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ABSTRACT

In an attempt to clarify the phenomena of psychological "process" variables, as applied to children with learning disabilities, a study was made of sensory modality preferences in 64 kindergarten and 64 first grade children. Ss were given a battery of seven measures grouped under the following four headings: standardized test approach; controlled laboratory approach; classroom-oriented approach; and teacher observation. For each of the seven measures, both a visual and an auditory mode were presented to each child. A series of four analyses was performed. The first series generated descriptive statistics on 81 variables in kindergarten and on 79 variables in first grade. The second series studied the standard z discrepancy scores between auditory and visual performances in the context of several complex factorial designs. The third series used the standard z scores of the second to study the incidence and nature of various types of sensory modality profiles. The fourth series used percentage correct (mastery) scores embedded in complex factorial designs to examine various types of auditory-visual comparisons. (Author/DB)

SENSORY MODALITY PREFERENCES: MEASUREMENT OF SELECTED PSYCHOLOGICAL "PROCESS" VARIABLES AND THEIR VALIDITY; IMPLICATIONS FOR APTITUDE - TREATMENT INTERACTION RESEARCH WITH LEARNING DISABLED CHILDREN

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PREFACE

The present report represents a major effort of research personnel in the Montgomery County (Pa.) Intermediate Unit to investigate psychological "process" phenomena of visual and auditory sensory modality type in young children. This report has been in preparation for several years due to various interruptions in each of the investigator's schedules associated with running day-to-day school activities. The research actually stems from a pilot study conducted in fall, 1973, and the actual project that was carried out during February and March, 1974. The present project is actually the second major effort by the Intermediate Unit to examine the functioning of sensory modalities. The first major efforts in this regard were carried out in connection with the initial efforts of the National Regional Resource Center of Pennsylvania (NRRC/P); this first set of efforts has already been amply described in three reports: Mann, Proger, and Cross (1973); Proger, Mann, Burger, and Cross (1972); and Proger and Mann (1973). The third set of efforts to study sensory modality functioning have occurred in connection with a Title III (Elementary and Secondary Education Act of 1965) Project entitled "Secondary Learning Disabilities Curriculum Development;" the latter project was directed by Dr. Goodman during 1974-1975 and 1975-1976 and has produced several publications (Goodman & Mann, 1975a; Goodman & Mann, 1975b). A publication yet to be released by Dr. Goodman will contain findings on the third project to deal with sensory modality phenomena. As the reader can see, the topic has been and continues to be one of interest to Intermediate Unit staff who have had some form of contact with the learning disabilities movement.

INTRODUCTION

Educators who have been trying to implement individualized instruction have often relied upon the concept of sensory modality preferences. In its simplest form, the model of modality preferences postulates a learner to be basically either of audile type (auditory strength) or visile type (visual strength). Presumably, if a child were basically diagnosed through various assessment procedures to be an audile learner, the educational programing specialist could then offer the child activities that would avoid his visual deficits and instead would capitalize upon his auditory strengths. Many large, regional, instructional materials centers have offered services for programing to the relative sensory strengths and weaknesses of children. In fact, a number of diagnostic and screening tests have embodied the concept of assessing sensory modality preferences (e.g., Illinois Test of Psycholinguistic Abilities, Detroit Test of Learning Aptitudes, Slingerland Screening Tests for Specific Learning Disabilities). Yet, aptitude-treatment interaction (ATI) research (with sensory preference as the "aptitude" and programing to the predominant sensory strength as the "treatment") has yielded very disappointing results. One reason often given for this situation is the lack of adequate aptitude measuring devices. The present study looked at different methods of measuring sensory modality preferences as a possible determinant to this poor showing of previous ATI research. Besides examining what might be a more effective way of measuring modality preferences, the study also sought to examine patterns of consistency among the different modality measurement methods. Finally, the study addressed the question of how such modality preferences are related to high and low achievement patterns in ongoing school work.

REVIEW OF LITERATURE

Several reviews of ATI research have been completed (Berliner & Cahen, 1973; Brocht, 1970; Salomon, 1972). While these reviews were not specifically aimed at sensory modality phenomena, they pointed out a number of issues that surround the very poor showing in ATI research.

Ysseldyke (1973) examined diagnostic-prescriptive teaching and how it relates to ATI research. He found five studies that dealt with the concept of sensory modality preferences (Bateman, 1968; Bruininks, 1967; Janssen, 1971; Sabatino & Ysseldyke, 1972; Sabatino, Ysseldyke & Woolston, 1973). All found negative results relative to the idea of differential programming based on sensory modality preferences. While discussing several flaws in such research, Ysseldyke concluded: "The primary problem interfering with efforts to carry out methodologically sound aptitude-treatment interaction investigations is a lack of reliable and valid devices which may be used to identify behavioral (ability) strengths and weaknesses in children. Special educators cannot afford to provide programs for only those children who demonstrate behavioral deficits, since, by chance, approximately half those defined as nondeficient will theoretically be false positives. On the other hand, few school districts can afford specialized training for all children diagnosed as deficient by current unreliable devices (Ysseldyke, 1973, p. 26)." The current study attempts to study intensively the validity of selected sensory measurements and will not examine their reliability.

Other studies have reflected upon the nature of differences between auditory and visual learning styles. Chalfont and Flathouse (1971) have provided a definite review. Snyder and Pope (1972) studied phenomena directly relevant to the present investigation.

Kazelskis (1970), in a study related to the nonsense syllable portion

of the present investigation, categorized graduate students into either field-dependent or field-independent groups. Two nonsense-syllable lists of consonant-vowel-consonant (cvc) type were presented in either an oral mode (spelling the syllables to the students) or an oral-visual mode (spelling the syllables as well as showing them on cards). The combined presentation mode produced significantly higher recall than just the oral mode.

Powers and Jacob (1975) reviewed several studies in the regular education realm. Contradictory patterns of findings were found in Oakan, Wiener, and Cromer (1971), Matz and Rohwer (1971), and Nelson (1970). Powers and Jacob used a directional map task whereby normal sixth-grade children had to select sequential answers that would tell how to go from one point on the map past obstacles to another given point. Regardless of IQ level, those children given oral directions did better than those children who had to read the directions by themselves.

Epstein (1970) studied sensory-modality preferences in learning meaningful words, rather than nonsense syllables. Two successive word lists were presented to undergraduate students in various modality combinations formed by having auditory presentation (tape recorder) or visual presentation (memory drum) for the first list and likewise for the second list; thus, the combinations would be AA, AV, VA, or VV. In referring to previous research on sensory modality effects (Laughery & Pinkus, 1966; Murdock & Walker, 1969), Epstein commented: "There is evidence that modality effects in free recall are favored by rapid rates of presentation...Rapid rates probably attenuate the tendency to represent viaual inputs acoustically, or the tendency to provide a common representation for both input modalities (p. 191)." Under a written response mode, subjects did best with VA and VV as input modes, but

when an oral response mode was used, the most effective combinations were AA and VV.

The sensory modality issue can be traced back to Washburn (1916), who found that auditory presentation of serial lists of words or digits is more effective for immediate recall than visual presentation. Crowder (1971) has been one of the main researchers in the modality areas; in reviewing more recent research (Corballis, 1966; Conrad & Hull, 1968; Crowder, 1970; Murdock, 1976; Murray, 1966), Crowder concludes that Washburn's finding is still true. (Just how such modality differences affect higher learning activities is less well delineated and is studied to some extent in the present investigation.) A recent theory proposed to explain these differences (Crowder & Morton, 1969) suggests: "Although visual and auditory input eventually lead to comparable forms of presentation in a central short-term memory (STM) there are logically earlier, more-peripheral, sensory memories, one for vision and one for audition, which carry information in prelinguistic form. Crowder and Morton called the peripheral auditory memory Precategorical Acoustic Storage (PAS) and proposed that it holds information at least for a few seconds—dramatically longer than the visual precategorical store is believed to persist. The PAS system is compromised by limited space capacity as well as limited time capacity, however, and this limitation on space has observable consequences for immediate ordered recall tasks. As a result of the space limitation, each item in a vocally presented list degrades the representation of previous items in PAS, presumably in a first-in—first-out manner. Since only the last few items in a series are followed by few or by no new inputs, the PAS effect (i.e., recency) is evident only for these items; that is, only list members which are free of retroactive displacement from their companion list members are expected to

show the advantage of extra information in PAS storage. Thus, two closely related observations, the conspicuous recency effect with auditory presentation and the modality effect when auditory and visual presentation are compared, are compatible with the PAS mechanism. (Crowder, 1971, pp. 587-588)."

Sidman and Cresson (1973) studied crossmodel transfer in severely retarded children. "Two severely retarded Down's syndrome boys were first taught to match printed words to each other (visual discrimination), and to match dictated words to their corresponding pictures (auditory comprehension), but were still incapable of matching the printed words to their pictures (reading comprehension), or of reading the printed words orally. They were next taught to match the dictated to the printed words, and were then able to read the words orally and with comprehension. The learned equivalences of dictated words to pictures and to printed words transferred to the purely visual equivalence of printed words to pictures. (p. 515)."

Waugh (1973) used the ITPA to classify children as audile or visile learners. Using two different treatments of auditory type and two different treatments of visual type, Waugh found that both audile and visile learners functioned equally well under either type of modality presentation. Again, the classical ATI hopes were dashed in a sensory modality setting!

In line with the present study's emphasis on examing measurement procedures for assessing modality strengths, Levin, Divine-Hawkins, Kerst, and Guttman (1974) devised an instrument to classify children as word learners (learning from printed words) and picture learners (learning from line drawings). While not congruent with the more traditional audile-visile schema, the effort is worthy of mention here. Consistency of classification of children

was found, as well as some programming possibilities on that basis of identification.

PROCEDURE

Treatment: Each subject was given both an auditory and a visual presentation of each of 7 subtests. Each subtest tapped a different aspect of sensory modality functioning. The "treatment," as such, was the application of auditory and visual tasks to the subjects under each of the 7 subtests.

Measures: The 7 sensory modality measures could be classified under four main types of instruments: (a) standardized approach (the closure subtests of the Revised Illinois Test of Psycholinguistic Abilities and the reception subtests of the same battery); (b) controlled laboratory approach (discrimination of consonant-vowel-consonant nonsense syllables, machine-gauged reaction time, and sequential digits subtests similar to the Wechsler Intelligence Scale for Children); (c) classroom-oriented approach (story-theme comprehension); and (d) teacher observation (structured rating scales). Thus, the entire battery given to each subject with the exception of the rating scales, which of course were completed by the teachers) had 7 different types of subtests, each of which had auditory and visual components. Every child took every test in the battery. All tests were individually administered.

The reaction time task was centered around standard laboratory apparatus. The machine used (Lafayette Instrument Company Model 6302 B Multi-Choice Reaction Times) employed a circular light stimulus (Lafayette Stimulus #4) and a locally made door-bell buzzer device housed in a small box. A standard telegraph-key response device (Lafayette) allowed the subject to turn off either the light or the buzzer. The reaction time sweep hand allowed recording down to hundredths of a second. The child received all the visual trials together and all the auditory trials together. There were 5 practice trials and 20 criterion trials for each sensory mode of presentation. The child saw only the light box (a red light was used), the buzzer device and the

back of the reaction time apparatus, while the examiner saw the sweep hand dial and controls when the stimulus is turned on. The task was introduced to each child as follows: "Have you ever seen a box like this before? I'll tell you how it works. We are going to do some races today. We want to see how fast you are. In this box I have a red light. In this box I have a buzzer noise — sort of like a doorbell. And this big box lets me turn either the light or buzzer on. That black button lets you turn them off. Let's try each one." Two rehearsals of each stimulus were completed and then the five practice trials of the initial modality were presented.

The basis for the nonsense syllable task was the classical study by Archer (1960). He looked at all possible (2480) trigrams of consonant-vowel-consonant (cvc) form in terms of meaningfulness. (Because of the young age levels of the subjects, it was decided to present only cvc syllables rather than longer versions as in Locascio & Ley, 1972.) Prior to Archer's definitive list, there had only been the partial listings issued by Glaze (1928) and by Krueger (1934). Archer determined meaningfulness by calculating the percentage of his sample (335 University of Wisconsin students enrolled in introductory psychology courses) who could answer affirmatively to one or more questions: "Is it a word? Does it sound like a word? Does it remind me of a word? Can I use it in a sentence? (p.2)." In the pilot study for the current sensory modality project, 10 syllables were selected from the medium high meaningfulness range (51% to 75%) and 10 from the very high range (76% to 100%). The items were selected by means of a standard randomization table (Rand, 1955). However, the pilot study showed that these levels of meaningfulness were far too easy for normal youngsters of this age (kindergarten and first grade). Also, 20 auditory and 20 visual

syllables were simply too many from a time standpoint. Thus, for both auditory and visual modes, two syllables each were selected randomly from the five, low-meaningfulness ranges: 1% to 10%, 11% to 20%, 21% to 30%, 31% to 40%, and 41% to 50%. The auditory syllables were different from the visual syllables to avoid practice effects.

The nonsense syllables in visual format were presented on 1½-by-3-inch oak tag cards. Only one word was on each card. The letters were printed with a black felt marker pen. Each of the three letters in a word was about 7/8 inch high and 1/2 inch wide. The response format was multiple choice, with a stimulus card and three option cards. The stimulus card had only the word on it, while the three option cards had a small number printed in the top right corner ("1," "2," or "3"). Three sets of such cards were used as examples, while ten sets became the criterion tasks. In each set of cards, the child merely had to tell the examiner the correct number of card that was identical to the stimulus.

Each set of four cards were shown sequentially rather than simultaneously, with each card being turned face down after being presented. The auditory version was similar in response format except that each stimulus and the three options were read aloud to the child. An auditory set would sound as follows: "dĕck (the stimulus was actually DEK). (pause). No. 1, dăck. No. 2, dawk. No. 3, dĕck." All the visual tasks were presented as a group and likewise with the auditory tasks. The instructions preceding either of the two groups were: "Now I will (show, say) a word to you. Then I will (show, say) three more words, each one with a number on it. (Look at, Listen to) all three words carefully. Tell me the number of the word I (showed, said) to you. Here's the (first, second, third) example."

The closure and reception tests under both modalities were taken verbatim from the Illinois Test of Psycholinguistic Abilities (ITPA Revised edition: Kirk, McCarthy, & Kirk, 1968). These tests were given in accord with the ITPA manual.

The comprehension stories were based upon the Peabody Langauge Development Kit (Dunn & Smith, 1965; Dunn & Smith, 1966). From Level 1, two "Story cards" were used without modification (Story Card 1: Family Scene - The Arrival of the New Baby, and Story Card 2: Street Scene - The Case of the Broken Window). From Level 2, two "I wonder" Cards were used as prepared by the publisher (I Wonder Card W-1: The Pet Store - Escaping Animals, and I Wonder Card W-2: The Street Huckster - The Runaway Vegetable Truck). For each of the four pictures, a script was written to reflect a logical sequence of action that the picture would suggest. Every attempt was made to ensure that as many details as possible of descriptive nature and action type present in the pictures were also embodied in the script. Each of the four scripts was then taped onto one side of a cassette by the same male who was experienced in story telling. Thus, for story comprehension, a parallel body of content existed for auditory and visual modes. For each story theme (which was available in either mode), two sets of questions were devised: one dealt with items common to both modes of presentation, while the second dealt with items specific to the modality of presentation. In terms of numbers of general (G), auditory specific (A), and visual specific (V) questions, this task involved the following: Family Scene (G=7, A=3, V=3), Broken Window (G=8, A=3, V=3), Pet Store (G=6, A=6, V=4), and Runaway Truck (G=8, A=5, V=3). If the auditory presentation came first, the child was told: "Do you know what this machine is? (pause for answer.) It is a tape recorder which can play back music or

stories just like a record player. I have put some stories on the machine and I would like you to listen to them. You will have to listen very carefully, because at the end of the story I am going to ask you some questions about what you heard. Are you ready? Good. Let's begin." If, on the other hand, the visual presentation came first, the child was told: "I have some pictures for you to look at. Each picture tells you a story. I want you to look at the picture very carefully because when you have finished, I am going to ask you some questions about what you saw. Are you ready? Good. Let's begin." (See Appendix A for questions used in study.)

The teacher rating scales were devised specially for purposes of this study to reflect specific differences in sensory modality functioning. A four-point differential scale was used in each of 16 items, 8 of which were aimed at auditory processing and 8 of which were aimed at visual processing. Four of the 16 items were worded negatively so that a "high" rating of 4 ("exhibits this behavior most of the time") actually indicated a low level of proficiency, while the opposite was true for a "low" rating of 1 ("Does not exhibit this behavior"). (See Appendix B for teacher rating scales.)

Pilot Study: In fall, 1973, two of the three examiners tested a few children of the same age levels as were involved in the final study. The purpose was to evaluate the feasibility and appropriateness of the several tests used in the final battery. As a result of this pilot study, certain portions of the testing were deleted and other portions were modified to varying degrees.

Subjects: The sample consisted of 64 kindergarten children and 64 first-grade children. The children came from two buildings within a large, suburban school district in the Greater Philadelphia Area. The children were all

of normal intelligence and possessed no noticeable difficulties in sensory processing. Both blacks and whites were represented in the sample, and the majority were from middle-class family structures.

Unused classrooms or storage areas were provided by the school district, which minimized as much as possible the usual interruptions of the classroom day. The majority of subjects were tested in February and March, 1974, with a few in April.

Design: There were 7 basic types of tests, each of which could be given in either auditory or visual fashion. If one wanted to balance order effects both in terms of which basic type of test comes next as well as which modality comes first, there would be a huge number of combinations ("treatments") to which subjects would have to be assigned randomly. The situation of treatment (or test) combinations becomes even more complex when one considers the possibilities within the area of comprehension stories. There were 4 basic themes, each of which could be presented in either auditory or visual fashion. It was intended that each child receive each theme, but to avoid thematic content, each story could be presented in only one modality. To minimize certain contamination effects associated with sequential order (e.g., fatigue), a modality sequence of AVVA or VAAV was randomly assigned to each child. In turn, the 4 story themes were randomly distributed throughout either of these modality sequences. Every possible combination of modality sequence and story assignment within that sequence, was represented in the study once at each grade level. However, because of the huge number of possibilities of order effects represented in all the above considerations, some arbitrary starting points had to be selected to reduce the design to manageable proportions.

One decision that was required was that certain types of tests would be

given by certain examiners. The same examiners would always give the same test types to all children. Whatever tests were assigned to an examiner would always be given to each child in the same order.

Three examiners who were well-experienced in individual test administration gave the battery to the subjects. Examiner A administered reaction time, nonsense syllables, and digit span (in that order). Examiner B administered the ITPA closure subtests and ITPA reception subtests (in that order). Examiner C administered the comprehension stories. Each examiner required approximately 20 to 30 minutes so that somewhat more than an hour of total test time was expended for each child. In effect, a total of about 160 hours of individual test administration time was expended in this project. To gain maximum efficiency from the three examiners, they tested children simultaneously; thus, a given examiner would not always be first, second, or third, for a given child.

Within each subtest of test types assigned permanently to an examiner, the main design consideration was whether or not the auditory mode was presented first for any given test type. This decision was made randomly (Rand, 1955) for each of the 7 tests, which generated 64 combinations for each grade level. These 64 possibilities ("treatments") were randomly assigned to the 64 children available at each grade level.

ANALYSES: OVERVIEW

Four series of analyses were undertaken. The first series contain simply descriptive statistics on all variables. Correlation tables are presented separately for each grade.

The second series of analyses made use of standard scores so that cross-modal comparisons could be made in an ipsative sense. However, direct comparisons between auditory and visual scores could not be undertaken with standard scores because the averages would, of course, be zero. Thus, discrepancy scores were computed and inserted into factorial designs. These discrepancy scores allowed the testing of several effects other than the direct visual-versus-auditory comparison. The standard scores were also calculated because of their precision in performing certain descriptive analyses in Series Three of this paper.

The third series of analyses were an outgrowth of the standard scores. Patterns of various modality profiles were calculated in terms of frequencies of occurrence for the many subtests in the study.

The final series of analyses dealt with percentage correct scores on the auditory and visual components on each of the several criteria. In contrast to the second series of analyses using standard scores, the percentage right scores allowed direct auditory-visual comparisons.

ANALYSES: SERIES ONE

Design: Descriptive statistics in terms of means and standard deviations were calculated by the BMDX84 program (Dixon, 1970b), which also yielded all possible correlations. Raw scores were used for this purpose.

Results: Table 1 contains all the variables studied in the present investigation. Table 2 provides the basic descriptive statistics for these variables in kindergarten, while Table 3 does the same for first grade.

Of interest to the validity of the various sensory modality measures is the intercorrelation results given in Table 4 (kindergarten) and in Table 5 (first grade). By examining hypothesized patterns of results in these matrices in the sense of the Campbell-Fiske convergent-discriminant model (Campbell & Fiske, 1959), one can assess validity. In relation to the ITPA, Proger, Cross, and Burger (1973) have suggested what might be inferred from such matrices in the Campbell-Fiske sense. Dziuban and Shirkey (1973) and Shepard and Glass (1973) have illustrated similar schemes of application.

Tables 2 and 3 demonstrate descriptively that auditory reaction time (Variables 7 to 26) was faster than visual reaction time (Variables 32 to 51). Similar auditory superiority is demonstrated in Tables 2 and 3 on digit span, nonsense syllables, and ITPA Reception. The other descriptive statistics in Tables 2 and 3 are self-explanatory and will not be gone into here.

Tables 4 and 5 present the intercorrelation results for kindergarten and first grade, respectively. For the general sample size of 62 in kindergarten, an r of .25 is significant in a two-tailed sense at the .05 level. (Two children had to be omitted at the kindergarten level because of unusable data.) The same situation is true for the general sample size of 64 in first grade. Sex does not appear to be correlated with any other variables to any meaningful extent. Generally speaking, the criterion trials for auditory and visual reaction time are intercorrelated at least to moderate degrees.

