THE EFFECTIVENESS OF THE ILLINOIS TEST OF PSYCHOLINGUISTIC ABILITY TO DISCRIMINATE SEVERAL ASPECTS OF PAIRED-ASSOCIATE LEARNING

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This study is an exploratory attempt to evaluate the efficacy of the use of the ITPA in discriminating between the learning performance of "good" and "poor" auditory learners and between "good" and "poor" visual learners on a paired-associate task presented visually or auditorially. The purpose of this investigation is to extend the interpretation of the results of the ITPA to another learning measure, the paired-associate task. The study attempts to bridge the gap between educational testing and learning tasks.

The forty preschool subjects attend a private school composed primarily of pupils from the upper-middle socio-economic level. Subjects were investigated on the basis of certain individual subtests, total scaled scores, scores grouped according to the dimensions of channels, and the representational level. The statistical techniques used were a two-way analysis of variance and a one-way simple analysis of variance.

Hypothesis One stated that "good" auditory paired-associate learners are expected to score significantly higher than "poor" auditory paired-associate learners on the following parts of the ITPA: Representational Level, Auditory Channel, Auditory Memory, Auditory Reception, Auditory Association, Auditory Closure/Sound Blending, and Psycholinguistic Age. Hypothesis One was rejected for comparisons between group means on the representational level, Auditory Memory, and Auditory Reception. A statistically significant difference was found between learners on the auditory channel, Auditory Association, Auditory Closure/Sound Blending, and the psycholinguistic age.

Hypothesis Two stated that "good" visual paired-associate learners are expected to score significantly higher than "poor" visual paired-associate learners on the following parts of the ITPA: Representational Level, Visual Channel, Visual Memory, Visual Reception, Visual Association, and Psycholinguistic Age. Hypothesis Two was rejected for comparisons between group means on the representational level, visual channel, Visual Memory, Visual Reception, and Visual Association. A statistically

significant difference was found between scores for "good" visual learners and "poor" visual learners on the psycho-linguistic age.

These results indicate the following conclusions. The overall abilities tested by the ITPA seem to assess similar abilities necessary in acquiring a list of paired-associates; therefore, a general relationship between the paired-associate task and the ITPA was indicated. Learning seems to be facilitated by presenting material in accordance with one's perceptual preference. Paired-associate learning seems to involve more complex conceptual abilities, rather than simply rote-memorization skills. The ITPA was a better discriminator of the auditory paired-associate learner's performance than of the visual paired-associate learner's performance. The nonsignificant results for the visual learners were attributed to the subjects possibly being strong auditory learners, as indicated by their ITPA scores. Unpredicted findings suggested that the nonsignificant results for the visual learners resulted from the design of the study, rather than from the inefficacy of the use of the ITPA as a discriminative instrument.

Recommendations included examining the efficacy of the use of the ITPA to discriminate between learners operationally defined according to both their visual and auditory preferences and deficits, examining the subjects in the present study at the completion of first grade to determine if the same perceptual preferences are demonstrated, and examining the question--do teaching methods in accordance with a defined perceptual preference facilitate learning how to read?

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CHAPTER I

INTRODUCTION

Great concern centers around optional development of a child's learning ability. Hundreds of tests have been created in an attempt to better assess a child's particular learning difficulty so that his learning capacity can be maximized. However, far too often the test does nothing more than serve as a classification instrument that elaborately labels the child, but does little to help him in his problem area. A major hazard with the "Age of Testing" is the vast amount of misused time, money, and human resources devoted to testing which results in very few concrete learning applications for the child.

Some major factors must be overcome for testing to become more helpful for the child. The testing instrument must become more precisely attuned to the ongoing learning processes of the child in a way that can pinpoint specific assets and deficits, and aid in the development of a specific remediation program. Secondly, the usefulness of a test increases only as the results the instrument yields

can be understood more fully. Little research evidence was found regarding the relationship between testing performance and what a child actually does in a learning situation.

The 1968 Revised Edition of the Illinois Test of Psycholinguistic Ability (ITPA), used in the present study, is a diagnostic tool which assesses specific ongoing learning processes (Kirk, 1968). Research investigating the test's relationship to other learning measures was found to be virtually non-existent. Until a more clear understanding is reached as to what test results can determine and cannot determine about learning processes, test results are not being utilized to their capacity.

The goal of maximizing a child's learning ability can begin to be met in the three following ways: using more precisely refined tests (such as the ITPA), examining test results in relationship to other learning measures, and implementing teaching methods that are in accordance with a child's individual learning style. Major differences exist in the way children learn. Some children have a greater facility in using one perceptual modality than another. A perceptual modality is the sense pathway through which an individual receives information and thereby learns. One

child may learn better by hearing the material, while another child may learn better by seeing the material (Lerner, 1971). Charcot, as early as 1886, observed that individuals used one sense modality over others and categorized people as "audile", "visile", and "tactile" learners. Russian scholars have also developed typology preferences of sense modalities that individuals exhibit in learning. A child's perceptual preferences as well as deficits must be evaluated before an appropriate and effective teaching method can be determined. A particular sense pathway may be an ineffective channel for learning, and learning could be impeded if material was presented through that particular sense pathway (Lerner, 1971).

The ITPA is a test that can detect perceptual modality preferences, as well as specifically delineate other learning processes (Kirk, 1971). The present study is an initial exploratory attempt to extend the usefulness of the test by examining the relationship of ITPA results to a paired-associate learning task presented auditorially or visually. Both the learning processes necessary in acquiring the task and the perceptual preferences that the children exhibit are examined. The study hopes to extend the ITPA's findings,

and also examines the research concerned with paired-associate learning presented through different sense modalities. The present study is an attempt to bridge the gap between an educational test, such as the ITPA, and a learning task, such as the paired-associate learning task. By understanding the relationship between these two measures, more precise information is gained about how individuals learn most effectively. With more precise knowledge about how individuals learn most effectively, the main goal of helping the child maximize his learning capacity comes closer to realization.

Statement of the Problem

The problem of this study concerns the efficacy of the use of the 1968 Revised Edition of the Illinois Test of Psycholinguistic Ability to discriminate preschool children's performance on a paired-associate learning task presented auditorially or visually. More specifically, the ITPA is being investigated by examining the efficacy of the use of the test results to discriminate between "good" and "poor" auditory learners, and between "good" and "poor" visual learners. These learners were operationally defined by their performance on the paired-associate learning task.

"Good" auditory learners scored at least one standard deviation above the mean of their group on the auditory presentation of the task. "Poor" auditory learners scored at least one standard deviation below the mean of their group on the auditory presentation of the task. "Good" visual learners scored at least one standard deviation above the mean of their group on the visual presentation of the task. "Poor" visual learners scored at least one standard deviation below the mean of their group on the visual presentation of the task.

The purposes to be served by this investigation are to extend the interpretation of the results of the ITPA to another learning measure, the paired-associate task. The study attempts to bridge the gap between educational testing and learning tasks so the ultimate aim of serving the child can be more effectively met. More specifically, the following questions were investigated.

1. Do "good" auditory paired-associate learners differ significantly from "poor" auditory paired-associate learners on the following parts of the ITPA?

   a. Representational Level,

   b. Auditory Channel,

c. Auditory Memory,

d. Auditory Reception,

e. Auditory Association,

f. Auditory Closure/Sound Blending,

g. Psycholinguistic Age (PLA).

2. Do "good" visual paired-associate learners differ significantly from "poor" visual paired-associate learners on the following parts of the ITPA?

a. Representational Level,

b. Visual Channel,

c. Visual Memory,

d. Visual Reception,

e. Visual Association,

f. Psycholinguistic Age (PLA).

Hypothesis

In order to investigate the above questions, the following hypotheses were tested.

1. Control Group I, "good" auditory paired-associate learners, is expected to score significantly higher than Experimental Group I, "poor" auditory paired-associate learners, on the following parts of the ITPA:

a. Representational Level,

b. Auditory Channel,

c. Auditory Memory,

d. Auditory Reception,

e. Auditory Association,

f. Auditory Closure/Sound Blending,

g. Psycholinguistic Age (PLA).

2. Control Group II, "good" visual paired-associate learners, is expected to score significantly higher than Experimental Group II, "poor" visual paired-associate learners, on the following parts of the ITPA:

a. Representational Level,

b. Visual Channel,

c. Visual Memory,

d. Visual Reception,

e. Visual Association,

f. Psycholinguistic Age (PLA).

Definition of Terms

The following definitions of terms, used by Kirk (1966) in reference to the ITPA, are also used for discussion and interpretation in the present study.

Association is the ability of the child to relate impressions received to the stored information obtained from previous experience, and to use it as a basis for encoding.

