PERFORMANCE OF SEVERELY AND PROFOUNDLY HEARING IMPAIRED CHILDREN ON AURAL/ORAL AND TOTAL COMMUNICATION PRESENTATIONS OF THE BOEHM TEST OF BASIC CONCEPTS

By

Daun Christine Dickie

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Special Education Administration

1979

ABSTRACT

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Numerous educators and researchers have argued as to the appropriate methods to be utilized in the education of severely and profoundly hearing impaired children. The two major methodologies used in educational training programs today are Aural/Oral and Total Communication, which differ primarily in the addition of a manual form for the latter approach.

In the midst of such controversy, federal and state mandates have been approved which require that the language performance of hearing impaired children be assessed using appropriate, nondiscriminatory measures. However, to date, no standardized testing instrument has been shown to be appropriate for use with this population when viewed in terms of presentation method (Aural/Oral or Total Communication).

In view of the above, this study investigated the receptive language performance of elementary-age severely

and profoundly hearing impaired children using the Boehm Test of Basic Concepts. Fifteen of the subjects had been taught using an Aural/Oral approach, and 15 utilized a Total Communication approach, resulting in a total of 30 subjects.

Each of the 50 test items of the Boehm Test of Basic Concepts was presented to each child twice, using the communication method with which each subject was familiar. The subjects' task was to mark a pictorial representation of the stimulus item.

The results revealed that the children of the Total Communication group performed significantly better than did their Aural/Oral counterparts. Age of subjects was not found to be related with test performance for either group investigated.

The reliability of results obtained during test-retest administration was found to be high for both groups of subjects. However, the internal reliability of this test was higher for subjects of the Aural/Oral group. This was due to a ceiling effect for scores correct which was evidenced for subjects using a Total Communication approach.

These findings suggest that differences do exist in the receptive language skills, as measured by this test, between hearing impaired children using an Aural/Oral or Total Communication approach. The results are related to

current concerns for educational programming, and implications for future research are discussed.

DEDICATION

To my parents, for their faith
and support despite undergraduate
days and grades.

ACKNOWLEDGMENTS

I wish to express my sincere appreciation to the members of my committee, Dr. Herbert J. Oyer, Dr. Charles Henley, Mrs. Vivian Stevenson, and Dr. Richard Featherstone, for their valuable time and thoughtful contributions.

I am also indebted to Mr. Rob Young and Dr. Grace Iverson of the Lansing School District Department of Evaluation Services, for their assistance in the evaluation and interpretation aspects of this study.

Appreciation is further extended to Dr. Velma Allen, Mrs. Mildred Richardson, and Mr. Malcolm Delbridge for their support throughout the entire process of this research project. In addition, I wish to thank Mrs. Brenda Hull for her active participation in this study, as well as the numerous hours of challenging thought which she provided.

For the friendship and support which I have experienced throughout this year, I extend my affection and appreciation to Diane, Kathy, Velma, Jody, Phyllis, and Tom.

Finally, I want to extend my extreme gratitude to my chairman, Dr. Charles Mange, whose encouragement, expectations, and belief in my ability were demonstrated throughout a time when they were needed most.

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CHAPTER I

INTRODUCTION

As a result of current state and federal legislation, educators and clinicians are presently faced with the task of assessing the language performance of severely and profoundly hearing impaired students. Section 121a.532 of the Rules and Regulations for the Implementation of Part B of the Education of the Handicapped Act mandates state and local education agencies shall ensure, at a minimum, that:

A. Tests and other evaluation materials:
   1. Are provided and administered in the child's native language or other mode of communication, unless it is clearly not feasible to do so;
   2. Have been validated for the specific purpose for which they are used; and
   3. Are administered by trained personnel in conformance with the instructions provided by their producer;

B. Tests and other evaluation materials include those tailored to assess specific areas of educational need and not merely those which are designed to provide a single general intelligence quotient;

C. Tests are selected and administered so as best to ensure that when a test is administered to a child with impaired sensory, manual, or speaking skills, the test results accurately reflect the child's aptitude or achievement level or whatever other factors the test purports to measure, rather than reflecting the child's impaired sensory, manual, or speaking skills (except where those skills are the factors which the test purports to measure);

D. No single procedure is used as the sole criterion for determining an appropriate educational program for a child; and

E. The evaluation is made by a multidisciplinary team or group of persons, including at least one teacher or other specialist with knowledge in the area of suspected disability.

F. The child is assessed in all areas related to the suspected disability, including, where appropriate, health, vision, hearing, social and emotional status, general intelligence, academic performance, communicative status, and motor abilities (Federal Register, 1977, pp. 42496-42497).

While the vast majority of professionals would view such a charge as highly desirable, a paucity of standardized, appropriately normed tests exists which may be reliably used with severely and profoundly hearing impaired students. In addition, professionals are typically unable to identify research efforts which clearly illustrate that existing standardized tests, which measure language skills, may be reliably used with hearing impaired populations (Michigan State Department of Education, 1977; Davis, 1974, 1977; Pressnell, 1973; Cooper, 1967).

Efforts to comply with such legal mandates frequently result in the indiscriminate use of language tests, which have been normed on nonimpaired populations, with hearing impaired persons. Such tests may or may not be modified in an attempt to assess more accurately the performance of hearing impaired individuals. For example, the written form may be added to oral presentations of test items in an attempt to minimize the disadvantages encountered as a result of limited auditory input.

Modifications made may vary with the individual examiner, thus further confounding the accuracy or reliability of the results of such tests.

An additional alternative employed may be the use of clinician- or teacher-made forms of language assessment. An example of such a technique is suggested by the Michigan State Department of Education Assessment Manual, whereby pictures are selected and presented to the child to elicit spontaneous written and expressive (spoken and/or signed) language samples. In such instances, no standardization of stimulus items exists, and results are largely based upon individual observations and judgments.

The above forms of language assessment are generally recognized as being acceptable practices when used as a portion of a comprehensive testing battery. However, when used exclusively, they fall short of meeting the charge of providing a comprehensive and nondiscriminatory assessment of language performance for hearing impaired children.

The difficulty of adequately assessing language performance of such a population is compounded by the type of communication method utilized by the child being tested. Presently, two major education/communication systems are used with hearing impaired children in the United States. The first of these, the Aural/Oral approach, stresses the development of communication skills by emphasizing oral

speech, speechreading, and auditory training. The use of any manual system is excluded in expressive or receptive strategies.

The second approach, Total Communication, is defined by Denton (1970) as including "the full spectrum of language modes--child-devised gestures, formal sign language, speech, speechreading, fingerspelling, reading, and writing."

Much controversy exists in the literature as to the benefits or appropriateness of either method (Miller, 1970; Bates, 1975; Lane, 1976; Vernon, 1972; Drumm, 1972). However, much of the available information is emotional in nature as opposed to data-based. The reader is frequently confronted with position statements, rather than content-oriented sources addressing communication method and related testing implications.

It is the contention of this investigation that a need exists to objectively examine appropriate standardized testing procedures for hearing impaired populations as related to both education/communication methodologies. This study, then, will attempt to examine whether a standardized measure of language performance may be reliably used with severely and profoundly hearing impaired children utilizing Aural/Oral or Total Communication approaches, and will examine the measured receptive language performance of these two groups. However, before

explicitly and formally stating the problem to be studied, the research to date relative to communication methodology and language-testing strategies will be discussed.

Aural/Oral Communication

The publications advocating the use of a strictly Aural/Oral approach for hearing impaired children are characterized by a profound degree of enthusiasm, but minimal documentation. Such statements as "Oralism is not an academic exercise. . . . It is a way of life" are typical of the highly zealous attitudes of its proponents (Miller, 1970).

As has been stated, an Aural/Oral approach would stress the teaching of communication skills utilizing speech, speechreading, and auditory training. The use of sign language or fingerspelling is forbidden, as it is felt that its inclusion would impede the development of speech (Van Uden, 1970; Olson, 1962). Much emphasis is placed upon early amplification and auditory training to maximize the use of any residual hearing which may be present.

The philosophical premise motivating such a commitment stresses the right of every deaf individual to function in society as a whole (Conner, 1972). To do so successfully, it is felt that the child must be adequately prepared to communicate in a normal environment (Stone, 1968; Position Paper AOEHI, 1975). This end would negate

the use of any "restricting" manual communication modes. The premise is that a child given the choice of speech only, versus a combination of speech and manual strategies, would most certainly choose the "easier" communication method at the expense of successful auditory/oral development (Owrid, 1972). Documentation for such a predicting attitude is not available in the literature to date. The difficulty of providing a truly Aural/Oral education is readily acknowledged by its proponents (Stone, 1968). However, enthusiastic position papers, plentiful in the literature, serve as motivating sources for continued application.