In both kindergarten and first grade, the auditory digit span criterion was significantly correlated with fewer variables than was the visual digit span criterion. Also, reaction time was not systematically correlated with digit span. In particular, in kindergarten, auditory digit span is significantly correlated with visual digit span, visual nonsense syllables criterion, visual stories criterion (negatively), MRT Matching, and MRT Alphabet. In first grade, auditory digit span was correlated with visual digit span criterion, nonsense syllable order effect, and ITPA Closure order effect. (The order effect correlations do not seem to possess any practical interpretation.) In kindergarten, the visual digit span criterion was correlated with auditory nonsense syllables practice, auditory nonsense syllables criterion, visual nonsense syllables practice, visual nonsense syllables criterion, MRT Word Meaning, MRT Matching, MRT Alphabet, and MRT Total. In first grade, visual digit span criterion was correlated with the same four nonsense syllable scores, visual ITPA Closure practice, auditory stories criterion, auditory teacher rating, visual teacher rating, and all SAT subtests.

Auditory and visual nonsense syllables were significantly correlated with each other as well as several other variables in both kindergarten and first grade; the number of other variables with which these two nonsense syllable variables are correlated increases as one goes from kindergarten to first grade. In particular, auditory nonsense syllables in kindergarten was significantly correlated with visual nonsense syllables practice, visual nonsense syllables criterion, visual ITPA reception criterion, auditory stories criterion, visual teacher rating, MRT Listening, MRT Matching, and MRT Total. However, in kindergarten (as in contrast to first grade), there were a number of variables with which visual nonsense syllables were significantly correlated that were not correlated with auditory nonsense syllables, even though audi-

tory and visual nonsense syllables themselves were highly correlated. Specifically, in first grade, visual nonsense syllables criterion was significantly correlated with ITPA Closure order effect, auditory teacher rating, visual teacher rating, SAT Paragraph Meaning, SAT Vocabulary, SAT Word Study Skills, and SAT Total. While all the above correlations were positive in nature, it should be noted that visual nonsense syllables criterion was also negatively correlated with most of the reaction time trials of both auditory and visual types. When one turns to first grade, many more variables enter the picture. In particular, auditory nonsense syllables criterion was significantly correlated in a positive sense with visual nonsense syllables practice, visual nonsense syllables criterion, auditory ITPA Closure criterion, visual ITPA closure practice, visual ITPA closure criterion, auditory ITPA reception criterion, visual ITPA reception criterion, auditory stories criterion, visual stories criterion, auditory teacher rating, visual teacher rating, MRT Word Meaning, MRT Listening, MRT Matching, MRT Alphabet, and MRT Numbers. In first grade, visual nonsense syllables criterion was significantly correlated in a positive sense with auditory ITPA closure criterion, visual ITPA closure practice, visual ITPA closure criterion, auditory ITPA reception criterion, auditory stories criterion, visual stories criterion, auditory teacher rating, visual teacher rating, SAT Word Meaning, SAT Paragraph Meaning, SAT Vocabulary, SAT Word Study Skills, and SAT Total. In addition, at the first-grade level, both auditory and visual nonsense syllables were significantly correlated in a negative sense with most reaction time trials.

Next, one turns to the situation involving the variables of auditory and visual ITPA closure. In kindergarten, auditory ITPA closure criterion was significantly correlated in a positive sense with auditory teacher rating,

MRT Word Meaning, MRT Numbers, and MRT Total. Also in kindergarten, visual ITPA closure criterion was significantly correlated in a positive sense with visual ITPA reception criterion, visual teacher rating, MRT Word Meaning, MRT Matching, MRT Numbers, and MRT Total. When one turns to first grade, he sees that auditory ITPA closure criterion is significantly correlated in a positive sense with visual ITPA closure practice, visual ITPA reception criterion, auditory stories criterion, visual stories criterion, auditory teacher rating, visual teacher rating, SAT Word Meaning, SAT Paragraph Meaning, SAT Vocabulary, SAT Word Study Skills, and SAT Total. Also in first grade, visual ITPA closure criterion was significantly correlated in a positive sense with auditory ITPA reception criterion, visual ITPA reception criterion, auditory stories criterion, visual stories criterion, visual teacher rating, SAT Word Meaning, SAT Vocabulary, and SAT Total.

The variables of auditory and visual ITPA reception present a different type of pattern than in the previous cases. In kindergarten, auditory ITPA reception criterion was significantly correlated in a positive sense only with visual ITPA reception criterion. Similarly in kindergarten, visual ITPA reception criterion was significantly correlated in a positive sense only with MRT Alphabet. In first grade, auditory ITPA reception criterion was significantly correlated in a positive sense with visual ITPA reception criterion, ITPA reception order effect, auditory stories criterion, auditory teacher rating, visual teacher rating, SAT Word Meaning, SAT Paragraph Meaning, SAT Vocabulary, and SAT Total. In first grade, visual ITPA reception criterion was significantly correlated in a positive sense with auditory stories criterion, visual stories criterion, SAT Paragraph Meaning, SAT Vocabulary, SAT

Word Study Skills, and SAT Total.

In kindergarten, auditory stories criterion was significantly correlated in a positive sense with MRT Matching, MRT Copying, and MRT Total. However, in kindergarten visual stories criterion was not significantly correlated with anything. In first grade, auditory stories criterion was significantly correlated in a positive sense with visual stories criterion, auditory teacher rating, visual teacher rating, SAT Word Meaning, SAT Paragraph Meaning, SAT Vocabulary, SAT Word Study Skills, and SAT Total. In first grade, visual stories criterion was significantly correlated in a positive sense only with SAT Word Meaning. Thus, in both kindergarten and first grade, visual stories criterion is a very peculiar type of variable in that it functions on its own with virtually no relationship to any other variables, even of a similar visual nature.

The final set of variables considered in the first series of analyses concerns the auditory and visual teacher ratings. In kindergarten, auditory teacher rating was significantly correlated in a positive sense with visual teacher rating, MRT Word Meaning, MRT Matching, MRT Alphabet, MRT Numbers, MRT Copying, and MRT Total. In kindergarten, visual teacher rating was significantly correlated in a positive sense with MRT Word Meaning, MRT Matching, MRT Numbers, MRT Copying, and MRT Total. In first grade, auditory teacher rating was significantly correlated in a positive sense with visual teacher rating, SAT Word Meaning, SAT Paragraph Meaning, SAT Vocabulary, SAT Word Study Skills, and SAT Total. In first grade, visual teacher rating was significantly correlated in a positive sense with SAT Word Meaning, SAT Paragraph Meaning, SAT Vocabulary, SAT Word Study Skills, and SAT Total.

ANALYSES: SERIES TWO

Design: For the actual analytical designs, standard z scores were generated separately for each modality version for each of the 7 types of tests; such standardized scores allowed legitimate cross-modal comparisons, which were of primary interest in this study. The input for any of the analyses was the discrepancy between the separate standard scores for the auditory and visual presentations of any given subtest. Factorial univariate analyses of variance were the primary vehicle of analysis. One factor that was built into all the analyses was end-of-year achievement level. In April and May, 1974, the Metropolitan Readiness Test (MRT) was given to all current kindergarten children, while the Stanford Achievement Test (SAT) was given to all first-grade children. From the MRT, the regular total score was used for rank-ordering purposes (i.e., the sum of word meaning, listening, matching, alphabet, numbers, and copying). From the SAT, a total had to be generated from the available 4 scores (word reading, paragraph meaning, vocabulary, and word study skills). However, 5 cases had missing word study skills data and the mean for all other first graders on that subtest was used for those 5 children. The children were then ordered by total achievement scores separately within each grade. The continuum for each grade level was then sliced into thirds (high, medium, and low). Because the two grades used different achievement tests, the factor of achievement levels was taken as nested under grade levels.

In all analyses, the factors of grade (K or 1) and order (auditory first or visual first) were treated as fixed effects, while the factor of achievement nested within grade was treated as a random effect. Thus, the designs were of mixed-effect nature. Because of this situation, the appropriate error terms for certain effects have a greatly diminished number of degrees of freedom than would be the case in a pure fixed-effects design. In effect, a mixed-effects

design will yield somewhat more conservative results than what truly should be the case. Accordingly, wherever there was a strong tendency toward statistical significance, the results were cautiously discussed as though they were significant. Before the analyses were carried out, two kindergarten children had to be omitted because of missing data. All 64 first-grade children had complete data.

Two different specific designs were used in this study. For reaction time, a repeated measures analysis of variance with four factors was used. The factors were grade, order trials, and achievement nested within grade. The BMD08V program from the UCLA Biomedical series (Dixon, 1970a, pp. 586-600) were used. To meet the requirement of an equal-cell-frequency, orthogonal design, Ss were randomly deleted from each nonrepeated-factor cell until 8 Ss were present for all 20 trials. Thus, there were 96 Ss in this analysis. Because the error terms were not always orthogonal to the effects being tested, quasi-mean squares were devised wherever necessary (Winer, 1962, pp. 199-202). In particular, the following effects required computation of quasi-mean squares: the main effect of grade was tested by the combination of achievement plus grade-by-trials minus achievement-by-trials; the main effect of order was tested by the combination of order-by-achievement plus order-by-trials; the main effect of achievement was tested by the combination of achievement-by-trials plus subjects minus subjects-by-trials; the interaction of grade-by-order was tested by the combination of order-by-achievement plus grade-by-order-by-trials minus order-by-achievement-by-trials; the interaction of order-by-achievement was tested by the combination of subjects plus order-by-achievement-by-trials minus subjects by trials. The other effects in the design were tested by readily available, orthogonal error terms: trials was tested with achievement-by-trials;

grade-by-trials with achievement-by-trials; order-by-trials with order-by-achievement-by-trials; achievement-by-trials with subjects-by-trials; grade-by-order-by-trials with order-by-achievement-by-trials; and order-by-achievement-by-trials with subjects-by-trials.

For the other 6 tests in this study, three-factor analyses of variance were run. The program was BMDX64 (Dixon, 1970b, pp. 34-50). The factors were grade, order, and achievement nested within grade. Because the program allows unequal numbers, all 125 Ss were included. However, because the program assumes fixed effects, the F ratios had to be adjusted by using the proper error terms for the mixed-effects design specifications. In particular, the grade main effect was tested with the error term of achievement within grade, the order main effect by the order-by-achievement interaction, the achievement main effect by the regular within-groups term, the grade-by-order interaction by the order-by-achievement interaction, and the order-by-achievement interaction by the regular within-groups term. The grade-by-achievement interaction could not be tested in this type of design.

Reaction Time: The overall analysis of variance is presented in Table 6. The only significance was found among two interactions. The grade-by-trial interaction presented in Figure 1 shows the general nature of a developmental difference. The scores plotted there are actually the discrepancy in standard scores, with the visual mode subtracted from the auditory mode. Thus, we see the relatively immature kindergarten children showing little difference in types of modality functioning in the early trials (low discrepancy scores) but showing increasingly large discrepancies in favor of the visual mode of presentation (large, negative discrepancies). On the other hand, the first-grade children have low, negative discrepancy scores which indicates that little

preference for either sensory modality exists, albeit a slight preference in favor of the visual mode is present.

What do these results mean? Reaction time is basically unlearned; it is a relatively primitive task. It would appear that for a low-level task such as reaction time, the physiology involved in the process of vision allows a quicker response to be made than with audition. However, after heavy exposure to school experience (this is, by mid-first grade), compensation in favor of auditory skills apparently occurs to yield negligible differences in functioning. However, it remains to compare this low-level task with more sophisticated thought and psychomotor tasks.

The order-by-achievement interaction (Figure 2) poses a special problem in interpretation: achievement is nested within grade. Whenever a factor of an interaction is nested within another factor, the concept of interaction becomes different than in the classical case. In particular, since achievement is nested within grade, the results for the two grades must be interpreted separately rather than across grades as would be the usual situation. In effect, one must consider the possibilities of two sub-interactions. Thus, when one considers the two kindergarten lines, he sees a very strong interaction. In particular, there is very little discrepancy between modality presentations when the visual mode is presented first, although there is a slight edge in favor of the visual mode. However, there is a separate interaction that is even stronger when one turns to the separate first-grade graphs. When the visual trials were presented first, there was in effect a negligible discrepancy between auditory and visual functioning.

Nonsense Syllables: Table 7 presents the summary analysis of variance table for the low-level memory recall task of nonsense syllables. Despite

the statistical conservatism to hypothesis testing that a mixed-effects design imposes on the error terms and degrees of freedom, statistical significance was achieved here for the main effect of order ($P < .01$) and the interaction effect of grade-by-order ($P < .05$). In terms of discrepancies between standard scores, the average for those children receiving the auditory mode first was −.58, while for those receiving the visual presentation first, it was +.59. Thus, one might be tempted to generalize that depending upon which mode was presented first, the opposite mode is more effective. (Another way of expressing this finding is that regardless of the initial mode of presentation, the second mode of presentation is more effective.) It appears that there might be a general practice or rehearsal effect at operation. However, this general finding must be qualified by the specific nature of the interaction.

The interaction of grade-by-order is given in Figure 3. The interaction tends to bear out the direction of the general main effect. For kindergarten, the main effect definitely holds true, but its strength is somewhat mitigated in first grade. Specifically, while the visual presentation was definitely better when the auditory mode was used first, the visual presentation of the task also was better when it came first itself.

Closure: A significant main effect for grade ($P < .10$) was found as shown in Table 8. (The significance, again, would even have been greater had it not been for the mixed design.) In terms of average discrepancies between standard scores, the auditory mode was definitely better (A-V=.35) than visual presentation, while in first grade this finding is the opposite (A-V=-.34). This result is partially consistent with the digit span grade-by-order interaction as long as the visual mode was used first. Thus, there

appears to be some concensus of evidence toward a developmental difference present in the early educational levels of a child.

Reception: Table 9 contains the analysis of variance results. The significant order-by-achievement interaction is given in Figure 4. As explained earlier in connection with the reaction time interaction of order-by-achievement, the nested nature of this interaction necessitates two separate interpretations from the very same set of results: one for kindergarten and one for first grade. In kindergarten, for both low-achieving and medium-achieving children, whatever modality was presented first produced the highest level of functioning; however, for high-achieving children, whatever modality was presented second was most effective. In first grade, for low-achieving children, whatever modality was presented first was most effective; however, for medium-achieving children the auditory mode was most effective regardless of order; for high-achieving children, there was virtually no preference. It is interesting to speculate that in the lower-achieving children (those presumably of lower ability, as a whole) they apparently profit little by having a prior opportunity (i.e., the initial presentation) to "psyche out" the mechanism at work in the task at hand. On the other hand, high-achieving children in kindergarten take into account everything they have seen in the first modality presented to them and thus do better on their second attempt (i.e., the other modality), while in first grade such children have learned to compensate sensorily and have comparable task performances regardless of what was presented first.

Stories: Table 10 contains the overall results. Here, the main effect of achievement nested within grade was significant ($P < .10$), and the interaction of grade-by-order was also in effect significant, allowing for the

great degree of conservatism that a mixed-effects design produces. The main effect of achievement showed that for comprehension of taped stories or dramatic pictures, the high achieving youngsters did far better when the modality was auditory, while the reverse was true for low- and medium-achieving children. However, this finding must be interpreted with caution in view of the interaction involving grade.

The grade-by-order interaction is plotted in Figure 5. In kindergarten, there is no difference in order effects; the same degree of discrepancy occurs in favor of visual presentation. However, in first grade, while there was no discrepancy in modalities when the auditory mode was first, the visual mode was most effective if presented first.

Digit Span: Table 11 presents the results for the digit span memory tests of auditory and visual type. Because of the mixed design, the degrees of freedom by default obscured any significance that might otherwise have been present. In terms of standard, absolute statistical criteria, there was no significance of any main effects. However, there was a fairly strong trend toward significance in the grade-by-order interaction; the situation is presented in Figure 6. One can see a classic interaction whereby there is a negligible discrepancy between visual and auditory modes if the auditory mode is presented first, but that the picture is quite different when the visual digit span task is presented first. In particular, those kindergarten children who received the visual task first did far better on the auditory task, while those first-grade children who received the visual task first did much better on the visual mode itself. Thus, the mere fact of presenting a visual task first brings out vividly a developmental difference in modality preferences. One might conjecture that the introduction of any material in the classroom

at these young ages should always be explained and illustrated verbally in detail and then carried out in whatever mode seems logically the most appropriate. Of course, this would only be good common sense, anyway, and nothing stunning has been uncovered.

ANALYSES: SERIES THREE

Tables 12 through 16 contain data on all the basic modality profiles that are possible in connection with amount of deviation (either ± 1 SD or ± 2 SD). Standard z scores were generated on all children in kindergarten and first grade as a result of the analyses already performed in the second series. However, it should be borne in mind that for each of the five measures, the z scores were generated for the combined grades. Thus, developmental profiles associated with grade necessarily affect incidence rates. (If the z scores had not been generated in this fashion, the crucial developmental patterns would not have been directly visible and would have been partially obscured by the separate calculations associated with each grade. Further, kindergarten and first grade were felt to be similar enough both in point of time and in developmental nature of the children involved that no great damage would occur by combining the two grades.) With these stipulations in mind, the reader can deduce several things from the tables.

In all five tables, one can see some general trends. First, sex differences are not very noticeable. Second, the level of stringency associated with ± 2 SD yields virtually no information on modality profiles. Third, the most infrequently occurring profiles are those in which a strong modality is coupled with a weak modality. Fourth, there is a very strong developmental pattern occurring across kindergarten and first grade; single-modality deficiency profiles are the most frequently occurring type in kindergarten, while in first grade single-modality strength profiles occur most frequently. Fifth, for three of the five measures (ITPA Closure, Digit Span, and Nonsense Syllables), the single-modality strength patterns found in first grade are usually of the strong-visual/mediocre-auditory type. Sixth, when one looks at the single-modality deficiency profiles that occur in kindergarten, he sees there is really no difference in incidence between visual and auditory modalities.

Table 17 contains incidence rates for the most important modality profiles found in Tables 12 through 16. Here, the percentages were calculated within rather than across grades to give the reader more direct comparisons between grade levels, although it must be remembered that the original z scores upon which this table is based were calculated across grades. Several things are apparent. First, one sees the same coherent pattern as in the first five tables of this section in terms of the shift from deficiencies in kindergarten to strengths in first grade. Clearly, this finding suggests that early screening and identification of learning disabled children must proceed very cautiously indeed. What may appear to be a deficiency may be nothing more than a temporary developmental phenomenon. Second, there is a striking consistency of measurement results as one goes across the five measures. This finding has direct implications for the reduction of redundancy in selecting a basic screening battery.

ANALYSES: SERIES FOUR

The analyses dealing with standard scores were performed as one attempt to get at the issue of unequal numbers of items in certain criteria when one went from the auditory component to the visual component. However, the only way to avoid the zero-average paradox in the auditory-versus-visual comparison was to use the discrepancy score calculation, which allowed only an indirect reflection on the modality comparison by a careful examination of the various interactions that arose. For this reason, another series of analyses were performed by means of percentage scores. That is, the number of correct points divided by the total number of points possible became the method of data input on all criteria. This calculation removes any difficulties associated with unequal numbers of items between the auditory and visual components of any subtest and at the same time avoids the zero-average paradox mentioned above, thus permitting direct modality comparisons. However, it should be noted that the percentages had to be computed only for the three out of seven criteria that had unequal numbers of items across modality components; otherwise, the raw scores were used. The following measures used raw scores directly: nonsense syllables (10 points for each modality); digit span (7 points); stories (29 points for the general section); teacher ratings (8 points). Percentage scores were computed for the following criteria: reception (50 points for auditory and 40 points for visual); closure (30 points for auditory and 50 points for visual), and stories' specific questions (17 points for auditory and 13 points for visual).

Three different designs were used in this series of analyses. The BMD08V program was used in all analyses. The first design included four factors: modality (auditory versus visual); order of presentation (auditory first or visual first); grade level (kindergarten or first grade); and

achievement (high, medium, or low). This first design was used for the five criteria of digit span, nonsense syllables, closure, reception, and stories. The second design was used just for the criterion of reaction time and simply had the fifth factor of trials appended to the first design. The third design was used only for teacher ratings and was the same as the first design except for deleting order. In the designs grade, modality, and order were taken as fixed effects, while achievement and subjects were considered as random effects (with achievement nested under grade).

For the first design, the error terms used to test each effect are given as follows as the second item of each pair: grade (G), A(G); order (O), AO(G); modality (M), AM(G); achievement (A(G)), S(GAO); GO, AO(G); GM, AM(G); OM, AOM(G); AO(G), S(GAO); AM(G), SM(GAO); GOM, AOM(G); and AOM(G), SM(GAO). It should be noted that S(GAO) and SM(GAO), both of which deal with subjects, do not have appropriate error terms available to them.

For the second design, one had the following pattern of error terms (the fifth factor of trials is denoted by T): G, A(G)+GT-AT(G); O, OT+AO(G)-AOT(G); M, MT+AM(G)-AMT(G); T, AT(G); A(G), AT(G)+S(GAO)-ST(GAO); GO, AO(G)+GOT-AOT(G); GM, AM(G)+GMT-AMT(G); OM, OMT+AOM(G)-AOMT(G); GT, AT(G); OT, AOT(G); MT, AMT(G): AO(G), S(GAO)+AOT(G)-ST(GAO); AM(G), AMT(G)+SM(GAO)-SMT(GAO); AT(G), ST(GAO); GOM, AOM(G)+GOMT-AOMT(G); GOT, AOT(G); GMT, AMT(G); OMT, AOMT(G); S(GAO); ST(GAO); AOM(G), SM(GAO)+AOMT(G)-SMT(GAO); AOT(G), ST(GAO); AMT(G), SMT(GAO); GOMT, AOMT(G); SM(GAO), SMT(GAO); and AOMT(G), SMT(GAO). Here, the two terms ST(GAO) and SMT(GAO) do not have appropriate error terms available.

