hypothesis 3. There will be no interaction effect between either auditory perception level, and treatment group membership; visual perception level and group; or IQ level and group, where auditory perception, visual perception, and IQ level are determined on the basis of pre-test scores.

Rationale of Hypothesis 3. Although support of this hypothesis does not preclude the possibility of developing a treatment prescription on the basis of pre-test profile, it does assert that this prescription cannot be developed on the basis of information provided by an IQ test, an auditory perception test, or a visual perception test.

Hypothesis 4. "AVAP-VAP" will perform significantly better than "GRP-AAP," and AVAP will perform significantly better than AAP on measures

of visual perception and on learning rate tests which use a look-say instructional method.

Hypothesis 5. "AVAP-AAP" will perform significantly better than "VAP-GRP," and AVAP will perform significantly better than VAP, on measures of auditory perception.

Rationale of Hypotheses 4 and 5. Training in letter naming and visual word discrimination is a part of the AVAP and VAP programs, but is not included in the AAP or GRP program. Training in auditory discrimination of beginning sounds is included in AVAP and AAP, but not in GRP or VAP. Support of Hypotheses 4 and 5 would suggest that both auditory and visual perception training are important for developing readiness skills. At the same time, it would demonstrate the plausibility of training perceptual skills specific to decoding.

Questions for Investigation

1. Do children who have difficulty making a shift from the visual to the auditory mode also have difficulty learning to read a list of words? We know that some children will perform less well on a test requiring an auditory shift than on a parallel test where the input is strictly visual. Do children who demonstrate this performance discrepancy perform less well on a word learning rate test than children who do not demonstrate this performance descrepancy? The answer to this question may provide information concerning the auditory-visual shifting behavior involved in beginning reading. A measure of auditory-visual shifting, and a measure of word-list learning will be used to investigate the question.
2. Does a child's activity level as assessed by a rating scale filled out by the teacher correlate significantly with post-treatment IQ or reading readiness scores? The answer to this question will

provide an indication of the effect of submissive behavior on learning. As the population of OEO children involved in the present study was observed by the teachers to be more submissive than OEO groups that had worked with in previous years, a high relationship between activity ratings and learning behaviors would have important implications for this study. Two pupil rating scales, a measure of primary Mental Ability, several measures of reading readiness, letter names, phoneme identification, auditory and visual perception, and learning rate - will be used to investigate this question.

3. Is the relative importance of auditory and visual perceptual training determined to any degree by the methodology used in teaching reading? The Murphy-Durrell reading readiness battery includes a sub-test which is called Learning Rate. This sub-test measures the child's ability to learn to read a list of irregularly spelled familiar words that are presented according to a standard approach and grouped according to meaning. The investigator constructed a similar learning rate test (LLR) but grouped the words used in the presentation according to spelling pattern similarities rather than meaning. Does the child in the VAP program who has been exposed to alphabet forms do better than the AAP child on the Murphy-Durrell learning test where success may depend on the ability to recall a configuration of symbols? Does the child who has been trained in an auditory alphabet program do better on the LLR than the VAP child where success may depend on the child's ability to discriminate likes and differences in beginning sounds?

PROCEDURES USED IN THIS STUDY

A. Design.

The design for the present study assigned 60 SEL I children to four treatment groups by a double stratified random sampling procedure on the basis of sex and IQ. Four teachers and eight aides were involved in the total program, with three of the four teachers and all eight aides working with the treatment material. For the morning sessions, the children were assigned to three classes conducted by aides, with five children from each of the four treatment groups (a total of twenty children) randomly assigned to each class. During the afternoon sessions, the four treatment groups were kept distinct. Each group rotated through four classrooms in the course of the afternoon, with equal amounts of time allotted to each class period. One teacher conducted a language concepts class; a second teacher taught reading readiness; a third, creativity, and; a fourth, mathematics. (Because all groups were taught math with the same program, the mathematics class, although part of the afternoon rotation, was not a part of the experiment.) Each teacher in the experiment, therefore, taught four different groups, using a different method with each group. Each child spent 25 minutes a day in each experimental class during the course of treatment. Class schedules were rotated every twelve days so that children who spent the first period with Teacher 1 in the first week, spent the first period with Teacher 2 in the following week, and so forth. This rotation guarded against a particular group's having prime time with a particular teacher. (See Table 1 below.)

TABLE 1

Morning

Aide 1	Aide 2	Aide 3
Class Composition	Class Composition	Class Composition
5 AAP children	5 AAP children	5 AAP children
5 VAP children	5 VAP children	5 VAP children
5 GRP children	5 GRP children	5 GRP children
5 AVAP children	5 AVAP children	5 AVAP children

Afternoon

	Teacher 1	Teacher 2	Teacher 3	Teacher 4
Period 1	GRP	VAP	AAP	AVAP
Period 2	VAP	AAP	AVAP	GRP
Period 3	AAP	AVAP	GRP	VAP
Period 4	AVAP	GRP	VAP	AAP

B. Development of Curriculum.

The development of curriculum for the present study was a major undertaking. The study called for an overall curriculum that would be appropriate for the SEL I child and would remain across treatment groups except for the perceptual training component. This perceptual training component had to be designed according to the specifications of each type of treatment, and then introduced into the general curriculum as an addition or modification. There were three classrooms in the experiment: reading readiness, creativity, and language concepts. Although the most concentrated perceptual training took place in the reading readiness classroom, perceptual training was also introduced into the language concepts and creativity classrooms. The investigator developed specific programs for each of the classrooms in the experiment, with four separate "editions" of these programs designed according to the specifications of the four experimental treatments. No special program was developed for mathematics, as the mathematics teacher used the same mathematics curriculum for all four treatment groups.

The first step in the building of curriculum was the development of objectives for the three experimental classrooms. These objectives were expressed in general terms for the creativity classroom and in behavioral terms for the language concepts classroom and the reading readiness classroom. The listing of objectives served four purposes: (1) It provided a set of guidelines for the teacher; (2) it provided a means of keeping the four treatments parallel; (3) it provided a basis for ongoing progress records, and; (4) it gave the instruction a programmed format and thus opened up the possibility for replication.

The second step in the construction of the treatment program was the development of a list of suggested activities to accompany the behavioral objectives. Based on the assumption that learning takes place as the result of an interaction between the child and his environment, the suggested activities were designed to provide experiences that would maximize the opportunity for the SEL child to learn through encounter rather than drill. These activities included the following features:

a. Several activities were suggested for each behavioral objective, providing alternatives that would take into account individual preferences, and enable a child to learn through successive encounters with his environment.

b. Suggested activities emphasized small group and individual activities, thus providing the child with opportunities for interaction with his peers as well as interaction with an adult on a one-to-one basis.

c. Concrete manipulative materials were used extensively.

d. Wherever possible, instructional materials included a self-corrective element so that the child could receive immediate feedback and reinforcement.

e. The activities provided the basis for individualized instruction in which an appropriate starting point and pace could be selected for each child.

1. Reading Readiness

The GRP reading readiness program was designed to develop an array of underlying auditory and visual skills related to decoding behavior. Three major sources were tapped: (a) Descriptive statistics revealing perceptual deficits of the SEL I child; (b) published studies relating performance in different perceptual tasks to decoding, and; (c) published

programs or listings of underlying perceptual skills related to decoding behavior, including the Frostig Program (Frostig & Horne, 1964), the New York Curriculum (1968) Sequence of Objectives, the Hartford "Follow-Through" Program (1969), Lauren Resnick's Preschool Curriculum (Resnick, 1967), and the Llorens Training Program (Llorens, et al, 1969).

The three reading readiness alphabet programs followed essentially the same format as the GRP reading readiness programs. The behavioral objectives listed for the VAP reading readiness program represent a modification of the general readiness visual perception listing, since with these objectives, the emphasis was shifted from visual experience with shape, color, and abstract symbol to visual experience with letters. Letters were used in tasks requiring discrimination, identification, perceptual constancy, sequency, figure-ground perception, and spatial orientation. The behavioral objectives listed for the AAP reading readiness program also represent a modification of general readiness auditory perception objectives, since the emphasis here is on the matching, identifying, ordering, and discriminating of letter sounds. The AVAP behavioral objectives incorporate the objectives of both VAP and AAP, and include a series of tasks that require modality shifting. In developing behavioral objectives and suggested activities for alphabet reading readiness programs, the following sources were tapped: The New York Curriculum (1968), the Lyons and Carnahan (1966) Reading Readiness Objectives Program, Chall (1967), and Bereiter and Engleman (1967).