No data-based articles using large numbers of students have been identified which objectively legitimize an Aural/Oral approach. Further, in no report has the benefit of such an approach for speech, speechreading, or auditory training development been shown to be superior to that of Total Communication. The majority of articles typically describe specific successful case studies, or deal with broad generalizations relative to the needs of the hearing impaired population as a whole (Connor, 1977; Lane, 1976; Miller, 1970; Blevins, 1976). Proponents frequently point out the need for quantifiable, supportive research to illustrate the superiority of an Aural/Oral approach. Such a charge was made to the profession as early as 1917 by

Goldstein and continues to be reiterated by current authors. However, to date, no such quantifiable results are available.

Total Communication

Total Communication is typically understood to include all aspects of the Aural/Oral approach, as well as the addition of fingerspelling and the use of signs (Furfey, 1974). Proponents of this approach stress the utilization of all available forms of input, and claim that the hearing impaired child is better able to assimilate language. This belief is predicated upon such factors as:

1. The "invisibility" of numerous speech sounds (Hardy, 1970);
2. The dual or multiple meanings of words in the English language which require contextual and/or visible cues to determine the meaning; and
3. The importance of receptive language skills being established during the critical early years of life (Alterman, 1970) as a prerequisite skill to that of speech acquisition (Olson, 1972).

Although a broad definition of Total Communication is generally recognized and accepted by educators, several forms of the necessary manual aspects of communication presently exist (Bornstein, 1973). Examples of

these are Seeing Essential English, Signed English, Signing Exact English, Amaslan, and Visual English. The fact that multiple sign systems may be operating within the inclusive category of Total Communication has been criticized by professionals favoring an Aural/Oral approach (Blevins, 1976). Educators of both of these philosophical predispositions stress the need for quantifiable research documenting the benefits of each sign system, if such exist.

As is true for the Aural/Oral method, numerous subjective articles may be found which advocate the use of Total Communication. McCay Vernon (1972) stresses the need for such an approach from a "common sense" point of view. He states that the National Association of the Deaf has officially endorsed the use of Total Communication. This endorsement by deaf persons themselves, who "know better than anyone else the terrible educational and psychological deprivation resulting from a restriction to just oralism" (p. 530), is felt by the author to be justification for the use of such a combined approach.

Many of the studies which do utilize any form of measurement techniques to document claims made, may be based upon the performance of a single subject. Olson (1972) describes the linguistic development of a preschool hearing impaired child over a three-year period during which "Sign Language therapy" was stressed. He concludes that "the child has a big jump on those acoustically

handicapped children who are still not attending to lip movement at age three" (p. 399). Articles of this type, based upon isolated samples, lend minimal support for any approach.

During recent years, research has been undertaken to document, on a broad scale, the benefits of a Total Communication approach. Vernon, Westminster, and Koh (1971) studied the speech and language skills of 123 graduates of three-year Oral preschool programs. Their performance was compared to that of (1) deaf children of deaf parents (manual communication between parents and child assumed), and (2) deaf children who had received no preschool training. Their results showed that deaf students who had received early manual training and no preschool experience were superior in academic and language performance to those students who had experienced an Oral preschool program. It should be noted, however, that the subjects studied were in their teenage years at the time of the comparative investigation. Numerous variables were not controlled, including the fact that the majority of all subjects investigated did not remain in or attend Aural/Oral programs.

Several large-scale descriptive studies which are frequently used to support the use of Total Communication are described by Nix (1975). Babbidge (1965) reports educational and achievement data on 269 schools and classes for the deaf, involving a total of 23,330 children.

The resulting implication of this study is that low achievement levels of hearing impaired students are positively related to Aural/Oral program instruction.

In a survey of 26 public residential schools, Denton (1966) reported on the scores of deaf students on the Stanford Achievement Test. Those students obtaining the highest scores on grade equivalent averages and language performance areas were those who had deaf parents. The author concludes that the higher average scores may be attributed to the early learning of a manual communication system.

Furfey (1974) studied the social abilities of 137 deaf adults. A case study format, based upon rating scales completed following home visits, was utilized. The author concluded that proficiency in manual communication was highly important for the socialization skills of deaf persons. He further stated that persons who had attended Oral schools often failed to learn effectively either Aural/Oral or a Manual communication form.

Letournea and Young (1975) describe the implementation of a Total Communication program at a school for the deaf in New York, as well as the research procedures planned to study its effectiveness. The results at the time of publication, however, rely upon teacher impressions of related language gains and social/emotional benefits.

Although articles and research efforts such as those previously described may serve to promulgate much discussion and/or dissension among professionals, they do little to provide conclusive, objective findings for the issue under investigation. The designs of such studies are most frequently descriptive in nature, and are not appropriately conducted to determine the advisability or superiority of either method. Efforts to control for such variables as degree of hearing loss, type of instruction, use of standardized assessment tools, and age at onset of loss have not been evidenced in the majority of these studies.

In an attempt to address needs such as those previously mentioned, White and Stevenson (1975) examined the effectiveness of the manual form of communication utilizing an experimental research design. They studied the performance of 45 students between the ages of 11.0 and 18.7 years, who were enrolled in one of two public residential schools for the deaf. Variables such as intelligence quotient and degree of hearing loss were controlled in a stratified random sample selection of students. A language assessment task was presented to each student through Oral, Manual, Total Communication, and Reading modes, in an attempt to determine the most effective method for assimilation of information.

Their results showed that the highest degree of information was transmitted through the written form,

followed by Manual Communication and Total Communication, respectively. The amount of information assimilated through the Oral presentation was less than that of any of the other above-mentioned approaches.

A replication of this study was then conducted at a residential school for the deaf, at which the staff espoused an Aural/Oral philosophy for the training of students. The results of this second study supported those of the previous investigation in terms of the effectiveness of language reception utilizing the various communication methods.

Moulton and Beasley (1975) studied the verbal coding strategies of 26 severely hearing impaired students utilizing a Total Communication approach. The stimulus items selected consisted of four lists of word pairs which were described as sharing either:

1. Similar sign--similar meaning,
2. Dissimilar sign--similar meaning,
3. Similar sign--dissimilar meaning, or
4. Dissimilar sign--dissimilar meaning.

The study was designed to obtain information relative to the verbal coding strategies used by hearing impaired subjects as related to proficiency in processing verbal information on a sign or semantic basis. Their results showed that while coding was possible using either basis, the semantic coding strategy appeared to be the more

efficient method. That is, hearing impaired subjects performed best when words shared either a similar meaning ("clean-wash") or a similar meaning and similar sign ("pretty-beautiful").

These latter two studies are among the first to provide experimental data relative to methodologies (Aural/Oral and Total Communication) being examined, and serve as a point of departure for continued scientific investigation in this area. They did not, however, utilize or provide standardized assessment techniques for measuring the language performance of public school elementary age hearing impaired students. In addition, no similar articles were found which experimentally demonstrate the benefits of an Aural/Oral approach for such a population.

Investigations Related to Testing Procedures for Hearing Impaired Children

Vernon and Brown (1964) describe general considerations for psychological testing of hearing impaired students, and offer subjective evaluations as to the appropriateness of tests normed on hearing populations for use with deaf and hard-of-hearing populations. Sachs et al. (1974), in addressing the issue of psychological evaluations of deaf individuals, point out that attention is increasingly being directed to better adaptation of measurement instruments for use with the hearing impaired. The lack of normative data on hearing impaired students for the

majority of test instruments presently in use is identified as being a severe limitation to adequate evaluation.

Schildroth (1976) has identified factors which may influence the legitimate application of existing tests to hearing impaired populations. Among these is the need by the examiner to possess a knowledge of deafness, as well as familiarity in communicating with deaf individuals.

Large-scale standardized testing efforts of the performance of hearing impaired students has focused primarily on the areas related to academic achievement. A Special Edition for Hearing Impaired of the 1973 Stanford Achievement Test was standardized nationally using a stratified random sample of 6,871 hearing impaired subjects. Data are now available for students' performance from all 50 states and several foreign countries. Using this instrument, Trybus and Karchma (1977) reported on the national school achievement scores of hearing impaired children over a three-year period. As a result of the existing norms for this evaluation tool, it is possible to compare an individual child's performance with those of both hearing and hearing impaired populations. Further, the establishment of such an instrument enables the use of test scores to assist in the monitoring of pupil and program progress.