Automatic-sequential level is the average of the four tests of closure and sequential memory. It involves habitual functions which are less voluntary than the representational level, but are highly organized and integrated.

Channels are the modes of language input and output, i.e., routes of communication:

> Auditory-Vocal Channel (A-V) is represented by the average of the five ITPA subtests involving auditory input and vocal output.
>
> Visual-Motor Channel (V-M) is represented by the average of the five ITPA subtests which measure visual input and motoric or gestural responses.

Diagnostic Test is an instrument designed to assess the child's abilities and disabilities in such a way that an educational or remedial program can be initiated.

Learning Disabled children are those who exhibit a disorder in one or more of the basic psychological processes

involved in understanding or in using spoken or written language. These may be manifested in disorders of listening, thinking, talking, reading, writing, spelling, or arithmetic. They do not include learning problems which are due primarily to mental retardation, emotional disturbance, or to environmental disadvantage.

Levels are the degrees of organization required in the act of communication. Automatic-sequential and representational are the levels tested by the ITPA.

Processes are the learning abilities necessary for language usage. The three processes tapped on the ITPA include reception, association, and expression.

Psycholinguistics is the study of human communication most directly concerned with the processes of reception and expression.

Reception is the ability required in obtaining meaning from auditory and visual stimuli.

Representational is the level of organization required in obtaining the meaning of auditory or vocal symbols.

Assumptions and Limitations

The hypotheses are based on the following assumptions and limitations.

1. Tests were appropriately administered, recorded, and scored by a qualified examiner. For practice, the examiner gave the ITPA to a number of students at the Research and Evaluation Center for Learning under the supervision of a certified examiner.

2. Experimental bias was controlled by using a double blind experimental design.

3. The subjects of this study were limited to white children from an upper-middle socioeconomic group. The children attended Lamplighter School, a private school located in North Dallas. The results of the study would not necessarily be the same if it were conducted with children of other socioeconomic status and/or different racial or ethnic backgrounds. Using a larger number of subjects may also produce findings difference from the present ones.

CHAPTER II

REVIEW OF THE LITERATURE

The discussion of literature related to this study includes empirical investigations related to learning paired-associates presented through different sense modalities, the development of the ITPA, and the relationship between paired-associate learning and language processes.

Paired-Associate Learning Tasks

McGeoch and Irion (1952) have provided one of the major forces behind children's research by comparing the auditory and visual input modalities in paired-associate learning tasks. They summarized some experimental results which found learning with visual presentation of material superior to learning with auditory presentation. Other studies they reviewed found learning with auditory presentation of material superior to learning with visual presentation. The greater effectiveness of the visual stimulation was explained by the clarity and unity of impression given by

visual material. The greater effectiveness of the auditory stimulation was explained by the stringent attention needed in learning auditorially presented material. Also, the more brief stimulation of auditory material and the more active response demanded on the part of the learner were possible explanations for the greater effectiveness of the auditory presentation (McGeoch and Irion, 1952).

Budoff and Quinlan (1964a) tested McGeoch and Irion's statement that young children learn more effectively with an auditory presentation than with a visual presentation. Primary grade children were presented word pairs visually by a Hunter Card Master and aurally by a tape recorder. Word pairs presented aurally were learned faster and more efficiently than word pairs presented visually. This finding was in agreement with McGeoch and Irion's statement that young children learn more effectively with auditory presentations than with visual presentation.

In contradiction to Budoff and Quinlan's results, Hall (1969) found that both kindergarten and second-grade subjects learned faster with the visual presentation during the initial acquisition. Walther (1969), in a comparison of low and high-IQ subjects, found that the low-IQ subjects

performed better on the visual than on the auditory task, while high-IQ subjects performed better on the auditory than on the visual presentation.

Hill and Hecker (1966), in contradiction to Budoff and Quinlan, Hall, and Walther's results, found that when task difficulty was equated, second graders' learning of paired associates was not affected by modality of stimulation. Therefore, the results of these studies indicated no significant differences between the auditory and visual presentations in facilitating learning of paired associates.

Because research has shown very contradictory findings as to which modality of stimulation facilitates learning the most effectively, Levin, Rohwer, and Cleary (1971) investigated individual differences in learning of verbally and pictorially presented paired associates. Most studies, as the ones previously discussed, focused on experimental variables that affected performance on a particular learning task. Levin et al. (1971) attempted to examine individual abilities in learning a paired-associate task. He stated that subjects with particular aptitudes or preferences for a stimulus input in one sense modality (aural or visual) had a greater probability of succeeding in specific learning

tasks if materials were presented in accordance with their preference. Grouping individuals on their verbal and pictorial item-type preference on form A (classifying list) of a paired-associate learning task provided a predictor of their performance on form B (criterion list) of a paired-associate task. The results suggested individual modes of preference in learning, and emphasized the importance of identifying and making provisions for different types of learners if instruction is to be truly individualized.

Dennison (1971) hypothesized that matching method of presentation of a task to a defined visual or auditory perceptual strength would enhance paired-associate learning. After selecting two groups, one with high visual scores, the other with high auditory scores, two lists of paired associates were administered, one presented pictorially, the other auditorially. The expected interaction between perceptual dominance and method of presentation did not reach statistical significance. Dennison stated that extreme difficulty existed in establishing reliable strengths or deficits within modalities. He said that the demands for success on a paired-associate task were possibly

dissimilar to the requirements for success on the perceptual tasks.

The incongruent findings concerning paired-associate learning presented through different sense modalities did not clearly delineate which modality was the most facilitating for paired-associate learning. In an effort to resolve the inconsistent findings, the role of perceptual preferences in learning was investigated. Partial support was found for the idea that subjects with particular aptitudes or preferences for a stimulus input in one sense modality had a greater probability of succeeding in specific learning tasks if materials were presented in accordance with their preference. The present study continued investigating the notion of perceptual preferences in learning by using the Illinois Test of Psycholinguistic Ability, which can delineate perceptual strengths and weaknesses.

The Illinois Test of Psycholinguistic Ability

The 1968 Revised Edition of the Illinois Test of Psycholinguistic Ability (ITPA), used in this study, is a diagnostic instrument used to detect psycholinguistic deficits in children. The authors are Samuel A. Kirk, James J. McCarthy, and Winifred D. Kirk.

The development of the test began in 1949, when Samuel Kirk and his associates noted that mentally retarded children had specific language, perceptual, and/or behavioral disorders. A global IQ could not detect the specific disabilities of these children. Therefore, in 1950, the first attempts were made to develop perceptual and language test that could focus more precisely on the disabilities of these children (Hellmuth, 1968).

After Charles Osgood developed a communication model, which attempted to interrelate the psychological functions that occur within an individual during communication activities, Dorothy Sievers (1961) developed a number of tests based on Osgood's model. James McCarthy (1969) used Siever's battery of tests with cerebral-palsied children and found the general rationale useful; however, the tests did not delineate discrete abilities and disabilities. Kirk, on the basis of McCarthy's, Siever's, and his own prior research, attempted to delineate specific abilities which had been shown to be important in determining reading ability (Hellmuth, 1968). The results of Kirk's research was the publication of the Experimental Edition

of the ITPA in 1961. The authors of this publication were Kirk and James McCarthy.

The ITPA was widely used in school systems, clinics, and experimental projects between 1961 (publication of the experimental edition) and 1965 (beginning of its revision). Several changes resulted from the information gained in that period, such as additional subtests, extended norms, changes in certain items of the subtests, and simplified administration (McCarthy, 1969).

Osgood's communication model provided a theoretical basis for the development of the clinical model of the ITPA, as well as a basis for the construction of the subtests. The clinical model is organized into three dimensions: channels of communication, psycholinguistic processes, and levels of communication (Kirk, 1961).

The channels of communication are the pathways or sense modalities through which communication flows. Linguistic symbols are received and responses are made through the channels. Sound and sight are most commonly used at the receiving end, and voice and gesture at the expressive end. The channels are labeled the auditory-vocal channel and the visual-motor channel (Kirk, 1961).

The psycholinguistic processes include reception, association, and expression. These processes constitute the language acquisition and usage. Reception is the ability to obtain meaning from sensory stimuli. Receptive understanding of words, gestures, and pictures seen or heard are tested by the reception subtests. Association is the manipulation of concepts and linguistic symbols internally. The associative process is the process whereby the incoming stimuli elicit the outgoing response. Expression is the process of expressing ideas in words and gestures (Hellmuth, 1968).