For the third design, the error terms were used as follows: G, A(G); M, AM(G); A(G), S(GA); GM, AM(G); and AM(G), SM(GA). No appropriate error terms are available for S(GA) and SM(GA).

Table 18 contains the summary ANOVA results for stories (general questions). One sees that the only significant effect in this entire analysis was the control factor of grade level. In particular, first grade children answered more questions correctly (21.15) than the kindergarten children (17.77).

Table 19 contains the summary ANOVA results for the criterion of reception taken from the Illinois Test of Psycholinguistic Abilities. Significant effects were obtained for grade, modality, and AOM(G). First grade pupils performed at a significantly higher level (66.70% competency) than kindergarten children (50.21% competency). In general, the auditory performance was significantly better (61.76% mastery) than the visual performance (55.15% mastery). The interaction among achievement level, order, and mode is quite complicated to interpret because of the fact that achievement level is nested within grade. Figure 7 contains the auditory performances within kindergarten, while Figure 8 contains the auditory performances within first grade. Figure 9 contains the visual performances within kindergarten, while Figure 10 contains the visual performances within first grade. (Interpretations from these graphs should not be made across grades due to the nesting phenomenon.) From Figure 7, one sees that order of presentation (O_1= auditory first and O_2=visual first) makes little difference in auditory performance for both high and low achievers in kindergarten. However, for medium achievers, auditory competency is greatly enhanced when the auditory presentation comes first. Still remaining in kindergarten, one sees from

Figure 9 that both high and medium achievers have much greater visual competency if the auditory presentation is first, while the reverse is true for low achievers. When one switches to first grade (Figures 8 and 10), a different and more complicated picture results. For auditory reception, competency is not affected by order of presentation for high achievers, but for both medium and low achievers competency is much higher if auditory comes first. For visual reception, there is very little difference in competencies between orders of presentation for both high and medium achievers, while low achievers have much greater competency if auditory was presented first. What can one conclude from all four figures? Generally, in most cases both visual and auditory receptive functioning is facilitated if the auditory mode is presented first. This finding is interesting in that it seems to reinforce the physiological research which demonstrates that visual mechanisms mature at a developmentally later date than their auditory counterparts, and in fact are more complex. Thus, it is not surprising that in communication where reception of stimuli is the first step in the three-phase learning model (reception, association, and expression), auditory is the preferred mode of learning in most cases.

Table 20 presents the summary analysis of variance for the two closure subtests of the Illinois Test of Psycholinguistic Abilities. The only statistically significant effects were the main effects of modality ($P < .005$) and achievement (nested within grade) ($P < .05$). It was found that the auditory closure competency of all students (62% mastery) was markedly higher than the visual closure competency of the same students (42% mastery). As expected, it was also found that the general competency of kindergarten children in both auditory and visual closure was much lower

(47% mastery) than their first grade peers (56% mastery).

Table 21 presents the summary analysis of variance for the nonsense syllable task. In this situation only three effects (fortunately, all of them of main-effect variety) were statistically significant: grade ($P \leq .05$), modality ($P < .025$), and achievement (nested within grade) ($P < .05$). In both the visual and auditory nonsense syllable tasks, the maximum score was ten, and in this analysis the raw scores were used. In kindergarten, the average score of all children was 6.57 versus 8.92 for all children in first grade. The average auditory functioning for all children in both grades was 8.15 versus 7.33 for visual functioning. Finally, one can see from Table 22 that there is increasing competency as one moves from low achievers to high achievers.

In Table 23 one sees the summary analysis of variance for digit span. The main effects of modality and achievement were statistically significant ($P \leq .005$ and $P < .05$, respectively). In particular, the average number of correct series obtained by all children under the auditory mode was 2.42, while under the visual mode was 1.55. Table 24 provides the average number of correct series scores for children in the two grades arranged according to varying levels of achievement. One sees a clear difference at all levels between first grade and kindergarten; one also sees a stunning difference between low achievers and each of the other two levels, but virtually no difference between medium and high achievers themselves.

Table 25 presents the summary analysis of variance for reaction time. Three effects were statistically significant: modality ($P < .01$); subjects nested within grade, achievement, and order ($P < .005$); and subjects-by-mode nested within grade, achievement, and order ($P \leq .005$). Because of

the complexity of interpretation of the latter two effects, only the first one will be considered here: modality. It was found that the average reaction time for auditory presentation was faster (.31 minutes) than for visual presentation (.35 minutes).

Table 26 indicates that there was a highly significant overall main effect of achievement ($P < .005$). In particular, out of a maximum of 64 points (which would indicate an unimpaired child, while the minimum of 16 points would indicate severe impairment), the grand mean was 26.38.

Table 27 shows the means of the achievement levels, which are nested within grade level. The low achieving students are clearly discerned from their medium- and high-achieving peers by the teacher ratings (see Proger, Carfioli, & Kalapos, 1973; Proger, Mann, Burger, Green & Bayuk, 1975; and Spivack & Swift, 1973, for reviews of teacher ratings). Thus, one sees another instance of where carefully structured teacher ratings have operated successfully.

Table 28 provides averages of each grade level for each modality. This table is associated with the interaction of grade by modality. These averages are plotted in Figure 11. It is quite clear that the interaction was caused by the discrepancy in auditory performance across the grades. That is, there is no significant difference in visual competency between grades, but the kindergarten children can be said to be significantly less competent in auditory processing than first grade children.

REFERENCES

Archer, E. J. A re-evaluation of the meaningfulness of all possible CVC trigrams. Psychological Monographs, 1960, 74 (10), 1 - 23.

Bateman, B. The efficacy of an auditory and a visual method of first grade reading instruction with auditory and visual learners. In H. K. Smith (Ed.) Perception and Reading. Newark, Del.: International Reading Association, 1968.

Berliner, D. C. & Cahen, L. S. Trait-treatment interaction and learning. In F. N. Kerlinger (Ed.) Review of Research in Education. Vol. 1. Itasca, Ill.: F. E. Peacock, 1973. Pp. 58 - 94.

Bracht, G. H. Experimental factors related to aptitude-treatment interactions. Review of Educational Research, 1970, 40, 627 - 645.

Bruininks, R. H. Teaching word recognition to disadvantaged boys. Journal of Learning Disabilities, 1967, 3, 30 - 39.

Campbell, D. T. & Fiske, D. W. Convergent and discriminant validation by the multitrait-multimethod matrix. Psychological Bulletin, 1959, 56, 81 - 105.

Chalfont, J. C. & Flathouse, V. E. Auditory and visual learning. In H. R. Myklebust (Ed.) Progress in learning disabilities (Vol. 11). New York: Grune & Stratton, 1971. Pp. 252 - 292.

Conrad, R. & Hull, A. J. Input modality and serial position curve in short-term memory. Psychonomic Science, 1968, 10, 135 - 136.

Corballis, M. C. Rehearsal and decoy in immediate recall of visually and aurally presented items. Canadian Journal of Psychology, 1966, 20, 43 - 51.

Crowder, R. G. & Morton, J. Precategorical acoustic storage (PAS). Perceptions and Psychophysics, 1969, 5, 365 - 373.

Crowder, R. G. The role of one's own voice in immediate memory. Cognitive Psychology, 1970, 1, 157 - 158.

Crowder, R. G. The sound of vowels and consonants in immediate memory. Journal of Verbal Learning and Verbal Behavior, 1971, 10, 587 - 596.

Dixon, W. J. (Ed.) BMD Biomedical Computer Programs. Los Angeles: University of California Press, 1970. Pp. 596 - 600. (a)

Dixon, W. J. (Ed.) BMD Biomedical Computer Programs: X-Series Supplement. Los Angeles: University of California Press, 1970. Pp. 34 - 50. (b)

Dunn, L. M. & Smith, J. O. Peabody Language Development Kit: Level 1. Circle Pines, Minn.: American Guidance Service, 1965.

Dunn, L. M. & Smith, J. O. Peabody Language Development Kit: Level 2. Circle Pines, Minn.: American Guidance Service, 1966.

Dziuban, C. D. & Shirkey, E. C. On the assessment of psychometric adequacy in correlation matrices. Paper presented at annual meeting of American Educational Research Association, New Orleans, February, 1973.

Epstein, W. Facilitation of retrieval resulting from post-input exclusion of part of the input. Journal of Experimental Psychology, 1970, 86, 190 - 195.

Estes, R. E. & Steward, Janet C. A comparison of visual and auditory channels in learning disabled and control children. Paper presented at Annual Meeting of American Educational Research Association, Washington, D.C., April, 1975.

Glaze, J. A. The association value of nonsense syllables. Journal of Genetic Psychology, 1928, 35, 255 - 269.

Goodman, Libby, & Mann, L. Learning disabilities in the secondary school; Title III: Curricular development for secondary learning disabilities. Norristown, Pa.: Montgomery County Intermediate Unit, 1975a.

Goodman, Libby & Mann, L. Needs assessment survey: Final report; Title III: Curricular development for secondary learning disabilities. Norristown, Pa.: Montgomery County Intermediate Unit, 1975b.

Janssen, D. R. Effects of visual and auditory perceptual aptitudes and letter discrimination pretraining on word recognition. Unpublished doctoral dissertation. The Pennsylvania State University, 1971.

Kazelskis, R. Field independence and the free-recall of nonsense syllables. Perceptual and motor skills, 1970, 31, 351-354.

Kirk, S. A., McCarthy, J. J. & Kirk, W. D. Examiner's manual: Illinois Test of Psycholinguistic Abilities. (Rev. Ed.) Urbana, Ill.: University of Illinois Press, 1968.

Kleinman, D. & John, E. R. Contradiction of auditory and visual information by brain stimulation. Science, 1975, 187 (4173), 271 - 273.

Krueger, W. C. F. The relative difficulty of nonsense syllables. Journal of Experimental Psychology, 1934, 17, 145 - 153.

Laughery, K. R. & Pinkus, A. L. Short-term memory: Effects of acoustic similarity, presentation rate, and presentation mode. Psychonomic Science, 1966, 6, 285 - 286.

Levin, J. R., Divine-Hawkins, P., Kerst, S. M., & Guttmann, J. Individual differences in learning from pictures and words: The development and application of an instrument. Journal of Educational Psychology, 1974, 66, 296 - 303.

Locascio, D. & Ley, R. Scaled-rated meaningfulness of 319 CVCVC words and paralogs previously assessed for associative reaction time. Journal of Verbal Learning and Verbal Behavior, 1972, 11, 243 - 250.

Mann, L., Proger, B. B., & Cross, L. H. Aptitude - treatment interactions with handicapped children: A focus on the measurement of the aptitude component. Paper presented at Annual Meeting of American Educational Research Association, New Orleans, February, 1973. (Available from ERIC as Document No. ED-075-510.)

Matz, R. & Rohwer, W. D., Jr. Visual elaboration of text. Paper presented at annual meeting of the American Educational Research Association, New York, March, 1971.

Murdock, B. B., Jr. Auditory and visual stores in short-term memory. Acta Psychologica, 1967, 27, 316 - 324.

Murdock, B. B. & Walker, K. D. Modality effects in free recall. Journal of Verbal Learning and Verbal Behavior, 1969, 8, 665 - 676.

Murray, J. D. Vocalization-at-presentation and immediate recall with varying recall methods. Journal of Experimental Psychology, 1966, 18, 9 - 18.

Nelson, J. B. The effect of visual-auditory modality preference on learning mode preference in first grade children. Unpublished dissertation. University of Pittsburgh, Pennsylvania, 1970.

Oakan, R., Weiner, M., & Cromer, W. Identification, organization, and reading comprehension for good and poor readers. Journal of Educational Psychology, 1971, 62, 71 - 78.

Powers, T. E. & Jacob, S. H. Comprehension of directional concepts as a function of IQ and mode of task presentation. Journal of Special Education, 1975, in press.

Proger, B. B., Carfioli, I. C., & Kalapos, R. L. A neglected area of accountability: The failure of present efforts in instructional materials evaluation and a rational solution. Journal of Special Education, 1973, 7, 269 - 282.

Proger, B. B., Cross, L. H., & Burger, R. M. Construct validation of standardized tests in special education: A framework of reference and application to ITPA research (1967-1971). In L. Mann & D. A. Sabatino (Eds.) The first review of special education. Philadelphia: JSE Press, 1973. Vol. 1. Pp. 165 - 201.

Proger, B. B., & Mann, L. Criterion-referenced measurement: The world of gray versus black and white. Journal of Learning Disabilities, 1973, 6, 72 - 84.

Proger, B. B., Mann, L., Burger, R. M., & Cross, L. H. Adapting criterion-referenced measurement to individualization of instruction for handicapped children: Some issues and a first attempt. Paper presented at Annual Meeting of American Educational Research Association, Chicago, April, 1972. (Available from ERIC as Document No. ED-064-354.)

Proger, B. B., Mann, L., Burger, R. M., Green, P. A., & Bayuk, R. J. Teacher rating scales as discriminators of clincally defined emotional maladjustment: Relative concurrent validities of the Behavior Problem Checklist and Devereux Scales. Journal of Abnormal Psychology, 1975, in press.

Rand Corporation. A million random digits with 100,000 normal deviates. New York: Free Press, 1955.

Sabatino, D. A., & Ysseldyke, J. E. An evaluation of diagnostic-prescriptive teaching with handicapped children. Mimeograph, The Pennsylvania State University, 1972.

Sabatino, D. A., Ysseldyke, J. E., & Woolston, J. Diagnostic-prescriptive teaching utilizing perceptual strengths of mentally retarded children. American Journal of Mental Deficiency, 1973, in press.

Salomon, G. Hewistic models for the generation of aptitude - treatment interaction hypotheses. Review of Educational Research, 1972, 42, 327 - 343.

Shepard, L. A. & Glass, G. V. A multitrait-multimethod approach to the construct validation of self-acceptance. Paper presented at annual meeting of American Educational Research Association, New Orleans, February, 1973.

Sidman, M., & Cresson, O., Jr. Reading and crossmodal transfer of stimulus equivalences in severe retardation. American Journal of Mental Deficiency, 1973, 77, 515 - 523.

Snyder, R., & Pope, P. Auditory and visual inadequacies in maturation at first grade levels. Journal of Learning Disabilities, 1972, 5, 620 - 625.

Spivack, G., & Swift, M. The classroom behavior of children: A critical review of teacher administered rating scales. Journal of Special Education, 1973, 7, 55 - 91.

Washburn, M. F. Movement and Mental Imagery. Boston, Mass.: Houghton-Mifflin Company, 1916.

Waugh, R. P. Relationship between modality preference and performance. Exceptional Children, 1973, 465 - 469.

Wechsler, D. Wechsler intelligence scale for children. New York: Psychological Corporation, 1949.

Ysseldyke, J. E. Diagnostic-prescriptive teaching: The search for aptitude-treatkent interactions. In L. Mann & D. A. Sabatino (Eds.) The first review of special education. Philadelphia: JSE Press, 1973, Vol. 1, pp. 5 - 32.

TABLES: SERIES ONE

ANALYSES

TABLE 1

LIST OF VARIABLES

Variable Number	Variable Name	Variable Number	Variable Name
1	Sex	63	ITPA Closure: Auditory Criterion
2 to 6	Reaction Time: Auditory Practice	64	ITPA Closure: Visual Practice
7 to 26	Reaction Time: Auditory Criterion	65	ITPA Closure: Visual Criterion
27 to 31	Reaction Time: Visual Practice	66	ITPA Closure: Order
32 to 51	Reaction Time: Visual Criterion	67	ITPA Reception: Auditory Criterion
52	Reaction Time: Order	68	ITPA Reception: Visual Criterion
53	Digit Span: Auditory Practice	69	ITPA Reception: Order
54	Digit Span: Auditory Criterion	70	Stories: Order
55	Digit Span: Visual Practice	71	Stories: Auditory Criterion (General)
56	Digit Span: Visual Criterion	72	Stories: Visual Criterion (General)
57	Digit Span: Order	73	Teacher Rating: Auditory
58	Nonsense Syllables: Auditory Practice	74	Teaching Rating: Visual:
59	Nonsense Syllables: Auditory Criterion	75a	MRT: Word Meaning
60	Nonsense Syllables: Visual Practice	76a	MRT: Listening
61	Nonsense Syllables: Visual Criterion	77a	MRT: Matching
62	Nonsense Syllables: Order	78a	MRT: Aphabet
		79a	MRT: Numbers
		80a	MRT: Copying
		81a	MRT: Total

[a] Variables 75 to 81 concern the Metropolitan Readiness Test, given only to kindergarten children. In first grade, the Stanford Achievement Test was given as that Variables 75 to 79 are replaced as follows: 75, SAT Word Meaning; 76, SAT Paragraph Meaning; 77, SAT Vocabulary; 78, SAT Word Study Skills; 79, SAT Total.

TABLE 2

DESCRIPTIVE STATISTICS: KINDERGARTEN

Variable Number	Mean	Standard Deviation	Variable Number	Mean	Standard Deviation
1	1.50	.50	42	.40	.21
2	.32	.09	43	.37	.18
3	.38	.20	44	.40	.19
4	.34	.13	45	.42	.17
5	.35	.13	46	.48	.60
6	.34	.12	47	.38	.19
7	.35	.13	48	.41	.22
8	.37	.17	49	.36	.15
9	.38	.16	50	.38	.13
10	.35	.12	51	.41	.17
11	.34	.11	52	1.50	.50
12	.35	.14	53	2.94	.40
13	.38	.17	54	2.23	.73
14	.33	.10	55	2.47	.90
15	.36	.14	56	1.08	.93
16	.34	.12	57	1.52	.50
17	.36	.17	58	2.03	1.21
18	.35	.13	59	6.53	3.27
19	.34	.12	60	1.82	1.11
20	.34	.19	61	5.66	2.68
21	.35	.13	62	1.50	.50
22	.34	.12	63b	16.43	5.04
23	.34	.13	64d	6.79	1.98
24	.36	.17	65c	18.26	5.24
25	.36	.17	66	1.50	.50
26	.33	.12	67a	26.25	7.36
27a	.38	.29	68a	18.95	7.05
28a	.38	.19	69	1.52	.50
29a	.37	.19	70	1.48	.50
30a	.37	.13	71a	16.95	4.78
31a	.36	.14	72a	18.74	3.90
32	.36	.14	73	25.53	4.68
33	.37	.17	74	26.56	3.31
34	.36	.11	75	9.66	2.47
35	.37	.16	76	10.92	2.14
36	.40	.32	77	10.27	2.61
37	.36	.14	78	14.21	2.59
38	.40	.22	79	15.16	3.93
39	.44	.44	80	8.77	3.61
40	.41	.19	81	68.89	12.30
41	.39	.32			

Note -- Unless otherwise specified, sample size was 62. For variables 2 to 51, the standard error of the mean ranged from .01 to .08, with the majority no larger than about .03. a Sample size was 61. b Sample size was 60. c Sample size was 57. d Sample size was 43.

TABLE 3

DESCRIPTIVE STATISTICS: FIRST GRADE

Variable Number	Mean	Standard Deviation	Variable Number	Mean	Standard Deviation
1	1.48	.50	41	.32	.18
2	.29	.10	42	.34	.19
3	.29	.09	43	.32	.11
4	.30	.10	44	.32	.21
5	.30	.11	45	.34	.24
6	.30	.10	46	.31	.12
7	.29	.10	47	.33	.15
8	.28	.09	48	.32	.12
9	.30	.09	49	.35	.24
10	.30	.14	50	.33	.14
11	.29	.12	51	.32	.14
12	.28	.08	52	1.50	.50
13	.29	.08	53	3.00	0.00
14	.30	.12	54	2.77	.77
15	.28	.07	55	2.80	.51
16	.29	.10	56	2.03	1.05
17	.30	.10	57	1.50	.50
18	.30	.10	58	2.64	.74
19	.31	.13	59	8.89	1.77
20	.30	.10	60	2.58	.73
21	.29	.10	61	8.41	2.00
22	.30	.16	62	1.48	.50
23	.31	.14	63b	19.98	3.79
24	.29	.07	64c	8.03	1.88
25	.31	.12	65b	23.34	5.54
26	.30	.10	66	1.47	.50
27	.28	.08	67b	34.79	6.43
28	.32	.14	68b	24.92	4.77
29	.30	.13	69	1.48	.50
30	.31	.11	70	1.52	.50
31	.33	.14	71	20.61	4.34
32	.34	.20	72a	21.68	3.78
33	.32	.15	73	27.11	4.69
34	.35	.23	74	26.31	4.54
35	.31	.17	75	22.97	5.52
36	.32	.14	76	21.08	6.12
37	.32	.16	77	28.17	8.26
38	.34	.27	78	27.31	11.34
39	.30	.11	79	99.52	26.54
40	.33	.17			

Note -- Unless otherwise specified, sample size was 64. For variables 2 to 51, the standard error of the mean ranged from .01 to .03, with the majority less than .02. a Sample size was 63. b Sample size was 62. c Sample size was 59.