2. Language Concepts

Behavioral objectives for the language concepts program are derived from the literature that describes the unique cognitive style and language characteristics of the SEL I child (Baratz, 1969; Cazden, 1968). The

language concepts program stresses listening, language production, verbal interaction, categorization, and generalization. Emphasis was placed on communication rather than production of standard English syntax. In line with the finding that the SEL I child acquires language through the co-occurrence of label and referent, routines in which the child describes an ongoing action were given particular emphasis. Pattern drills were introduced with the hope of training the SEL I child to use language in a mediational role, allowing him to use internal language as a cognitive tool (Bereiter, Engleman, Osborn, and Reidford, 1966). Games and routines were introduced to teach constructions with a low frequency in SEL I black language repertoire. Accordingly, "not" constructions, pronouns, passive constructions, function words, and tense constructions were given special emphasis. General instructions to the teacher in a manual accompanying the objective listings pointed up the importance to the child of self-expression through language and discouraged the teacher from "correcting" non-standard usage. Major sources for the language concepts objectives and activities were: Bereiter and Engelman, Osborn, and Reidford (1966), Gotkin (1968), Baratz (1969), and O'Donnell (1068). AAP, VAP, and AVAP versions of the general readiness program included the same behavioral objectives as the GRP language program. In the suggested activities, however, modifications in line with the treatment prescription were introduced whenever appropriate. An example follows:

Behavioral Objective:	Uses "not" construction appropriately in a sentence.
Suggested Activity for GRP Equipment:	A series of containers with objects belonging to two different classes in each container. One container has shells and rocks; a second container has leaves and flowers; a third container has squares of paper and squares of fabric.

Procedure:	Each child selects one object from one container and describes it using this format: "This is a shell. It is not a rock."
Suggested Activity for VAP Equipment:	A series of containers, each holding two letters.
Procedure:	The child selects a letter and says, "This is a b. This is not a d."
Suggested Activity of AAP Equipment:	A series of containers, each holding two pairs of rhyming objects, or two pairs of objects with like beginning sounds. Examples are: shell - bell, car - star, for rhyming objects; bell-boat, cat - car, for objects with like beginning sounds.
Procedure:	The child selects an object from one of the containers. "This is a cat. It begins like car. It does not begin like dog."
Suggested Activity for AVAP Equipment:	A series of containers, each holding two objects and two letters; the letters correspond to the beginning sounds of the objects. For example, with the letters b and w, the objects might be a ball and a wagon.
Procedure:	The child selects an object. "This is a ball. It begins with a b. It does not begin with a w."

3. Creativity

For the creativity program, objectives were stated in general rather than behavioral terms. The teacher was given a book of daily lesson plans with activities included for each of the four treatment groups. These activities included for each day an art or craft activity, and a music, dance, or dramatic activity, with appropriate modifications for the different treatment groups. An example of a craft activity follows:

MATERIAL: CLAY

Suggested Activity for GRP:	Make a variety of shapes with clay.
Suggested Activity for AAP:	Make objects with the same beginning sounds as boy.(Ball, beads, boats, bananas serve as models.)
Suggested Activity for VAP:	Make an upper case and lower case b out of clay.
Suggested Activity for AVAP:	Make a lower case b and an object that begins with the b sound.

C. Description of Sample.

The sample for the study consisted of 30 males and 30 females, ranging at the beginning fo the study from four years six months to six years of age, with 90 percent of the children between five and six years old. Fifty-three of the children were black and 7 white. These children were recruited by the staff of the Office of Economic Opportunity in Broward County, Florida. All of the children in the study came from economically deprived areas in the environs of Hollywood, Florida. Family income ranged from $3,000 to $4,000 per family per year. The majority of the children lived either in project single dwelling or project apartments located in Hollywood, West Hollywood, and Dania; 6 of the children came from the migrant worker colony in Davie. Statistics on employment, marital status, and parent education were difficult to acquire as the parents were sensitive about being questioned. (Parents of registrants responded verbally to a questionnaire on the family, but were not required to answer any questions if they raised objections.) Thirty-five families responded to a question on marital status. Of these, 25 reported parents living together, 8 reported parental separation with child living with mother, and 2 listed themselves as "guardians." Applicants who did not respond to the question on marital status may have been protective of their aid-to-dependent children status, or perhaps were

involved in family situations where parentage was not clearly delineated. Nine families responded to the question on educational status of both parents, and nine more reported the highest grade attended by one parent. Among these respondees, three parents had attended two years of college, eleven parents were graduated from high school, and four parents had gone through the eleventh grade. The remaining respondees on education reported between four and ten years of school attendance. It was the impression of the OEO social worker that applicants who failed to respond to the question on education were likely not have finished elementary school. Occupations were reported for 25 fathers and 17 mothers. Eleven fathers worked in construction, seven in service, four in farming or gardening, and two in auto repairs. Fifteen mothers were domestics, one was a beautician, and one was a nurse's aide. It was the impression of the social worker that many fathers who did not list their occupations worked as day laborers, fruit pickers, or field workers. Place of birth and number of siblings were listed on all applications. All but three of the children were born in Florida and all but seven were born in Broward County. The mean number of children per family was three.

All children in the school were given a physical examination during the course of treatment and reports were made available to the investigator. The most common health problem was anemia with hemoglobin below a gram percentage of 37 reported for all OEO children in the school. (A gram percentage of less than 65 falls below the normal range.) Four cases of systolic murmur, three cases of coarse chest rales, three orthopedic problems, two ear problems, two cases of ketone bodies in the urine, one hydrocele, one umbilical hernia, one protruding abdomen, one case of epilepsy, and several uper respiratory infections were reported by the

physician. Children with special problems were wait-listed for referral to a specialist. Daily vitamin and iron pills were prescribed for all of the O.E.O. children.

D. Setting

The study was conducted in the University School Center in Hollywood, Florida. The University School is a private, non-profit school with a close working relationship with the Social and Behavioral Sciences Center of Nova University. It was housed in the Sunday School wing of Temple Beth El. The University School, jointly with the Broward County Office of Economic Opportunity, sponsored a Day Care program for SEL I Kintergarten children. The SEL I children in the center were all Head Start applicants who were not enrolled in the regular Broward County Head Start program because of either late applications or lack of space in the facility in their area. The children were bussed to school by the Office of Economic Opportunity, and were given hot lunches through the Broward County School System. The children remained in school for the entire day, with the morning program conducted under the auspices of the Office of Economic Opportunity Day Care staff, and the afternoon program conducted under the auspices of the University School staff.

The Staff. Two full time staff members employed by the Office of Economic Opportunity and eight trainees sponsored by the Broward County Economic Opportunity Center were associated with the SEL I program. Two teachers from the University School worked half-time with the SEL I program. In addition, there were several volunteers, including a retired art teacher, who helped with the morning program. Formal instruction took place in the afternoon, with one teacher and two Opportunity Center aides in each classroom. Qualifications of staff members follow.

Teacher	Area	Sex	Race	Training
OEO Teacher	Mathematics	Male	Negro	College trained but not certified
University School Teacher	Reading Readiness	Female	White	Certified in Early Childhood Education
University School Teacher	Language	Female	White	Certified in Early Childhood Education
OEO Teacher	Creativity	Female	Negro	High School diploma: Child-care Certificate
Trainees (Total 8)	Rotate	Female	7 Negro 1 White	High School dropouts High School dropout

E. Tests and Measures

1. Test of General Ability

The Pinter-Cunningham Primary IQ Test was selected as the measure of IQ. This selection was made on the basis of experience with the SEL I child. After experimenting with several group IQ tests, including the Cattell-Culture-Fair Test, the concensus of opinion of the University School staff was that the Pintner-Cunningham Primary Test was the most useful instrument for the SEL I children at the school. This judgement was made on the basis of ease of administration, total testing time, clarity of directions, format and layout, and appropriateness of content. In contrast to performance on several other measures of general ability, very few children zeroed out completely on this test.

The primary battery of Pintner-Cunningham is designed for K-2. According to Thorndale and Hagen (1966), both reliability and validity are satisfactory, and the manual is clear and complete. The manual reports a split-half reliability figure of .84.

2. Measures of Reading Readiness.

Reading readiness measures used as predictors and/or criteria for the

study include: (a) the Murphy-Durrell Reading Readiness Analysis sub-tests; Phonemes Part I, Letter Names, and Learning Rate; (b) the Gates-MacGinitie Readiness Measures:Auditory Discrimination and Visual Discrimination subtests; (c) a linguistic learning rate test developed by the investigator using the same format as the Murphy-Durrell Learning Rate Test with modification of the word list and mode of presentation, and; (d) an auditory-visual shifting test constructed by the investigator.