The levels of communication include the automatic-sequential level and the representational level. The two levels represent the degree to which habits of communication are organized within the individual. The automatic-sequential level requires retention of visual and auditory sequences, automatic habit chains, and vocal and motor imitation. Less voluntary and more automatic responses of language are tested at this level, compared to the more meaningful aspects of auditory and visual symbols of language tested at the representational level. The functions of the representational level include meaningful auditory

and visual reception and association, and verbal and motor expression (Hellmuth, 1968).

The norms were derived from the responses of approximately 1,000 average children between the ages of two to ten years. The sample of children were drawn from the communities of Bloomington, Decatur, Danville, and Urbana, Illinois, and Madison, Wisconsin. These children were selected as being average on performance of traditional measures of intelligence, school achievement, motor and sensory development, and personal-social adjustment. All of the children were of the same socioeconomic status and from English-speaking families. Four per cent of the sample were Negro (Kirk, 1968).

A great deal of research exists concerning the statistical analysis of the ITPA, special abilities and disabilities of different groups of children, and the effects of remediation on ITPA performance. Paraskevopoulos (1969) reported validity data on the 1968 Revised Edition. Some of the results found that the composite score and the psycholinguistic quotient (PLQ) correlated higher with IQ and MA than any of the individual subtests. Tests at the representational level tended to correlate higher with

MA and IQ than tests at the automatic level. At the representational level a comparison of the three processes showed that the association tests had a higher correlation with MA and IQ than either of the other processes. Vocabulary scores of the Binet correlated highest with the auditory subtests at the representational level and with Grammatic Closure.

Huizinga (1971) investigated the concurrent validity of the Revised ITPA. He found that the PLQ was highly correlated with the Stanford Binet Form L-M IQ and with the Wechsler Intelligence Scale for Children on the Verbal and Full Scale IQ's of six-year-old children. Reviews by Bateman (1965) and Huizinga (1971) are excellent references for studies reviewing the reliability, validity, and factor loadings of the test.

Paired-Associate Learning and Language Processes

Vicory (1963) stated that some linguists felt psychological experiments in verbal learning, such as paired-associate learning, were not representative of language learning because of their excessive simplification. However, Vicory (1963) presented some data indicating that a paired-associate task is not unrelated to language learning.

Vicory investigated the relationship of a one-word unit paired-associate learning task to the learning of a complex foreign language. The main predictor of learning the language was a paired-associate task using ten English word pairs to ten Polish word pairs presented visually, and ten English word pairs to ten Polish word pairs presented auditorially. The results showed the English-Polish paired-associate task learned auditorially correlated almost perfectly with ratings of fluency taken after one, two, and six months of language training. The results implied that the reductionism of a paired-associate task still preserved a representative relationship to the complex learning of a specific language if the response units of the paired-associate task were drawn from the population of utterances for a particular natural language (Vicory, 1963).

Gahagan (1968) investigated paired-associate learning as a partial validation of a language development program. The experiment was done to evaluate the effects of a two-year language program on children from five to seven years. The aim of the language program was to extend the child's verbal repertoire. The language program did not directly focus on improving learning of paired associates. However,

those children who received special language training performed significantly better than those children who had not received special language training on producing a range of sentences and learning a paired-associate task.

Friedrichs (1971) investigated the interrelations among learning and performance tasks with middle and upper-middle class four- and five-year-olds. The low correlation (.17) between different learning tasks indicated a high degree of differentiation or specificity of learning abilities in preschool children. These children performed very well on some tasks and very poorly on others. This finding emphasized the need to develop teaching methods in accordance with a child's specific abilities and disabilities rather than in accordance with their global IQ. The results of Friedrich's study also found the paired-associate task significantly correlated to observational learning (puzzle solving), problem solving II, and category sorting. Performance on a paired-associate learning task was considered to be a simple form of rote-memory learning by Kessen and Glick (1968); however, the significant correlations found in Friedrich's study (1971) suggested that paired-associate learning involved more complex

functions such as perceptual, discriminative, and conceptualizing skills.

Stevenson, Williams, and Coleman (1971) replicated Friedrich's study, except the subjects were four- and five-year-old disadvantaged children. Again a high degree of differentiation of learning abilities was found. Only seven out of thirty-six correlations were significant. The paired-associate task was significantly related to visual serial memory. Concept formation was significantly related to both the paired-associate task and serial memory. Observational learning was significantly related to the paired-associate task, serial memory, and category sorting. Jensen (1969) said a continuum of learning exists from Level I associative learning (such as a paired-associate task) to Level II cognitive or conceptual learning (such as a problem solving task). Jensen stated that Level I abilities are necessary before one can acquire Level II abilities. Therefore, the results of both Friedrich's and Stevenson's studies and Jensen's statements about levels of ability indicated that paired-associate learning is more than a simple rote learning task. Paired-associate learning seemed to assess some of the more complex functions needed in learning the conceptual tasks.

Greathouse (1969) investigated the relationship between third-and fifth-grade pupil's verbal associative learning ability and ability to verbalize. The verbalization measures, obtained from transcribed language samples, were significantly related to the verbal paired-associate test score. Because the verbalizations represented a unitary aspect of language variance, Greathouse recommended replicating the study using a more precise language analysis instrument to investigate the extent of the relationship between language and verbal associative learning ability.

The results of the studies reviewed through 1969 indicated a relationship between paired-associate learning and language learning. In order to more clearly understand the relationship between these two measures, a recommendation was made to use a more precise language analysis instrument. Also, the level of cognitive organization necessary for acquiring a paired-associate was investigated. These findings suggested that paired-associate learning involved complex conceptual skills and not simply rote memorization skills.

Estes and Huizinga (1971) investigated learning disabled children's performance on a ten-item

paired-associate task presented visually and auditorially, and their performance on the ITPA. The children were students at the Research and Evaluation Center for Learning. Their mean age was ten years four months, and their mean IQ was 95.4. Estes and Huizinga found that the paired-associate task presented visually consistently produced a greater number of correct responses than did the paired-associate task presented auditorially. However, no significant correlations were found between the scores on the paired-associate learning task and the scores on the ITPA. A number of factors possibly contributed to the lack of significant correlations between the two measures. According to Kirk (1968), the standardization of the ITPA is poor at the upper age limit. The upper age limit is from eight to ten years which is the range of the subjects' ages in Estes' and Huizinga's study. Secondly, a possibility existed that by age ten, the children learned compensatory mechanisms for adjusting to their deficits. Also, the children's mental age was used for grouping them as to who would receive which modality presentation of the paired-associate task. A mental age does not necessarily provide an adequate basis for grouping children as to which modality

presentation they should receive. In order to find a significant correlation between paired-associate learning presented through different modalities and the ITPA, a measure more closely related to the demands of the sensory presentations of the paired-associate task would be needed for grouping purposes.

Estes (personal communication, November 15, 1972) continued his investigation of the effect of different modality presentations on the learning of paired associates. Three-hundred and seventy children, who attended Lamplighter School in Dallas, Texas, participated in the study. The children included preschoolers, first, second, third, and fourth graders. Each child was randomly assigned to one of the six paired-associate conditions. Subjects for the present study were selected from the preschool group. The preschool subjects were administered either ten trials of picture presentations of the paired-associate task followed by five trials of auditory presentations of the paired-addociate task, or ten trials of auditory presentations of the paired-associate task followed by five trials of picture presentations of the paired-associate task. The paired-associate task consisted of the following eight picture

and number pairs: Ball/6, Cat/4, Fish/9, Bed/2, Box/8, Cow/1, Dog/5, and Pig/3. Half of the preschool subjects were administered ten trials of the paired-associate task presented auditorially followed by five trials presented pictorially, while the remaining half were presented the same list in the reverse order, i.e., ten trials presented pictorially followed by five trials presented auditorially. The following instructions were given for the picture presentation.

> You are first going to see some pictures and numbers that go together. For each picture there is a number that goes with that picture. Next you will see one of the pictures; then the T.V. screen will go blank for a few seconds. While the screen is blank, you tell me the number that goes with that picture. The picture and the number that goes with it will then be shown on the screen so you can see if you were right. You must tell me the number before you can see it on the screen. If you can't remember the correct number, make a guess (Estes, 1972).

Subjects were then presented the eight paired-associates with a three-second interval between pairs. After a ten-second inter-list interval, the stimulus picture for the first pair was presented, followed six seconds later by the stimulus and response number. There was a three-second interpair interval after which the next stimulus picture was presented. This time sequence was

followed until the list was presented ten times with a random intra-list pair sequence, constituting ten learning trials. The following instructions were given for the auditory presentation.

> You are first going to hear some words and numbers that go together. For each word there is a number that goes with that word. Next you will hear one of the words; then there will be a silence for a few seconds. During this silence you tell me the number that goes with the word. The word and the number that goes with it, will then be heard so you can tell if you were right. You must tell me the number before you hear it over the speaker. If you can't remember the correct number, make a guess (Estes, 1972).