TABLE 4 (PANEL 1)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1.00	.12	.16	.30	.10	.06	.01	.06	.35	.37	.38	.02	.05	.22
2			.47	.60	.67	.73	.58	.55	.62	.48	.54	.45	.47	.50
3				.56	.56	.43	.29	.28	.30	.47	.55	.30	.28	.32
4					.64	.58	.46	.54	.57	.53	.58	.44	.42	.50
5						.75	.59	.52	.57	.48	.59	.57	.57	.51
6							.65	.60	.60	.44	.55	.50	.49	.53
7								.48	.33	.30	.39	.61	.60	.30
8									.56	.42	.37	.33	.38	.52
9										.56	.54	.38	.37	.57
10											.70	.46	.47	.47
11												.56	.56	.45
12													.74	.39
13														.32
14														
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TABLE 4 (PANEL 2)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	15	16	17	18	19	20	21	22	23	24	25	26	27
1	.12	.27	.27	.16	.17	.23	.23	.25	.14	.32	.25	.22	-.08
2	.61	.55	.56	.51	.50	.60	.50	.59	.52	.46	.45	.40	.19
3	.38	.25	.39	.42	.27	.27	.36	.34	.58	.28	.23	.12	.07
4	.52	.59	.43	.49	.48	.44	.58	.70	.65	.59	.51	.49	.16
5	.44	.48	.58	.44	.50	.45	.49	.64	.71	.48	.51	.46	.18
6	.51	.64	.46	.55	.56	.60	.50	.64	.68	.43	.38	.52	.30
7	.43	.40	.39	.38	.42	.49	.41	.64	.54	.38	.43	.52	.19
8	.40	.57	.40	.41	.35	.41	.40	.42	.47	.32	.31	.38	.18
9	.38	.70	.57	.46	.52	.34	.41	.46	.46	.33	.41	.36	.16
10	.45	.45	.48	.50	.33	.38	.26	.40	.39	.33	.42	.26	.05
11	.47	.42	.44	.50	.32	.42	.36	.53	.49	.36	.26	.25	.02
12	.43	.32	.37	.43	.36	.50	.40	.57	.42	.42	.39	.43	.06
13	.39	.24	.32	.40	.36	.40	.37	.52	.45	.34	.29	.45	.05
14	.28	.47	.60	.43	.48	.38	.47	.44	.42	.33	.41	.18	.19
15		.45	.33	.44	.41	.41	.39	.41	.39	.47	.27	.31	.10
16			.54	.51	.49	.55	.52	.53	.49	.39	.39	.42	.50
17				.50	.47	.36	.46	.50	.48	.20	.42	.24	.20
18					.49	.48	.59	.52	.53	.36	.46	.52	.10
19						.40	.39	.50	.54	.36	.52	.46	.19
20							.44	.63	.46	.55	.41	.40	.25
21								.52	.69	.46	.47	.54	.15
22									.64	.52	.62	.64	.21
23										.45	.51	.60	.17
24											.45	.57	.13
25												.48	.09
26													.06
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TABLE 4 (PANEL 3)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-.06	.10	.24	.17	.11	.21	.10	.04	-.09	.05	.11	.16	.01
2	.35	.43	.57	.67	.41	.53	.36	.56	.31	.39	.39	.24	.57
3	.17	.31	.38	.35	.18	.23	.28	.38	.22	.35	.19	.48	.56
4	.31	.44	.48	.46	.29	.48	.44	.56	.22	.40	.32	.53	.47
5	.32	.41	.48	.60	.29	.62	.49	.49	.26	.43	.30	.27	.56
6	.43	.57	.46	.62	.27	.57	.51	.42	.29	.51	.36	.21	.48
7	.43	.55	.40	.49	.12	.45	.37	.29	.12	.48	.23	.15	.47
8	.27	.43	.51	.68	.19	.56	.45	.44	.21	.39	.37	.16	.34
9	.27	.37	.49	.46	.14	.49	.32	.41	.19	.36	.34	.23	.25
10	.22	.41	.35	.37	.20	.47	.38	.38	.16	.48	.31	.13	.40
11	.12	.32	.42	.42	.27	.51	.31	.35	.12	.42	.20	.17	.36
12	.21	.38	.21	.34	.28	.59	.41	.33	.25	.60	.15	.15	.34
13	.15	.29	.26	.33	.33	.60	.55	.35	.27	.54	.23	.31	.28
14	.17	.29	.37	.35	.26	.42	.45	.53	.26	.36	.48	.26	.27
15	.21	.37	.28	.34	.30	.36	.36	.48	.22	.28	.07	.23	.40
16	.45	.54	.55	.46	.30	.48	.39	.47	.26	.42	.39	.13	.35
17	.29	.48	.43	.36	.35	.41	.38	.69	.21	.37	.37	.33	.34
18	.20	.49	.46	.30	.52	.43	.33	.64	.38	.63	.26	.24	.47
19	.36	.48	.36	.35	.13	.33	.45	.54	.28	.36	.33	.39	.29
20	.29	.48	.38	.48	.24	.42	.47	.37	.23	.40	.33	.04	.40
21	.22	.48	.41	.25	.46	.39	.37	.44	.09	.46	.28	.34	.30
22	.34	.53	.49	.54	.33	.54	.42	.47	.24	.55	.36	.41	.42
23	.37	.63	.48	.48	.21	.35	.46	.37	.15	.46	.33	.47	.40
24	.21	.38	.34	.40	.23	.39	.41	.31	.16	.36	.33	.13	.38
25	.26	.41	.41	.33	.27	.37	.37	.35	.07	.37	.24	.25	.29
26	.26	.53	.35	.47	.37	.42	.38	.23	.21	.49	.31	.18	.36
27	.76	.48	.29	.33	.25	.22	.17	.22	.24	.26	.15	.09	.18
28		.77	.34	.39	.21	.29	.11	.29	.21	.32	.20	.17	.32
29			.40	.46	.32	.40	.34	.43	.24	.59	.35	.28	.39
30				.65	.28	.57	.17	.39	.20	.36	.34	.19	.34
31					.27	.58	.31	.32	.29	.41	.39	.11	.54
32						.47	.22	.53	.26	.38	.09	.21	.26
33							.44	.52	.40	.58	.30	.24	.39
34								.38	.19	.49	.30	.36	.26
35									.53	.40	.35	.45	.46
36										.37	.37	.22	.56
37											.36	.27	.45
38												.14	.26
39													.14
40													

TABLE 4 (PANEL 4)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
1	-.08	.03	.08	.05	.14	.20	.03	.11	.05	.13	.11	.10	-.16	.13	.05
2	.38	.39	.48	.49	.54	.40	.52	.55	.64	.65	.74	.04	-.41	-.04	-.19
3	.26	.40	.33	.42	.27	.18	.31	.52	.43	.56	.43	-.34	-.19	.14	.14
4	.27	.32	.41	.45	.37	.30	.40	.60	.55	.52	.53	-.35	-.30	.11	.10
5	.28	.38	.37	.44	.39	.23	.39	.58	.62	.65	.63	-.18	-.20	.02	-.02
6	.37	.36	.45	.51	.44	.30	.44	.56	.54	.55	.62	-.07	-.25	.10	-.07
7	.18	.13	.28	.29	.60	.30	.32	.47	.43	.49	.63	-.15	-.30	.04	-.22
8	.27	.29	.41	.34	.24	.14	.26	.36	.44	.38	.56	-.16	-.18	-.09	-.05
9	.20	.23	.30	.33	.41	.20	.35	.44	.41	.35	.41	.06	-.09	.12	.12
10	.13	.25	.34	.32	.25	.09	.28	.42	.46	.44	.46	-.02	-.19	-.04	.05
11	.14	.21	.31	.32	.19	.23	.27	.46	.43	.51	.43	-.03	-.19	.20	.02
12	.15	.19	.40	.39	.33	.37	.28	.50	.53	.58	.54	.01	-.37	.09	.03
13	.18	.20	.33	.41	.34	.24	.31	.40	.51	.50	.52	.02	-.28	.05	.02
14	.19	.27	.45	.40	.24	.17	.29	.36	.35	.36	.53	-.01	-.16	.03	.11
15	.21	.20	.39	.27	.32	.23	.30	.35	.40	.44	.48	-.05	-.27	-.09	-.16
16	.24	.33	.40	.44	.54	.41	.39	.46	.46	.47	.54	-.17	-.30	.11	.02
17	.13	.30	.28	.27	.34	.23	.34	.37	.42	.48	.60	.04	-.10	-.07	-.01
18	.33	.40	.48	.51	.38	.17	.45	.50	.40	.49	.56	-.21	-.15	.13	.06
19	.24	.43	.38	.43	.50	.16	.49	.53	.46	.47	.51	-.08	-.07	.03	-.05
20	.20	.24	.49	.54	.42	.65	.37	.46	.55	.55	.64	-.13	-.78	.04	-.10
21	.08	.21	.27	.35	.43	.25	.16	.41	.39	.40	.45	-.18	.23	.12	-.09
22	.23	.26	.43	.46	.47	.35	.49	.56	.59	.61	.57	-.16	-.36	.02	-.16
23	.22	.39	.34	.43	.43	.15	.35	.60	.56	.54	.50	-.24	-.09	.07	-.05
24	.17	.17	.37	.47	.42	.33	.26	.43	.47	.50	.40	-.22	-.35	-.03	-.08
25	.07	.19	.26	.25	.49	.12	.28	.38	.43	.49	.35	.01	-.18	-.03	-.19
26	.23	.27	.29	.39	.44	.15	.33	.48	.41	.43	.40	-.17	-.08	-.04	-.04
27	.19	.20	.15	.25	.33	.11	.29	.20	.23	.19	.32	-.23	-.14	-.04	-.05
28	.23	.27	.23	.24	.40	.07	.34	.40	.37	.31	.42	-.19	-.11	-.07	-.20
29	.21	.25	.34	.37	.54	.16	.33	.60	.56	.50	.53	-.32	-.16	-.04	-.27
30	.29	.38	.44	.40	.50	.33	.40	.42	.41	.43	.46	-.21	-.22	.21	-.11
31	.44	.44	.48	.45	.39	.24	.47	.51	.59	.57	.61	-.16	-.26	-.15	-.22
32	.12	.24	.26	.25	.19	.12	.16	.23	.32	.34	.43	-.10	-.18	.00	-.06
33	.34	.32	.51	.46	.32	.39	.36	.45	.55	.52	.60	-.11	-.23	.15	-.04
34	.07	.15	.32	.43	.22	.26	.20	.30	.41	.40	.44	-.14	-.33	.01	.13
35	.39	.46	.53	.48	.30	.21	.51	.50	.53	.50	.66	-.27	-.14	-.02	.00
36	.87	.76	.82	.76	.36	.21	.81	.65	.59	.51	.51	-.25	-.06	-.05	.12
37	.26	.24	.44	.56	.42	.19	.40	.53	.57	.49	.52	-.30	-.18	-.05	.02
38	.34	.40	.43	.58	.34	.23	.38	.39	.42	.48	.42	-.25	-.12	-.05	-.08
39	.14	.24	.19	.24	.25	.12	.27	.37	.34	.26	.22	-.17	-.02	.11	.08
40	.62	.54	.60	.59	.50	.23	.63	.72	.62	.60	.64	-.37	-.24	-.13	-.02

TABLE 4 (PANEL 5)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	56	57	58	59	60	61	62	63	64	65	66	67	68
1	.12	-.06	.00	-.06	.10	.01	-.23	.18	.04	.11	.10	.00	.08
2	-.22	.12	-.33	-.20	-.09	-.36	-.09	-.31	-.27	-.19	.30	.09	.15
3	.06	.17	-.14	.04	-.12	-.13	.19	-.08	-.08	-.09	-.20	.08	.19
4	-.16	.07	-.39	-.20	-.17	-.41	-.07	-.07	-.14	-.13	-.18	-.04	.12
5	-.23	.17	-.40	-.29	-.20	-.38	.04	-.06	-.17	-.16	-.14	.03	.08
6	-.13	.17	-.29	-.21	-.05	-.28	-.04	-.04	-.22	-.17	-.30	-.01	.14
7	-.26	.00	-.38	-.34	-.09	-.34	-.06	-.01	-.07	.02	-.08	.04	.06
8	-.16	.02	-.40	-.30	-.05	-.30	-.25	-.16	-.03	-.09	-.15	-.08	.01
9	.04	.18	-.31	-.26	-.11	-.26	-.20	-.12	-.28	-.15	-.31	.01	.07
10	-.07	.01	-.23	-.23	.04	-.21	-.08	-.17	-.13	-.11	-.22	-.08	.05
11	.07	.16	-.19	-.20	.01	-.08	-.10	-.02	-.19	.03	-.22	.06	.14
12	-.09	.07	-.39	-.33	.06	-.20	-.04	-.02	.24	-.10	-.05	.02	.04
13	-.15	-.08	-.46	-.30	.01	-.21	-.02	-.12	.12	.02	-.06	-.07	-.14
14	.02	.17	-.23	.01	-.04	-.24	-.11	-.20	-.18	-.08	-.22	-.01	.14
15	-.26	.03	-.26	-.18	-.03	-.30	-.01	.03	.04	-.01	-.08	-.06	.12
16	-.19	.28	-.39	-.41	-.27	-.35	-.29	-.04	-.07	-.16	-.24	-.14	.07
17	-.07	.30	-.26	-.21	-.17	-.41	-.03	-.11	.05	-.12	-.22	.10	-.01
18	-.09	.07	-.13	-.07	.09	-.25	-.09	.02	-.14	-.14	-.32	.13	.23
19	-.22	.21	-.23	-.10	-.18	.39	-.21	.01	-.16	-.09	-.31	-.02	.16
20	-.23	.15	-.31	-.33	-.08	-.27	-.19	.01	-.24	-.23	-.10	.12	.12
21	-.11	.02	-.16	-.09	-.02	-.26	-.23	.00	-.22	-.09	-.05	.00	.08
22	-.25	.07	-.42	-.27	-.14	-.53	.00	.02	-.21	-.21	-.19	.00	-.02
23	-.15	.08	-.32	-.18	-.21	-.43	-.06	.09	-.18	-.12	-.19	.10	.08
24	-.19	-.03	-.23	-.15	-.06	-.29	-.08	.12	-.18	-.11	.05	.06	.11
25	-.30	.08	-.23	-.24	-.08	-.47	-.06	-.04	-.24	-.28	-.08	.09	-.10
26	-.28	-.11	-.18	-.13	.09	-.31	-.13	-.04	-.04	-.15	.05	-.04	.12
27	-.25	.09	-.42	-.33	-.29	-.22	-.23	.04	-.24	-.22	-.21	-.14	-.14
28	-.31	-.08	-.49	-.44	-.34	-.45	-.20	.07	-.31	-.16	-.37	-.01	-.05
29	-.28	-.01	-.46	-.45	-.26	-.53	-.21	.07	-.25	-.03	-.30	.04	.03
30	.01	.02	-.25	-.27	-.26	-.26	-.01	-.16	-.24	-.22	-.24	.04	-.06
31	-.28	-.02	-.41	-.37	-.12	-.33	-.18	-.14	-.22	-.35	-.16	-.09	-.06
32	-.21	.11	-.19	-.15	.13	-.13	-.04	-.12	-.06	-.11	-.14	-.05	.05
33	-.02	.01	-.41	-.44	-.06	-.23	-.04	-.05	-.09	-.17	-.14	.05	-.08
34	-.18	.06	-.30	-.15	.04	-.21	.10	-.05	.04	.08	.08	-.08	.05
35	-.19	.21	-.38	-.14	-.23	-.45	-.10	-.10	.05	-.12	-.35	.07	.09
36	-.19	-.08	-.32	-.02	-.12	-.35	.08	-.15	-.01	-.13	-.21	-.04	.11
37	-.11	-.04	-.32	-.25	.03	-.25	.02	.00	-.16	-.08	-.24	-.03	.04
38	-.22	.08	-.32	-.12	-.20	-.37	-.16	-.13	.06	-.21	-.09	-.23	-.17
39	.02	.08	-.32	-.02	-.20	-.37	.14	.01	-.05	.06	-.20	.03	-.08
40	-.29	-.15	-.27	-.16	-.18	-.33	.12	-.22	-.04	-.22	-.24	.02	.27

TABLE 4 (PANEL 6)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	69	70	71	72	73	74	75	76	77	78	79	80	81
1	.00	.19	-.02	-.05	.23	.32	-.06	-.17	-.01	.11	-.09	-.05	.00
2	-.04	.33	-.16	-.18	-.24	-.27	-.30	-.26	-.50	-.01	-.35	-.18	-.37
3	-.12	.24	-.19	.02	.08	.11	.00	-.02	-.14	.21	.08	-.09	.01
4	.06	.31	-.16	-.12	-.17	-.17	-.09	-.05	-.26	.23	-.28	-.18	-.18
5	-.04	.34	-.18	-.03	-.02	-.06	.01	-.18	-.35	.03	-.14	-.04	-.17
6	.03	.41	-.10	-.05	-.02	-.15	-.08	-.26	-.36	.07	-.23	-.05	-.20
7	-.02	.46	-.13	-.01	-.20	-.29	-.12	-.38	-.37	-.11	-.26	.00	-.26
8	.02	.29	-.07	-.04	-.11	-.15	-.19	-.18	-.24	-.04	-.29	-.05	-.29
9	.03	.22	-.04	-.24	.01	.03	-.06	-.23	-.16	.12	-.18	-.05	-.13
10	.01	.08	.05	.12	.06	.10	-.05	-.15	-.23	-.05	-.08	-.02	-.11
11	.05	.29	-.09	-.01	.04	.08	.10	-.09	-.18	.17	.05	-.11	.00
12	.06	.26	-.14	.04	-.08	-.08	.04	-.24	-.23	-.08	-.05	-.01	-.13
13	.07	.36	-.15	.10	-.20	-.17	.03	-.30	-.37	-.16	-.09	-.20	-.24
14	.16	.18	.08	-.03	-.07	.03	-.06	-.33	-.11	-.01	-.21	-.09	-.22
15	-.08	.20	-.07	-.01	-.08	-.12	-.13	.04	-.23	.03	-.13	-.04	-.14
16	.08	.30	-.12	-.19	-.01	-.06	-.06	-.21	-.24	.15	-.19	-.02	-.14
17	.05	.17	.03	.05	-.02	.04	-.05	-.35	-.18	-.07	-.13	-.07	-.13
18	.10	.17	.09	-.03	-.02	.04	-.02	-.22	-.12	.07	-.03	-.01	-.03
19	.08	.17	.04	-.18	-.13	-.12	.03	-.24	-.26	-.08	-.27	-.13	-.23
20	.14	.24	-.14	-.06	-.06	-.21	-.15	-.32	-.38	-.06	-.23	-.19	-.29
21	.14	.42	-.14	.01	-.05	-.03	-.05	-.23	-.06	-.01	-.20	-.10	-.17
22	.07	.43	-.12	-.07	-.18	-.21	-.12	-.33	-.41	.00	-.35	-.13	-.26
23	.04	.41	-.11	.11	-.10	-.17	.03	-.21	-.24	-.05	-.24	-.11	-.17
24	.01	.33	-.07	.05	-.05	-.09	.05	-.10	-.30	.06	-.36	-.23	-.22
25	.02	.19	.01	-.18	-.02	-.00	-.11	-.35	-.29	-.27	-.20	.14	-.20
26	.02	.37	.12	.04	-.02	-.07	-.02	-.27	-.27	-.05	-.37	-.05	-.21
27	-.04	.25	-.09	-.06	-.10	-.26	-.09	-.17	-.35	.05	-.22	-.26	-.25
28	-.13	.35	-.12	-.03	-.15	-.30	-.21	-.34	-.43	-.16	-.42	-.25	-.39
29	.00	.35	-.07	-.01	-.04	-.16	-.14	-.49	-.33	-.20	-.37	-.19	-.38
30	.06	.39	-.23	-.14	-.15	-.17	-.08	-.24	-.29	.08	-.24	-.16	-.21
31	-.02	.27	.09	-.06	-.17	-.32	-.30	-.22	-.50	.00	-.42	-.20	-.43
32	-.05	.23	.08	-.05	-.08	-.01	-.14	-.15	-.28	.05	-.05	-.19	-.16
33	.03	.42	-.10	-.07	-.07	-.09	-.14	-.25	-.29	.04	-.14	-.12	-.18
34	.18	.31	.09	.09	.06	-.01	.08	-.20	-.18	-.09	-.08	-.08	-.20
35	.08	.05	-.07	-.13	-.20	-.15	-.12	-.14	-.25	.08	-.15	-.20	-.19
36	.10	-.03	-.14	-.12	-.07	-.09	-.12	-.10	-.29	.08	-.12	-.16	-.18
37	.13	.27	.08	.18	.01	.01	-.05	-.31	-.10	-.02	-.03	-.03	-.12
38	.05	.28	-.15	-.11	.00	.00	-.05	-.39	-.26	-.10	-.31	-.14	-.30
39	-.09	.22	-.06	-.14	-.17	-.09	-.06	-.02	-.06	.05	-.12	-.16	-.10
40	-.11	.05	-.04	.06	-.04	-.15	-.27	-.10	-.38	.09	-.21	-.08	-.25