While gains have been demonstrated in the area of assessment procedures for hearing impaired students in the academic domain, minimal attempts have been undertaken to

address this need in the measurement of receptive language skills. Rather, Siegel and Broen (1976) state that formal tests in general are inadequate in dealing with the wide range of children encountered. They are of the opinion that an excessive amount of time is spent in trying to "fit the child to the model." They describe the best form of language assessment as being an informed clinician who is not overly attached to a single model of assessment. While such an opinion may have subjective appeal, the fact remains that neither formal tests nor documented models of assessment have been proven to be appropriate for hearing impaired populations.

Recently, two major studies have been conducted in an attempt to address this need. Davis (1977) examined the reliability of the Test of Auditory Comprehension of Language (Carrow, 1973) when used with 18 elementary age hearing impaired children. Ten of the subjects demonstrated mild to moderate levels of hearing loss and used an Aural/Oral communication approach. The remaining eight subjects demonstrated severe to profound losses and utilized a Total Communication approach. The test was administered to each child on two occasions utilizing the communication presentation method with which each child was familiar. Results indicated high reliability of responses for both groups of children. Error patterns for each group were examined and proved to be similar in type.

No description of individual or group scores on the test was presented.

The author concluded that the Test of Auditory Comprehension of Language appeared to be an appropriate and reliable test for use in assessment of receptive language skills of hearing impaired children. While numerous variables were not controlled in subject selection, and comparisons of individual and group performance is not possible, this study does serve as an indicator of a possible measure of receptive language performance for use with hearing impaired children.

An earlier investigation was conducted by Davis in 1974 which also addressed the need for language assessment tools. The author studied the performance of 24 hard-of-hearing children (ages 6 years to 8 years, 11 months) on the Boehm Test of Basic Concepts (1971). Their performance on this task was compared to that of 24 normal-hearing children of a similar age range. Responses were analyzed according to age level and degree of hearing loss. Percentile rankings revealed that 75 percent of the hearing impaired children scored at or below the tenth percentile when compared to the norms for normal-hearing children of the same age or younger. This finding was particularly significant in view of the fact that none of the hearing impaired subjects of the study were more than two years behind the normal-hearing subjects in academic placement,

and seven were enrolled in grade levels appropriate to their chronological ages. Therefore, the fact that 75 percent of the hearing impaired subjects scored below the tenth percentile in terms of knowledge of basic language concepts raises crucial questions as to the probability of academic success for this population.

Results indicated that significant differences in test performance were associated with the degree of hearing loss. That is, the greater the loss of hearing, the poorer were the language skills as measured by the test. However, the author did not specify levels of hearing loss other than by the use of the labels "mild" and "moderate." No significant differences in test performance were found between the older and younger hearing impaired children.

These latter two studies are limited in the number and type of subjects selected, and do not report attempts to control for numerous possible confounding variables. However, they do serve to illustrate test procedures which may be utilized in the assessment of language performance in hearing impaired populations. A study should be carried out which would reveal whether an existing standardized test of receptive language performance may be reliably used with severely and profoundly hearing impaired children. Further, it should attempt to provide information relative to the performance of these children as a

result of the communication approaches presently being utilized in educational programs for this population.

Statement of the Problem

Educators, researchers, and legal mandates have stressed the need for appropriate, reliable assessment instruments for use with hearing impaired children. To date, a paucity of such evaluative tools has been demonstrated as appropriate for use with children having significant levels of hearing loss, and utilizing Aural/Oral versus Total Communication. In addition, minimal information is available to demonstrate the superiority of either of these communication approaches for such a population.

Purpose of the Study

The purpose of this study is to investigate the receptive language performance of severely and profoundly hearing impaired elementary children, who have been taught using either Aural/Oral or Total Communication methods, on the Boehm Test of Basic Concepts. The reliability of this test for both populations of children will also be examined.

The following questions will be addressed:

1. Does the Boehm Test of Basic Concepts appear to be an appropriate test for use with profoundly hearing impaired children of both groups?

2. Does the manner of teaching and test presentation (spoken versus spoken and signed) affect the reliability of the responses?
3. Do hearing impaired children taught using an Aural/Oral approach exhibit similar patterns of test responses on individual test items to those taught using Total Communication?
4. Do differences exist between the receptive language levels (as measured by test performance) of children taught using an Aural/Oral approach and those taught using Total Communication?

CHAPTER II

EXPERIMENTAL PROCEDURES

This study examined the performance of hearing impaired subjects on a test designed to assess receptive language skills. The method of communication (Aural/Oral or Total Communication) which each subject had been taught was utilized during each of two test administrations per subject.

Subjects

A total of 30 hearing impaired students enrolled in one of two Michigan programs for the hearing impaired were used as subjects in this study. Both programs were located in large urban public school systems and were housed in regular elementary schools. Fifteen of the subjects were being educated using Aural/Oral procedures, while the remaining 15 subjects utilized a Total Communication approach.

The subjects from the Total Communication program ranged in age from 8 years, 5 months to 13 years, 7 months with a mean age of 10 years, 7 months. Those children from the Aural/Oral program ranged in age from 6 years, 11 months to 13 years, 4 months with a mean age of 10 years, 5 months.

School records of audiological assessment revealed that all subjects demonstrated a severe or profound level of hearing loss, whereby the mean of three speech frequencies (500, 1000, 2000 Hz) of 75-90 dB indicated a severe loss and a greater than 90 dB mean loss was judged to be profound (Goodman, 1965; Davis & Silverman, 1970). One child in the Total Communication program demonstrated a severe hearing loss, while 14 demonstrated a profound level of hearing loss. Of the children in the Aural/Oral program, 4 demonstrated a severe loss while 11 showed profound hearing losses. All subjects experienced the hearing impairment prior to the age of one year. See Appendices A and B for information on individual subjects.

All subjects were of normal intelligence as ascertained by school psychological reports. The criteria utilized required that overall scores on intelligence test batteries resulted in an intelligence quotient of 75 or better. No handicap other than that of hearing impairment was demonstrated by any of the subjects. English was the primary language of the home for all subjects. The 15 subjects within each of the two programs for the hearing impaired were the only children available within the two school systems meeting the control specifications mentioned above.

Materials

The Boehm Test of Basic Concepts (Form B), which consisted of 50 picture displays representing concepts from basic kindergarten, first and second grade curriculum materials, was used in this investigation. The author describes this test as being a screening instrument designed "to measure children's mastery of concepts considered necessary for achievement in the first years of school" (Boehm, 1971, p. 3). The test is intended to identify children with language deficiencies as well as the concepts on which children may need assistance. It is typically presented to classroom groups rather than individual subjects.

The 50 items contained within the test were selected following a comprehensive examination of preschool and primary-level curriculum materials in the areas of reading, mathematics, and science. Items or concepts were selected which:

1. Occurred with considerable frequency;
2. Were seldom if ever explicitly defined, or were defined in their simple forms but subsequently used in complex forms without adequate transitions;
3. Represented relatively abstract basic concepts or ideas; or
4. Were concepts with which the majority of students were unfamiliar ("concept unfamiliarity") (Boehm, 1971, pp. 3-4).

The concepts selected were categorized according to type. Twenty-three concepts related to <u>space</u> (example:

"between"), 4 related to time (example: "after"), 18 related to quantity (example: "least"), and 5 concepts were classified as miscellaneous (example: "different"). The concepts tested and the assigned classifications are listed in Appendix C. The items were embedded in sentences during actual test presentation. These sentences are listed in Appendix D.

Two test forms (A and B) were developed separately. The Form A standardization sample was normed at the beginning of the school year (September and October) using kindergarten, first and second grades in each of 16 cities throughout the United States. Data for midyear (November-February) norms were also obtained utilizing subjects from five cities. A total of 9,737 children were tested at the beginning and 2,668 during the middle of the school year. The sample subjects for each grade level were divided according to socioeconomic level as being "high," "middle," or "low."

Testing to determine the equivalence of Forms A and B was conducted during December and January of the school year. The subjects were subdivided according to socioeconomic levels and a total of 1,192 were administered both forms of the test. The resulting mean scores on Forms A and B were 42.4 and 42.9, respectively. Standard deviations of 7.3 (Form A) and 7.0 (Form B) were obtained. An analysis of graphed representations of the frequency

distributions depicting the corresponding percentile equivalents for each of the raw scores demonstrated that at no point were scores on Form B more than 1.5 points higher than the comparable scores on Form A. Thus, the author concluded that the two forms would yield essentially equivalent raw scores.

For the purposes of the present investigation, Form B was selected for use in testing. This selection was based upon the time of year during which data would be gathered (February).

Form B of the test was divided into two booklets (1 and 2) of 25 items each. Three picture displays were presented for each stimulus item, from which the child was to select the correct representation and indicate his/her choice by marking an "X." The test items were presented in order of increasing degree of difficulty.