Murphy-Durrell Reading Readiness Measures: The Murphy-Durrell Reading Readiness Analysis was selected as one of the operational measures of reading readiness. It was the only standard Reading Readiness battery reported in Buros (1968) that included both a phoneme discrimination test and a learning rate measure. Three sub-tests from the Murphy-Durrell Analysis were used as both pre-tests and post-tests: (a) the phonemes test, providing an inventory of the child's ability to identify separate sounds in spoken words; (b) the letter names test, measuring the child's ability to identify named letters, and; (c) the learning rate test, measuring the number of words a child can recognize one hour after a formal instructional presentation using a standard look-say approach. The odd-even split-half realiability coefficient for the Phonemes is .94, for Letter Names, .94, and for Learning Rate, .88. The total test reliability using odd-even, split-half correlation coefficients is .98, the correlation with the Pintner-Cunningham Primary Test is .94, and the predictive validity coefficient with the Stanford Reading Achievement Test is .65.

Gates-MacGinitie Reading Readiness Measures: The Gates-MacGinitie Reading Readiness Test was selected as a second operational measure of Reading Readiness.

behavior. These rating scales were not a part of the original plan for the study but were an outgrowth of a conference with the school principal. The principal expressed the opinion that this class of OEO children seemed quieter and more submissive than children who had been in the school in previous years. Because the sample for the study was small, it seemed important to have a pre-measure of any atypical behavior that could have an effect on treatment. The pupil rating scales were modifications of behavior rating scales that had been developed and had been developed and used in the University School. The Attending Behavior Scale was developed as a measure of various attending behaviors including responsiveness, attention span, and ability to follow directions. These behaviors were rated as excellent, very good, good, fair or poor. The Activity Level scale was developed as a measure of the child's response level, and included amount of activity, speed of activity, amount of talking and amount of laughter. These behaviors are rated on a 5 point scale: 1 = to little; 2 = somewhat too little; 3 = appropriate; 4 = somewhat too much, and; 5 = too much (see Appendix).

F. Administration of Program

1. Administration of Pre-Tests.

Pre-tests were conducted in a two-week period prior to the introduction of the treatment regime. Several members of the University School staff, and several volunteers from the community with prior testing experience, administered the pre-tests. All standardized group tests were given on Tuesday, Wednesday, and Thursday. Manual specifications were adhered to exactly. Group size was held at the minimum level suggested by the manual, and adult-pupil ratio was held at the maximum level. Where the manual presented an option of giving the test in one or two sittings, the second option was selected. For four weeks prior to the testing program

children were given daily practice in the following tasks: (a) placing a mark on a picture; (b) making an X; and (c) drawing a line under a picture.

The following pre-test measures were collected for the total study population prior to treatment:

(a) Pintner-Cunningham Primary IQ Test.

(b) Murphy-Durrell Reading Readiness Analysis: Phonemes Part I, Letter Names, and Learning Rate Sub-tests.

(c) Gates-MacGinitie Reading Measures: Auditory Discrimination and Visual Discrimination Sub-tests.

(d) Auditory-Visual Shifting Test constructed by the examiner.

In addition, teacher aide teams were asked to fill out pupil rating sheets, with each team responsible for completing the forms for twenty children. When team members could not decide upon or agree upon a particular rating, a supervisory teacher was consulted.

Sampling Procedures. Pre-tests were administered to a total sample of 64 children. On the bases of these pre-tests four children were eliminated from the sample. Three children zeroed out completely on the pre-tests (scribbled across the pages), and could not be assigned a score. One child was partially sighted and could not be tested. The 60 remaining children were stratified according to sex and IQ level (upper, middle, or lower third) and randomly assigned to treatment group through a double stratification procedure.

Orientation

Teacher orientation extended over a three-day period, with the first day devoted to a group conference, and the second and third days devoted to individual conferences with each of the three teachers involved in the experimental program. The following materials were given to each of the experimental teachers at the beginning of the conference:

a. A set of behavioral objectives and suggested activities arranged in sequence (see Appendix A).

b. A teacher's manual with detailed instructions for suggested activities (see Appendix F).

c. A game kit with materials and detailed instructions for all self-corrective manipulative games to be used in the programs. These games were constructed specifically for the study in accordance with the behavioral objectives set forth (see Appendix G).

d. A set of booklets with pencil and paper activities for each child. These activities were constructed for the study in accordance with the behavioral objectives (see Appendix H).

e. A kit of records, books, and materials purchased for the study.

f. A set of tapes with cards and a listening board to be used for individualized listening activities (see Appendix I).

g. A set of individual child record sheets constructed in accordance with the behavioral objectives (see Appendix J).

The Course of Treatment

The course of treatment extended over a three-month period and included a total of thirty-six instructional days. The investigator had planned for a total of sixty instructional days but several unexpected contingencies arose which eliminated a total of twenty-four treatment days. Five days were lost because of health visits scheduled by the Board of Health, four days were lost because of bus breakdowns, three days because of special programs scheduled by the OEO Office, six days because of teacher illness, four days because of unscheduled school holidays, and two days because building construction required the facility to be evacuated. The period of time devoted to treatment per day was also cut back. Original plans called for 40-minute class period, giving each child a total of 120 minutes or two hours per day in a treatment program. Lunch schedules and bus schedules interferred with this timetable, so that each period had to be cut from 40 to 25 minutes. This gave each child approximately 75 minutes per day in a treatment program. The afternoon period was always apportioned so that each treatment group spent an equal period of time in each of the four classrooms, with a bell signaling the end of each period.

Attrition. Seven children were dropped from the original sample. Five of these children left the school, a sixth child was dropped from the study when it was discovered that the birthdate was wrong on her application form and she was only three years old, and a seventh child was dropped

because he had been absent for seven consecutive weeks. The investigator had stated as a preliminary condition that any child absent more than two consecutive weeks would be dropped from the sample.

Follow-ups were done on the five children who left the school. In two cases, families had moved away from the area. In two other cases, the children were taken out because of "family troubles"; in the fifth case, the family would not give a reason. As a result of this attrition, the composition of the final groups was as follows: GRP, 13; VAP, 13; AAP, 14; and AVAP, 13.

Administration of Post-tests

Post-tests were carried on during the two-week period following the treatment course by a team of testers similar to the pre-test team. Morning classroom groupings, in which treatment groups had proportional representation, were retained during this testing period. The following post-tests were administered to the total population:

(a) Pintner-Cunningham Primary IQ Test.

(b) Murphy-Durrell Phonemes Part I and Letter Names Sub-tests.

(c) Gates-MacGinitie Auditory Discrimination and Visual Discrimination Sub-tests.

(d) Linguistic Learning Rate Test constructed by the examiner.

G. DATA ANALYSIS

Pre-treatment Information

Prior to the treatment, the following measures were collected on the total group: The Pintner-Cunningham Mental Ability Test, Form A; the Gates-MacGinitie Readingness Skills sub-tests II and III; the Murphy-Durrell Reading Readiness Analysis, Phonemes sub-test Part I, Letter Names sub-test Part I, and Learning Rate Test; and auditory-visual shifting test constructed by the investigator, Attending Behavior Rating, and Activity Level Rating.

Pre-test measures for the population tended to be positively skewed (see Appendix L for distributions) with a disproportionate number of children receiving zero scores on the letter names test, the learning rate test, and the Gates Visual Perception Test (see Table 2). Unfortunately, this truncated distribution could have obscured real differences in the sample that may have influenced the outcome of treatment. According to national norms, mean scores for the sample were in the 2nd stanine on standard reading readiness sub-tests and IQ. Reading readiness measures were not independent, with Letter Naming, and Gates Auditory and Vistual tests significantly correlated with IQ (see Table 3).

Treatment Groups

A double stratified random sampling procedure was used for distribution of the sample into treatment groups. Subjects were categorized according to sex and IQ level. A raw score of 17 or under represented the cut-off point

TABLE 2

PRE-TEST SCORES N = 53

(As Adjusted for Attrition)

TEST	GROUP MEAN	STANDARD DEVIATION	RANGE	NUMBER OF SUBJECTS WITH ZERO SCORES	NATIONAL STANINES
Pintner-Cunningham I.Q.	23.7	11.6	10-57	0	2
Murphy-Durrell Phonemes	6.8	3.4	0-15	1	2
Letter Names	2.4	4.37	0-17	36	2
Learning Rate	3.41	3.40	0-16	16	2
Gates Auditory	9.71	4.01	0-19	1	2
Gates Visual	3.8	3.5	0-19	10	2
1-1 Auditory	4.01	3.46	0-10	6	
1-1 Visual	5.1	3.58	0-10	2	

TABLE 3

CHART 1

PRE-TEST
INTERCORRELATIONS

	SEX	IQ	PHONEMES	LETTER NAMING	LEARNING RATE	GATES AUDITORY	GATES VISUAL
SEX		.02	.05	.09	-.01	.16	.09
IQ			.38	**.64	.25	**.51	**.50
PHONEMES				.33	.14	.41	.17
LETTER NAME					.12	**.50	.42
LEARNING RATE						.24	.17
GATES AUDITORY							*.47
GATES VISUAL							

*significant at the .05 level
**significant at the .01 level

for low IQ, and a raw score of 24 or over represented the cut-off point for high IQ. A table of random numbers was used to placesubjects from the six cells, representing sex and IQ level, into four treatment groups.