TABLE 4 (PANEL 7)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55
41	1.00	.78	.79	.73	.36	.19	.83	.67	.59	.52	.47	-.22	-.05	-.07	.00
42			.72	.66	.34	.19	.79	.69	.58	.56	.55	-.17	-.06	-.08	-.06
43				.82	.40	.39	.76	.67	.62	.64	.66	.20	-.32	.04	.08
44					.47	.41	.74	.70	.69	.68	.64	-.35	-.36	.04	.13
45						.37	.50	.62	.51	.57	.52	-.15	-.24	.03	-.17
46							.28	.37	.39	.39	.47	-.06	-.76	.28	.11
47								.77	.71	.60	.60	-.16	-.15	-.13	-.05
48									.81	.68	.61	-.30	-.23	.03	.02
49										.74	.68	-.22	-.35	-.18	-.21
50											.74	-.18	-.36	-.01	-.19
51												-.27	-.47	-.06	-.02
52													.08	-.09	-.16
53														-.12	-.01
54															.43
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TABLE 4 (PANEL 8)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	56	57	58	59	60	61	62	63	64	65	66	67	68
41	-.16	-.18	-.24	-.02	-.06	-.31	.06	-.20	.08	-.20	-.18	-.03	.09
42	-.28	.07	-.20	.00	-.09	-.34	-.03	-.17	.03	-.19	-.25	-.01	.12
43	-.16	-.12	-.29	-.08	-.04	-.38	.04	-.15	-.08	-.15	-.29	.05	.14
44	-.18	.00	-.29	-.10	-.10	-.32	.09	-.21	-.10	-.25	-.22	-.05	.10
45	-.23	.07	-.31	-.35	-.26	-.49	-.07	-.13	-.33	-.14	-.25	-.10	.02
46	.05	.22	-.21	-.35	-.09	-.10	-.02	-.01	-.17	-.02	.08	.08	.15
47	-.30	-.02	-.36	-.11	-.20	-.44	.08	-.20	-.09	-.18	-.30	.01	.10
48	-.23	.05	-.38	-.22	-.22	-.45	.01	-.13	-.25	-.07	-.26	-.01	.18
49	-.35	.08	-.54	-.37	-.25	-.52	-.06	-.16	-.17	-.10	-.16	-.02	.03
50	-.36	.14	-.44	-.35	-.19	-.54	.02	-.08	-.16	-.24	-.14	-.07	-.04
51	-.32	.13	-.44	-.31	-.08	-.41	-.14	-.15	.00	-.18	-.27	.04	.16
52	-.12	.00	.24	.09	.25	.04	.03	-.10	-.23	.05	.03	-.06	-.13
53	.19	-.08	.21	.28	-.06	.09	.08	.11	.22	.16	-.08	-.03	-.07
54	.48	.03	.06	.06	.07	.28	.00	.23	-.05	.10	.09	.16	.06
55	.48	-.04	.18	.31	.23	.39	.16	.01	-.08	-.03	-.05	-.04	.26
56		-.09	.35	.30	.25	.54	.19	.11	-.16	.06	-.02	.16	.20
57			.13	-.02	-.10	-.05	.00	-.04	.06	-.11	-.06	.02	-.04
58				.69	.59	.49	.19	-.10	.08	.02	.13	.15	.18
59					.48	.41	.13	-.10	.05	.17	.13	.13	.28
60						.48	.02	.04	.08	.06	.28	-.02	.14
61							.02	-.02	.24	.19	.25	.14	.22
62								-.10	.16	-.05	.03	-.02	.00
63									.04	.21	.17	.04	.08
64										.29	.32	.12	-.01
65											.21	.24	.40
66												-.17	-.09
67													.26
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TABLE 4 (PANEL 9)

KINDERGARTEN INTERCORRELATION MATRIX

Variable	69	70	71	72	73	74	75	76	77	78	79	80	81
41	.10	.03	-.14	-.09	-.19	-.27	-.25	-.06	-.37	.12	-.20	-.17	-.22
42	.02	.03	-.10	.02	-.04	-.06	-.12	-.03	-.30	.10	-.20	-.12	-.16
43	.19	.14	-.16	.00	-.14	-.12	-.20	-.20	-.31	-.00	-.23	-.14	-.24
44	.22	.26	-.20	-.05	-.12	-.11	-.16	-.28	-.34	.05	-.24	-.25	-.27
45	-.03	.21	-.16	-.24	-.07	-.15	-.09	-.38	-.33	-.05	-.29	-.05	-.28
46	.05	.23	.15	-.21	-.05	-.10	-.06	-.21	-.17	.13	-.10	-.09	-.11
47	.09	.10	-.12	-.05	-.22	-.27	-.23	-.17	-.50	.03	-.31	-.22	-.31
48	.08	.10	-.10	-.10	-.03	-.10	-.12	-.21	-.34	.12	-.23	-.14	-.22
49	.04	.17	-.20	-.04	-.18	-.27	-.16	-.24	-.52	-.10	-.26	-.29	-.38
50	.07	.39	-.31	-.17	-.13	-.12	-.10	-.37	-.48	-.09	-.22	-.15	-.33
51	.04	.34	-.14	-.02	-.25	-.23	-.26	-.38	-.41	-.03	-.32	-.25	-.37
52	.00	-.13	.11	.01	-.00	.03	-.05	-.05	-.08	-.23	-.01	.19	.03
53	-.08	-.17	.21	.12	.13	.16	.21	.18	.25	.04	.13	.22	.24
54	.03	.23	-.16	-.39	.20	.15	.23	.07	.28	.31	.21	-.05	.25
55	.04	-.18	.21	-.01	.35	.37	.33	.25	.48	.48	.28	.16	.44
56	-.02	-.08	.05	-.01	.21	.21	.26	.15	.42	.40	.23	.07	.43
57	-.03	-.03	.02	-.30	.08	.14	.14	-.02	.02	.12	.26	.11	.16
58	-.05	-.24	.38	.15	.27	.40	.22	.31	.45	.10	.34	.33	.51
59	.08	-.21	.29	.13	.15	.31	.18	.32	.33	.20	.24	.15	.39
60	-.04	-.02	.36	.21	.19	.30	.04	.18	.26	.05	.22	.17	.33
61	.01	.11	.18	.21	.28	.30	.17	.35	.41	.37	.48	.15	.48
62	.00	.06	.03	.17	.11	.08	.02	.04	.11	.07	.19	.18	.15
63	-.07	.08	.07	-.02	.27	.12	.37	.20	.31	.15	.27	.16	.34
64	-.22	.02	.13	.28	.30	.26	.06	.25	.23	.03	.31	.31	.36
65	.07	.03	.13	.18	.21	.29	.30	.12	.25	.04	.35	.20	.29
66	.00	.06	.09	.01	.13	.07	.05	.08	.01	-.09	.11	.05	.02
67	-.11	.04	.10	.21	-.03	.02	-.01	-.04	.04	-.06	.09	.08	.10
68	-.05	-.12	.18	.03	.19	.21	.18	.15	.14	.30	.03	.07	.15
69		.03	.02	-.01	-.16	-.10	-.07	-.19	.10	.17	.05	-.08	-.05
70			-.23	-.02	-.14	-.09	-.09	-.37	-.24	-.13	-.23	-.21	-.23
71				.22	.18	.18	.13	.16	.30	.01	.20	.34	.30
72					.00	.01	-.04	.05	.03	-.14	.04	.08	.07
73						.82	.44	.18	.46	.28	.50	.55	.54
74							.42	.10	.53	.16	.52	.57	.57
75								.42	.39	.23	.50	.34	.62
76									.36	.40	.41	.20	.59
77										.25	.54	.49	.65
78											.30	.02	.47
79												.57	.81
80													.65
81													1.00

TABLE 5 (PANEL 1)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1.00	.14	-.04	.11	.10	.30	.12	.14	.08	.05	.04	.10	.16
2			.30	.43	.37	.23	.21	.34	.26	.59	.07	.44	.31
3				.34	.30	.17	.22	.32	.20	.13	.36	.46	.25
4					.58	.30	.37	.46	.32	.31	.07	.59	.32
5						.42	.32	.49	.30	.24	.18	.59	.25
6							.44	.33	.12	.33	.19	.38	.20
7								.42	.15	.09	-.01	.60	.30
8									.44	.30	.29	.62	.16
9										.26	.24	.41	.19
10											.38	.35	.29
11												.23	.29
12													.48
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TABLE 5 (PANEL 2)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	14	15	16	17	18	19	20	21	22	23	24	25	26
1	.20	.07	.15	-.06	-.07	.27	.08	.06	.12	.22	.16	-.02	.09
2	.14	.21	.28	.17	.29	.24	.37	.31	.33	-.34	-.04	.14	.28
3	.10	.17	.27	.46	.08	.06	.33	.28	.22	.21	.20	.23	.38
4	.18	.19	.12	.29	.18	.39	.50	.29	.38	.05	-.04	-.08	.24
5	.09	.26	.22	.21	.22	.39	.53	.43	.60	.14	.08	.05	.25
6	.31	.38	.23	.25	.36	.18	.36	.36	.35	.11	.29	.01	.17
7	-.02	.32	.29	.24	.35	.23	.43	.31	.30	.14	.16	-.03	.37
8	-.01	.37	.42	.34	.51	.43	.58	.45	.52	.25	.32	.14	.32
9	.14	.32	.34	.28	.11	.34	.39	.40	.30	.31	.15	.04	.44
10	.09	.30	.21	.16	.24	.13	.32	.34	.24	.10	.20	.02	.22
11	.10	.26	.24	.17	.18	.08	.25	.25	.23	.22	.26	.27	-.01
12	.09	.39	.32	.40	.33	.34	.64	.58	.63	.27	.23	.10	.36
13	.23	.36	.34	.36	.20	.14	.50	.38	.38	.37	.07	.06	.23
14		.18	.13	.20	.10	.14	.27	.45	.33	.32	-.03	-.03	.08
15			.30	.27	.41	.28	.37	.47	.35	.22	.33	.12	.20
16				.24	.29	.25	.34	.39	.44	.44	.23	.01	.39
17					.19	.18	.39	.37	.22	.13	.22	-.05	.46
18						.24	.52	.33	.38	.30	.38	.14	.18
19							.38	.32	.44	.22	.19	-.07	.18
20								.49	.58	.34	.12	.06	.27
21									.70	.23	.24	.01	.33
22										.45	.21	.06	.22
23											.31	.18	.22
24												.13	.24
25													-.04
26													
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TABLE 5 (PANEL 3)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	27	28	29	30	31	32	33	34	35	36	37	38	39	40
1	-.09	.23	.08	.17	.10	.08	.01	.12	.04	.22	.12	.19	.12	.08
2	.40	.26	.52	.42	.37	.27	.17	.30	.39	.40	.40	.30	.16	.35
3	.43	.28	.38	.32	.24	.25	.24	.45	.35	.40	.24	.16	.08	.28
4	.45	.28	.52	.35	.54	.40	.15	.34	.46	.44	.47	.32	.21	.40
5	.38	.38	.65	.46	.66	.70	.29	.51	.60	.52	.65	.60	.49	.61
6	.29	.30	.26	.38	.36	.23	.08	.28	.36	.39	.36	.33	.25	.41
7	.55	.29	.36	.13	.26	.26	.05	.22	.38	.41	.40	.28	.21	.30
8	.49	.49	.58	.47	.64	.46	.16	.41	.53	.52	.60	.47	.37	.57
9	.34	.50	.51	.44	.47	.24	.20	.29	.37	.42	.38	.26	.20	.34
10	.37	.19	.36	.42	.28	.23	.14	.23	.27	.24	.34	.20	.20	.43
11	.32	.18	.21	.29	.34	.10	.02	.38	.22	.20	.27	.16	.16	.40
12	.63	.42	.73	.55	.62	.56	.26	.56	.59	.62	.71	.54	.35	.67
13	.40	.30	.41	.32	.25	.23	.09	.32	.29	.50	.39	.27	.09	.34
14	.11	.10	.23	.48	.34	.19	.21	.17	.18	.32	.19	.20	.11	.25
15	.35	.21	.37	.37	.36	.21	.21	.23	.34	.44	.38	.44	.19	.45
16	.43	.52	.39	.38	.21	.24	.08	.20	.58	.52	.33	.27	.26	.32
17	.37	.22	.41	.31	.27	.31	.04	.47	.46	.39	.33	.25	.10	.32
18	.50	.25	.34	.40	.49	.30	.12	.21	.32	.34	.44	.27	.37	.55
19	.31	.43	.53	.32	.43	.54	.24	.51	.60	.45	.56	.45	.26	.40
20	.54	.45	.69	.60	.66	.51	.30	.50	.50	.67	.67	.47	.40	.58
21	.56	.37	.62	.63	.52	.55	.32	.53	.56	.62	.64	.62	.26	.70
22	.46	.45	.71	.62	.65	.72	.36	.63	.73	.68	.83	.74	.43	.80
23	.24	.48	.41	.36	.27	.24	.14	.24	.27	.50	.34	.30	.19	.40
24	.26	.23	.16	.18	.18	.18	.03	.21	.16	.21	.18	.13	.16	.37
25	.06	.09	.10	.23	.16	.04	.62	.14	.02	.08	.06	.06	.07	.15
26	.31	.28	.37	.31	.33	.24	.07	.29	.46	.38	.28	.00	.04	.17
27		.31	.59	.48	.43	.43	.17	.37	.50	.47	.53	.36	.28	.57
28			.57	.43	.39	.40	.21	.50	.47	.64	.51	.43	.25	.42
29				.63	.66	.79	.39	.64	.69	.80	.83	.66	.36	.70
30					.70	.58	.54	.46	.50	.63	.63	.48	.27	.64
31						.60	.34	.56	.53	.58	.70	.55	.43	.66
32							.43	.60	.63	.65	.77	.65	.52	.72
33								.31	.31	.31	.30	.36	.30	.42
34									.63	.57	.68	.56	.32	.61
35										.58	.70	.58	.37	.62
36											.69	.57	.34	.65
37												.76	.38	.82
38													.37	.73
39														.59
40														

TABLE 5 (PANEL 4.)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	41	42	43	44	45	46	47	48	49	50	51	52	53
1	.05	.13	-.01	-.09	.12	.10	.26	.18	.08	.10	.82	-.16	.00
2	.35	.50	.36	.36	.40	.12	.44	.46	.26	.38	.35	.07	.00
3	.24	.30	.34	.41	.26	.06	.24	.38	.10	.27	.25	-.24	.00
4	.40	.42	.32	.35	.51	.16	.43	.49	.26	.65	.30	-.08	.00
5	.64	.58	.34	.25	.68	.47	.58	.56	.53	.76	.51	-.14	.00
6	.30	.28	.45	.09	.37	.36	.38	.34	.17	.35	.26	.06	.00
7	.32	.30	.34	.31	.34	.42	.35	.41	.20	.30	.19	-.08	.00
8	.51	.57	.49	.52	.56	.32	.58	.66	.40	.57	.41	.10	.00
9	.34	.34	.44	.51	.39	.13	.33	.41	.23	.44	.48	.24	.00
10	.31	.35	.44	.20	.39	.18	.35	.46	.18	.37	.27	.17	.00
11	.22	.15	.40	.14	.24	.10	.28	.25	.13	.19	.21	-.02	.00
12	.66	.68	.63	.59	.68	.47	.64	.73	.58	.64	.46	.01	.00
13	.26	.25	.35	.27	.33	.21	.35	.46	.22	.40	.13	-.01	.00
14	.25	.26	.26	.14	.27	.12	.32	.20	.17	.16	.19	.11	.00
15	.39	.35	.60	.36	.36	.20	.37	.46	.20	.31	.20	.16	.00
16	.37	.28	.50	.22	.33	.22	.31	.44	.20	.25	.28	.19	.00
17	.22	.34	.39	.34	.29	.27	.25	.46	.10	.30	.15	.07	.00
18	.40	.32	.50	.29	.35	.27	.40	.32	.18	.34	.33	.20	.00
19	.50	.48	.33	.25	.54	.23	.44	.46	.42	.46	.44	-.01	.00
20	.58	.60	.50	.48	.62	.46	.62	.67	.46	.65	.45	.02	.00
21	.70	.64	.62	.39	.68	.48	.59	.71	.63	.51	.47	.02	.00
22	.86	.79	.56	.37	.85	.54	.82	.72	.73	.61	.48	-.03	.00
23	.32	.44	.48	.30	.34	.13	.51	.39	.21	.23	.31	.02	.00
24	.23	.23	.47	.26	.22	.14	.30	.25	.07	.21	.26	-.02	.00
25	.14	.11	.16	.12	.03	.01	.08	.04	.01	.08	.13	-.10	.00
26	.16	.24	.42	.43	.19	.00	.16	.35	.09	.22	.24	.05	.00
27	.52	.44	.59	.53	.53	.32	.53	.59	.32	.51	.34	.04	.00
28	.44	.41	.41	.25	.45	.33	.39	.63	.37	.37	.55	.04	.00
29	.78	.79	.65	.66	.82	.45	.75	.81	.65	.78	.63	-.04	.00
30	.62	.55	.54	.44	.66	.31	.62	.68	.45	.49	.38	.19	.00
31	.67	.64	.49	.54	.69	.37	.65	.58	.53	.66	.54	.19	.00
32	.79	.73	.42	.43	.83	.55	.66	.68	.68	.71	.53	-.15	.00
33	.50	.35	.22	.16	.41	.28	.34	.33	.33	.34	.35	-.04	.00
34	.69	.68	.45	.34	.66	.48	.61	.68	.58	.52	.49	-.16	.00
35	.71	.63	.62	.34	.70	.42	.60	.68	.52	.57	.50	.10	.00
36	.69	.68	.58	.53	.72	.49	.67	.80	.48	.60	.48	-.05	.00
37	.82	.83	.60	.48	.88	.53	.81	.80	.74	.66	.55	-.07	.00
38	.78	.75	.42	.32	.79	.53	.74	.71	.72	.60	.49	.01	.00
39	.59	.47	.28	.15	.43	.66	.42	.35	.31	.51	.57	-.01	.00
40	.86	.78	.66	.38	.86	.62	.82	.76	.69	.68	.60	-.04	.00

TABLE 5 (PANEL 5)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	54	55	56	57	58	59	60	61	62	63	64	65	66
1	.09	-.04	.30	-.03	.01	-.12	.05	.24	.06	-.23	-.04	-.01	-.22
2	-.01	-.35	-.18	.14	-.34	-.40	-.41	-.30	-.05	-.24	-.22	-.24	-.16
3	.13	.07	-.02	.08	-.30	-.36	-.28	-.30	.14	-.08	-.27	-.24	.09
4	.22	-.09	-.08	.02	-.29	-.58	-.35	-.22	-.02	.23	-.37	-.20	.13
5	.24	-.14	-.17	.12	-.41	-.60	-.41	-.42	.21	-.14	-.34	-.39	.01
6	-.03	-.05	-.09	.11	-.37	-.29	-.40	-.31	.03	-.19	-.13	-.03	-.09
7	.20	.02	.15	.09	-.23	-.22	-.19	-.15	.18	-.18	-.06	-.07	-.01
8	.28	-.01	.04	-.03	-.43	-.35	-.36	-.18	.15	-.21	-.20	-.06	.11
9	.03	-.02	-.14	-.01	-.29	-.27	-.35	-.31	.06	-.13	-.29	-.25	.07
10	.02	.37	-.11	.11	-.32	-.22	-.29	-.24	-.08	-.15	-.11	-.10	.04
11	.05	-.05	.00	.11	-.30	-.06	-.25	-.26	-.05	-.02	-.03	.01	.12
12	.27	-.20	-.15	.08	-.44	-.52	-.36	-.45	.19	-.34	-.42	-.29	-.04
13	.14	-.20	-.12	.10	-.32	-.26	-.19	-.26	.13	-.11	-.05	.13	-.36
14	-.11	.00	-.16	-.16	-.19	-.22	-.16	-.16	-.07	-.37	-.16	.14	-.10
15	.06	-.03	-.18	-.01	-.52	-.20	-.34	-.42	.11	-.28	-.32	-.15	.08
16	.04	-.01	-.07	-.01	-.44	-.15	-.32	-.20	.14	-.00	-.07	.08	-.18
17	.02	.00	-.04	.22	-.43	-.18	-.25	-.15	.02	-.06	.00	.08	.14
18	-.01	-.06	-.15	-.08	-.48	-.22	-.29	-.29	.10	-.21	-.02	.08	.08
19	-.10	-.29	-.13	-.02	-.40	-.38	-.30	-.18	.06	-.16	-.12	-.09	-.17
20	.24	-.13	-.05	.10	-.52	-.42	-.26	-.32	.11	-.15	-.22	-.16	.00
21	.04	-.24	-.29	-.07	-.40	-.46	-.48	-.53	.04	-.36	-.34	-.15	-.14
22	.04	-.31	-.22	-.03	-.45	-.52	-.38	-.46	.13	-.41	-.42	-.16	-.09
23	.01	-.02	.00	-.09	-.39	-.13	-.20	-.27	.16	-.36	-.23	-.04	-.07
24	-.07	.02	.06	-.25	-.24	.04	-.08	-.07	.04	-.13	-.11	.06	.16
25	-.10	.11	.03	-.13	-.14	-.05	-.12	-.23	.05	-.32	-.17	-.14	-.16
26	-.03	.06	-.04	-.10	-.27	-.13	-.30	-.17	.06	-.17	.03	-.01	-.09
27	.14	.06	-.21	.02	-.41	-.41	-.51	-.45	.07	-.15	-.27	-.09	.11
28	.05	-.14	.08	.21	-.46	-.31	-.32	-.34	.13	-.14	-.13	-.18	-.14
29	.06	-.28	-.32	.13	-.65	-.65	-.55	-.49	.09	-.33	-.35	-.31	-.10
30	.00	-.24	-.27	-.07	-.44	-.44	-.40	-.42	.17	-.31	-.36	-.19	-.21
31	.13	-.22	-.21	-.09	-.43	-.44	-.36	-.37	.10	-.33	-.35	-.15	.01
32	.04	-.36	-.28	.04	-.49	-.57	-.40	-.38	.20	-.25	-.30	-.30	-.09
33	-.11	-.12	-.10	-.15	-.21	-.29	-.19	-.37	.16	-.34	-.29	-.33	-.18
34	-.02	-.36	-.06	.19	-.46	-.45	-.39	-.39	.01	-.22	-.29	-.28	-.07
35	.04	-.20	-.17	.07	-.54	-.43	-.45	-.40	.12	-.18	-.23	-.12	-.13
36	.07	-.15	-.24	.03	-.67	-.51	-.47	-.42	.13	-.29	-.31	-.19	-.17
37	.02	-.36	-.22	.18	-.56	-.61	-.47	-.51	.12	-.42	-.32	-.29	-.01
38	.19	-.34	-.09	.20	-.39	-.50	-.33	-.46	.23	-.29	-.42	-.34	.00
39	.11	-.09	.06	-.12	-.30	-.22	-.12	-.20	.00	-.06	-.07	-.12	.08
40	.03	-.29	-.26	.01	-.56	-.54	-.45	-.61	.08	-.46	-.44	-.29	.00