Presentation Procedures

The 50 test items of the Boehm Test of Basic Concepts (Form B) were presented to each child individually in a single testing session by a trained Teacher of the Hearing Impaired. The speech patterns of this single examiner were unfamiliar to the children of both programs.

Each subject was seated in a school room while directly facing the examiner, who was seated approximately two feet in front of each child. The individual

hearing aid(s) of each child was worn during the testing situation.

The children from the Aural/Oral program received the spoken stimulus only, while the children from the Total Communication program received both the spoken and signed representation of all directions and test items presented. The signed representations utilized linguistic formations in accordance with those portrayed in the Signing Exact English system. The actual sign symbols were obtained from textbooks frequently used as resources in Total Communication programs (Gustason et al., 1975; Babbini, 1976; Watson, 1973). If no formal sign could be found in any text consulted, the word was fingerspelled. The words fingerspelled in this study were "hoops, (road) sign, ring, forward, skip, cones, match."

In six instances ("ties, behind, below, least, inside," and "store"), signs familiar to the children of that particular program for the hearing impaired were utilized. Four of these words were actual concept test items, whereas the remaining two appeared in carrier sentences. The sources for all signs used are listed in Appendix E.

The experimenter was observed during all testing situations by a trained Speech and Language Pathologist

in an attempt to monitor rate, volume, and articulation patterns. All items for both groups of subjects were presented by the experimenter using live voice at normal conversation and effort level.

The directions from the test manual were simplified for presentation to hearing impaired children (see Appendix F). Each child demonstrated an understanding of the three practice items of the test before actual testing procedures were initiated. Once testing began, the introductory statement for each item was presented to each child (Example: "Look at the pictures of the animals."). The actual test sentence was then presented to each child twice ("Mark the animal that is next to the rabbit.") If a subject requested additional presentations of a particular sentence, the item was repeated. Each subject was allowed as much time as was needed to complete all 50 items. The longest individual testing session was 22 minutes.

Each subject responded to each test item by marking an "X" on the pictorial representation of his/her intended response.

To ascertain test/retest reliability, the entire test was administered to each child twice. To minimize learning effects occurring between presentations, no more than a single school day time interval between testings was allowed. The children of the two programs participated

in the testing procedures during a 10-day period in the winter of the same school year.

After each session, each child was given a bag of M&M's as a reward for participating in the experiment.

Analysis

The data were hand scored by the experimenter. The number of items correct and incorrect for each subject was computed for both administrations of the test. This resulted in a first test and second test score for each subject in both the Aural/Oral and Total Communication groups.

The data were placed into a two-way analysis of variance with repeated measures design, and suitable F-tests were performed (computerized). There were 15 subjects per cell for a total of 30 subjects.

An item analysis of the performance of the Aural/Oral and Total Communication subjects on each of the 50 test items was performed to determine which were:

1. Correct on both presentations of the test;
2. Correct on the first administration, incorrect on the second;
3. Incorrect on the first administration, correct on the second;
4. Incorrect on both test presentations.

The summary data depicting the results of this analysis are listed in Appendices G, H, and I.

The Kuder-Richardson test for reliability of measurement was performed separately on the test responses of each group to determine if the test consistently sampled the language performance of the children tested. A high Kuder-Richardson reliability coefficient would indicate that the test items were homogenous and measured similar patterns. A more detailed description of analysis procedures may be found in the following section.

CHAPTER III

RESULTS

The results of this study support the thesis that significant differences do exist between children's test performance on the Boehm Test of Basic Concepts as a combined result of presentation mode (Aural/Oral or Total Communication) and prior training. The overall results demonstrate that this particular test is reliable across both groups of subjects. However, examination of the data reveals that reliability is higher for Aural/Oral populations than for subjects utilizing the addition of sign language and fingerspelling. Reliability for this latter group utilizing a Total Communication approach is poorer as a result of a ceiling effect which occurs with regard to a higher number of items correct.

Age is not a significant factor, regardless of the group of students being investigated. The following discussion of the results illustrates these facts more specifically.

The mean scores for the two group factors under consideration by first and second test administration are presented in Table 1. Table 2 depicts the results of a

Table 1.--Summary table of an analysis performed on the mean scores correct of both groups (Aural/Oral and Total Communication) and test administration (first, second, and combined test results).

	N	Mean	Range of Scores	Standard Deviation	F	Level of Significance	Eta Squared
First Test Administration							
Total Communication	15	36.67	27–44	4.53			
Aural/Oral	15	23.87	16–41	8.14			
Combined	30	30.27		9.18	28.31	$p < .0001$	.5028
Second Test Administration							
Total Communication	15	37.53	31–43	3.70			
Aural/Oral	15	23.27	13–46	9.66			
Combined	30	30.40		10.21	28.52	$p < .0001$	.5046
First & Second Tests Combined							
Total Communication	15	74.20	58–87	7.92			
Aural/Oral	15	47.13	29–87	17.52			
Combined	30	60.67		19.18	29.73	$p < .0001$	.5150

Table 2.--Summary table of an analysis of variance performed on the number of correct scores of both groups (Aural/Oral and Total Communication) and both test administrations (first and second).

Source	SS	df	MS	F	Level of Significance
Total	5469.33	59	..	..	..
Between subjects	5334.33	29	..	..	..
Groups	2747.27	1	2747.27	29.73	$p < .0001$
Between subjects error	2587.07	28	92.39	..	..
Within subjects	135.00	30	..	..	..
Trials	0.27	1	0.27	.059	NS
Trials x groups	8.07	1	8.07	1.78	NS
Within subjects error	126.67	28	4.52	..	..

two-way analysis of variance with repeated measures (Winer, 1962). Appendices J and K list the raw score data for each subject by group and test presentation.

Main Effect of Group

Table 1 reveals that the difference between groups (Aural/Oral versus Total Communication) is significant at the $p < .0001$ level. Thus, the overall means of 47.13 and 74.20 for the two groups, Aural/Oral and Total Communication respectively, when averaged over both first and second test presentations, do differ significantly. The effects of presentation method were extremely powerful. The Eta Squared for the difference between the two groups was 0.5150, indicating that 50 percent of the variation in language performance skills (as measured by this test) could be accounted for by group membership.

The results of a two-way analysis of variance with repeated measures design are presented in Table 2. These findings would suggest that when degree of loss, compounding handicapping conditions, and age of onset are considered in subject selection, hearing impaired children from Aural/Oral versus Total Communication programs would not perform equally on this particular test of receptive language ability. Rather, the children of the Aural/Oral group perform markedly and significantly below those of the group utilizing a Total Communication approach.

The tabled values of correct scores for each subject by group are listed in Appendix L.

Effect of Age

A nonsignificant correlation was found between age of the subjects and test performance. This was true of subjects across both groups combined ($r = .065$), as well as within groups (Aural/Oral: $r = .020$; Total Communication: $r = .150$). Thus, regardless of the group investigated, test performance on the Boehm Test of Basic Concepts was not significantly correlated with age of subjects.

Test Reliability

The Kuder-Richardson test for reliability of measurement was performed on the test responses of both groups. This statistic measured the internal consistency of the test items and the extent to which they measured similar patterns. Table 3 depicts the results of this analysis by group (Aural/Oral and Total Communication). As can be seen, a highly significant ($p < .0001$) correlation exists for test-retest (first and second test) reliability over the two groups.

The Fisher Z test for determining the differences between two independent correlations was performed. The resulting difference in Z value of .54 between the

correlations for the Aural/Oral and Total Communication groups was not found to be significant at a $p < .05$ level.

Table 3.--Summary table of test-retest reliability by group (Aural/Oral and Total Communication).

Group	N	Correlation (R)	Level of Significance
Total Communication	15	0.85	$p < .0001$
Aural/Oral	15	0.93	$p < .0001$
Combined	30	0.96	$p < .0001$

Table 4 illustrates that the obtained reliability coefficients were higher for the Aural/Oral group on both first and second test administrations than for the Total Communication group. This may be due to a ceiling effect which occurs for the Total Communication population on both first and second test administrations.

Table 4.--Summary data depicting the results of the Kuder-Richardson test of reliability by group (Aural/Oral and Total Communication) and test administration (first and second).

	KR 20 First Test Administration	KR 20 Second Test Administration
Total Communication	0.68	0.53
Aural/Oral	0.85	0.89
Combined	0.90	0.92

Test items were identified for both groups which had zero or highly limited variance. These are listed in Appendix M. As can be seen, a large number of items had zero variance for the group of subjects using Total Communication, as they were correctly identified during testings by these children.