The auditory presentation followed the same order and time sequence used in the picture presentation. The second list was composed of the first half of the first list. The second list, whether presented pictorially or auditorially, was administered five times with a random intra-list pair sequence, constituting five learning trials.

The pictures used in Estes' 1971 and 1972 study were selected by the subjects at the Research and Evaluation Center for Learning. The items selected were those pictures on which there was agreement among subjects regarding the name of the picture. Single-digit, one-syllable numbers were chosen because those numbers were felt to be the

easiest to recall. The experimenters wanted the task to assess primarily associative skills; therefore, both the stimulus and response items chosen were items the investigators believed were already in the subject's repertoire.

Estes (1972) found that the picture presentations of the paired-associate task significantly facilitated learning more than did the auditory presentations for the preschool subjects. The subjects for the present study were selected from the preschool group of Estes' 1972 study.

The present study was an attempt to reduce some of the factors that possibly interferred with finding a significant relationship between paired-associate learning and the ITPA in Estes' 1971 study. The age range of subjects and the grouping procedures for deciding who would receive which mode of presentation were discussed as possible limitations in Estes' 1971 study. Therefore, the present investigation used subjects between the ages of five and six, where the standardization of the ITPA is excellent (Kirk, 1966). Also, the possibility that the children had learned compensatory mechanisms for adjusting to their deficits was reduced due to their younger ages. Subjects were grouped according to operationally defined perceptual

weaknesses or strengths, rather than their mental age, as Estes (1971) had used.

In the review of the literature, findings suggested that material presented in accordance with one's perceptual preference facilitated learning. Other findings indicated a general relationship between paired-associate learning and language processes; however, to examine the extent of the relationship between the two, a precise language analysis instrument must be used. Some results also suggested that paired-associate learning involved conceptualizing abilities rather than simply rote-memorization skills.

The research reviewed provided a general rational for the present study. The present investigation examined the role of perceptual preferences in learning, the general and specific relationship between paired-associate learning and language processes, and the level of cognitive organization necessary for acquiring paired-associates. The present study, using subjects from Estes' 1972 study, attempted to control for the difficulties discussed in Estes' 1971 study in order to find reliable and valid answers to the above questions.

CHAPTER III

METHODS AND PROCEDURES

Subjects

The subjects for the study were forty preschool children attending Lamplighter School in Dallas, a private school whose pupils are primarily from the upper-middle class. The chief scientist at the Research and Evaluation Center for Learning in Dallas selected the forty subjects. The subjects were selected on the basis of their performance on the first ten trials of a paired-associate learning task presented either visually or auditorially. Those children who performed significantly below the mean of their group for the first ten trials of the paired-associate task presented auditorially comprised Experimental Group I, labeled "poor" auditory learners, and consisted of five females and five males. Those children who performed significantly above the mean of their group for the first ten trials of the paired-associate task presented auditorially comprised Control Group I, labeled "good" auditory learners, and consisted of five females and five males.

Those children who performed significantly below the mean of their group for the first ten trials of the paired-associate task presented visually comprised Experimental Group II, labeled "poor" visual learners, and consisted of five females and five males. Those children who performed significantly above the mean of their group for the first ten trials of the paired-associate task presented visually comprised Control Group II, labeled "good" visual learners, and consisted of five females and five males. Lamplighter School had no IQ's for the subjects in the present study; however, the mean intellectual level of functioning for the student body at the school was in the above average range of intelligence. The subjects in the study were white, and ranged in age from five years two months to six years one month.

Instrument

The Illinois Test of Psycholinguistic Ability (ITPA) was previously discussed quite extensively. The following discussion describes the test in more detail, according to what each individual subtest measures. The ITPA is a three-dimensional test consisting of ten subtests and two supplementary subtests, each representative of a level,

process, and channel of communication (Kirk, 1968). Two tests at the representational level which assess a child's receptive process are the auditory and visual reception subtests.

1. Auditory Reception--tests the child's ability to gain meaning from verbally presented material by requiring him to indicate "yes" or "no" to fifty short questions.

2. Visual Reception--tests the child's ability to gain meaning from visually presented material by requiring the child to select the one picture out of four most like the stimulus one. There are forty of these items.

Two tests at the representational level which assess a child's organizing process included auditory association and visual association.

3. Auditory Association--the child responds verbally with a word to each of forty-two incomplete analogies that get progressively more difficult.

4. Visual Association--the child responds to the visual analogies by pointing to the one of four surrounding pictures that was associated with the center stimulus picture.

Two tests at the representation level which assess a child's expressive process included verbal and manual expression.

5. Verbal Expression--the child was asked to talk about four familiar objects, one at a time, and was scored on the number of discrete, relevant, and factual concepts expressed.

6. Manual Expression--the child was shown fifteen pictures of common objects, one at a time, while asked to pantomime the appropriate action associated with the objects.

Two tests at the automatic level which assess a child's short-term sequential memory included auditory sequential memory and visual sequential memory.

7. Auditory Sequential Memory--the child repeated verbally from two to eight digits in sequence. The digits were presented at the rate of one per one-half second, and the child was given two chances to correctly repeat the sequence.

8. Visual Sequential Memory--the child reproduced visual sequences of non-meaningful figures after viewing each sequence for five seconds. The sequence increased in length from two to eight figures.

Three tests at the automatic level which assess a child's closure ability--the ability to fill in the missing parts of an incomplete expression--include grammatic closure, visual closure, and auditory closure.

9. Grammatic Closure--the examiner made a complete statement about a picture and then made an incomplete statement that the child finished. The conceptual level of the test was low so that items demonstrated the child's ability to respond automatically with frequently used grammatic expressions.

10. Visual Closure--the child was required to find objects that were partially hidden in four different scenes, with thirty seconds allowed for each scene.

11. Auditory Closure--a supplementary subtest at the automatic level, in which the examiner pronounced common words leaving out some of the parts. The child was asked to pronounce the word correctly.

12. Sound Blending--a supplementary subtest at the automatic level, in which the child had to identify the word spoken by the examiner. The word was pronounced in segments of one-half seconds each. The child's task was to connect the individual sounds into the whole words.

Procedure

The data for this investigation were collected within a two-week period by the same examiner. The individually administered ITPA took from fifty minutes to an hour for each subject. Testing of all subjects was done in the same room at Lamplighter School and was given during school hours. The experimental design was a double blind one, with neither the examiner nor the child knowing the previous scores on the paired-associate task.

CHAPTER IV

RESULTS AND DISCUSSION

Results

Scores on the ITPA were statistically analyzed to determine if the test discriminated between the two groups of "good" and "poor" auditory learners and between the two groups of "good" and "poor" visual learners. A two-way analysis of variance was used to determine statistically significant differences between the means of Experimental Group I, auditory "poor" learners, and Control Group I, auditory "good" learners, on the following parts of the ITPA: representational level, auditory channel, Auditory Memory, Auditory Reception, Auditory Association and Auditory Closure/Sound Blending. A simple one-way analysis of variance was used to determine statistically significant differences between the means of Control Group I and Experimental Group I for the psycholinguistic age (PLA).

A two-way analysis of variance was also used to determine statistically significant differences between the means of Experimental Group II, visual "poor" learners, and

Control Group II, visual "good" learners, on the following parts of the ITPA: representational level, visual channel, Visual Memory, Visual Reception and Visual Association. A simple one-way analysis of variance was used to determine statistically significant differences between the means of Experimental Group II and Control Group II for the psycholinguistic age (PLA). This study included a total of forty subjects, with half females and half males in each of the four groups of ten.

Analysis of the children's ITPA scores included viewing the test in relation to its dimensions, which are the channels, levels, and processes. The dimensions of the ITPA were grouped subtests of various combinations that represented the channels (visual and auditory), and one of the levels (representational). The third dimension, the processes, was not analyzed as a whole, but as visual and auditory processes separately.

The scores of the two channels of communication, auditory and visual, were each represented by the mean of five subtest scores. The auditory-vocal channel comprised the subtests of Auditory Reception, Auditory Association, Verbal Expression, Auditory Memory, and Grammatic Closure.

The mean of scores obtained on the subtests of Visual Reception, Visual Association, Manual Expression, and Visual Closure represented the visual-motor channel.

The representational level of organization was obtained by using the mean of the six subtest scores. These subtests are Auditory Reception, Auditory Association, Verbal Expression, Visual Reception, Visual Association, and Manual Expression.