TABLE 5 (PANEL 6)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	67	68	69	70	71	72	73	74	75	76	77	78	79
1	-.09	-.17	-.06	-.12	-.04	-.11	.10	.22	.07	.32	.08	.08	.15
2	-.11	-.14	.04	.03	-.11	-.01	-.27	-.22	-.19	-.12	-.22	-.17	-.21
3	-.03	-.14	.15	.19	-.15	-.02	-.16	-.23	-.08	.25	-.19	-.20	-.22
4	-.14	-.18	.15	.03	-.17	-.07	-.15	-.17	-.05	-.07	.00	-.02	-.03
5	-.35	-.14	.22	.06	-.28	-.26	-.21	-.35	-.20	.17	-.04	-.16	-.16
6	-.14	-.03	.21	-.03	-.19	-.16	-.23	-.14	-.20	-.10	-.01	-.21	-.16
7	-.22	-.08	.07	.04	-.08	-.22	.01	-.14	.12	.14	-.10	.26	.14
8	-.22	-.01	.08	-.01	-.24	-.08	-.16	-.33	.00	-.01	.00	-.06	-.03
9	-.13	.08	-.11	-.02	-.14	.08	-.24	-.36	-.11	-.19	-.13	-.05	-.13
10	-.11	.06	.10	-.18	-.05	.10	-.14	-.10	-.14	-.15	-.16	-.13	-.17
11	-.09	.06	.15	-.03	-.07	.24	-.11	-.19	-.03	-.13	-.06	-.15	-.12
12	-.28	-.21	.08	.01	-.26	-.21	-.24	-.41	-.17	-.16	-.24	-.07	-.18
13	-.08	-.08	.16	.16	.02	.16	-.20	-.33	-.20	-.20	-.14	.02	-.12
14	-.06	-.13	-.04	-.01	-.13	.01	-.42	-.30	-.21	-.27	-.04	-.25	-.23
15	-.24	.05	.25	.10	-.22	-.16	-.33	-.35	-.23	-.12	-.17	-.18	-.20
16	-.11	-.02	.15	-.03	-.11	-.14	-.14	-.22	-.12	.02	-.02	.06	.00
17	.06	.05	.14	-.02	.08	.17	.25	-.20	-.05	-.21	-.06	-.12	-.13
18	-.32	.10	.10	-.08	-.21	-.22	-.34	-.40	-.12	-.12	-.13	-.07	-.12
19	-.11	-.21	.16	.04	-.24	-.20	-.15	-.16	-.10	-.03	-.06	.01	-.04
20	-.29	.02	.14	-.19	-.16	-.14	-.24	-.43	-.07	-.14	.02	-.05	-.06
21	-.41	-.14	.05	-.06	-.27	-.14	-.36	-.45	-.19	-.22	-.22	-.18	-.24
22	-.36	-.15	.07	-.16	-.32	-.25	-.38	-.46	-.24	-.20	-.16	-.06	-.17
23	-.21	-.07	-.07	.06	-.14	-.08	-.34	-.30	-.21	-.13	-.13	-.11	-.16
24	-.15	.10	.12	.19	-.06	-.06	-.04	-.01	.02	.08	-.01	.03	.03
25	-.15	.01	.19	.05	-.14	-.03	-.03	-.18	.11	-.14	-.15	-.18	-.18
26	-.14	.05	.10	.01	.09	.11	-.09	-.20	-.02	-.13	-.14	.10	-.04
27	-.22	-.05	.09	.05	-.15	-.18	-.26	-.34	-.12	-.13	-.17	-.02	-.12
28	-.12	-.05	-.09	.05	-.18	-.19	-.11	-.21	-.07	-.07	-.10	-.11	-.11
29	-.28	-.24	.06	-.06	-.29	-.20	-.41	-.53	-.24	-.27	-.23	-.20	-.27
30	-.19	.02	.10	-.15	-.38	-.19	-.44	-.44	-.31	-.24	-.11	-.27	-.27
31	-.23	-.05	.11	-.11	-.30	-.11	-.32	-.44	-.20	-.23	-.04	-.27	-.22
32	-.35	-.30	.12	-.12	-.46	-.35	-.35	-.40	-.29	-.25	-.17	-.15	-.23
33	-.23	-.18	.18	-.26	-.38	-.37	-.14	-.27	-.21	-.22	-.12	-.14	-.19
34	-.18	-.21	.13	-.01	-.20	-.14	-.16	-.25	-.07	-.23	-.10	-.15	-.16
35	-.20	-.14	.25	-.11	-.17	-.17	-.25	-.30	-.14	-.14	-.12	.05	-.08
36	-.31	-.19	.18	-.01	-.24	-.21	-.30	-.39	-.20	-.20	-.15	-.17	-.21
37	-.43	-.17	.14	-.20	-.34	-.25	-.45	-.55	-.32	-.28	-.27	-.19	-.30
38	-.32	-.24	.16	-.08	-.29	-.29	-.31	-.40	-.18	-.05	-.03	-.18	-.13
39	-.24	-.18	.00	-.16	-.17	-.34	-.08	-.14	-.14	-.04	.06	-.07	-.05
40	-.46	-.21	.15	-.17	-.38	-.35	-.44	-.47	-.34	-.32	-.28	-.24	-.33

TABLE 5 (PANEL 7)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	41	42	43	44	45	46	47	48	49	50	51	52	53
41	1.00	.84	.60	.41	.88	.67	.78	.76	.75	.70	.58	-.02	.00
42			.59	.55	.86	.58	.84	.80	.71	.68	.57	-.08	.00
43				.60	.59	.33	.54	.63	.40	.50	.47	.15	.00
44					.49	.11	.48	.54	.36	.53	.36	.12	.00
45						.59	.87	.82	.75	.76	.54	-.01	.00
46							.50	.54	.46	.42	.40	-.11	.00
47								.74	.64	.68	.51	-.03	.00
48									.65	.64	.45	-.04	.00
49										.57	.44	-.18	.00
50											.60	-.05	.00
51												-.01	.00
52													.00
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TABLE 5 (PANEL 8)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	54	55	56	57	58	59	60	61	62	63	64	65	66
41	.03	-.37	-.24	.01	-.52	-.58	-.45	-.53	.06	-.36	-.48	-.30	-.10
42	.06	-.35	-.18	.04	-.48	-.54	-.40	-.44	.03	-.42	-.48	-.29	-.10
43	.03	-.09	-.30	-.02	-.70	-.42	-.58	-.59	-.02	-.40	-.36	-.18	.01
44	.13	-.13	-.30	-.08	-.45	-.46	-.36	-.31	.01	-.23	-.36	-.22	.14
45	.07	-.38	-.30	.11	-.51	-.62	-.45	-.53	.14	-.34	-.51	-.31	-.08
46	.02	-.20	-.09	.19	-.31	-.24	-.08	-.28	-.06	-.13	-.16	-.20	-.08
47	.08	-.21	-.16	.04	-.44	-.50	-.38	-.40	.15	-.40	-.47	-.20	-.03
48	.14	-.35	-.14	.14	-.58	-.55	-.44	-.46	.10	-.29	-.37	-.27	.08
49	.06	-.60	-.26	.09	-.39	-.58	-.38	-.54	.07	-.34	-.41	-.35	-.19
50	.20	-.24	-.24	-.04	-.51	-.66	-.46	-.38	.05	-.20	-.43	-.30	.06
51	.12	-.17	-.13	.03	-.39	-.40	-.36	-.36	.12	-.23	-.17	-.27	.02
52	.02	.09	-.03	.00	.02	.24	.02	.05	.03	.25	-.07	.17	.00
53	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
54		-.16	.40	-.14	.13	.02	.08	.04	.34	.16	-.18	-.22	.33
55			.25	-.16	.14	.34	.11	.22	.08	.04	.13	.21	.19
56				-.06	.36	.39	.39	.46	.09	.21	.26	.09	.15
57					-.15	-.13	-.11	-.10	-.03	.16	.02	.20	.00
58						.49	.65	.54	-.04	.26	.09	.05	-.01
59							.56	.49	.02	.34	.47	.44	.04
60								.67	.05	.26	.28	.14	.07
61									-.01	.35	.42	.34	.14
62										-.01	.00	-.06	.03
63											.30	.12	.12
64												.61	.13
65													.09
66													
67													
68													
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TABLE 5 (PANEL 9)

FIRST-GRADE INTERCORRELATION MATRIX

Variable	67	68	69	70	71	72	73	74	75	76	77	78	79
41	-.38	-.24	.19	-.14	-.38	-.40	-.33	-.42	-.26	-.21	-.17	-.17	-.23
42	-.36	-.23	.14	-.03	-.28	-.18	-.43	-.44	-.29	-.25	-.21	-.25	-.29
43	-.30	-.12	.20	.05	-.32	-.20	-.46	-.50	-.36	-.30	-.34	-.27	-.36
44	-.11	-.08	.05	.13	-.15	.00	-.40	-.52	-.25	-.23	-.18	-.18	-.24
45	-.44	-.22	.20	-.13	-.41	-.28	-.41	-.46	-.26	-.26	-.18	-.16	-.24
46	-.24	-.19	.07	-.20	-.20	-.37	-.11	-.20	-.08	-.08	-.09	-.14	-.12
47	-.35	-.15	.05	-.11	-.20	-.23	-.40	-.42	-.19	-.13	-.05	-.10	-.13
48	-.29	-.14	.10	-.06	-.26	-.19	-.32	-.37	-.19	-.16	-.18	-.15	-.20
49	-.41	-.29	.09	-.16	-.36	-.34	-.40	-.45	-.35	-.27	-.25	-.22	-.31
50	-.39	-.23	.18	-.01	-.26	-.16	-.27	-.42	-.20	-.19	-.03	-.10	-.14
51	-.30	-.23	-.02	-.04	-.26	-.27	-.17	-.33	-.17	-.16	-.14	-.19	-.20
52	.09	.16	-.03	-.03	.13	.14	-.02	-.08	.07	-.01	.13	.05	.08
53	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
54	-.13	.01	.22	.03	-.09	-.03	.22	.04	.18	.24	.22	.14	.22
55	.08	.05	-.04	.23	.26	.06	.26	.13	.34	.20	.26	.18	.27
56	.05	.19	-.09	-.03	.30	.12	.50	.44	.49	.45	.37	.43	.50
57	-.03	-.04	-.03	-.03	.02	-.10	-.07	-.14	-.06	-.13	-.13	-.20	-.17
58	.19	.16	-.16	-.09	.28	.24	.48	.43	.38	.35	.30	.32	.39
59	.28	.30	-.08	-.13	.35	.30	.54	.58	.46	.38	.36	.36	.45
60	.27	.20	-.26	-.09	.33	.21	.46	.41	.40	.39	.32	.35	.42
61	.32	.18	-.26	-.07	.36	.27	.55	.56	.50	.51	.46	.43	.55
62	-.26	.06	.06	.00	-.19	-.22	.00	-.06	-.02	.05	.04	.14	.08
63	.22	.27	.05	.10	.29	.29	.36	.29	.32	.29	.42	.30	.39
64	.25	.20	-.22	-.20	.37	.39	.31	.30	.32	.28	.21	.22	.29
65	.30	.28	-.16	-.14	.36	.47	.14	.26	.25	.21	.30	.19	.27
66	-.03	.04	.03	-.03	.08	.16	.06	.02	.07	.06	.19	-.03	.08
67		.31	-.32	.10	.29	.22	.28	.42	.27	.34	.34	.10	.28
68			-.11	-.02	.32	.32	.23	.20	.24	.25	.36	.27	.33
69				.00	-.19	-.01	-.04	-.09	-.11	-.13	-.04	-.13	-.12
70					.09	.06	-.06	-.08	.05	.04	-.02	-.10	-.03
71						.52	.37	.33	.49	.41	.42	.36	.48
72							.09	.09	.28	.11	.20	.13	.20
73								.81	.78	.71	.82	.61	.78
74									.59	.64	.52	.49	.64
75										.78	.63	.68	.87
76											.69	.66	.89
77												.44	.79
78													.86
79													

TABLES: SERIES TWO

ANALYSES

TABLE 6

REACTION TIME

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
Grade (G)	1	.09	.57a
Order (O)	1	1.39	2.85a
Trials (T)	19	.03	.91
Achievement (Grade), A(G)	4	.14	.64a
GO	1	.08	.16a
GT	19	.05	1.60b
OT	19	.05	1.36
OA(G)	4	.48	2.21a,b
TA(G)	76	.03	1.01
GOT	19	.05	1.51
Subjects, S(GOA)	84	.22	---
OTA(G)	76	.03	1.00
ST(GOA)	1596	.03	---

a Because of the mixed-effects nature of this design, there were no immediately available error terms that were orthogonal to some of the effects being tested. Thus, quasi-mean squares for error were generated wherever needed.

b $P < .10$

TABLE 7

NONSENSE SYLLABLES

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
Grade (G)	1	1.09	1.13
Order (O)	1	1.14	23.41**
Achievement (Grade), A(G)	4	.96	1.03
GO	1	.48	9.93*
OA(G)	4	.05	.05
Error	114	.94	

* $P \leq .05$

** $P \leq .01$

TABLE 8

ITPA CLOSURE

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
Grade (G)	1	.39	7.58*
Order (O)	1	.01	.01
Achievement (Grade), A(G)	4	.05	.03
GO	1	.03	.04
OA(G)	4	.70	.46
Error	107	1.52	

* $P < .10$

TABLE 9

ITPA RECEPTION

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
Grade (G)	1	.29	.46
Order (O)	1	1.19	.40
Achievement (Grade), A(G)	4	.63	.60
GO	1	.29	.10
OA(G)	4	2.95	2.82*
Error	111		

* $P \leq .05$

TABLE 10

COMPREHENSION STORIES

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
Grade (G)	1	.01	.03
Order (O)	1	.34	.00
Achievement (Grade), A(G)	4	2.24	.28
GO	1	1.80	2.10*
OA(G)	4	1.19	1.51
Error	112	1.07	

* $P < .10$

TABLE 11

DIGIT SPAN

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
Grade (G)	1	.60	.60
Order (O)	1	.00	.00
Achievement (Grade), A(G)	4	1.01	1.02
GO	1	.93	1.41
OA(G)	4	.66	.67
Error	114	.99	

TABLES: SERIES THREE

ANALYSES

TABLE 12

BASIC MODALITY PROFILES FOR

ITAP CLOSURE

Profile Type	Level of Stringency							
	± 1 SD				± 2 SD			
	K		Grade 1		K		Grade 1	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
Strong on Both			5	1				
Med. on Both	24	16	16	18	29	27	32	28
Weak on Both	1	4		1				1
Srong V-Med. A	1	1	6	7		1		3
Strong A-Med.V		1	4	1				
Weak V-Med. A	4	5			1	1		
Weak A-Med. V	2	5		3	2	3		
Strong V-Weak A				1				
Strong A-Weak V			1					

TABLE 13

BASIC MODALITY PROFILES FOR

ITPA RECEPTION

Profile Type	Level of Stringency							
	± 1 SD				± 2 SD			
	K		Grade 1		K		Grade 1	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
Strong on Both	1		3	3				
Med. on Both	16	10	13	17	31	30	32	30
Weak on Both	3	6		2				
Srong V-Med. A	1	1	6	3				
Strong A-Med.V		3	7	5				
Weak V-Med. A	1	8	1			2		1
Weak A-Med. V	8	4	1	2	1			1
Strong V-Weak A								
Strong A-Weak V	2		1					

TABLE 14

BASIC MODALITY PROFILES FOR

COMPREHENSION STORIES (GENERAL QUESTIONS)

Profile Type	Level of Stringency							
	± 1 SD				± 2 SD			
	K		Grade 1		K		Grade 1	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
Strong on Both			3	6				
Med. on Both	15	12	18	18	28	29	30	29
Weak on Both	3	5	1	1				1
Srong V-Med. A	3	1	3	2			1	2
Strong A-Med.V	2	2	5	3			1	
Weak V-Med. A	4	6	1	1	2	1		
Weak A-Med. V	4	6	1		2	2		
Strong V-Weak A								
Strong A-Weak V	1			1				

TABLE 15

BASIC MODALITY PROFILES FOR

DIGIT SPAN

Profile Type	Level of Stringency							
	± 1 SD				± 2 SD			
	K		Grade 1		K		Grade 1	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
Strong on Both		1	3	3				
Med. on Both	21	14	21	14	32	31	27	30
Weak on Both	1	2						
Srong V-Med. A	1	1	7	10		1	4	1
Strong A-Med.V	1	1		2			1	1
Weak V-Med. A	6		1	2				
Weak A-Med. V	2	3		1				
Strong V-Weak A								
Strong A-Weak V								

TABLE 16

BASIC MODALITY PROFILES FOR

NONSENSE SYLLABLES

Profile Type	Level of Stringency							
	± 1 SD				± 2 SD			
	K		Grade 1		K		Grade 1	
	Boy	Girl	Boy	Girl	Boy	Girl	Boy	Girl
Strong on Both								
Med. on Both	19	15	17	20	28	23	32	31
Weak on Both	4	5		1	1	3		1
Strong V-Med. A	2	2						
Strong A-Med.V								
Weak V-Med. A	4	5	2			2		
Weak A-Med. V	3	5	1		3	4		
Strong V-Weak A								
Strong A-Weak V								

TABLE 17

INCIDENCE RATES FOR GENERAL

MODALITY PROFILES (± 1 SD)

Measure	Profile Type									
	Deficiencies				Strengths				Mediocre	
	One Modality		Both Modalities		One Modality		Both Modalities			
	K	1	K	1	K	1	K	1	K	1
ITPA Closure[a]	25%(16)	(3)5%	8%(5)	(1)2%	5%(3)	(18)28%	0%(0)	(6)9%	62%(40)	34(53%)
ITPA Reception[b]	33%(21)	(4)6%	14%(9)	(2)3%	8%(5)	(21)33%	2%(1)	(6)9%	41%(26)	30(47%)
Comprehension[c]	31%(20)	(3)5%	12%(8)	(2)3%	12%(8)	(13)20%	0%(0)	(9)14%	42%(27)	36(56%)
Digit Span	33%(21)	(4)6%	5%(3)	(0)0%	6%(4)	(19)30%	2%(1)	(6)9%	55%(35)	35(55%)
Nonsense Syll.	27%(17)	(3)5%	14%(9)	(1)2%	6%(4)	(23)36%	0%(0)	(0)0%	53%(34)	37(58%)

[a]Two children in grade 1 had profiles of a strong modality in combination with a weak modality and were not included.

[b]Two children in kindergarten and one child in first grade had profiles of a strong modality in combination with a weak modality and were not included.

[c]One child in kindergarten and one child in first grade had profiles of a strong modality in combination with a weak modality and were not included.

TABLES: SERIES FOUR

ANALYSES

TABLE 18

COMPREHENSION STORIES

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G (Grade)	1	507.52	11.37*
O (Order)	1	.10	.01
M (Modality	1	64.38	2.14
A (G) (Ach.)	4	44.65	1.54
GO	1	20.02	1.91
GM	1	36.21	1.20
OM	1	48.21	4.11
AO(G)	4	10.47	.36
AM(G)	4	30.10	2.00
GOM	1	4.67	.40
S(GAO)	72	28.96	--
AOM(G)	4	11.71	.78
SM(GAO)	72	15.06	--

*$P < .05$

TABLE 19

ITPA RECEPTION

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G (Grade)	1	1.14	79.90[a]
O (Order)	1	.10	1.35
M (Modality	1	.18	11.55[b]
A (G) (Ach.)	4	.01	.70
GO	1	.00	.00
GM	1	.01	.85
OM	1	.00	.06
AO(G)	4	.17	1.42
AM(G)	4	.01	1.09
GOM	1	.01	.22
S(GAO)	72	.02	--
AOM(G)	4	.05	3.52[b]
SM(GAO)	72	.01	--

[a] $p < .005$

[b] $p < .05$

TABLE 20

ITPA CLOSURE

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G (Grade)	1	.40	6.99
O (Order)	1	.03	.82
M (Modality	1	1.87	446.42[a]
A (G) (Ach.)	4	.06	3.74[b]
GO	1	.00	.01
GM	1	.01	2.08
OM	1	.00	.22
AO(G)	4	.03	2.26
AM(G)	4	.00	.26
GOM	1	.01	1.24
S(GAO)	84	.02	--
AOM(G)	4	.01	.56
SM(GAO)	84	.02	--

[a] $\underline{P} < .005$

[b] $\underline{P} < .05$

TABLE 21

NONSENSE SYLLABLES

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G (Grade)	1	231.01	11.21[b]
O (Order)	1	3.15	2.96
M (Modality	1	28.34	12.14[b]
A (G) (Ach.)	4	20.61	3.41[a]
GO	1	6.48	6.08
GM	1	3.15	1.36
OM	1	6.48	4.37
AO(G)	4	1.07	.18
AM(G)	4	2.32	.67
GOM	1	.05	.04
S(GAO)	72	6.04	--
AOM(G)	4	1.48	.43
SM(GAO)	72	3.45	--

[a] $P < .05$

[b] $P < .025$

TABLE 22

NONSENSE SYLLABLES

AVERAGES FOR ACHIEVEMENT NESTED

WITHIN GRADE

Grade	Achievement Level		
	Low	Medium	High
Kindergarten	5.43	7.21	7.07
First	8.14	9.11	9.50

TABLE 23

DIGIT SPAN

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G (Grade)	1	13.33	4.55
O (Order)	1	0.00	0.00
M (Modality	1	22.53	48.28[a]
A (G) (Ach.)	4	2.93	3.67[b]
GO	1	1.63	3.50
GM	1	2.70	5.79
OM	1	.03	.10
AO(G)	4	.47	.58
AM(G)	4	.47	1.02
GOM	1	.53	1.60
S(GAO)	48	.80	--
AOM(G)	4	.33	.73
SM(GAO)	48	.46	--

[a] $P < .005$

[b] $P < .05$

TABLE 24

DIGIT SPAN

AVERAGES FOR ACHIEVEMENT NESTED

WITHIN GRADE

Grade	Achievement Level		
	Low	Medium	High
Kindergarten	1.15	1.85	1.95
First	1.95	2.45	2.55