The internal consistency between subjects was higher for the Aural/Oral group due to the variation of subjects' scores evidenced. Thus, the overall test reliability of the Boehm Test of Basic Concepts was high. Several of the test items appear to be too simple for subjects of this age range using the Total Communication approach, and are limited in their discriminating abilities. They may, however, be appropriate items for inclusion for meeting a basic purpose of the test, which is to determine if these concepts are understood by individual students.

CHAPTER IV

DISCUSSION

Group Differences in Test Performance

As has been demonstrated, a significant difference exists between the mean test scores of the groups of children using an Aural/Oral versus a Total Communication approach. This difference is apparent for both first and second test administrations. The range of scores is noticeably greater for the Aural/Oral group (16 to 41 for the first test and 13 to 46 for the second test) than for the Total Communication group (27 to 44 for the first test and 31 to 43 for the second test). As can be seen, no subject using a Total Communication approach performed as poorly as did the lowest-scoring Aural/Oral subjects.

One difference between subjects in the composition of the two groups was that of degree of hearing loss. Four of the 15 subjects in the Aural/Oral group demonstrated severe as opposed to profound levels of hearing impairments. However, only a single subject in the Total Communication group demonstrated such relatively high hearing ability. There are insufficient data in the present investigation to allow for absolute comparative

statements relative to subject performance as related to degree of hearing loss (severe versus profound). However, it is interesting to note that despite the Aural/Oral group's possible advantage due to increased hearing acuity, the subjects nevertheless performed significantly poorer than did those of the Total Communication group.

A Total Communication presentation is often described as being highly ideographic in nature, with sign symbols visibly illustrating the intended word (Davis, 1977). Thus, it may be argued that many of the stimulus sentences were so graphically portrayed for the Total Communication subjects that correct responses were arrived at without actual prior knowledge of the word(s) involved.

An examination of the actual concepts tested reveals that, in many instances, such a claim may be accurate. The sign symbols for concepts such as "over, around, behind, below, zero, and above" are indeed graphic in nature. However, this is not true for the more obscure sign representations for concepts such as "least, always, some, not many, most, beginning" or fingerspelled items such as "forward." Further, it should be stressed that the 50 concepts were embedded in sentence combinations of up to 22 words in length, during test presentations. It is questionable whether subjects of this age could correctly select the single concept sign to successfully respond to

an item without some degree of comprehension of the language material being presented. This may be illustrated through the examination of such test items as:

#9. Look at the clothes hanging on the line. Mark the dress that is farthest from the socks.

#27. Look at the box of pencils and the groups of pencils. Mark the group that has as many pencils as the box.

#42. Look at the groups of circles and dots. Mark the group that has a dot in every circle.

Finally, it should be reiterated that the actual purpose of Total Communication is to present all available forms of input to maximize comprehension. An originating premise purports that an Aural/Oral presentation is too often insufficient in conveying information to the hearing impaired individual. The addition of graphic cues where possible, to enhance communication abilities, is an intended aspect of Total Communication.

The results of this investigation would not allow for the conclusive statement that children trained utilizing a Total Communication approach possess significantly better overall receptive language skills than do their Aural/Oral counterparts. Only those comments regarding performance as measured by this single test may be made with assurance. Therefore, it may be concluded that children trained to use a Total Communication approach, receiving the stimulus items of the Boehm Test of Basic Concepts via that same presentation mode, perform significantly

better on this test than do children of a similar age range utilizing an Aural/Oral approach. Documentation of this finding using other groups of children and measures of assessment could allow for a more conclusive statement to be made.

Comparison of Test Performance With That of Hard-of-Hearing Subjects

Davis (1974) provides data depicting the performance of 24 hard-of-hearing children, ranging in age from 6 years to 8 years, 11 months, on the Boehm Test of Basic Concepts. Although these subjects were younger as a group than those included in the present investigation, some interesting comparative observations may be made.

The subjects of the Davis study demonstrated mild or moderate levels of hearing loss and the majority were integrated into classrooms for the normally hearing for at least one-half of the school day. Comparisons of the percentile scores students obtained on the Boehm Test of Basic Concepts were compared to those of middle socio-economic level subjects demonstrating normal levels of hearing acuity. Her results pertaining to hearing impaired subjects revealed that:

> Only 22 percent of the seven and eight year olds scored at or above the 40th and 60th percentile levels on the test. Fifty percent of the six year olds scored at or below the 10th percentile, while 67% of the seven year olds and 83% of the eight year olds scored below that level. Only two hearing impaired children scored above the 80th percentile;

> each of them exhibited a high frequency hearing loss characterized by normal hearing through 500 Hz. Most discouraging of all, two-thirds of the seven and eight year old hearing impaired children scored at the 1st percentile in knowledge of these concepts (p. 346).

The performance of many of the severely and profoundly hearing impaired children of the present investigation was very similar to the results reported by Davis for younger hard-of-hearing subjects using an Aural/Oral approach. When the scores of the first and second tests were combined, 12 of the 15 subjects using an Aural/Oral approach scored at the first percentile level for normal hearing first graders. Comparison of performance with that of normal hearing second graders shows that 13 of the Aural/Oral group scored at the first percentile. (See Appendix J.)

Using an average of the first and second test scores, only one of the subjects utilizing a Total Communication approach scored at the first percentile level when compared to the normed first grade data. A total of 9 of the 15 subjects scored at the first percentile level when compared to existing norms for normal hearing second graders. (See Appendix K.)

It would appear, then, that the severely and profoundly hearing impaired subjects of the present investigation performed similarly to those younger hard-of-hearing subjects reported on by Davis. This is especially true of those children using an Aural/Oral approach. Further

research is needed to investigate more definitively the performance of children who vary in level of hearing loss, age, and communication approach utilized.

Relationship of Age and Subject Performance

An examination of the percentile rankings of raw scores of the hard-of-hearing subjects studied by Davis (1974) revealed that age of subjects was not a significant factor when correlated with test performance. This finding was also confirmed in the present investigation. The total age range of these present subjects studied was 6 years, 11 months to 13 years, 7 months. This large span, however, did not result in significant correlations between age and test performance for either the Aural/Oral or Total Communication group.

The severely depressed language abilities of hearing impaired children have been frequently documented in the literature (McClure, 1966; Simms & Yater, 1974; Wrightsone et al., 1963). The results of the present investigation would support Davis' premise of a severe lack of progress in the development of these language concepts as hearing impaired children advance in age. Such a finding may have significant implications as related to recommendations for programming designed to place emphasis upon specific conceptual development for the child demonstrating a need in this area.

Types of Subject Errors

The results of an item analysis of the errors made by subjects of the Aural/Oral and Total Communication groups are listed in Appendices G, H, and I. Appendix N illustrates those items by group which were in error one-half of the time or more, and identifies the classification type (Space, Quantity, Time, Miscellaneous) for each of these concepts.

A total of 29 of the 50 concepts were in error 15 times or more during both test presentations combined, for the children of the Aural/Oral group. As can be seen, the errors made by children of the Aural/Oral group are numerous, and appear to be somewhat random in nature. No single classification group appears to present a disproportionate amount of difficulty for these subjects. Rather, the Aural/Oral children appear to have problems related to all conceptual classifications tested.

It is interesting to note that several of these concepts ("few, over, below, left, above, third") are relatively "visible" in terms of speech production. These are also items which are typically included in language curriculum programs used with hearing impaired students. The results of this study would lend support to previously made statements relative to the limitations of Aural/Oral interpretive abilities of children when deciphering concepts presented in sentential forms.

A total of 8 of the 50 concepts were in error 15 times or more during both test presentations combined, for the children of the Total Communication group. All eight of these concepts ("right, as many, equal, beginning, never, alike, match, skip") were also among those most frequently missed by the Aural/Oral subjects. Further, these concepts were either fingerspelled, or were ones for which the signed representation was minimally graphic in nature. Thus, it would appear that these items are ones which either are rarely presented to hearing impaired children, or, if presented, are not reiterated sufficiently to insure mastery of these concepts. These high-frequency errors made by the subjects of both groups were distributed through all four of the conceptual categories. However, the subjects of the Total Communication group appear to perform better than their Aural/Oral counterparts in the identification of concepts related to "space" (1 error versus 13 errors, respectively) and "quantity" (2 errors versus 10 errors, respectively).

Test Reliability

Figures related to test/retest reliability have been presented in Table 3. A highly significant ($p < .0001$) correlation was found to exist for this factor. For both the Aural/Oral and Total Communication groups, scores obtained by each subject on the first and second tests were either identical or very similar. Thus, it would

appear that the score obtained from a single administration of the Boehm Test of Basic Concepts would serve as a reliable estimate for additional testing presentations.