Using all pre-test scores as variables, a discriminant function analysis was performed using the Veldman Discriminant Function Program (1967). The discriminant function yielded a nonsignificant overall F ratio of 1.109 ($p = .35$ with D.F. 18 and 124). The univariate F tests for the four treatment groups on each of the individual pre-tests were also nonsignificant. On the basis of this analysis, the original treatment assignments were maintained. In a second discriminant function analysis where study dropouts were deleted all the F ratios remained nonsignificant.

Teachers' Opinionnaires

The three teachers taking part in the experimental program were asked to fill out an opinionnaire in the beginning and at the end of the experimental program. This opinionnaire was designed to measure teacher reaction to the four treatment programs (see Teacher Attitude Questionnaire - Table 4). The Principal of the school was also interviewed before and after treatment (Fessler, 1969, 1970), and questioned as to her perceptions of the teacher attitudes toward the four treatment programs. According to the Principal, Teacher A was a confirmed advocate of a general readiness approach, while teachers B and C tended to be more pragmatic and more open to innovative ideas. The original opinionnaire filled out by the teachers after the workshop reflected no strong bias on the part of any of the teachers. The final opinionnaire showed a general enthusiasm for GRP, little change of opinion for AVAP, and a skepticism about the effectiveness of AAP and VAP, with teacher A assuming a strong negative position.

TABLE 4

TEACHER ATTITUDE QUESTIONNAIRE

LEGEND:
TEACHER A = READING READINESS
TEACHER B = LANGUAGE
TEACHER C = CREATIVITY

1 = Pre. 2 = Post

	Definitely Agree	Moderately Agree	Don't Know	Disagree Mildly	Disagree Strongly
1. The Auditory Program should be easy for the teacher to follow.	A-1 C-1,2	A-2 B-1,2			
2. The Visual Program should be easy for the teacher to follow.	A-1 B-1 C-1,2	A-2 B-2			
3. The Auditory Visual Program should be easy for the teacher to follow.	A-1 C-1,2	B-1,2 A-2			
4. The General Readiness Program should be easy for the teacher to follow.	A-1 B-1,2 C-1,2	A-2			
5. The Auditory Program should work well with the children in my class.	C-1	A-1 B-2	B-1 C-2	A-2	
6. The Visual Program should work well with the children in my class.	A-1 C-1	B-1,2	C-2	A-2	
7. The Auditory-Visual Program should work well with the children in my class.	A-1 C-1,2	B-1,2 A-2			
8. The General Readiness Program should work well with the children in my class.	A-1 B-2 C-1,2	B-1 A-2			
9. The children should enjoy the Auditory Program.	A-1 B-1 C-1	B-2	C-2		A-2
10. The children should enjoy the Visual Program.	A-1 B-1 C-1	B-2	C-2		A-2
11. The children should enjoy the Auditory-Visual Program.	A-1 B-1 C-1	B-2 C-2		A-2	
12. The children should enjoy the General Readiness program.	A-1 B-1,2 C-1,2	A-2			

Post-Tests

Post-tests were conducted immediately following the experimental program with conditions closely paralleling conditions of the pre-test. Post-test measures included Pintner-Cunningham IQ, Gates Auditory and Visual Sub-tests, Murphy-Durrell Learning Rate, Letter Names, and Phonemes I Sub-tests, and a Linguistic Learning Rate test constructed by the investigator. The Linguistic Learning Rate Test and Murphy-Durrell Learning Test were split in half. Part I of each test was administered at one sitting, and Part II of each test at a second sitting. This split-half procedure was used to circumvent the problem of differential practice effects. Means, standard deviations and Stanine scores were computed for each group on each measure (see Appendix K). Based on National norms the total group registered a mean gain of one or more stanines on all measures (see Table 5). In contrast to pre-test measures, post-test measures tended to be normally distributed (see Appendix L). The pattern of intercorrelations on the post-test also differed from the pre-test patterns. LLR, MDLR and Gates Visual were significantly correlated with each other but not with IQ, while letter names, IQ and Gates Auditory were highly intercorrelated (see Table 6).

RESULTS

STATISTICAL PROCEDURES USED FOR TESTING HYPOTHESES

All hypotheses are tested with a multiple regression analysis of covariance using a computer program adapted from Veldman (1967). The multiple regression approach is analogous to a single classification analysis of variance. It defines a "full" model which takes into account the predictive power of group membership and compares it to a restricted model where group membership is not utilized as a predictor. A squared multiple correlation coefficient (R^2) for both the full and restricted models is calculated an an F ratio and probability value is

TABLE 5

PRE- AND POST-TEST SCORES ACCORDING TO GROUP

TREATMENT	TOTAL GROUP 53	PRE	POST	DIFFERENCE
PHONEMES	MEAN	6.8	11.6	5.2
	S.D.	3.4	3.8	
	S. ERR.	.47	.53	
	STANINE	2	3	1
LETTER NAMES	MEAN	2.4	23.8	21.4
	SD	4.3	14.4	
	S. ERR.	1.11	2	
	STANINE	2	4	2
MDLR	MEAN	3.4	9.6	6.2
	S.D.	3.5	3.9	
	S. ERR.	.56	.53	
	STANINE	2	5	3
LLR	MEAN		10.1	
	S.D.		3.3	
	S. ERR.		.46	
	STANINE			
PINTNER-CUNNINGHAM	MEAN	23.7	34.3	10.6
	S.D.	11.7	14.2	
	S. ERR.	1.61	1.95	
	STANINE	2	3	1
GATES AUDITORY	MEAN	9.8	13.6	3.8
	S.D.	3.7	4	
	S. ERR.	.51	.56	
	STANINE	2	3	1
GATES VISUAL	MEAN	4.4	9.5	5.1
	S.D.	3.5	6.1	
	S. ERR.	.53	.85	
	STANINE	2	4	2

TABLE 6

POST-TEST INTERCORRELATIONS

	Phonemes	Letter Names	Gates Auditory	Gates Visual	LLR	MDLR	IQ
Phonemes		28	32	**86	**78	**75	14
Letter Names			51	35	38	37	57
Gates Auditory				36	38	32	**64
Gates Visual					**71	**65	16
LLR						**65	30
MODL							23

calculated on the basis of the R^2 difference between the two models. This procedure does not require an equal number of subjects per cell.

The investigator used multiple regression analysis of covariance rather than variance in testing all hypotheses to control for differences in post-test performance that could be attributed to differences in pre-test performance. In each instance the covariate is a pre-test score used as a predictor in both the full and restricted models to eliminate the R^2 difference between models that could be explained by entering knowledge or ability.

A pre-condition of the analysis of covariance is the establishment of homogeneity of regression or parallelism of regression lines. The establishment of homogeneity of regression indicates that the amount of change in post-test score per unit of pre-test score is the same for all treatment groups. Models are set up to test for homogeneity of regression according to the procedures recommended in Ward and Bottenberg (1963). (See Appendix E.) The full model uses the pre-test score of each treatment group as a separate predictor, and computes partial regression weights for each predictor. The reduced model combines all treatment group covariate scores into one predictor and computes a single regression weight.

STATISTICAL ANALYSIS OF HYPOTHESES

(For the purpose of the analysis all hypotheses are stated in the null form.)

HYPOTHESIS I.

(A) With homogeneity of regression established, and Gates Reading Readiness Auditory Perception Pre-test scores used as a covariate, there will be no significant difference in performance between AVAP and GRP using the Gates Readiness Auditory Perception Post-test as a criterion.