Auditory Memory, Visual Memory, Auditory Reception, Visual Reception, Auditory Association, and Visual Association were each represented with a single scaled score. The two supplementary subtests of Auditory Closure and Sound Blending were also analyzed using each test's scaled score. The psycholinguistic age was represented by the mean of the ten subtests, excluding the two supplementary subtests. All scores used in the present study were the scaled scores from Table 2 in the 1968 Revised ITPA.

This study was concerned with the efficacy of the use of the ITPA in discriminating "good" from "poor" performance within the same sense modality; therefore, no comparisons

were made between the auditory learners and the visual learners. The following hypotheses were tested.

Hypothesis One stated that Control Group I, "good" auditory paired-associate learners, is expected to score significantly higher than Experimental Group I, "poor" auditory paired-associate learners, on the following parts of the ITPA.

a. Representational Level

b. Auditory Channel

c. Auditory Memory

d. Auditory Reception

e. Auditory Association

f. Auditory Closure/Sound Blending

g. Psycholinguistic Age (PLA)

The results of hypothesis one are reported in Table I below.

Although the first hypothesis was rejected as a whole, certain parts could not be rejected. The hypothesis was rejected in comparisons between the group means on the representational level, Auditory Memory, and Auditory Reception since no significant differences were found. The hypothesis was not rejected for comparisons between the group means for the auditory channel, Auditory Association,

psycholinguistic age and the two supplementary subtests of Auditory Closure and Sound Blending. Table I indicates that "good" auditory learners scored significantly higher than "poor" auditory learners on the auditory channel, Auditory Association, Auditory Closure/Sound Blending and on the psycholinguistic age.

TABLE I

DIFFERENCES BETWEEN "GOOD" AND "POOR" AUDITORY LEARNERS ON CERTAIN PARTS OF THE ITPA

ITPA	Experimental I "Poor" Learners		Control I "Good" Learners		F
	Mean	SD	Mean	SD	
Representational Level	40.20	5.02	43.10	3.52	NS
Auditory Channel	39.74	3.57	46.50	5.04	**14.04
Auditory Memory	34.30	4.22	40.50	5.52	NS
Auditory Reception	38.80	9.11	46.10	9.08	NS
Auditory Association	40.10	5.63	50.30	5.78	***16.01
Auditory Closure/ Sound Blending	45.25	2.95[a] 3.08	52.90	3.68[a] 5.95	** 8.53
Psycholinguistic Age (PLA)	72.7	9.65	84.80	10.06	* 7.53

*p <.05. **p <.01. ***p <.001. [a]S.D. for each subtest.
NS - Not significant.

Hypothesis Two stated that Control Group II, "good" visual paired-associate learners, is expected to score significantly higher than Experimental Group II, "poor" visual paired-associate learners, on the following parts of the ITPA.

a. Representational Level

b. Visual Channel

c. Visual Memory

d. Visual Reception

e. Visual Association

f. Psycholinguistic Age (PLA)

The results of hypothesis two are reported in Table II below.

Although the second hypothesis was rejected as a whole, one part could not be rejected. The hypothesis was rejected in comparisons between the group means for the representation level, Visual Memory, Visual Reception, and Visual Association since no significant differences were found. The hypothesis was not rejected for comparisons between the group means for the psycholinguistic age (PLA). Table II indicates that "good" visual learners scored significantly higher than "poor" visual learners on the psycholinguistic age.

TABLE II

DIFFERENCES BETWEEN "GOOD" AND "POOR" VISUAL LEARNERS ON CERTAIN PARTS OF THE ITPA

ITPA	Experimental II "Poor" Learners		Control II "Good" Learners		F
	Mean	SD	Mean	SD	
Representational Level	39.83	2.79	43.20	3.78	NS
Visual Channel	37.98	4.24	41.30	2.56	NS
Visual Memory	34.20	5.33	42.30	3.27	NS
Visual Reception	38.70	6.83	41.70	7.37	NS
Visual Association	39.30	6.98	40.80	5.49	NS
Psycholinguistic Age (PLA)	75.40	9.37	85.30	7.83	*6.57

*p <.05. NS - Not significant.

The present study made only specific hypotheses about differences between the group of "good" and "poor" auditory learners and between "good" and "poor" visual learners. Auditory learners were operationally defined only by their performance on the auditory presentations of the paired-associate task. Visual learners were operationally defined only by their performance on the visual presentations of the paired-associate task. Therefore, an individual's performance on an auditory task provided no basis for prediction of performance on a visual task. Similarily, an individual's

performance on a visual task provided no basis for prediction of performance on an auditory task. The significant differences between the channels of communication and between the associate processes of communication for auditory learners could not have been predicted, as the above rational explained, but are reported in Table III below.

TABLE III

DIFFERENCES BETWEEN THE CHANNELS AND BETWEEN THE PROCESSES OF COMMUNICATION FOR "GOOD" AND "POOR" AUDITORY LEARNERS

Auditory Learners	Auditory-Vocal Channel		Visual-Motor Channel		F
	Mean	SD	Mean	SD	
"Good" learners	46.50	3.04	38.72	3.72	*25.05
"Poor" learners	39.74	3.57	38.94	4.72	.94
	Auditory Association		Visual Association		
	Mean	SD	Mean	SD	F
"Good" learners	50.30	5.77	39.40	5.10	*29.30
"Poor" learners	40.10	5.63	42.20	6.01	.83

*p <.001.

Table III indicates that "good" auditory learners scored significantly higher on the auditory channel than on the visual channel. Also, "good" auditory learners scored significantly higher on Auditory Association than on Visual Association. No significant difference was found in the performance of "poor" auditory learners between the two channels or between the two associative processes.

The significant differences between the channels and between the associative processes of communication for visual learners could not have been predicted, as previously explained, but are reported in Table IV below.

TABLE IV

DIFFERENCES BETWEEN THE CHANNELS AND BETWEEN THE PROCESSES OF COMMUNICATION FOR "VISUAL" LEARNERS

Visual Learners	Auditory-Vocal Channel		Visual-Motor Channel		
	Mean	SD	Mean	SD	F
"Good"/"Poor" learners	42.46	4.79	39.64	3.81	*7.48
	Auditory Association		Visual Association		
	Mean	SD	Mean	SD	F
"Good"/"Poor" learners	45.3	6.35	40.50	6.16	*7.73

*p <.05.

Table IV indicates both "good" and "poor" visual learners combined scored significantly higher on the auditory channel than on the visual channel. Also, both "good" and "poor" visual learners combined scored significantly higher on Auditory Association than on Visual Association.

The unpredicted significant differences between "good" and "poor" visual learners on both levels, both channels, both the auditory and visual memory, and on both supplementary subtests of the ITPA are reported in Table V below.

TABLE V

DIFFERENCES BETWEEN "GOOD" AND "POOR" VISUAL LEARNERS ON THE LEVELS, CHANNELS, MEMORY, AND SUPPLEMENTARY SUBTESTS OF THE ITPA

ITPA	Experimental II "Poor" Learners		Control II "Good" Learners		F
	Mean	SD	Mean	SD	
Representational/ Automatic Levels	38.89	3.77	42.98	3.34	* 8.18
Auditory/Visual Channels	39.08	3.76	43.02	4.39	* 7.73
Auditory/Visual Memory	35.05	5.87	40.65	5.27	**11.14
Auditory Closure/ Sound Blending	44.05	12.08	51.30	12.59	* 5.66

*p <.05. **p <.01.

Table V indicates that the "good" visual learners scored significantly higher than the "poor" visual learners on the levels (representational and automatic), channels (visual and auditory), memory (visual and auditory), and on the two supplementary subtests (auditory closure and sound blending).

Discussion

The results of the present study were consistent with many findings in the literature. A relationship seemed to exist between the learning demands required in attaining a list of paired-associates and the learning demands required in performing on the ten different language subtests of the ITPA. The psycholinguistic age (PLA) yielded a global measure of psycholinguistic development. The PLA significantly discriminated between "good" and "poor" auditory learners and between "good" and "poor" visual learners; therefore, the ITPA seemed to assess similar abilities necessary in acquiring a list of paired-associates. This finding supported the research results of Greathouse (1969), who found verbalization measures from language samples significantly related to verbal paired-associate learning.

The ITPA yielded not only a global measure of language performance, but also scores that represented specific learning processes and sense modality strengths and weaknesses. The results indicated that "good" auditory learners scored significantly higher than "poor" auditory learners on auditory association and on the auditory channel. These findings suggested that the learning demands necessary in acquiring a paired-associate task were detected by these two subtests of the ITPA.