The reliability of this test for each of the two groups of subjects was investigated. The Boehm Test of Basic Concepts proved to be an internally reliable instrument for use with subjects of the Aural/Oral group. This was largely due to the wide variability of subjects' performance on test responses. That is, there were sufficient differences among subjects' scores to allow individual test items to act as discriminating determiners of overall scores.

This high degree of internal reliability was not found for the Total Communication presentations. Generally, these subjects tended to achieve similar scores and demonstrated a reduced range of score variability. A ceiling effect was evidenced, and the Boehm Test of Basic Concepts was found to be limited in serving as a sufficiently powerful tool for discerning differences in subject performance for this group. The test could, however, be useful in the assessment of an individual child's knowledge of particular concepts or conceptual groups.

Implications Related to the Integration of Hearing Impaired Children

Public Law 94-142 mandates that handicapped children must be educated in the least restrictive environment

which is deemed appropriate to meet individual needs. As a result, numerous hearing impaired children are being considered for placement in general education classrooms for varying portions of the school day. Karchmer and Trybus (1977) report that, at the time of investigation, 19 percent of hearing impaired students were being served in integrated programs consisting of part-time classes, resource rooms, or itinerant services. Such forms of integration may stress social, academic, or a combination of these areas of need for each child.

Decisions as to the appropriateness of such placements continue to be predicated primarily upon staff and parental input, as well as academic performance in selected subjects. The need exists, both as a result of legal mandates as well as concern for successful experiences for children, to identify instruments which may be reliably used to measure the language performances of these children. The documentation obtained could then be utilized, in combination with staff input and academic performance, to make more appropriate recommendations for programming.

The results of this study would suggest that elementary level hearing impaired children of both groups, regardless of chronological age, demonstrate severe limitations in their receptive language abilities. The Boehm Test of Basic Concepts measures a very limited sampling of the multitude of concepts which the hearing impaired

child may be expected to encounter in the very early elementary grades. If, however, it is indeed indicative of the broader range of language concepts necessary for academic and social success, then all of the hearing impaired students tested demonstrate severe limitations and are highly disadvantaged.

It would appear that the Boehm Test of Basic Concepts is an instrument which could be used with hearing impaired children in an attempt to more objectively assess the appropriateness of placement in a regular education classroom. Examiners should realize that test performance represents behavior which may be expected to occur under more ideal conditions than are encountered in an on-going classroom experience. However, when used as an additive source of input to existing procedures, the Boehm Test of Basic Concepts could serve to enhance the validity of judgments made relative to appropriate child placement and programming.

Implications for Future Research

The present investigation has demonstrated that the Boehm Test of Basic Concepts is an instrument which may be used with hearing impaired students in an attempt to more objectively assess the appropriateness of recommendations for placement into general education classrooms. The overall performance of the subjects investigated was

found to be low when compared to normal-hearing children of younger ages. Further research is needed to determine the percentile or criteria of performance on this assessment instrument necessary for successful academic performance in regular educational placements. Research designed to correlate test scores with an "integration adequacy index" could result in a predictive instrument which would strengthen present subjective judgments of recommendations for student placement and programming.

An obvious area requiring further research is that with regard to the nature of the test used in this study. A single test, designed to assess receptive language performance through a representative sampling of basic concepts, was employed. While data-based information was obtained, the need exists to expand such investigations to other standardized instruments for use with hearing impaired children. Further, the need continues to exist for the identification of other instruments which assess additional areas of language performance which have been demonstrated as reliable for use with children who use Total Communication.

The present investigation utilized a "Signing Exact English" manual portrayal of stimulus items presented. Additional research is needed to determine whether the findings of this study, with regard to subject

performance, would be similar for students utilizing other sign systems.

Another area for future research deals with possible implications of an examiner bias effect. The individual selected to present the test items to all of the subjects was employed by, and favored, a Total Communication program. Every testing session was observed by the experimenter in an effort to monitor integrity of presentation mode. It may be argued that this bias contributed to the depressed scores of the children in the Aural/Oral group. However, it should also be noted that a true form of Total Communication would have allowed for the use of facial and body cues during presentations, which was not allowed in the present investigation. Additional research could be conducted using an examiner who favors an Aural/Oral approach and could allow for the total spectrum of input forms for children.

Although the range of ages for subjects studied was relatively large, limited representation of subjects at any specific age category was present. Future research should increase the number of subjects by age to obtain more conclusive results. Such investigation could also be expanded to include comprehensive information related to varying degrees of hearing loss, ranging from mild to profound levels of hearing impairment.

Further research is also needed to address the question of how hearing impaired students of Aural/Oral and Total Communication programs perform on measures of receptive language when the variable of presentation frequency is controlled. That is, a research study should be designed to determine the relative efficiency and effectiveness of learning by students using either communication method, while controlling for exposure to concept presentation. In the present investigation, this factor was an unknown variable. It was impossible to determine conclusively why the Total Communication subjects performed better than their Aural/Oral counterparts. The question must be raised as to the degree of exposure to the various concepts presented children of each program had experienced. A study designed to match the number of exposures for children of both groups could better ascertain the effectiveness of conceptual learning by children as related to presentation method.

Finally, the present study investigated the performance of subjects from public-school settings for whom the confounding variable of additional handicapping condition(s) was controlled. Numerous students are presently enrolled in other types of programs for the hearing impaired, and/or exhibit multiple handicaps (Jensema & Trybus, 1975). This latter factor increases the difficulty of appropriate assessment of performance. However,

the need most definitely exists to identify instruments which may be reliably used with this population as well.

Jensema and Trybus (1978) state that too often educators favor a "quick jump to the bottom line" approach to obtain information related to highly complex issues. They stress that the factors related to the communication patterns and achievement levels of hearing impaired students cannot be properly understood or evaluated, except in their complexity. The critical need for continued experimental examination, to determine appropriate assessment procedures, is an absolute necessity for meeting the goal of providing more effective programming for hearing impaired individuals.

APPENDICES

APPENDIX A

DESCRIPTIVE DATA OF SUBJECTS USING AN AURAL/ORAL APPROACH

APPENDIX A

DESCRIPTIVE DATA OF SUBJECTS USING AN AURAL/ORAL APPROACH

Subject Number	Age in Years and Months	Sex	Hearing Thresholds (dB)		
			500 Hz	1000 Hz	2000 Hz
1	13-4	Female	90	105 (1500 Hz)	NR*
2	7-8	Male	90	105	105
3	6-11	Male	85	105	115
4	13-1	Female	95	105	100
5	13-1	Female	95	105	110
6	11-10	Female	75	80	80
7	10-2	Female	80	90	105
8	7-8	Male	NR	NR	NR
9	11-0	Male	60	70	80
10	8-2	Male	80	100	NR
11	12-3	Male	100	105	105
12	9-9	Male	70	80	85
13	8-1	Female	70	100	105
14	12-2	Male	80	90	95
15	12-8	Male	90	95	105

*NR = no response.

APPENDIX B

DESCRIPTIVE DATA OF SUBJECTS USING A TOTAL COMMUNICATION APPROACH

APPENDIX B

DESCRIPTIVE DATA OF SUBJECTS USING A TOTAL COMMUNICATION APPROACH

Subject Number	Age in Years and Months	Sex	Hearing Thresholds (dB)		
			500 Hz	1000 Hz	2000 Hz
1	11-1	Female	110	NR*	105
2	10-9	Female	95	105	110
3	10-0	Female	70	90	NR
4	12-3	Female	90	NR	NR
5	12-2	Female	100	110	NR
6	12-10	Female	90	110	110
7	8-9	Female	110	NR	NR
8	13-7	Female	95	105	NR
9	12-0	Female	80	85	80
10	9-2	Female	90	95	100
11	9-11	Male	85	100	NR
12	8-5	Male	90	105	NR
13	9-1	Male	80	95	105
14	10-1	Male	95	110	NR
15	10-2	Male	95	100	NR

*NR = no response.