The first step of the analysis for this hypothesis is the test for homogeneity of regression to determine whether the amount of gain per unit of concomitant variable was the same under the two treatment conditions. Establishment of homogeneity of regression would indicate that the relative effectiveness of the treatments did not vary across individuals as a function of pre-test performance level. With models set up according to the procedures defined above, the R Square difference between the full model and the restricted model was .059, yielding a non-significant F ratio of 3.14 with one and twenty-three degrees of freedom. With homogeneity of regression established we can then ask the question, are the GRP and AVAP equally effective for subjects with pre-test scores within the observed range? Comparison of the R Squares for the full model and the restructed model yields an R Square difference of .0066 with a corresponding non-significant F ratio of .162 ($p < 0.85$ with 1 and 23 degrees of freedom). On the basis of this P value we cannot reject the null hypothesis that AVAP and GRP treatments are equally effective with Gates auditory perception sub-test as the criterion.

TABLE 7

Comparison Between AVAP and GRP on Gates Auditory Post-test with Gates Auditory Pre-test Used as a Covariate

R^2 Full Model	.5300
R^2 Reduced Model	.5235
R^2 Difference Between Models	.0066
F Ratio with 1 and 23 Degrees of Freedom	.162
Probability	<.85
AVAP Mean	13.4
GRP Mean	14.0

TABLE 8

Comparison Between AVAP and GRP on Gates Visual Post-test with Gates Visual Pre-Test Used as a Covariate

R^2 Full Model	.2826
R^2 Reduced Model	.2780
R^2 Difference Between Models	.0045
F Ratio with 1 and 23 Degrees of Freedom	.073
Probability	$<.93$
GRP Mean	9.8
AVAP Mean	8.8

Statistical Hypothesis IB. With homogeneity of regression established and the Gates visual perception pre-test scores used as a covariate, there will be no significant difference in performance between AVAP and GRP using the Gates visual perception post-test as the criterion.

A multiple regression approach was used to test this hypothesis, with models set up following the procedure defined in Chapter 3. In the test for homogeneity of regression the R-square difference between the full and restricted model was .0001 yielding a non-significant F ratio of .003 ($p < .95$). In the test between models demonstrating the effect of group membership, the difference between R-square full and R-square reduced was .0045 yielding an F ratio of .073 (p value $<$ .93). The null hypothesis stating that there was no significant difference in performance between AVAP and GRP could not be rejected (see Table 5B).

Procedures Preliminary to Further Hypothesis Testing:

Preliminary to further statistical analysis, tests for homogeneity of regression across treatment groups were performed on all pre-test measures assigned as covariates, using the multiple regression approach. Using the procedures outlined above homogeneity of regression across treatment

groups was established for all covariates with the exception of Gates Auditory (see Table 9). In the case of Gates Auditory Test the R-square difference between the full and restricted model was .13 yielding an F value of 3.13, significant at the .05 level. Homogeneity of regression between pre- and post-Gates Auditory Perception Test had already been established for GRP and VAP. It seemed appropriate, therefore, to explore the pre-post scores scattergrams for the four treatment groups (Appendix M). It is evident from the scattergrams that the relationship between pre-test and post-test scores is erratic in the VAP treatment group. Accordingly, the Gates Auditory pre-tests could not be used appropriately as a covariate in data analysis when all four groups are considered in the analysis.

Statistical Hypothesis 2. With homogeneity of regression established and Pintner-Cunningham pre-scores used as a covariate, there will be no significant difference in performance between AVAP and "GRP, AAP, and VAP" taken as a pooled group.

The Manova program was used for this analysis, using the special contrast option (Edwards, 1967), allowing a comparison between AVAP and the average of GRP, VAP and AAP. This analysis yielded an F value of 2.98, significant at the .05 level with 3 and 49 degrees of freedom. On the basis of this analysis we can reject the null hypothesis stating that there is no significant difference in post-test Pintner-Cunningham IQ scores resulting from treatment (see Table 10).

Statistical Hypothesis 3. With homogeneity of regression established and pre-test scores used as covariates, there will be no interaction effect between pre-treatment (a) auditory perception level and group, (b) visual perception level and group, (c) IQ level and group, on post-test performance.

TABLE 9

F TESTS BETWEEN MODELS FOR THE ESTABLISHMENT OF HOMOGENEITY OF REGRESSION WITH POST-TEST USED AS CRITERIA AND PRE-TESTS USED AS COVARIATES

ACROSS ALL GROUPS

F TEST NUMBER	CRITERIA	COVARIATE	R SQUARE FOR THE FULL MODEL	R SQUARE FOR THE REDUCED MODEL	DIFFERENCE	DF OF NUMERATOR	DF OF DENOMINATOR	F VALUE	P VALUE
1	Post-tests of Murphy-Durrell Phonemes Part I	Pre-tests of Murphy-Durrell Phonemes Part I	0.0874	0.0471	0.0402	3	44	0.646	P<0.59
2	Post-tests of Murphy-Durrell Learning Rate Sub-test	Pre-tests of Murphy-Durrell Learning Rate Sub-test	0.0942	0.0659	0.0282	3	44	0.457	P<0.72
3	Post-tests of Murphy-Durrell Letter Name	Pre-tests of Murphy-Durrell Letter Name	0.2886	0.2795	0.0090	3	44	0.187	P<0.90
4	Post-tests of Pintner-Cunningham I.Q.	Pre-tests of Pintner Cunningham I.Q.	0.6245	0.5965	.03	3	44	1.10	P<0.36
5	Post-tests of Gates Auditory	Pre-tests of Gates Auditory	0.3891	0.2587	0.1303	3	44	3.13	P<0.03
6	Post-tests of Gates Visual	Pre-tests of Gates Visual	0.2647	0.2559	0.0087	3	44	0.175	P<0.91

TABLE 10

AVAP VS VAP, AAP AND GRP POOLED ON PINTER-CUNNINGHAM I.Q.
MANOVA PROGRAM FOR COMPUTATION OF GROUP EFFECTS USING SPECIAL CONTRASTS

GROUPS	OBS	PINTNER-CUNNINGHAM PRE-TEST		PINTNER-CUNNINGHAM POST-TEST	
		MEANS	S.D.	MEANS	S.D.
GRP	13	26.31	13.52	35.70	13.12
VAP	13	20.85	7.65	29.77	14.17
AAP	14	23.29	12.63	31.07	13.18
AVAP	13	24.14	12.57	41.14	14.48

CONTRASTS	WEIGHTS	CRITERION	COVARIATE	DF	F VALUE	P VALUE <
AVAP vs. VAP, AAP & GRP	.33 .33 .33 -1	Post P.C. I.Q.	Pre P.C. I.Q.	3.49	2.962	.041

For this analysis, each subject was assigned a level score of 1, 2 or 3 for visual, auditory and IQ level, according to the ordinal position of his associated pre-test scores on the Gates visual and auditory pre-tests and the Pintner-Cunningham IQ test. In each case, individuals scoring in the lower third of the distribution were assigned a 1, in the middle third a 2, and in the upper third a 3.

Using the Manova program with a 3 x 4 factorial design, three analyses were performed testing the interaction effect of pre-treatment auditory level and group, pre-treatment visual level and group, and pre-treatment IQ level and group. No significant interaction effects were revealed (see Table 11), and the null hypothesis could not be rejected.

Statistical Hypothesis 4. With homogeneity of regression established and the Murphy-Durrell letter names, learning rate, and the Gates visual perception scores used as covariates, there will be no significant differences in performance (a) between AVAP and VAP pooled and GRP and AAP pooled, and (b) between AVAP and AAP on post-test performance using the Murphy-Durrell letter names sub-test, the Gates visual perception sub-test, and the Murphy-Durrell learning rate sub-test as the criteria.

A multivariate analysis of variance with special contrasts was used to test this hypothesis. In the first analysis AVAP and VAP (where treatment included visual alphabet training) were combined, and AAP and GRP (the groups that did not receive visual alphabet training) were combined. The analysis yielded a nonsignificant F value of 1.5, ($p < .19$). However, the univariate test with the letter name sub-test approaches significance, yielding a F value of 3.817 and a probability value of .056 (Table 12). The multivariate analysis comparing AVAP and AAP on letter names and Murphy-Durrell Learning Rate yields an F value of 3.4, significant at the .05 level.