Jensen (1969) described paired-associate learning as an associative task, and assumed that the abilities required in learning paired-associations were necessary before conceptual learning occurred. In agreement with Jensen, Friedrichs (1971) and Stevenson et al., (1971) found significant correlations between paired-associate learning and conceptual tasks; however, Kessen and Glick (1968) found that paired-associate learning was a simple rote-memory task. The significantly higher "good" auditory learner's score as compared to the "poor" auditory learner's scord on auditory association supported the notion of paired-associate learning being a more complex conceptual task. Auditory Association is considered to require a representational

level of language organization, which requires conceptual thinking (Kirk, 1968).

The finding that "good" auditory learners scored significantly higher than "poor" auditory learners on the auditory channel were consistent with the research results of Levin et al., (1971) and Dennison (1971). These authors found that paired-associates presented in accordance with one's perceptual strengths facilitated learning. The "good" auditory learners scored significantly higher than the "poor" auditory learners on the auditory supplementary subtests of auditory closure and sound blending. This finding also indicated that presentation of material through the preferred sense modality facilitated learning. The supplementary subtests appeared to require the same perceptual strengths necessary in learning the paired-associate list presented auditorially.

Finding no significantly different scores between the "good" and the "poor" auditory learners on the representational level, Auditory Memory, and Auditory Reception indicated the inefficacy of the use of these subtests in assessing abilities similar to those necessary in learning a list of paired-associates. The process of learning a list

of paired-associates was believed to be a task that demanded a representational level of cognitive organization. However, the representational level did not discriminate "good" from "poor" auditory learners, which possibly resulted because of the organization of the representational level of the ITPA. This level does not separate the visual from the auditory channel. Although learning the paired-associate list possibly required a representational level of language orientation, the representational level subtests were not presented in differentiated sense modalities as the paired-associates were presented.

Stevenson et al. (1971) found paired-associate learning and serial memory were significantly correlated; however, Auditory Memory on the ITPA, in the present study, did not discriminate between "good" and "poor" auditory learners. This result indicated that the memory factor required in paired-associate learning was different from the memory tested by the Auditory Memory subtest. The Auditory Memory subtest assessed a short-term sequential memory (Kirk, 1968); whereas the memory needed in learning the paired-associate list appeared to require a long-term complex memory.

The Auditory Reception subtest of the ITPA did not significantly differentiate between "good" and "poor" auditory learners. Although the paired-associates presented auditorially required auditory-receptive abilities, the auditory reception subtest possibly tested only a part of the necessary skills needed in learning paired-associations. These results appeared to indicate that the receptive phase of learning a paired-associate was not the crucial determinant in discriminating between those who performed well or poorly on the task. The associative phase was possibly more crucial to paired-associate learning as was indicated by the Auditory Association subtest's ability to discriminate between "good" and "poor" auditory learners.

The "good" visual learners scored significantly higher than the "poor" visual learners on the psycholinguistic age. This finding indicated a general relationship between the learning demands necessary in acquiring paired-associates and the learning demands necessary in performing on the ten different language subtests of the ITPA. For both the auditory and the visual learners, the ITPA seemed to assess the same overall abilities necessary for performance on the paired-associate task. However, the global PLA score was

more definitive than specific subtest scores in discriminating between "good" and "poor" visual learners.

The more specific analysis of the ITPA did not discriminate between "good" and "poor" visual learner's performance as had been expected. Finding no significant difference between "good" and "poor" visual learner's scores on the representational level, visual channel, Visual Memory, Visual Reception, and Visual Association indicated that the demands necessary for acquiring paired-associates were dissimilar to those required on the above listed subtests.

Some additional unpredicted results were found which may help explain the lack of significant findings. All twenty of the visual learners, both the "good" and the "poor", scored significantly higher on the auditory channel than on the visual channel. Both the "good" and the "poor" visual learners combined also scored significantly higher on auditory association than on visual association. The visual learners were defined by their performance on only the visual presentations of the paired-associate task; therefore, no basis existed for predicting their performance on the auditory subtests of the ITPA. These visual learners may or may not have been strong auditory learners. The

visual learners of the present study appeared to prefer the auditory sense modality as was indicated by their significantly higher auditory channel and auditory association scores as compared to their visual channel and visual association scores. The inefficacy of the use of the different ITPA subtests to discriminate between "good" and "poor" visual learners was possibly due to the total sample appearing to be strong auditory learners. In learning the paired-associate list presented visually, the apparently stronger auditory learners may have sub-vocalized the associations. If sub-vocalization occurred, interference between "seeing" a paired-associate and "vocalizing" a paired-associate to oneself may have impeded their performance on the task (Milgram, 1967).

The unpredicted findings that "good" auditory learners scored significantly higher on the auditory channel as compared to the visual channel, and scored significantly higher on auditory association as compared to visual association provided additional support for the sub-vocalization explanation (Milgram, 1967). If the auditory learners sub-vocalized, while learning the paired-associates, their performance on the task would be facilitated rather than

impeded as was the performance of the visual learners. The ITPA scores of all forty subjects indicated a preference for the auditory presentations of the paired-associate task learned most effectively, whereas those subjects who received visual presentations of the paired-associate task learned least effectively. An experimental design which defined strong modality sense preferences according to performance utilizing both sense modalities separately might better control for the above difficulty and present different findings.

Another unpredicted finding was the significantly better performance of "good" visual learners as compared to "poor" visual learners on both levels (representational and automatic), both channels (visual and auditory), memory (visual and auditory), and on both supplementary subtests (Auditory Closure and Sound Blending). These results indicated that the ITPA discriminated between "good" and "poor" visual learners, not in accordance with their defined "visual" learner label, but in a more general way. The superior performance of these "good" visual learners on both levels, both channels, both auditory and visual memory, and on both supplementary subtests indicated that regardless of

mode of presentation of the paired-associate task, these parts of the ITPA did discriminate "good" from "poor" visual learners. The fact that the ITPA discriminated between the two groups in a more general way, indicated that this test still assessed some of the similar abilities necessary in learning the paired-associates. The fact that the ITPA did not discriminate between the two groups in a more precise way, according to their defined perceptual preference, possibly resulted from the design of the study rather than from the inefficacy of the use of the ITPA as a discriminative instrument.

The auditory supplementary subtests discriminated the "good" from the "poor" visual learners. This finding supported the previously discussed idea that this group preferred the auditory sense modality. If the group had been selected according to performances using both modalities separately, the ITPA might have been able to discriminate between "good" and "poor" learners in a more precise way.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

Summary

Research relating diagnostic test findings to learning tasks has been seriously neglected. To better meet the educational needs of children, further knowledge is required about the test results that are used in making important academic decisions. The Revised Illinois Test of Psycholinguistic Ability, published in 1968, has been widely accepted for use with learning disabled children as well as with other disabled populations. However, little research evidence was found concerning the relationship of the ITPA to other learning tasks.

This study was an exploratory attempt to evaluate the efficacy of the use of the ITPA in discriminating between the learning performance of "good" and "poor" auditory learners and between "good" and "poor" visual learners on a paired-associate task. The ITPA claims to delineate perceptual strengths and weaknesses (Kirk, 1968); therefore,

the learning task used was presented through two different sense modalities--audition or vision.

The forty preschool subjects of the study, matched on sex, attend a private school composed primarily of pupils from the upper-middle class. The subjects were investigated on the basis of certain individual subtests, total scaled scores (PLA), scores grouped according to the dimensions of channels, and the representational level of the ITPA. The statistical techniques utilized in the investigation included an application of a two-way analysis of variance and a one-way simple analysis of variance.

The following hypotheses were tested.

1. "Good" auditory paired-associate learners are expected to score significantly higher than "poor" auditory paired-associate learners on the following parts of the ITPA.

   a. Representational Level

   b. Auditory Channel

   c. Auditory Memory

   d. Auditory Reception

   e. Auditory Association

   f. Auditory Closure/Sound Blending

   g. Psycholinguistic Age (PLA)

The hypothesis was rejected for comparisons between group means on the representational level, Auditory Memory, and Auditory Reception since no significant differences were found. A statistically significant difference was found between scores for "good" auditory learners and "poor" auditory learners on the auditory channel, Auditory Association, Auditory Closure/Sound Blending, and the psycholinguistic age.

2. "Good" visual paired-associate learners are expected to score significantly higher than "poor" visual paired-associate learners on the following parts of the ITPA.

a. Representational Level

b. Visual Channel

c. Visual Memory

d. Visual Reception

e. Visual Association

f. Psycholinguistic Age

The hypothesis was rejected for comparisons between group means on the representational level, visual channel, Visual Memory, Visual Reception, and Visual Association since no significant differences were found. A statistically significant difference was found between scores for "good"

visual learners and "poor" visual learners on the psycholinguistic age (PLA).