TABLE 25

REACTION TIME

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G(Grade)	1	2.94	4.28
O(Order)	1	1.21	3.60
M(Modality)	1	1.75	27.51[a]
T(Trial)	19	.01	.80
A(G)(Ach.)	4	.69	1.62
GO	1	.05	.16
GM	1	.05	.57
OM	1	.69	2.85
GT	19	.01	.80
OT	19	.01	.77
MT	19	.02	.91
AO(G)	4	.34	.79
AM(G)	4	.07	.64
AT(G)	76	.02	.90
GOM	1	.04	.16
GOT	19	.02	1.18
GMT	19	.03	1.59
OMT	19	.02	1.36
S(GAO)	84	.43	24.39[b]
AOM(G)	4	.24	2.21
AOT(G)	76	.02	1.05
AMT(G)	76	.02	1.01
GOMT	19	.03	1.51
SMT(GAO)	84	.11	6.29[b]
ST(GAO)	1596	.02	--
AOMT(G)	76	.02	.99
SMT(GAO)	1596	.02	--

[a] $p < .01$

[b] $p < .005$

TABLE 26

TEACHER RATINGS

SUMMARY ANALYSIS OF VARIANCE

Source	df	Mean Square	F
G(Grade)	1	32.44	.07
M(Modality)	1	.16	.03
A(G) (Ach.)	4	443.99	23.30[a]
GM	1	49.28	8.03[b]
S(GA)	108	19.06	--
AM(G)	4	6.14	1.69
SM(GA)	108	3.64	--

[a] $\underline{P} < .005$

[b] $\underline{P} < .05$

TABLE 27

TEACHER RATINGS

AVERAGES FOR MAIN EFFECT

OF ACHIEVEMENT

GRADE LEVEL	Achievement Level		
	Low	Medium	High
K	23.26	26.08	28.66
1	22.29	27.92	30.05

TABLE 28

TEACHER RATINGS

AVERAGES FOR INTERACTION OF GRADE BY MODALITY

GRADE LEVEL	Modality	
	Auditory	Visual
K	25.51	26.49
1	27.19	26.32

FIGURES: SERIES TWO

ANALYSES

FIGURE 1

REACTION TIME

GRADE-BY-TRIAL INTERACTION

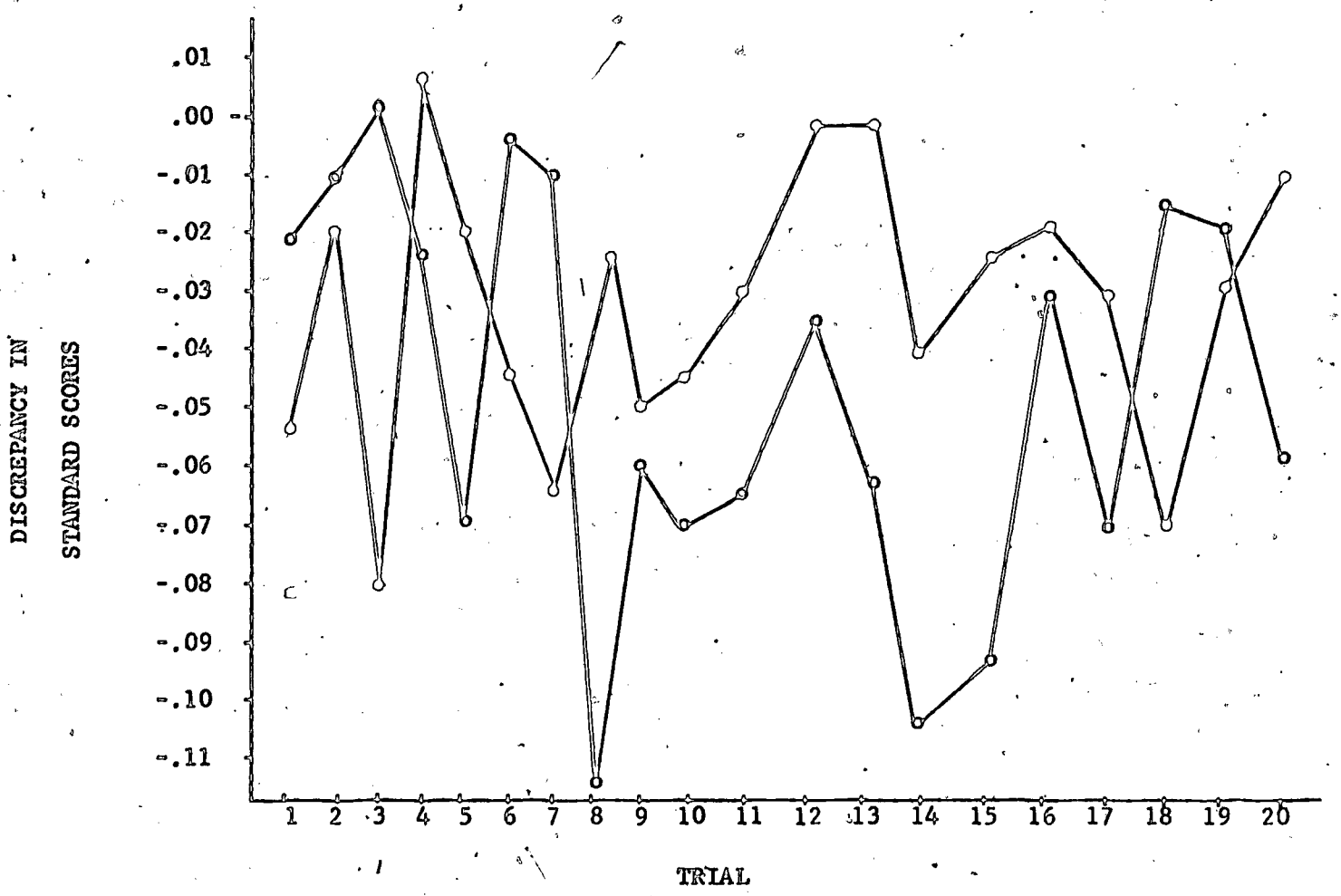


FIGURE 2

REACTION TIME

ORDER-BY-ACHIEVEMENT INTERACTION

(ACHIEVEMENT NESTED WITHIN GRADE)

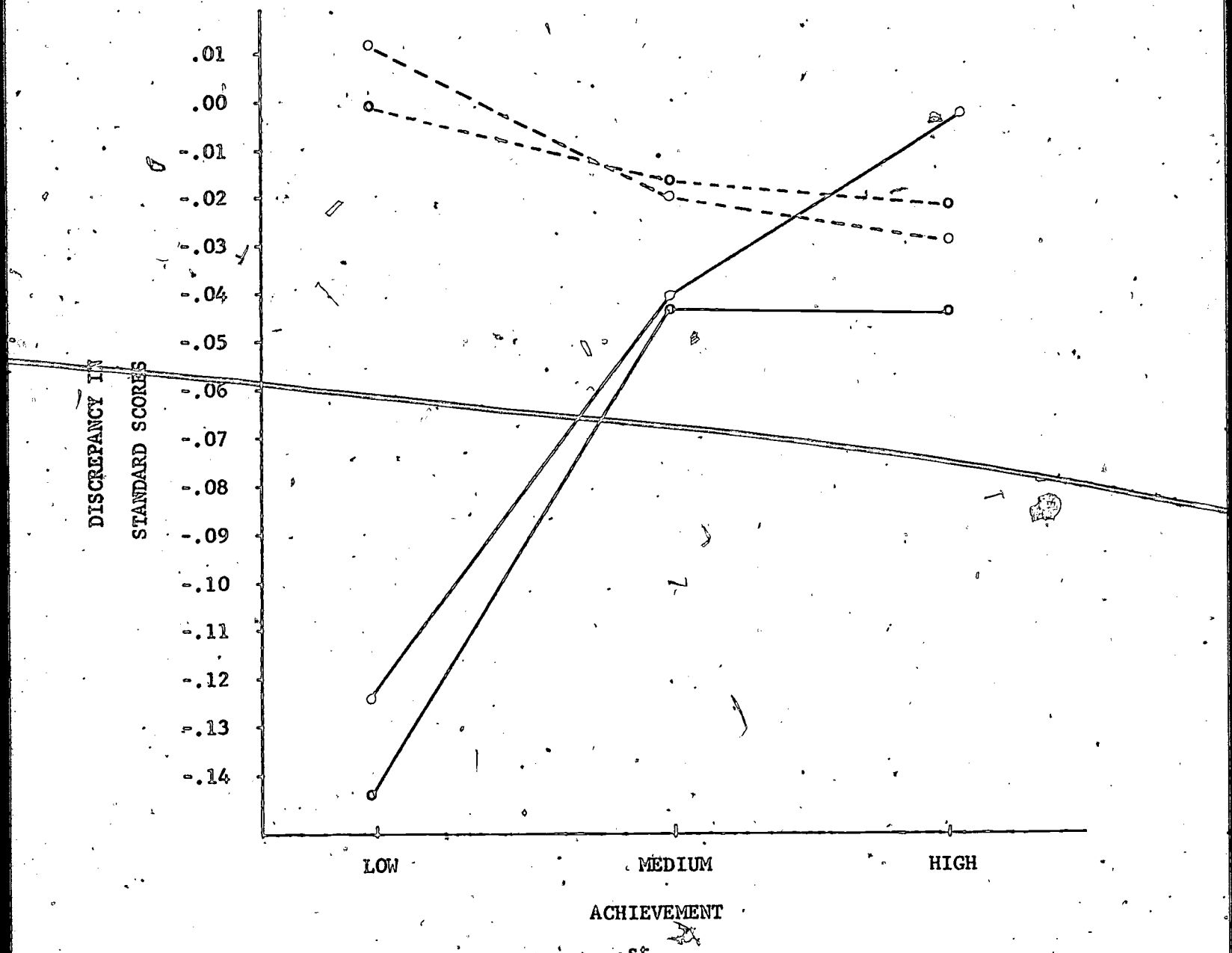


FIGURE 3

NONSENSE SYLLABLES

GRADE-BY-ORDER INTERACTION

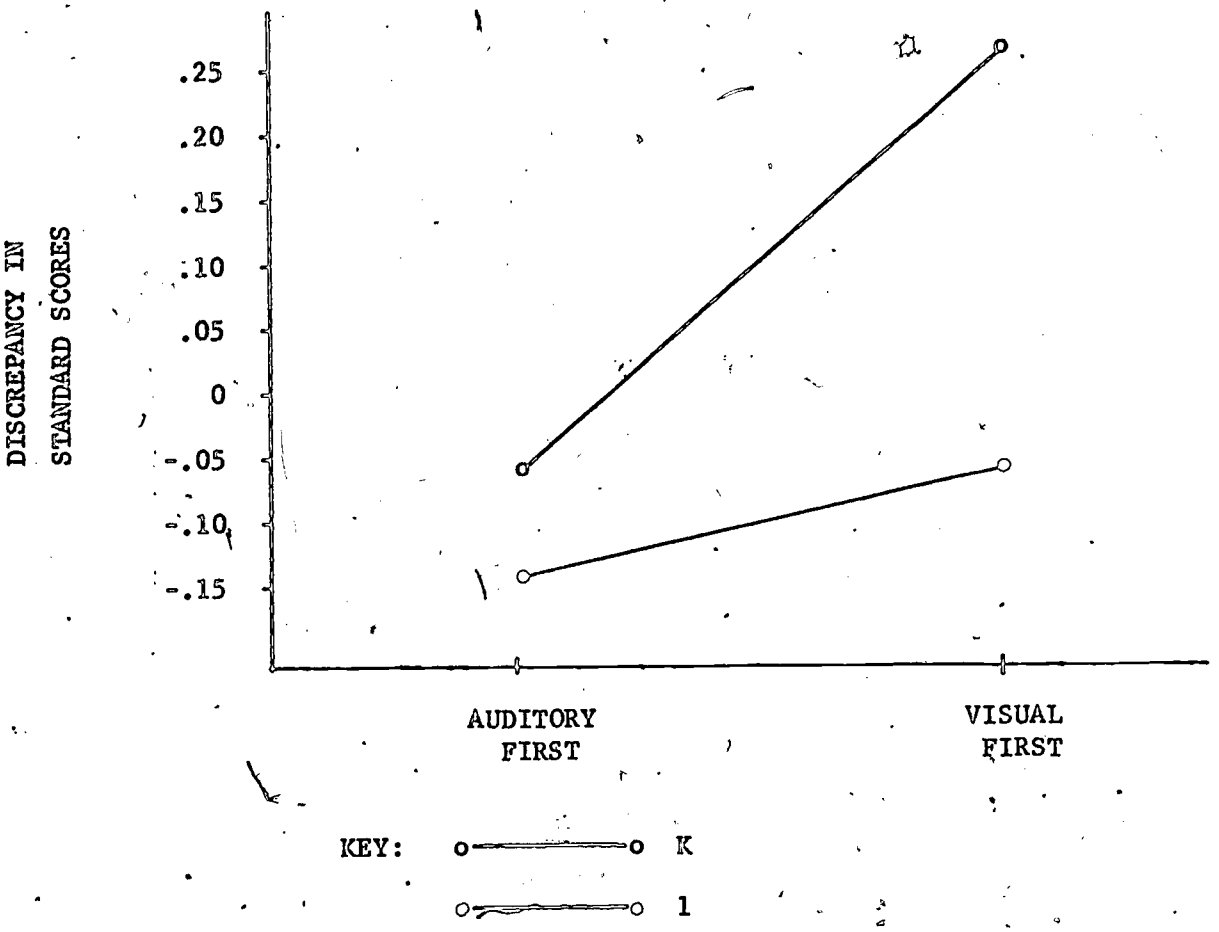


FIGURE 4

ITPA RECEPTION

ORDER-BY-ACHIEVEMENT INTERACTION

(ACHIEVEMENT NESTED WITHIN GRADE)

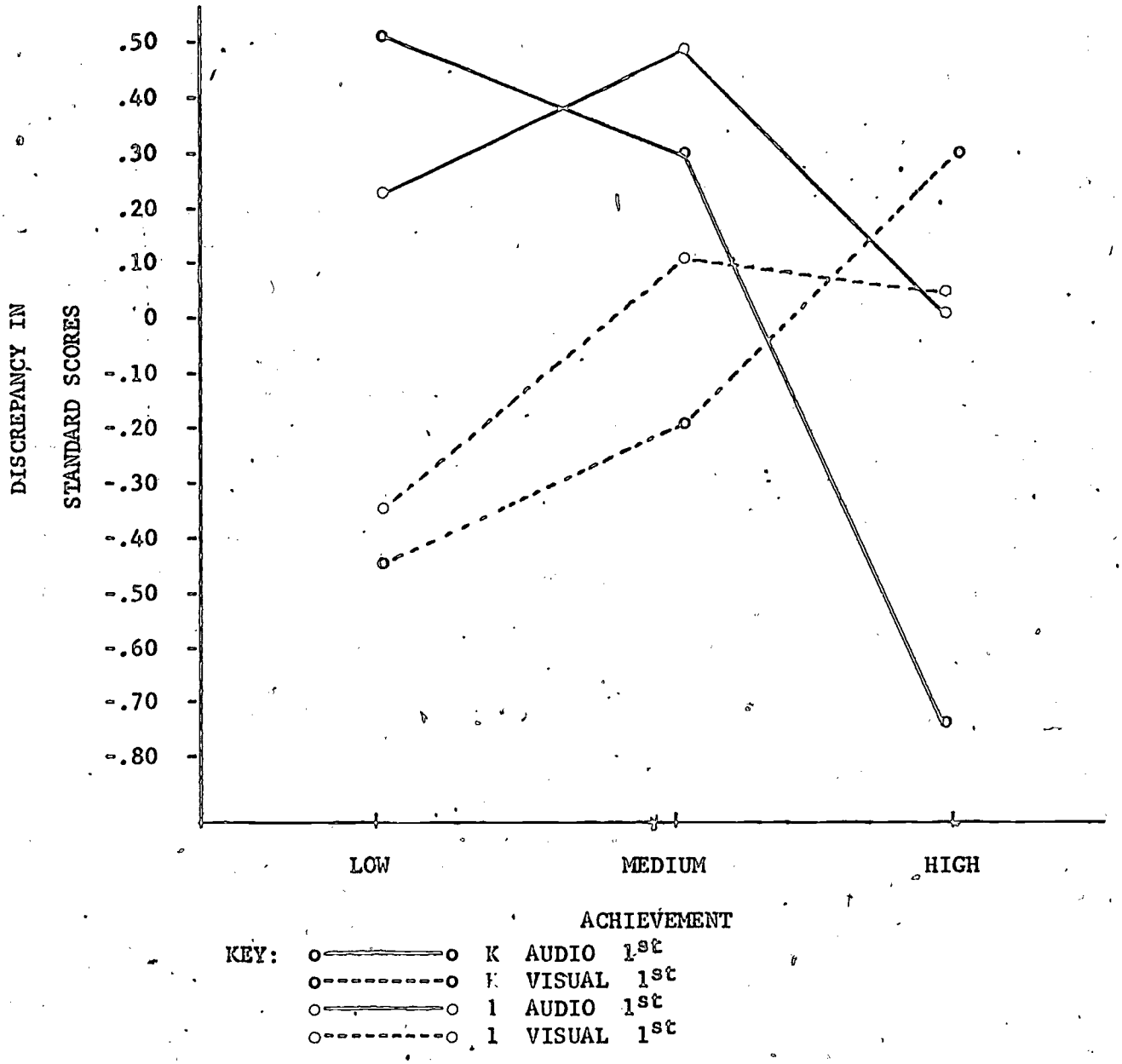


FIGURE 5

COMPREHENSION STORIES

GRADE-BY-ORDER INTERACTION

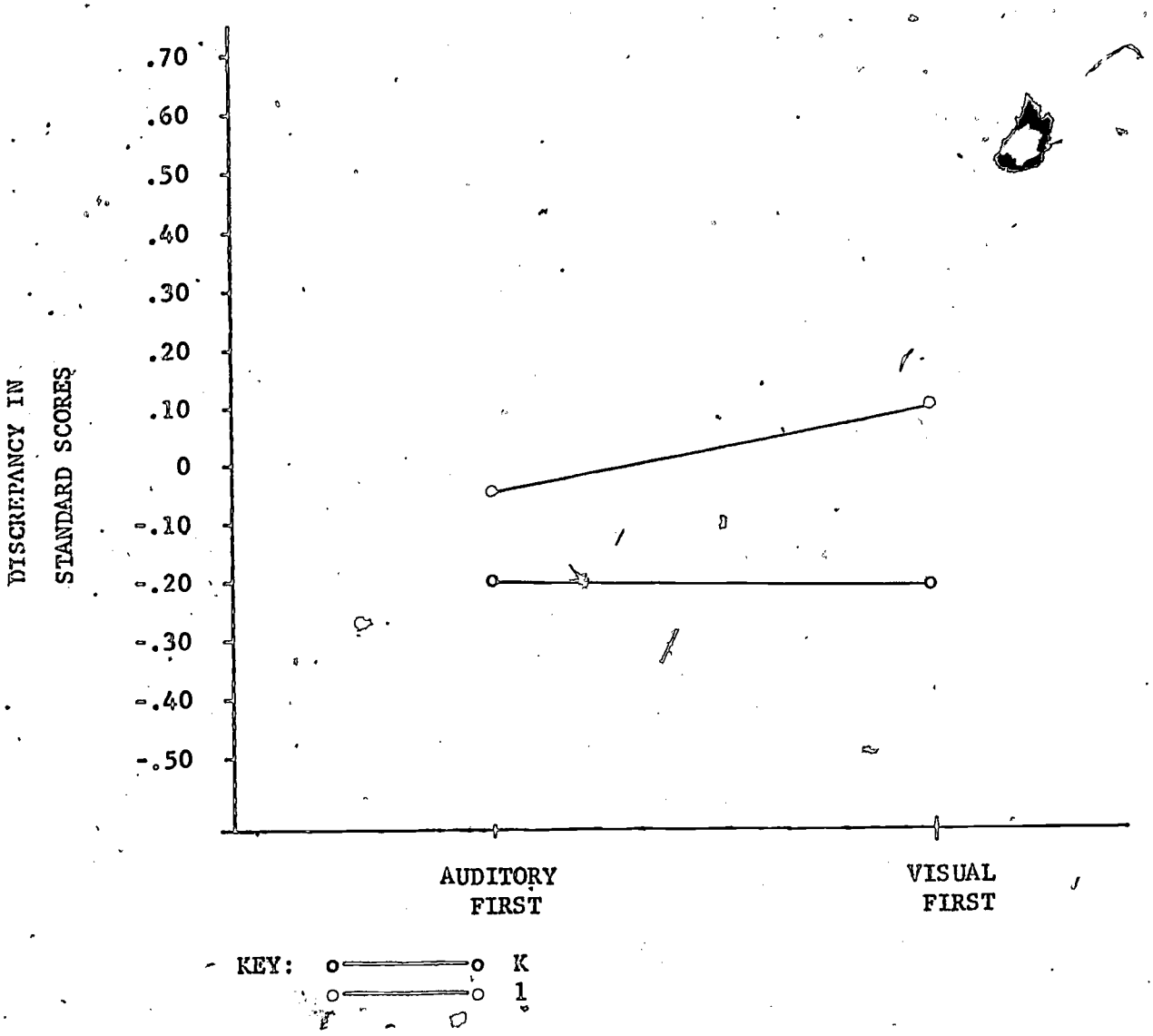
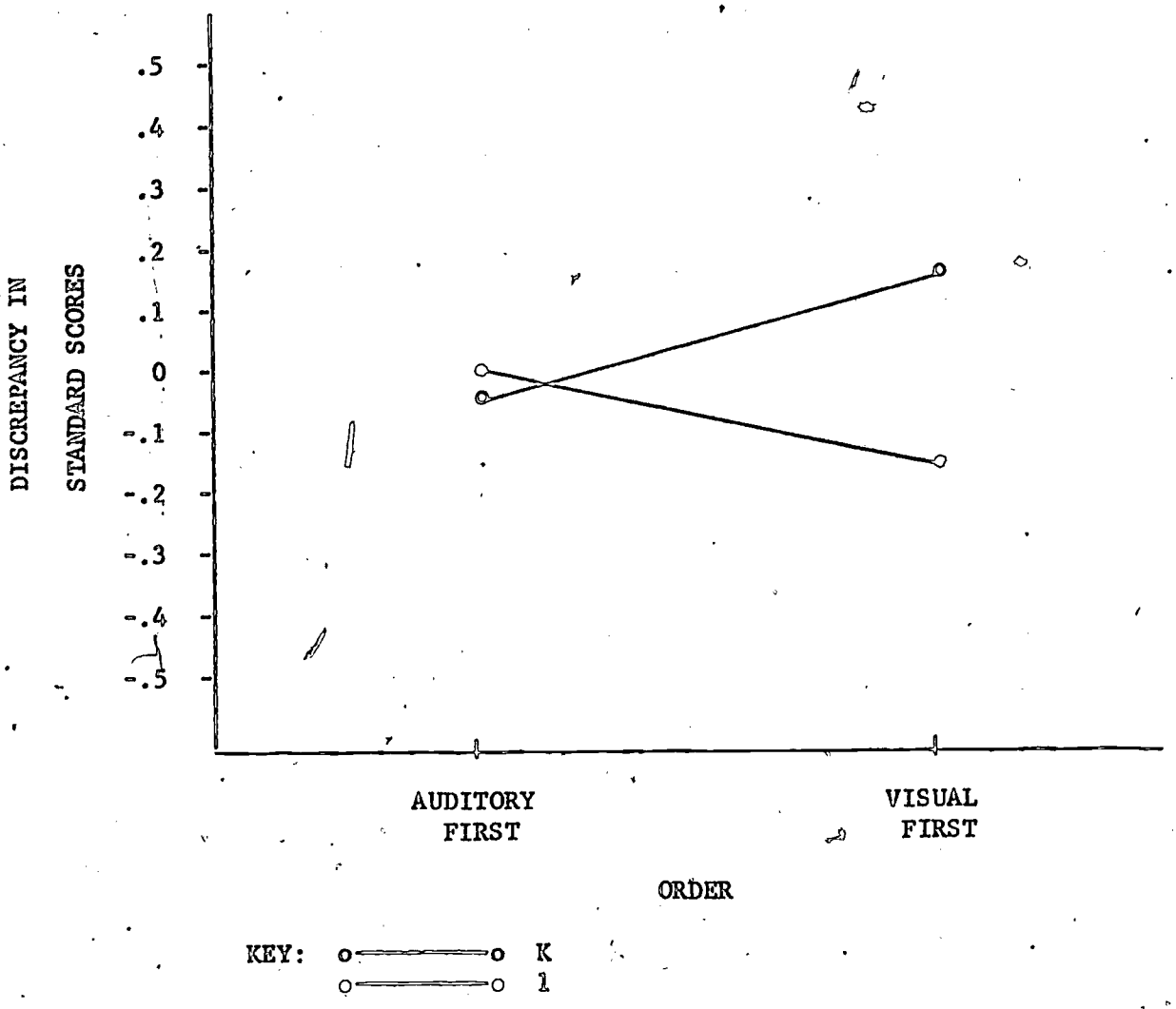