TABLE 11

MANOVA, FACTORIAL DESIGN FOR COMPUTATION OF INTERACTION EFFECTS

MULTIVARIATE TESTS OF SIGNIFICANCE USING WILKS LAMBDA CRITERION

FACTORS	CELLS	F VALUE	DEGREES OF FREEDOM FOR HYPOTHESIS	DEGREES OF FREEDOM ERROR	PROBABILITY LESS THAN
AUDITORY PERCEPTION LEVEL & GROUP	12	1.263	30	130	.19
VISUAL PERCEPTION LEVEL & GROUP	12	.946	30	130	.55
IQ LEVEL AND GROUP	12	1.4412	30	130	.08
SEX AND GROUP	8	.663	15	47	.81

TABLE 12

MULTIVARIATE ANALYSIS WITH VISUAL MEASURES

MANOVA PROGRAM FOR COMPUTATION OF GROUP EFFECTS USING SPECIAL CONTRASTS

GROUPS	OBE	PRE-LETTER NAMES		POST-LETTER NAMES		PRE-MDLR		POST-MDLR		GATES VISUAL PRE		GATES VISUAL POST	
		Means	S.D.	Means	S.D.	Means	S.D.	Means	S.D.	Means	S.D.	Means	S.D.
GRP	13	2.2	4.3	20.1	13.1	3.0	4.0	9.6	3.7	10.5	4.5	14.1	3.2
VAP	13	3.7	5.3	26.4	13.2	2.8	2.9	9.4	3.7	8.9	4.0	14.1	4.0
AAP	14	2.6	3.9	19.1	16.3	3.5	4.5	8.1	4.1	10.1	2.8	13.0	4.1
AVAP	13	1.6	4.7	29.4	14.8	5.0	3.4	11.1	4.1	10.1	3.8	13.5	5.1

CONTRASTS	WEIGHTS	CRITERION	COVARIATE	DF	F VALUE	P VALUE
AVAP & VAP vs. GRP and AAP	1 -1 1 -1	MDLR Post Letter Names Post Gates Vis. Post	MDLR Pre Letter Names Pre Gates Vis. Pre	1	1.5	.19
AVAP vs. AAP	0 0 -1 1	MDLR Post Letter Names Post	MDLR Pre Letter Names Pre	1	3.4	.04

The univariate F value for the letter name test was 5.53 and for the Murphy-Durrell Learning Rate Test 5.55 with P values of .038 and .022 respectively (Table 12).

On the basis of this analysis, we cannot reject Hypothesis 4, Part I, asserting that there will be no significant difference in performance on visual measures between groups given specific visual alphabet training, and groups not given specific alphabet training. We can, however, reject Part II of the Hypothesis. There is a significant difference on visual measures between AVAP and AAP, the group that received auditory and visual alphabet training, and the group that received only auditory alphabet training. In the univariate tests the visual measures show significant differences while the auditory measures do not (Table 13).

Statistical Hypothesis 5. With homogeneity of regression established and Murphy-Durrell Phonemes and Learning Rate Tests used as covariates, there will be no significant difference in performance on the Murphy-Durrell phoneme tests between (1) AVAP and AAP pooled, and GRP and VAP pooled, or (2) between AVAP and VAP (Gates Auditory Perception sub-test is omitted from the analysis as homogeneity of regression was not established (Table 14).

Hypothesis 2 was tested with a multivariate analysis program again using the special contrast option. Combining AVAP with VAP and GRP with AAP, specific auditory alphabet training groups with nonspecific auditory alphabet training groups, the analysis yields a nonsignificant F value of 1.341 (p less than .2666) with no significant univariate F tests. The null hypothesis, therefore, cannot be rejected.

TABLE 13

MANOVA PROGRAM FOR COMPUTATION OF GROUP EFFECTS USING SPECIAL CONTRASTS

UNIVARIATE F TESTS AVAP VS. AAP

VARIABLE	F VALUE	P VALUE
Post PCIQ	10.675	.002
Post LLR	.277	.60
Post-Phon	.103	.759
Post-Mdlr	3.89	.05
Post-Ltr Name	5.69	.02

TABLE 14

MULTIVARIATE ANALYSIS WITH AUDITORY MEASURES

MANOVA PROGRAM FOR COMPUTATION OF GROUP EFFECTS USING SPECIAL CONTRASTS

GROUPS	OBS	PRE-PHON Means	PRE-PHON S.D.	POST-PHON Means	POST-PHON S.D.	PRE-MDLR Means	PRE-MDLR S.D.	POST-LLR Means	POST-LLR S.D.
GRP	13	8.0	4.0	11.8	3.5	3.0	4.0	10.1	4.2
VAP	13	6.2	3.3	9.9	3.1	2.85	2.88	9.3	3.1
AAP	14	8.1	3.9	11.7	4.0	3.5	4.5	11.1	2.8
AVAP	13	6.4	2.5	12.4	5.4	4.9	3.4	10.1	3.1

CONTRASTS	WEIGHTS	CRITERION	COVARIATE	DF	F VALUE	P VALUE
(1) AVAP & AAP vs. GRP & VAP	1 1 -1 -1	Post llr Post Phon	Pre MDLR Pre Phon	1	1.44	.23
(2) AVAP vs. VAP	0 -1 0 1	Post llr Post Phon	Pre MDLR Pre Phon	1	1.34	.26
(3) AVAP vs. AAP	0 0 -1 1	Post llr Post Phon	Pre MDLR Pre Phon	1	.56	.69

QUESTIONS FOR INVESTIGATION:

I. Do children who perform better on a visual test than on a test requiring an auditory-visual shift have difficulty with word learning tasks? The auditory visual shifting test measured performance on a task requiring a grasp of the concept of one-to-one correspondence. The interest of the investigator was focused on the differential in performance between the first part of the test where the child matched two visual stimuli, and the second part where he matched an auditory stimulus with a visual stimulus. The mean performance of the group on the visual task was 5.1, and on the auditory task 4.01. Eighteen children, approximately one-third of the group, got 2 or less on both the visual and the auditory-visual tasks. As these subjects did not succeed with the task in either form, differential scores for these subjects contribute no information. In the remaining group, three subjects received scores more than 3 points higher on the auditory-visual than on the visual, while 13 children scored 3 or more points higher on the visual than on the auditory-visual. It appeared that the test could measure visual shifting behavior for only those children who grasped the concept of one-to-one correspondence.

Although auditory-visual shifting as measured by the auditory visual shifting test was positively correlated in the post-test with IQ (r=.24) shifting scores are not correlated with learning rate in either learning rate test.

Murphy-Durrell Learning Rate & Auditory Visual Shift $r = -.16$
Linguistic Learning Rate & Auditory Visual Shift $r = -.05$

These correlation figures suggest that an auditory-visual shifting measure may provide information about learning potential over and above the information provided by IQ, if a more effective measure were utilized (see Table 15).

TABLE 15

CORRELATIONS BETWEEN PRE- AND POST-TESTS

AV SHIFT	EXCESS	INSUFF	GA PRE	GA POST	PHON PRE	PHON POST	MDLR PRE	MDLR POST	GATES V PRE	GATES V POST	ABC PRE	ABC POST	LLR POST	IQ PRE	IQ POST	AGE
AV	14	-19	01	16	-12	-06	02	-16.	31	10	13	13	-03	27	21	-07
EXCESS		04	-30	-17	-02	-24	-04	11	11	11	11	01	-18	-07	-08	22
INSUFF			-34	-33	-15	-13	-13	-25	-11	-19	10	-34	-22	-31	-36	-24
GA PRE				*60	54	52	46	46	31	51	58	50	52	38	49	12
GA POST					32	32	18	32	27	36	46	51	38	42	**64	06
PHON PRE						**75	52	59	-00	**75	**67	22	**68	01	21	15
PHON POST							55	**75	-08	**86	**66	28	**78	-14	14	01
MDLR PRE								39	08	49	44	14	55	06	18	-04
MDLR POST									-02	**77	53	37	**65	07	23	16
GATES V PRE										16	19	37	-11	44	35	12
GATES V POST											**70	35	**71	07	16	-01
ABC PRE												39	**73	22	37	-05
ABC POST													34	47	57	-05
LLR POST														15	30	-15
IQ PRE															**73	06
IQ POST																15

(* significant at the .05 level.
** significant at the .01 level.)

II. Does a child's activity level as assessed by a rating scale filled out by the teacher correlate significantly with post-treatment IQ or ready readiness scores? Because the investigator was interested in determining the relationship between activity level and test performance two total scores were developed on the basis of the rating sheet: 1) a composite score of excesses, representing the number of points above three recorded for a subject, and 2) a total score of insufficiencies, representing the number of points below 3 recorded for a subject, where a score of three represented "appropriate" behavior. The maximum possible score for both insufficiencies and excesses was 18, or two times the number of items (see Table 16).

TABLE 16

ACTIVITY I. BEHAVIORAL TOTAL SCORES:

	MEAN	STANDARD DEVIATION	NUMBER OF ZERO SCORES
TOTAL EXCESSES	4.92	5.06	11
TOTAL INSUFFICIENCIES	2.60	3.43	18

The Attending Behavior items were not totalled, as a composite score would mask information that might be provided by the individual items (see Table 17).