Conclusions

The results presented in the study appeared to justify the following conclusions for preschool children at Lamplighter School in Dallas, Texas. Caution should be exercised in applying these generalizations to children of other socioeconomic, racial, and ethnic characteristics.

1. The ITPA is a global measure, represented by the PLA, discriminated between "good" and "poor" auditory learners as well as between "good" and "poor" visual learners.

2. The auditory channel discriminated between "good" and "poor" auditory learners.

3. Auditory Association discriminated between "good" and "poor" auditory learners.

4. The auditory supplementary subtests, which included Auditory Closure and Sound Blending, discriminated between "good" and "poor" auditory learners.

5. The overall abilities tested by the ITPA, represented by the PLA, seemed to assess similar abilities necessary in acquiring a list of paired-associates;

therefore, a general relationship between the paired-associate task and the ITPA was indicated.

6. The notion that learning is facilitated by presenting material in accordance with one's perceptual preference was partially supported by the findings of the significantly higher scores of "good" auditory learners as compared to "poor" auditory learners on the auditory channel, auditory associative process, and on the auditory supplementary subtests.

7. The notion that paired-associate learning involves more complex conceptual abilities rather than simply rote memorization skills was partially supported by the efficacy of the Auditory Association subtest to discriminate between "good" and "poor" auditory learners. The Auditory Association subtest measures language processes at the representational, meaningful level of cognitive organization.

8. The ITPA was a better discriminator of the auditory paired-associate learner's performance than of the visual paired-associate learner's performance, as indicated by the greater number of significant differences found for the auditory learners.

9. The specific analysis of the ITPA, which utilized the visual channel, representational level, and particular subtest scores, did not discriminate between "good" and "poor" visual learners. The lack of significant findings was discussed as possibly due to the subjects being strong auditory learners, as indicated by their ITPA scores. Attention was called to several unpredicted significant findings which suggested that the nonsignificant predicted findings resulted from the design of the study, rather than from the inefficacy of the use of the ITPA as a discriminative instrument.

Recommendations

Following the prescribed recommendations for further research would extend the findings of this study and contribute to the overall evaluation of ITPA in relation to other learning measures.

1. Examine the efficacy of the use of the ITPA to discriminate between learners who are operationally defined according to both their visual and auditory preferences and deficits.

2. Examine the subjects of the present study at the completion of first grade in order to determine if the same perceptual preferences are demonstrated.

3. Examine the following question--do teaching methods in accordance with a defined perceptual preference facilitate learning how to read?

APPENDIX

RAW DATA ON THE PAIRED-ASSOCIATE TASK FOR "AUDITORY" LEARNERS

	Auditory Trials											Picture Trials					
	1	2	3	4	5	6	7	8	9	10	T	1	2	3	4	5	T
"Poor" auditory females	0	1	1	0	0	1	1	1	2	1	8	1	3	2	2	3	11
	0	1	0	0	2	1	2	2	2	4	14	6	5	6	7	8	32
	0	2	1	1	0	2	0	2	1	3	12	2	4	4	4	5	19
	3	1	0	1	1	0	0	1	0	0	7	2	1	3	2	2	10
	0	2	2	1	1	1	1	0	1	0	9	0	2	3	3	2	10
"Good" auditory females	1	3	6	7	8	8	7	6	8	7	61	7	8	6	7	8	36
	3	4	6	6	8	8	6	8	8	8	65	7	8	6	6	7	34
	3	4	7	6	7	6	7	8	8	7	63	8	8	7	7	8	38
	3	5	6	6	6	7	7	8	8	8	64	8	7	8	8	7	38
	5	4	4	6	7	7	6	8	7	8	62	8	7	8	7	8	38
			$\bar{X}$ = 34											$\bar{X}$ = 27			
			σ = 10.32											σ = 9.55			
"Poor" auditory males	1	0	0	1	1	0	0	0	3	1	7	0	1	2	4	4	11
	0	1	0	1	3	0	0	0	0	0	5	1	2	1	0	2	6
	1	1	1	1	1	3	1	1	2	0	12	2	2	4	6	7	21
	0	0	0	0	0	1	0	0	0	0	1	0	2	2	2	3	9
	0	1	0	0	2	0	1	2	1	2	9	0	0	0	0	0	0
"Good" auditory males	1	5	6	6	6	7	7	7	8	6	59	4	7	8	8	7	34
	3	6	6	8	8	7	8	7	8	8	69	8	8	8	8	5	37
	3	5	6	7	7	8	8	8	8	8	68	8	6	8	8	6	36
	3	3	4	6	6	6	7	8	7	8	58	6	7	7	8	8	36
	3	6	6	8	8	8	7	8	8	8	70	8	8	6	8	8	38
			$\bar{X}$ = 32											$\bar{X}$ = 25			
			σ = 19.05											σ = 10.4			

RAW DATA ON THE PAIRED-ASSOCIATE TASK FOR "VISUAL" LEARNERS

	Picture Trials											Auditory Trials					
	1	2	3	4	5	6	7	8	9	10	T	1	2	3	4	5	T
"Poor" visual females	3	2	3	4	3	4	5	3	4	4	33	4	5	5	6	6	26
	2	0	1	2	2	4	3	3	6	6	29	5	4	5	4	5	23
	2	3	2	2	1	3	2	1	2	1	19	1	1	3	2	1	8
	1	1	2	4	5	3	5	4	7	6	38	3	3	4	6	6	22
	1	3	4	2	4	4	3	3	4	7	35	5	6	6	6	7	30
"Good" visual females	6	6	8	7	7	7	7	7	8	7	70	6	8	8	8	8	38
	5	5	7	7	8	8	8	8	8	8	72	7	7	6	7	8	35
	4	5	5	8	8	8	8	8	8	7	69	8	8	8	8	8	40
	3	6	8	8	7	8	8	6	8	8	70	8	8	8	7	8	39
	6	8	8	8	8	8	8	6	8	8	78	7	8	8	8	8	39
		$\bar{X}$ = 54										$\bar{X}$ = 33					
		σ = 14.5										σ = 7.20					
"Poor" visual males	0	2	2	1	1	2	4	4	5	7	28	7	6	6	5	5	29
	1	0	2	0	3	3	0	2	2	5	18	4	3	4	4	3	17
	0	2	1	2	1	4	2	3	5	5	25	5	4	6	7	4	26
	0	1	2	2	2	4	4	5	6	7	33	6	7	7	6	7	23
	0	2	2	3	3	3	5	5	4	3	30	4	4	4	5	4	21
"Good" visual males	6	8	7	6	7	7	7	7	8	7	70	8	8	7	7	8	38
	4	6	7	8	7	7	8	8	8	8	71	8	8	8	8	8	40
	6	7	7	8	7	6	8	8	8	8	73	8	8	7	8	8	39
	5	7	7	8	6	7	8	6	8	7	69	8	7	7	7	8	37
	3	4	5	8	8	7	8	6	8	8	66	8	8	8	8	8	40
		$\bar{X}$ = 49										$\bar{X}$ = 31					
		σ = 14.96										σ = 8.43					

SCALED SCORES ON THE ITPA FOR "AUDITORY" LEARNERS

	Levels		Channels		Supplementary Subtests		
	Representational	Automatic	Visual	Auditory	Auditory Closure	Sound Blending	PLA
"Poor" auditory females	41.8	36.3	37.2	42	36	65	72
	48.7	46.3	46	47.6	40	68	92
	35	38	34.6	37.8	33	45	70
	33.8	38	34.6	36.4	40	42	59
	36.7	38.3	37	37.6	40	66	74
"Good" auditory females	49.7	48	44.2	53.8	46	66	106
	44.8	46.3	40.2	50.6	47	66	93
	39.3	40.3	37.8	41.6	40	68	72
	43.8	42.8	37.6	49.2	39	66	88
	42.2	40.8	37.4	45.8	43	66	82
"Poor" auditory males	46.5	42.3	45.4	41.6	36	51	80
	44.0	41.3	43.8	42	36	37	79
	37.2	40.3	38.6	38.2	43	68	69
	41.5	35.3	39.6	38.4	40	40	72
	37.5	29.3	32.6	35.8	39	40	60
"Good" auditory males	43.8	42.3	45	40.6	35	55	88
	40.3	42	36	46	44	66	81
	44.7	39.5	37	48.2	44	68	80
	37.3	32.8	32.8	38.2	41	51	72
	45.7	46	40.6	51	39	68	86

SCALED SCORES ON THE ITPA FOR "AUDITORY" LEARNERS (CONTINUED)