FIGURE 6

DIGIT SPAN

GRADY-BY-ORDER INTERACTION



FIGURES: SERIES FOUR

ANALYSES

FIGURE 7

ITPA RECEPTION

INTERACTION AMONG ACHIEVEMENT,

ORDER, AND MODALITY

(ACHIEVEMENT NESTED WITHIN GRADE):

AUDITORY RECEPTION IN KINDERGARTEN

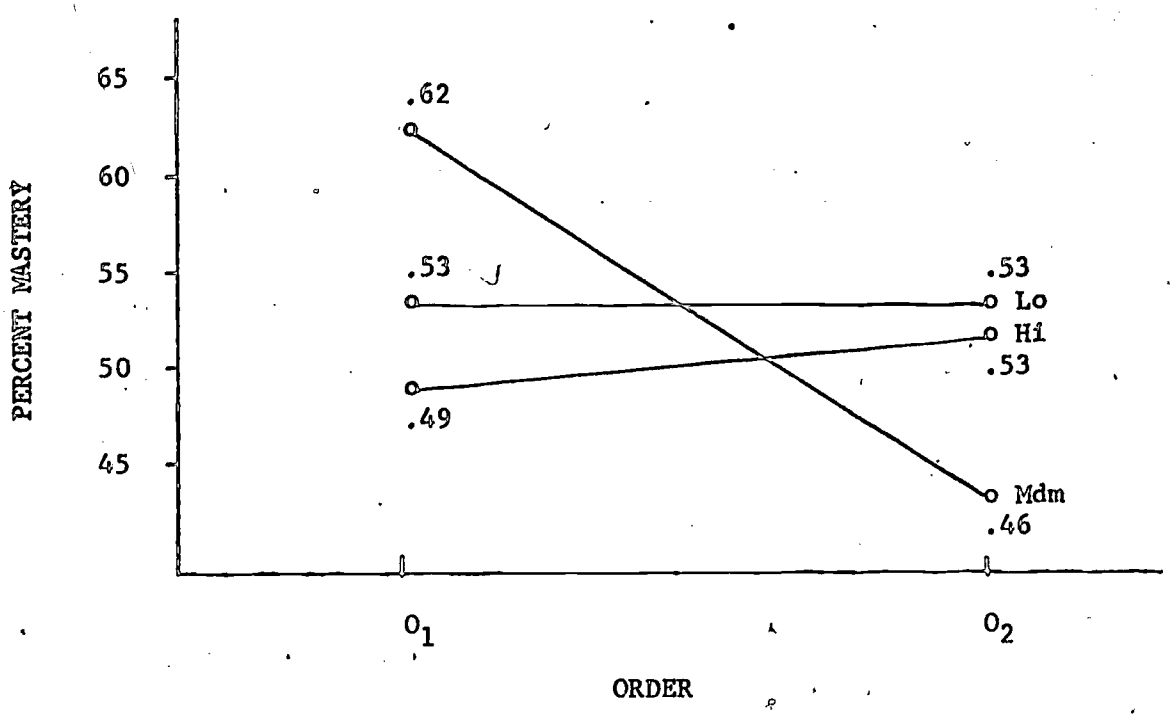


FIGURE 8

ITPA RECEPTION

INTERACTION AMONG ACHIEVEMENT,

ORDER, AND MODALITY

(ACHIEVEMENT NESTED WITHIN GRADE):

AUDITORY RECEPTION IN FIRST GRADE

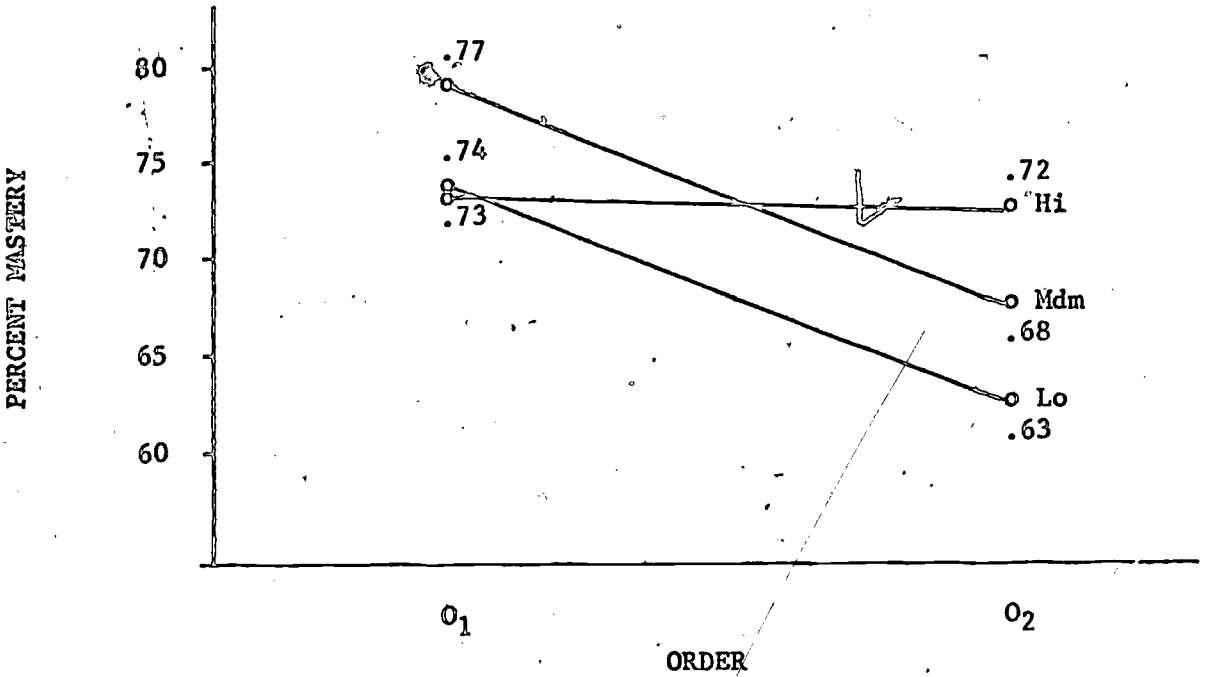


FIGURE 9

ITPA RECEPTION

INTERACTION AMONG ACHIEVEMENT,

ORDER, AND MODALITY

(ACHIEVEMENT NESTED WITHIN GRADE):

VISUAL RECEPTION IN KINDERGARTEN

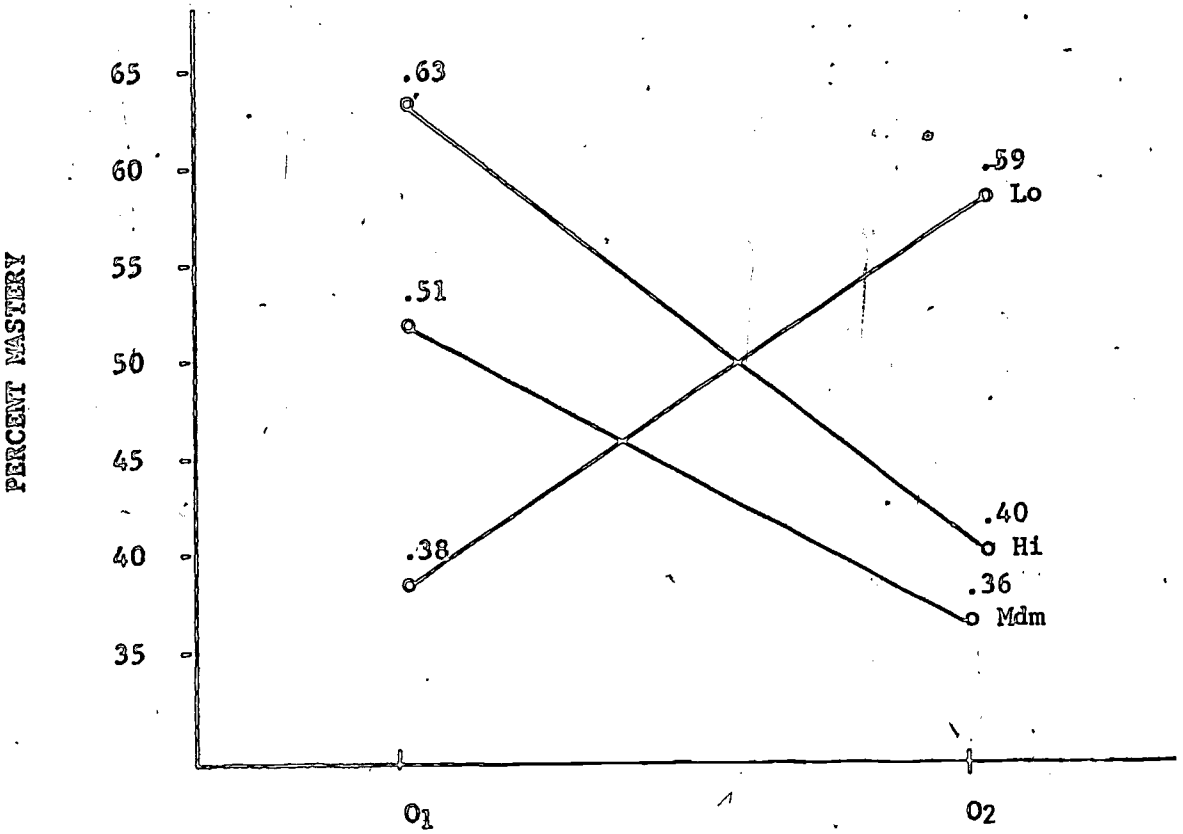


FIGURE 10

ITPA RECEPTION

INTERACTION AMONG ACHIEVEMENT,

ORDER, AND MODALITY

(ACHIEVEMENT NESTED WITHIN GRADE):

VISUAL RECEPTION IN FIRST GRADE

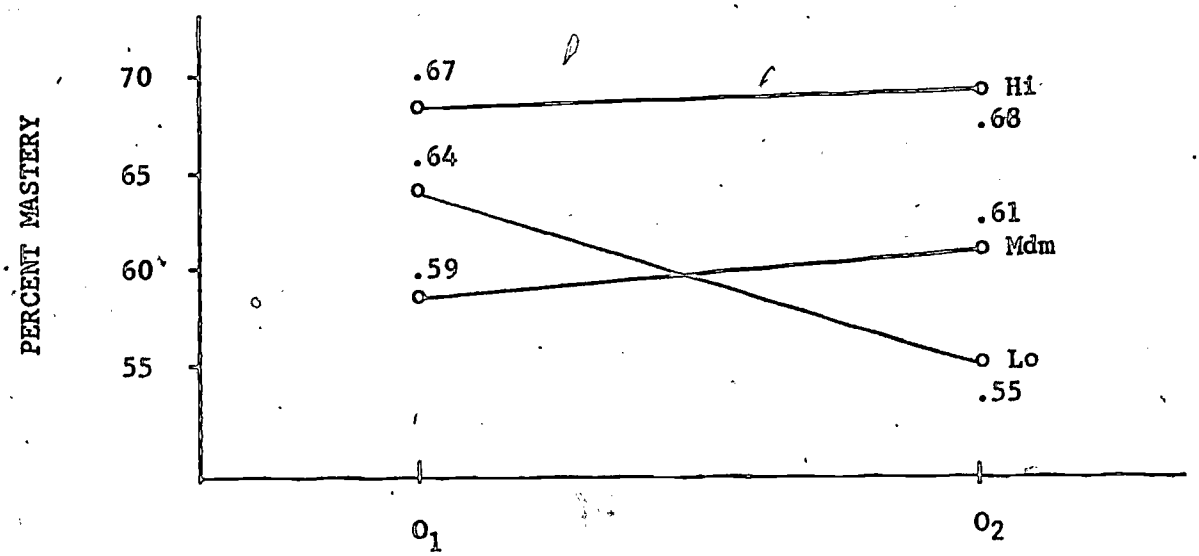
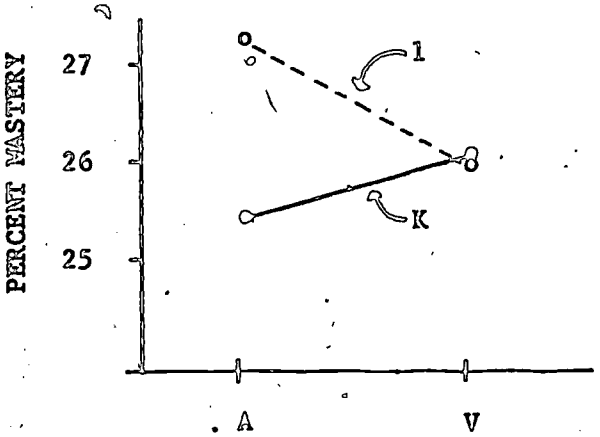


FIGURE 11

TEACHER RATINGS

INTERACTION OF GRADE BY MODALITY



APPENDIX A

QUESTIONS ASKED WITH COMPREHENSION STORIES

Answer Sheet

Auditory/Visual Story Comprehension

Student_____ Teacher_____

Grade_____ Date_____

Tester_____

The Family Scene

Modality: Aud. Vis.

Questions for both modality presentations

1. Tell me all of the people in the story that you can remember?

Aud-Jane
2. How does Vis- the little girl feel about the new baby? Why?

Aud-Billy
3. How does Vis- the little boy feel about the new baby? Why?

4. Mother has been away. Where has she been?

5. Who was waiting when the new baby came home?

6. Who brought mother and baby home?

7. The story we have just heard (or seen) did not have a name. I will give you three possible names for the story. You tell me the one that you think is best. Listen to all three names before you pick your answer.

a. A Visit to Grandmother's House
b. The New Baby Comes Home
c. Taking Care of the New Baby

Questions for the auditory presentation

1. Who asked Billy to help feed the baby? Why?

2. Why was Billy worried?

3. Who was Charlie?

Questions for the visual presentation

1. What kind of furniture was in the picture?

2. What did the children have to play with?

3. Who was the older lady in the picture?

Answer Sheet

Auditory/Visual Story Comprehension

Student_____ Teacher_____

Grade_____ Date_____

Tester_____

The Pet Shop

Modality: Aud. Vis.

Questions for both modality presentations

1. Who were the children in the story?

2. How many animals can you remember?

3. Who let the kitten out of her cage?

4. Where did the kitten go after she got out of her cage?

5. What do you remember about the baby panda bear?

   How was the baby panda bear fed?

6. The story which we just heard (or saw) did not have a name. I will give you three possible names for the story. You tell me the one that you think is best. Listen to all three names before you pick your answer.

   a. Monkies on the Loose
   b. The Field Trip
   c. My Pet Turtle

Questions for the auditory presentation

1. Which of the children had pet turtles at home?

2. How did the monkeys get out of their cages?

3. Why did Mary pick up the kitten?

4. What did Joseph think bears were supposed to be like?

5. Why wasn't Joseph afraid to feed the baby panda bear?

6. Why was Fluffy a good name for the kitten?

Questions for the visual presentation

1. Where was the parrot?

2. Where was the turtle?

3. How did the girl in the picture feel about the kitten?

4. Were any of the children wearing a special kind of clothing?

Answer Sheet

Auditory/Visual Story Comprehension

Student_____ Teacher_____

Grade_____ Date_____

Tester_____

The Runaway Truck

Modality: Aud. Vis.

Questions for both modality presentations

1. Who were the people in the story?

2. Where did the story take place?

3. Why did the truck start rolling away?

4. How did the children feel when they saw the truck racing toward them? Why?

5. Can you tell me what the truck looked like?

6. Can you remember any of the fruits and vegetables that were on the truck?

7. Who almost got hit by the truck?

8. The story which we just heard (or saw) did not have a name. I will give you three possible names for the story. You tell me the one that you think is best. Listen to all three names before you pick your answer.

   a. Summer in the City
   b. John Almost Gets Hit
   c. The Runaway Truck

Questions for the auditory presentation

1. Who brought fruits and vegetables from Mr. Stewart?

2. Where did Mr. Stewart buy his fruits and vegetables?

3. Why did Mr. Stewart have to drive his truck slowly and carefully?

4. Why was Mr. Stewart huffing and puffing?

5. What do you think Mr. Stewart had to do after the accident?

Questions for the visual presentation

1. Who was stepping off the curb (into the street) just as the truck was about to go by?

2. The picture showed us many ways that people can go (travel) from one place to another. How many different ways of traveling do you remember?

Answer Sheet

Auditory/Visual Story Comprehension

Student_____ Teacher_____

Grade_____ Date_____

Tester_____

The Broken Window

Modality: Aud. Vis.

Questions for both modality presentations

1. Tell me all of the people in the story that you can remember?

2. What game were the boys playing?

3. How did the windqw get broken?

4. What do you think the policeman is going to do?

5. What is Aud. - Mrs. Brown / Vis. - the lady going to do?

6. How do you think the boy with the bat feels?

7. What happened inside the store when the window was broken?

8. The story which we just heard (or saw) did not have a name. I will give you three possible names for the story. You tell me the one that you think is best. Listen to all three names before you pick your answer.

   a. The Broken Window
   b. Playing in the Street
   c. The Ball Game

Questions for the auditory presentation

1. How did Mrs. Foster feel when the window broke?

2. Why did the child have to play in the street?

3. What kind of shop (store) did Mrs. Brown have?

Questions for the visual presentation

1. Where did the story take place?

2. Where did the lady in the picture come from?

3. Do you remember the grown-up people in the picture? Who were they?

4. Besides the policeman and the lady, were there any other grown-up people in the picture? (If the child answers yes.). Who? What were they doing?

APPENDIX B

TEACHER RATING SCALE

TEACHER RATING SCALE

INSTRUCTIONS: Relative to your class as a whole, please note each child's performance on the 16 characteristics.

TEACHER _____

STUDENT _____

	Does not exhibit this behavior	Exhibits this behavior only occasionally	Exhibits this behavior fairly often	Exhibits this behavior most of the time
1. The child can discriminate the sounds of consonants and vowels.	1	2	3	4
2. The child avoids doing pencil and paper tasks (e.g., completing worksheets, handwriting practice).	1	2	3	4
3. The child listens attentively in group discussions.	1	2	3	4
4. The child sounds out unfamiliar words.	1	2	3	4
5. The child readily learns new words through the "look-say" method.	1	2	3	4
6. The child needs to be shown individually how to perform a task before he is able to carry it out alone.	1	2	3	4
7. The child answers questions about stories read orally to the class.	1	2	3	4
8. The child enjoys music and singing activities.	1	2	3	4
9. The child has difficulty copying from the blackboard	1	2	3	4
10. The child spends his free time looking at picture books, coloring, drawing, etc.	1	2	3	4
11. The child can tell whether two spoken words (similar pairs such as boy-toy, moon-noon, big-pig) are the same or different.	1	2	3	4
12. The child has reversals, omissions, inversions in his written work.	1	2	3	4
13. The child has good penmenship.	1	2	3	4