TABLE 17

Pupils Attending Behavioral Rating Sheet Results

PRE-TEST TOTALS:

Item	Attention Span	Responsiveness	Physical Health	Attitude Toward School	Ability to Follow Directions	Independence
Means	2.57	2.72	3.85	3.15	2.63	2.83
Standard Deviations	.96	.97	.55	.84	1.14	1.12

Correlations between rating scale scores and pre-test scores revealed some interesting patterns. Total insufficiencies were negatively correlated with all learning rate measures with the highest negative correlation $r = -.41$ between insufficiencies and Gates Auditory. Total excesses, on the other hand, showed slight positive correlations with some pre-test measures, including phonemes and learning, and very slight negative correlations with others; including IQ, the Gates sub-tests, and letter naming. Items on attending behavior scales were all positively but not significantly correlated with pre-test measures (see Table 18). There were no significant correlations between post-test measures and any pupil ratings.

III. Is the relative importance of auditory and visual training determined to any degree by the methodology used in teaching reading?

VAP, where visual alphabet perception was stressed, had a higher mean gain score than all other groups on the Murphy-Durrell Learning Rate Test where an irregularly spelled word list grouped according to meaning was presented with a look-say approach. AAP, the group that stressed auditory alphabet perception had the highest mean score on the LLR test where a list of regularly spelled words were grouped according to spelling pattern and presented in triplets where only the first phoneme changed (bat, cat, rat). Mean differences between VAP and AAP were not statistically significant (see Appendix K).

There was a significant difference on a univariate test between AVAP and AAP on the MDLR, F value 3.89, $p < .05$, but not on the LLR, F value .277, $p < .60$, indicating that the addition of a visual perception component had a different affect on the two learning tests.

DISCUSSIONS & CONCLUSIONS

The purpose of the present study is to provide information that can be helpful in planning a kindergarten perceptual program for the SEL I black child. Although the experimental hypotheses of the investigator are not supported in every instance, the study provides information that sheds light on several pivotal issues involving perceptual training.

The first issue concerns the appropriate sequencing of a perceptual training program. Educators who advocate placing the SEL I black kindergarten child on a program that emphasizes general readiness non-alphabet skills assume a hierarchical model in which a cluster of lower-order perceptual sub-skills serve as prerequisites for higher-order perceptual sub-skills directly involved in decoding. Because the black SEL I child is known to lack mastery of the lower-order sub-skills, he is placed on a general readiness program in the kindergarten year.

The first hypothesis in the present study assumes the position that the SEL I child will be just as successful on a program that stresses alphabet skills as he will be on a program that stresses general readiness non-alphabet skills. This hypothesis is supported. There is no significant difference between AVAP and GRP on post-test measures of auditory and visual perception. On the Gates Auditory post-test, GRP registers a mean gain of 3.6 raw score points compared with a mean gain of 3.4 for AVAP,

and on the Gates Visual post-test GRP shows a mean gain of 4.2 compared with a mean gain of 5.7 for AVAP. The assumption of a hierarchical model in which lower level non-alphabet skills are prerequisites for higher-order alphabet skills is not validated by the data in the present study. The outcome of the study would be consistent, however, with a theoretical position asserting that the crucial element in a perceptual program is not the kind of symbol that is perceived or manipulated, but the operations involved in their perception or manipulation. It may not be important in terms of a child's development whether he deals with geometric or alphabetic symbols. What may be important is the mental operation, the attending, filtering, focusing, matching, serializing or categorizing processes required by the task. If the task demands in AVAP and GRP are equally appropriate for the SEL I black child, the type of visual or auditory symbols manipulated in the tasks they provide would not be critical.

A second, and closely related issue, is whether the child's pre-test profile can provide information which will allow the teacher to decide what kind of perceptual program would best serve his needs. In the present study there was no interaction between treatment group and pre-test IQ level, visual perception level as measured by Gates Visual sub-test, or auditory perception level as measured by Gates Auditory sub-test. These findings do not preclude the possibility of matching treatment to pre-test profile. They do suggest that assignment to a particular treatment group cannot be made simply on the basis of IQ, or on the basis of selected readiness measures. The practice of placing low IQ children in a general readiness program, and higher IQ children on an alphabet skill program is not supported.

The third issue concerns the relative effectiveness of visual and auditory alphabet training programs. Here there are four concerns:

a. Are the development of auditory and visual alphabet skills linked to maturation, or can their development be accelerated through training?

b. Does auditory training improve auditory skills and visual training improve visual skills?

c. What is the relative importance of visual and auditory training in preparing a child to read?

d. Is the relative importance of auditory and visual perceptual training determined to any extent by the methodology of a subsequent reading program?

a. Are the development of auditory and visual alphabet skills linked to maturation, or can their development be accelerated through training? The correlation of age with other readiness measures used in the present study provides some information relative to this question. None of the post-test readiness measures are significantly correlated with age. Four of the seven correlation coefficients between age and readiness scores are positive, three are negative. Apparently maturation alone cannot explain perceptual development. The effect of training on development, must be recognized as intricate.

b. Does auditory training improve auditory skills and visual training improve visual skills? This question cannot be answered definitively on the basis of the present study. The investigator hypothesized that AVAP and AAP would outperform VAP and GRP on auditory alphabet measures, and that AVAP and VAP would outperform AAP and GRP on visual perception

alphabet measures. These hypotheses were not supported. One of the difficulties here is the problem of sub-test validity. The investigator divided the reading readiness sub-tests into two categories, auditory and visual, according to their apparent content. Gates Visual, Murphy-Durrell Learning Rate, and Letter Names were classified as visual, and Gates Auditory and Murphy-Durrell Phonemes were classified as auditory. Examination of the task requirements and intercorrelation patterns of these tests indicates that other classificatory schemes are possible. Four of the post-tests, LLR, MDLR, Gates Visual, and Phonemes, are significantly intercorrelated, but are not correlated with IQ. The common and critical element in each

	LLR	MDLR	GATES VIS.	PHONEMES	IQ
LLR		**.65	**.71	**.78	.30
MDLR			.49	**.75	.23
GATES VIS.				**.86	.16
PHONEMES					.14

(** significant at the .01 level)

of these tests may be the ability of the child to make an auditory or visual discrimination and/or association. The other two reading readiness tests, Letter Naming and Gates Auditory, are correlated with each other, r = .51, and also with IQ. The correlation is .64 between Gates Auditory and IQ and .57 between Letter Naming and IQ. An examination of the task demands of the Letter Name and the Gates Auditory sub-tests suggests that both these tests require the interpretation of a visual symbol. In the Gates Auditory test, for instance, when the examiner says, "marks, march," the critical feature may not be the child's ability to discriminate between the two words he hears, but his ability to identify the symbol for "marks"

and the drawing that is representative of the word "march." In the Letter Name test, the examiner names a series of letters which the child must mark off on an answer sheet. In order to mark off the appropriate letter, the child must be able to identify its critical features. It may be that the Gates Auditory and the Letter Naming sub-test measure an ability to deal with symbolic content which is different from the discrimination and association ability that is tapped on the other sub-tests.

Although the "auditory vs. visual" is not the only classificatory scheme that can be used to group the sub-tests, the mean scores on the sub-tests indicate a trend in the direction of the original hypothesis. The mean gain score for AAP-AVAP on the Phonemes test was 4.8, compared to a mean gain score for GRP - VAP of 3.75. The mean gain score for AVAP - VAP on the Letter Names test was 24.8, compared to a mean gain for GRP - AAP of 17.1.

C. What is the relative importance of visual and auditory training in preparing a child to read? Although there is no significant difference between VAP and AAP in the reading readiness measures in the multivariate sense, AVAP is significantly better than AAP ($p < .05$), but not significantly better than VAP, indicating that the VAP program had a greater immediate effect on the reading readiness measures than the AAP program. An examination of the rank order of the four treatment groups gives additional support to the claim that the VAP program is superior to AAP. It is possible, however, that the teachers' original prediction as to treatment outcome may have served as a self-fulfilling prophecy and influenced the results.

RANK ORDER OF TREATMENT GROUPS ON SUB-TESTS

	1	2	3	4
Letter Name	AVAP	VAP	GRP	AAP
Gates Audit.	VAP	GRP	AVAP	AAP
IQ	AVAP	GRP	VAP	AAP
LLR	AAP	AVAP	GRP	VAP
MDLR	VAP	GRP	AVAP	AAP
Gates Visual	VAP	AVAP	GRP	AAP
Phonemes	AVAP	VAP	GRP	AAP

d. Is the relative importance of auditory and visual perceptual training determined to any extent by the methodology of a subsequent reading program? This question concerns the differential effects of VAP and AAP on word-list learning with two different types of tests -- the MDLR test which uses irregularly spelled words grouped according to meaning, and the LLR test using a list of regularly spelled words grouped according to spelling pattern similarities. A comparison of the performance of the four groups on the two learning rate tests reveals some interesting trends.