APPENDIX C

CLASSIFICATION OF THE CONCEPTS TO BE TESTED USING THE BOEHM TEST OF BASIC CONCEPTS

APPENDIX C

CLASSIFICATION OF THE CONCEPTS TO BE TESTED USING THE BOEHM TEST OF BASIC CONCEPTS

	Concept	Concept Category			
		Space	Quantity	Time	Misc.
1	Top	x			
2	Through	x			
3	Away from	x			
4	Next to	x			
5	Inside	x			
6	Some, not many		x		
7	Middle	x		*	
8	Few		x		
9	Farthest	x			
10	Around	x			
11	Over	x			
12	Widest		x		
13	Most		x		
14	Between	x		*	
15	Whole		x		
16	Nearest	x		*	
17	Second	*	x	*	
18	Corner	x			
19	Several		x		
20	Behind	x			
21	Row	x			
22	Different				x
23	After	*		x	
24	Almost		x		
25	Half		x		
26	Center	x			
27	As many		x		
28	Side	x			
29	Beginning	*		x	
30	Other				x

	Concept	Concept Category			
		Space	Quantity	Time	Misc.
31	Alike				x
32	Not first or last	*	x	*	
33	Never			x	
34	Below	x			
35	Matches				x
36	Always			x	
37	Medium-sized		x		
38	Right	x			
39	Forward	x			
40	Zero		x		
41	Above	x			
42	Every		x		
43	Separated	x		*	
44	Left	x			
45	Pair		x		
46	Skip				x
47	Equal		x		
48	In order	x			
49	Third	*	x	*	
50	Least		x		

X's indicate the context category of each concept as it is tested.

Asterisks indicate additional contexts in which the concepts may be employed. For example, the concept of beginning (item 29) is used in the context of time on the BTBC, but it may also be used to express relationships involving space.

APPENDIX D

DIRECTIONS GIVEN TO SUBJECTS FOR EACH ITEM OF FORM B OF THE BOEHM TEST OF BASIC CONCEPTS

APPENDIX D

DIRECTIONS GIVEN TO SUBJECTS FOR EACH ITEM OF FORM B OF THE BOEHM TEST OF BASIC CONCEPTS

1. Look at the flags on the poles. Mark the pole with the flag at the top. . . . Mark the pole with the flag at the top.

2. Look at the dogs and the hoops. Mark the dog that is going through the hoop. . . . Mark the dog that is going through the hoop.

3. Look at the baby and the blocks. Mark the block that is away from the baby. . . . Mark the block that is away from the baby.

4. Look at the animals. Mark the animal that is next to the rabbit. . . . Mark the animal that is next to the rabbit.

5. Look at the boxes and balls. Mark the box with the balls inside it. . . . Mark the box with the balls inside it.

6. Look at the bowls of flowers. Mark the bowl that has some but not many flowers. . . . Mark the bowl that has some but not many flowers.

7. Look at the children. Mark the child who is in the middle. . . . Mark the child who is in the middle.

8. Look at the pictures of boxes. Mark the picture that has a few boxes. . . . Mark the picture that has a few boxes.

9. Look at the clothes hanging on the line. Mark the dress that is farthest from the socks. . . . Mark the dress that is farthest from the socks.

10. Look at the flowers and strings. Mark the flower that has a string around it. . . . Mark the flower that has a string around it.

11. Look at the children and the rope. Mark the child who is over the rope. . . . Mark the child who is over the rope.

12. Look at the ties. Mark the tie that is widest. . . . Mark the tie that is widest.

13. Look at the boxes of buttons. Mark the box that has the most buttons. . . . Mark the box that has the most buttons.

14. Look at the pictures of toys. Mark the picture that has a bear between two blocks. . . . Mark the picture that has a bear between two blocks.

15. Look at the apples. Mark the apple that is whole. . . . Mark the apple that is whole.

16. Look at the dogs and the bone. Mark the dog that is nearest the bone. . . . Mark the dog that is nearest the bone.

17. Look at the line of trucks and the sign. Mark the second truck from the sign. . . . Mark the second truck from the sign.

18. Look at the buildings. Mark the building that is at a corner of the street. . . . Mark the building that is at a corner of the street.

19. Look at the groups of knives, forks, and spoons. Mark the group that has several spoons. . . . Mark the group that has several spoons.

20. Look at the boys and the wagon. Mark the boy who is behind the wagon. . . . Mark the boy who is behind the wagon.

21. Look at the pictures of bottles. Mark the picture where all the bottles are in a row. . . . Mark the picture where all the bottles are in a row.

22. Look at the piles of books. Mark the pile that is different from the others. . . . Mark the pile that is different from the others.

23. Look at the pictures of a piece of wood. Mark the picture that shows how the wood looked after it was cut. . . . Mark the picture that shows how the wood looked after it was cut.

24. Look at the baskets of fruit. Mark the basket that is almost full. . . . Mark the basket that is almost full.

25. Look at the boxes. Mark the box that is half black. . . . Mark the box that is half black.

26. Look at the ring and the marbles. Mark the marble that is at the center of the ring. . . . Mark the marble that is at the center of the ring.

27. Look at the box of pencils and the groups of pencils. Mark the group that has as many pencils as the box. . . . Mark the group that has as many pencils as the box.

28. Look at the car and the boys. Mark the boy at the side of the car. . . . Mark the boy at the side of the car.

29. Look at the boys on the stairs. Mark the boy who is beginning to climb the stairs. . . . Mark the boy who is beginning to climb the stairs.

30. Look at the toys. One is a doll and one is a truck. Mark the other toy. . . . Mark the other toy.

31. Look at the socks. Mark the socks that are alike. . . . Mark the socks that are alike.

32. Look at the ducks in the water. Mark the duck that is not the first or the last. . . . Mark the duck that is not the first or the last.

33. Look at the lamp, the wristwatch, and the shoe. Mark the thing that a child should never wear. . . . Mark the thing that a child should never wear.

34. Look at the bench and the birds. Mark the bird that is below the bench. . . . Mark the bird that is below the bench.

35. Look at the shirts and pants. Mark the pants that match one of the shirts. . . . Mark the pants that match one of the shirts.

36. Look at the box, the wheel, and the feather. Mark the thing a bicycle always has. . . . Mark the thing a bicycle always has.

37. Look at the butterflies. Mark the butterfly that is medium sized. . . . Mark the butterfly that is medium sized.

38. Look at the apples on the shelf. Mark the apple at the right end of the shelf. . . . Mark the apple at the right end of the shelf.

39. Look at the little chicks. Mark the chick that is bending forward. . . . Mark the chick that is bending forward.

40. Look at the rabbits and carrots. Mark the rabbit that has zero carrots. . . . Mark the rabbit that has zero carrots.

41. Look at the windows of the house. Mark the window that is above the door. . . . Mark the window that is above the door.

42. Look at the groups of circles and dots. Mark the group that has a dot in every circle. . . . Mark the group that has a dot in every circle.

43. Look at the pictures of boxes. Mark the picture where the boxes are separated. . . . Mark the picture where the boxes are separated.

44. Look at the trees. Mark the tree on the left. . . . Mark the tree on the left.

45. Look at the pictures of dolls. Mark the picture that shows a pair of dolls. . . . Mark the picture that shows a pair of dolls.

46. Look at the circles. One circle has an X in it. Skip a circle and make another X. . . . Skip a circle and make another X.

47. Look at the groups of stars. Mark the groups that have equal numbers of stars. . . . Mark the groups that have equal numbers of stars.

48. Look at the pictures of boxes. Mark the picture where the boxes are in order from small to large. . . . Mark the picture where the boxes are in order from small to large.

49. Look at the store and the houses. Mark the third house from the store. . . . Mark the third house from the store.

50. Look at the pictures of ice cream cones. Mark the picture that has the least cones. . . . Mark the picture that has the least cones.

APPENDIX E

SOURCE/METHOD OF MANUAL PRESENTATION FOR THOSE ITEMS NOT FOUND IN SIGNING EXACT ENGLISH

APPENDIX E

SOURCE/METHOD OF MANUAL PRESENTATION FOR THOSE ITEMS NOT FOUND IN SIGNING EXACT ENGLISH (Gustason et al., 1975)

Item	Source/Method of Presentation
Hoops	Item fingerspelled
(Street) Sign	Item fingerspelled
(Circular) Ring	Item fingerspelled
Forward	Item fingerspelled
Skip	Item fingerspelled
(Ice Cream) Cones	Item fingerspelled
Always	(Babbini, 1976)
Not	(Babbini, 1976)
Alike	(Babbini, 1976)
Different	(Babbini, 1976)
Around	(Babbini, 1976)
Never	(Babbini, 1976)
Match	(Babbini, 1976)
Few	(Babbini, 1976)
Order	(Watson, 1973)
Row	(Watson, 1973)
(Neck) Ties	*Program Sign
Store	*Program Sign
Behind	*Program Sign
Below	*Program Sign
Least	*Program Sign
Inside	*Program Sign

*"Program Signs" were employed when no existing formal sign could be located which conveyed the appropriate meaning of the intended item. These were signs which the children of this particular program for the hearing impaired utilized to illustrate a particular word.

APPENDIX F

INTRODUCTORY DIRECTIONS GIVEN TO ALL SUBJECTS

APPENDIX F

INTRODUCTORY DIRECTIONS GIVEN TO ALL SUBJECTS

(Modified from those prescribed in test manual of the Boehm Test of Basic Concepts)

I have given you a book with some pictures in it. Watch, and listen, and do what I say.