	Memory		Reception		Association	
	Auditory	Visual	Auditory	Visual	Auditory	Visual
"Poor" auditory females	30	36	47	42	47	34
	37	45	60	52	46	52
	40	34	38	37	38	35
	42	36	32	30	29	41
	32	42	38	31	41	42
"Good" auditory females	45	45	59	45	59	38
	44	45	58	31	54	48
	40	39	33	31	46	41
	40	34	51	42	47	36
	35	34	41	44	45	35
"Poor" auditory males	32	44	42	46	42	52
	32	39	37	52	46	42
	36	40	32	34	37	40
	32	44	30	43	35	40
	30	29	32	35	40	44
"Good" auditory males	33	47	49	44	47	46
	47	36	38	42	54	34
	40	40	53	36	513	38
	33	34	41	41	42	34
	48	39	38	41	58	44

SCALED SCORES ON THE ITPA FOR "VISUAL" LEARNERS

	Levels		Channels		Supplementary Subtests		
	Representational	Automatic	Visual	Auditory	Auditory Closure	Blending	PLA
"Poor" visual females	44.7	40	41.2	43.8	39	66	86
	38.5	39.3	37	40.6	40	68	71
	38.7	39.3	38.4	39.4	31	46	69
	43.8	47.8	48.4	42.4	40	62	96
	39.3	40.3	37.6	41.8	43	68	72
"Good" visual females	47.2	44	43	48.8	40	54	88
	35.3	39.8	38	36.2	36	45	71
	43.3	40.8	38.2	46.4	44	66	83
	48.2	50.3	42.6	55.4	40	68	97
	44.7	41.3	43.8	42.8	39	66	87
"Poor" visual males	42.5	33.3	34.4	43.2	38	41	76
	36.7	33	35.8	34.6	32	34	63
	41.5	36	37.6	41	39	47	77
	36.3	35	35.8	35.8	35	41	73
	36.8	35.8	33.6	39.2	32	39	71
"Good" visual males	40.7	41.3	38.6	43.2	48	66	97
	46.5	44.5	44.8	46.6	40	63	85
	40.8	42.8	43.4	39.8	38	66	85
	41.8	41.3	41.2	42	42	66	81
	43.5	41.8	39.4	46.2	36.	63	79

SCALED SCORES ON THE ITPA FOR "VISUAL" LEARNERS (CONTINUED)

	Memory		Reception		Association	
	Auditory	Visual	Auditory	Visual	Auditory	Visual
"Poor" visual females	39	38	49	39	47	35
	45	31	39	37	44	41
	28	42	50	42	373	37
	44	42	40	48	39	57
	44	33	30	45	44	42
"Good" visual females	41	40	42	44	56	36
	33	45	34	40	37	32
	36	42	49	39	45	41
	52	42	57	38	51	37
	38	47	53	51	42	41
"Poor" visual male	31	30	55	30	52	36
	29	31	35	43	32	37
	34	26	49	42	47	41
	32	37	39	35	42	32
	33	32	34	26	40	35
"Good" visual males	48	39	40	30	54	47
	35	45	56	49	51	45
	33	46	40	32	46	49
	40	38	40	51	48	44
	34	39	45	43	52	36

BIBLIOGRAPHY

Bateman, B. D. The ITPA in Current Research: Summaries of Studies. Urbana: University of Illinois Press, 1965.

Bateman, B. D. A Reference Line for Use with the ITPA. Journal of School Psychologist, 1967, 11, 128-135.

Bateman, B. D. Interpretation of the 1961 Illinois Test of Psycholinguistic Abilities. Seattle: Special Child Publications, 1968.

Budoff, M., & Quinlan, D. Auditory and Visual Learning in Primary Grade Children. Child Development, 1964a, 35, 583-586.

Dennison, J. W. Relationship of Auditory and Visual Perceptual Strengths to Methods of Teaching a Paired-Associate Task to First Graders. Perceptual and Motor Skills, 1971, 32, 218.

Estes, R. E., & Huizinga, R. J. Comparison of Visual and Auditory Presentations of a Paired-Associate Learning Task with Learning Disabled Children. Unpublished study, 1971.

Friedrichs, A. G., Hertz, T. W., Moynahan, E. D., Simpson, W. E., Arnold, M. R., Cristy, M. D., Cooper, C. R., & Stevenson, H. W. Interrelations Among Learning and Performance Tasks at the Pre-School Level. Developmental Psychology, 1971, 4, 173-177.

Gahagan, G. A., & Gahagan, D. M. Paired-Associate Learning as a Partial Validation of a Language Development Program. Child Development, 1968, 39, 1119-1131.

Greathouse, L. J. Relationships Between Language Development and Verbal Associative Learning of 3rd and 5th Grade Pupils. Unpublished doctoral dissertation, New Mexico State University, 1968.

Hall, V. C. Acquisition and Transfer Differences Between Kindergartens and Second-Graders on Aurally and Visually Presented Paired-Associates Using an A-B, A-C Design. Journal of Experimental Child Psychology, 1969, 7, 400-406.

Hellmuth, J. (Ed.) Learning Disorders, Volume III. Seattle: Special Child Publications, 1968.

Hill, S. D., & Hecker, N. E. Auditory and Visual Learning of a Paired-Associate Task by Second Grade Children. Perceptual and Motor Skills, 1966, 23, 814.

Huizinga, R. J. The Relationships of the Illinois Test of Psycholinguistic Abilities to the Standford-Binet Form L-M and the Weschler Intelligence Scale for Children. Unpublished doctoral dissertation, University of Arizona, 1971.

Jensen, A. R. How Much Can We Boost IQ and Scholastic Achievement? Harvard Educational Review, 1969, 39.

Kessen, W., & Glick, J. Conceptual and Mnemonic Factors in Paired-Associate Learning. Journal of Experimental Child Psychology, 1968, 6, 120-130.

Kirk, S. A. The Diagnosis and Remediation of Psycholinguistic Disabilities. Urbana: University of Illinois Press, 1966.

Kirk, S. A., & Kirk, W. D. Psycholinguistic Learning Disabilities: Diagnosis and Remediation. Urbana: University of Illinois Press, 1971.

Kirk, S. A. & McCarthy, J. J. The Illinois Test of Psycholinguistic Ability--An Approach to Differential Diagnosis. American Journal of Mental Deficiency, 1961, 66, 399-412.

Kirk, S. A., McCarthy, J. J., & Kirk, W. D. Examiner's Manual: ITPA. Urbana: University of Illinois Press, 1968.

Lerner, J. W. Children with Learning Disabilities. Boston: Houghton Mifflin Co., 1971.

Levin, J. R., Rohwer, W. D., & Cleary, T. A. Individual Differences in the Learning of Verbally and Pictorially Presented Paired-Associates. American Educational Research Journal, 1971, 8, 11-24.

Lifton, H., & Goss, A. E. Aural-Visual Transfer of Paired-Associate Learning. The Journal of General Psychology, 1962, 66, 225-234.

McCarthy, J. J. & McCarthy, J. F. Learning Disabilities--Unified Approach. Boston: Allyn & Bacon, Inc., 1969.

McGeoch, J. A. The Psychology of Human Learning. New York: Longmans, Green & Co., 1942.

Milgram, M. A. Verbal Context Versus Visual Compound in Paired-Associate Learning by Children. Journal of Experimental Child Psychology, 1967, 5, 597-603.

Murdock, B. B. Visual and Auditory Stores in Short-Term Memory. Quarterly Journal of Experimental Psychology, 1966, 18, 206-211.

Paraskevopoulous, J. N., & Kirk, S. A. The Development of Psychometric Characteristics of the Revised ITPA. Urbana: University of Illinois Press, 1969.

Rohwer, W., Lynch, S., Levin, J. R., Suzuki, N. Pictoral and Verbal Factors in the Efficient Learning of Paired-Associates. Journal of Educational Psychology, 1967, 58, 278-284.

Runquist, W. N., Hutt, V. H. Verbal Concept Learning in High School Students with Pictorial and Verbal Representation of Stimuli. Journal of Educational Psychology, 1961, 52, 108-111.

Sievers, D. J., & Essa, S. H. Language Development in Institutionalized and Community Mentally Retarded Children. American Journal of Mental Deficiency, 1961, 3, 413-420.

Stevenson, H. W., Williams, A. M., & Coleman, E. Interrelations Among Learning and Performance Tasks in Disadvantaged Children. Journal of Educational Psychology, 1971, 62, 179-184.

Vicory, A. C. The Paired-Associate Task as a Predictor of Foreign Language Fluency. Unpublished master's thesis, San Jose State College, 1963. Cited by J. J. Asher, Perceptual and Motor Skills, 1964, 19, 255-300.

Walther, C. J. An Investigation of Paired-Association Learning within and across Intelligence Levels and Sense Modalities. Unpublished doctoral dissertation, University of Oregon, 1969.