	LINGUISTIC LEARNING RATE TEST		MURPHY-DURRELL LEARNING RATE	
	MEAN	S.D.	MEAN GAIN	S.D.
VAP	9.3	3.1	6.5	3.6
AAP	11.1	2.1	4.5	3.2
GRP	10.0	4.2	6.0	3.2
AVAP	10.1	3.2	5.5	4.0

GRP and AVAP, the two groups that had equal stress on auditory and visual inpur, had almost identical mean scores on both Learning Rate tests. VAP, where visual training was stressed, scores highest on the MDLR and lowest on the Liguistic Learning Rate test, AAP, where auditory training was stressed, scores lowest on the MDLR and highest on the LLR. Considering that the LLR and MDLR are highly correlated, ($r = .65$) and follow an almost identical format, these differences although not statistically significant, suggest the need for further inquiry. If it is established that auditory training is particularly important when a linguistic reading approach is followed, and visual training is particularly important when a look - say approach is followed, this information could provide important guidelines for determining the appropriate emphasis for a particular reading readiness perceptual program.

The fourth issue concerns the relative overall effectiveness of the four treatment programs for the SEL I kindergarten child. Because of the limited predictive validity of reading readiness measures, and the relative

stability of IQ, the investigator selected IQ as the basis for evaluating the four treatment programs. Here the statistical findings are decisive. After 36 days of treatment, controlling for pre-test performance, AVAP performed significantly better than GRP, VAP and AAP pooled on the Pintner-Cunningham Primary Ability Test. In terms of raw scores, the mean score gain for the AVAP group was 16.6 compared to 9.3 for GRP, 8.9 for VAP and 7.8 for AAP. In addition, while three subjects in GRP, VAP and AAP showed a loss between pre- and post-tests, all subjects in AVAP gained 4 or more points between pre- and post-tests.

The question arises, then, as to what it was about AVAP that created the significant difference. AVAP differed from GRP in that it stressed alphabet rather than general readiness skills. The differences in post-test performance, however, were not in the reading readiness scores that were intended to measure the alphabet skills, but in the IQ test that was intended to measure primary ability. A plausible explanation of these results may be that the children in the AVAP program, receiving dual modality input as well as experience with new and challenging tests, learned a new set of behaviors rather than a new set of skills. The superior performance of the AVAP group on the IQ test was not predicted by the teachers. The opinionaires indicated that teachers were unanimous in their feeling that GRP was as or more effective than /VAP, and that the children found the GRP program more enjoyable. This discrepancy between teacher opinion and testing outcome could have been based on the fact that space limitations placed constraints on the alphabet groups that were not placed on the general readiness group. The afternoon classes were held in classrooms which were used in the morning for a pre-kindergarten program. These

rooms were well equipped with general readiness perceptual material. The GRP children were the only group that could be allowed free access to this material.

A final and most important question raised by the study concerns the overall effectiveness of treatment for the total population. Considering that the children had spent a month prior to treatment practicing tasks that involved listening to directions and making appropriate written responses, the differences in scores between pre-tests and post-tests cannot be attributed to the practice effect of making marks on paper. An examination of the mean stanine gains (based on national norms) for the total group after 36 days of treatment, attests to the effectiveness of the total curriculum. The total group gained one stanine point on Murphy-Durrell phonemes, Gates Auditory and Pintner-Cunningham IQ, two stanine points on Gates Visual perception sub-test, and three stanine points on Murphy-Durrell Learning rate test. No one group, however, outperformed the other three groups on all reading readiness post-test measures. In addition, each of the four treatment groups gained at least one stanine point on each of the six post-tests. Considering the length of the treatment period, these stanine gain scores are impressive. They cannot be explained solely on the basis of maturation or specific skill training. Perhaps the real learning that took place in the program involved a kind of task orientation. Through interaction with a carefully structured environment, the children may have learned to filter out irrelevant stimuli, and attend to the critical features of a task. Active participation in a task-oriented learning environment may have given them a better grasp of the idea of a task, and taught them how to mobilize their cognitive resources for more

effective performance. Whether or not this kind of learning will have a lasting effect on performance cannot be predicted. It may well depend on the kind of experiences these children encounter as they continue through the system.

LIMITATIONS OF THE STUDY

Limitations in the study can be attributed to flaws in the research design itself, difficulty with procedures, and problems associated with the restrictions imposed by the setting.

LIMITATIONS ATTRIBUTABLE TO DESIGN

Although the design controlled for contamination resulting from teacher behavior, it did not control for contamination resulting from student behaviors. Students in AAP were heard singing alphabet songs on their way to and from class, and children on the VAP program were observed drawing letters on the chalk-board during morning classes.

LIMITATIONS ATTRIBUTABLE TO PROCEDURE

Reliability and validity could not be established for the Auditory Visual Shifting Test and the Linguistic Learning Rate Test.

LIMITATIONS ATTRIBUTABLE TO THE SETTING

The major limitations of the study are attributable to the setting. The n of 60, representing the total population available in the setting, is small, the teacher aides with the program were untrained, and only two out of the three teachers supervising the afternoon program were certified. The course of treatment, and the length of treatment time per day, were drastically shortened due to such contingencies as bus breakdown, health visits, building repairs, and teacher absence. The classroom-sharing and storage problems made it difficult for the teacher to change the materials

in the classroom according to treatment specifications. Thus, the AVAP, VAP, and AAP children were not permitted access to open shelves containing general readiness materials.

SUGGESTIONS FOR FURTHER RESEARCH

Because of the limitations of the present study, a replication study with a larger n, a more adequate staff and a longer training period may be in order. The following questions could be pursued in a replication study:

(1) Are there differences in performance on reading readiness measures associated with treatment groups?

(2) Is a program stressing visual and auditory alphabet skills more effective than a program stressing general readiness perceptual skills?

(3) Does a group trained in auditory perception perform better on auditory measures of reading readiness, and a group trained in visual perception perform better on visual measures of reading readiness? (In answering this question it may be advantageous to use a different set of reading readiness measures as criterion.)

(4) Does the visually trained group perform better on the Murphy-Durrell Reading Readiness measure, and the group trained in auditory perception perform better on the Linguistic Learning Rate test?

(5) Are gains in post-test performance maintained over time?

(6) Are there differences in reading performance in the first grade attributable to treatment? If so, are these differences maintained in the upper grades?

(7) Are there differences in non-reading measures including language, mathematics, attending behaviors, and affect associated with treatment?

(8) Would four weeks of VAP followed by four weeks of AAP or vice versa be as effective as eight weeks of AVAP?

(9) Do the teacher rating sheets assessing attending behaviors and activity level contribute to the prediction of reading readiness and/or reading achievement?

(10) What is the relationship between success within treatment as measured by the behavioral objectives and post-test scores?

Additional Research Questions:

(1) Is there a relationship between auditory-visual shifting behavior and reading readiness performance?

(2) Would the effects of treatment be the same with a non-SEL I population?

SUMMARY AND CONCLUSIONS

The present study compares the effectiveness of four different perceptual training prescriptions introduced into a structured curriculum with a population of 60 SEL I kindergarten children.

FINDINGS:

(1) There is no significant difference in performance on reading readiness measures between the group that received general readiness training and the group that received auditory and visual alphabet skill training.

(2) The auditory-visual alphabet group performed significantly better than the auditory alphabet group on visual measures but not on auditory measures. There is no significant difference in either auditory or visual measures between the auditory-visual treatment group and the visual treatment group.

(3) The findings of this study provide no basis for matching pre-test profile with type of modality training program.

(4) The group trained in auditory visual alphabet registered significantly higher gains on the Pintner-Cunningham Primary Mental Ability test than all other groups taken in combination.

(5) All four treatment groups register gains of one or more stanine points on all reading readiness measures after 36 days of treatment.

(6) The study demonstrates the feasibility of testing four treatments in a single setting where the teacher variable is controlled by training the teachers to use four different instructional methods.

A by-product of the present study is a total kindergarten curriculum with demonstrated effectiveness with the SEL I child. A sequence of behavioral objectives was developed in the areas of language and perception, and a set of general objectives was developed for the creativity program. Lists of suggested activities accompanied all behavioral objectives, and appropriate teacher manuals and instructional materials were provided. All instructional materials that were not commercially available were constructed for the program. The total curriculum was individualized with major emphasis on individual and small group activity. A record-keeping system was developed in accordance with the behavioral objectives so that progress could be assessed on an on-going basis.

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