You are going to look at pictures and mark "X's" on them. This is how you make an "X" (experimenter demonstrates).

Now look at the shoe, the hat, and the sock. Mark an "X" on the hat. . . . Mark an "X" on the hat.

Now look at the things to ride in. Mark an "X" on the boat. . . . Mark an "X" on the boat.

Look at the fruit. Mark the banana. . . . Mark the banana.

Very good.

If you make a mistake or want a different answer, that is OK. Make a circle around the wrong picture like this (experimenter demonstrates). Then make the new "X."

APPENDIX G

SUMMARY DATA DEPICTING TYPES OF RESPONSES IN THE GROUP USING AN AURAL/ORAL APPROACH

APPENDIX G

SUMMARY DATA DEPICTING TYPES OF RESPONSES IN THE GROUP USING AN AURAL/ORAL APPROACH

Test Item Number	Incorrect on Both Test Presentations	Correct on Both Test Presentations	Total Number of Consistent Responses	Correct on First Test-- Incorrect on Second Test	Incorrect on First Test-- Correct on Second Test	Total Number of Inconsistent Responses
1	1	10	11	4	0	4
2	3	9	12	1	2	3
3	4	5	9	0	6	6
4	9	4	13	0	2	2
5	2	11	13	1	1	2
6	7	4	11	3	1	4
7	5	4	9	3	3	6
8	8	3	11	1	3	4
9	9	3	12	1	2	3
10	1	11	12	2	1	3
11	6	6	12	3	0	3
12	7	4	11	3	1	4
13	3	7	10	4	1	5
14	3	6	9	4	2	6
15	8	3	11	2	2	4
16	3	8	11	3	1	4
17	3	7	10	4	1	5
18	3	7	10	2	3	5
19	4	3	7	3	5	8
20	9	4	13	1	1	2
21	6	3	9	3	3	6
22	3	11	14	1	0	1
23	3	7	10	2	3	5
24	5	5	10	3	2	5
25	7	5	12	1	2	3

Test Item Number	Incorrect on Both Test Presentations	Correct on Both Test Presentations	Total Number of Consistent Responses	Correct on First Test-- Incorrect on Second Test	Incorrect on First Test-- Correct on Second Test	Total Number of Inconsistent Responses
26	7	4	11	3	1	4
27	11	3	14	0	1	1
28	5	5	10	2	3	5
29	8	3	11	1	3	4
30	5	6	11	3	1	4
31	0	15	15	0	0	0
32	4	5	9	2	4	6
33	6	5	11	2	2	4
34	8	4	12	0	3	3
35	11	3	14	1	0	1
36	5	5	10	3	2	5
37	7	6	13	1	1	2
38	10	2	12	1	2	3
39	4	7	11	3	1	4
40	1	12	13	2	0	2
41	7	4	11	3	1	4
42	4	6	10	3	2	5
43	2	5	7	4	4	8
44	5	2	7	4	4	8
45	11	1	12	0	3	3
46	9	4	13	2	0	2
47	0	15	15	0	0	0
48	6	3	9	2	4	6
49	6	4	10	2	3	5
50	5	7	12	3	0	3
Total	269	286	555	102	95	195

APPENDIX H

SUMMARY DATA DEPICTING TYPE OF RESPONSES IN THE GROUP USING A TOTAL COMMUNICATION APPROACH

APPENDIX H

SUMMARY DATA DEPICTING TYPE OF RESPONSES IN THE GROUP USING A TOTAL COMMUNICATION APPROACH

Test Item Number	Incorrect on Both Test Presentations	Correct on Both Test Presentations	Total Number of Consistent Responses	Correct on First Test-- Incorrect on Second Test	Incorrect on First Test-- Correct on Second Test	Total Number of Inconsistent Responses
1	0	15	15	0	0	0
2	0	14	14	1	0	1
3	2	13	15	0	0	0
4	6	9	15	0	0	0
5	0	15	15	0	0	0
6	5	8	13	0	2	2
7	2	12	14	0	1	1
8	1	13	14	0	1	1
9	5	7	12	3	0	3
10	0	14	14	0	1	1
11	1	14	15	0	0	0
12	1	14	15	0	0	0
13	0	14	14	1	0	1
14	0	15	15	0	0	0
15	3	10	13	0	2	2
16	0	14	14	1	0	1
17	0	13	13	0	2	2
18	1	14	15	0	0	0
19	4	9	13	1	1	2
20	1	10	11	2	2	4
21	0	15	15	0	0	0
22	3	9	12	1	2	3
23	3	9	12	3	0	3
24	6	9	15	0	0	0

Test Item Number	Incorrect on Both Test Presentations	Correct on Both Test Presentations	Total Number of Consistent Responses	Correct on First Test-- Incorrect on Second Test	Incorrect on First Test-- Correct on Second Test	Total Number of Inconsistent Responses
25	0	14	14	0	1	1
26	3	9	12	1	2	3
27	11	2	13	0	2	2
28	2	9	11	1	3	4
29	6	6	12	1	2	3
30	1	12	13	0	2	2
31	6	5	11	1	3	4
32	1	14	15	0	0	0
33	8	7	15	0	0	0
34	1	14	15	0	0	0
35	0	2	2	13	0	13
36	0	15	15	0	0	0
37	5	6	11	4	0	4
38	7	7	14	0	1	1
39	3	8	11	1	3	4
40	1	14	15	0	0	0
41	0	15	15	0	0	0
42	0	14	14	0	1	1
43	1	14	15	0	0	0
44	4	8	12	2	1	3
45	6	6	12	2	1	3
46	13	2	15	0	0	0
47	14	1	15	0	0	0
48	1	7	8	2	5	7
49	2	10	12	3	0	3
50	3	11	14	0	1	1
Total	98	524	664	44	42	86

APPENDIX I

SUMMARY DATA DEPICTING TYPES OF RESPONSES FOR EACH ITEM (FIRST AND SECOND TESTS) OVER BOTH GROUPS (AURAL/ORAL AND TOTAL COMMUNICATION) COMBINED

APPENDIX I

SUMMARY DATA DEPICTING TYPES OF RESPONSES FOR EACH ITEM (FIRST AND SECOND TESTS) OVER BOTH GROUPS (AURAL/ORAL AND TOTAL COMMUNICATION) COMBINED

Test Item Number	Incorrect on Both Test Presentations	Correct on Both Test Presentations	Total Number of Consistent Responses	Correct on First Test--Incorrect on Second Test	Incorrect on First Test--Correct on Second Test	Total Number of Inconsistent Responses
1	1	25	26	4	0	4
2	3	23	26	2	2	4
3	6	18	24	0	6	6
4	15	13	28	0	2	2
5	2	26	28	1	1	2
6	12	12	24	3	3	6
7	7	16	23	3	4	7
8	9	16	25	1	4	5
9	14	10	24	4	2	6
10	1	25	26	2	2	4
11	7	20	27	3	0	3
12	8	18	26	3	1	4
13	3	21	24	5	1	6
14	3	21	24	4	2	6
15	11	13	24	2	4	6
16	3	22	25	4	1	5
17	3	20	23	4	3	7
18	4	21	25	2	3	5
19	8	12	20	4	6	10
20	10	14	24	3	3	6
21	6	18	24	3	3	6
22	6	20	26	2	2	4
23	6	16	22	5	3	8
24	11	14	25	3	2	5

Test Item Number	Incorrect on Both Test Presentations	Correct on Both Test Presentations	Total Number of Consistent Responses	Correct on First Test-- Incorrect on Second Test	Incorrect on First Test-- Correct on Second Test	Total Number of Inconsistent Responses
25	7	19	26	1	3	4
26	10	13	23	4	3	7
27	22	5	27	0	3	3
28	7	14	21	3	6	9
29	14	9	23	2	5	7
30	6	18	24	3	3	6
31	21	5	26	1	3	4
32	5	19	24	2	4	6
33	14	12	26	2	2	4
34	9	18	27	0	3	3
35	24	3	27	1	2	3
36	5	20	25	3	2	5
37	12	12	24	5	1	6
38	17	9	26	1	3	4
39	7	5	12	4	4	8
40	2	26	28	2	0	2
41	7	19	26	3	1	4
42	4	20	24	3	3	6
43	3	19	22	4	4	8
44	9	10	19	6	5	11
45	17	7	24	2	4	6
46	22	6	28	2	0	2
47	29	1	30	0	0	0
48	7	10	17	4	9	13
49	8	14	22	5	3	8
50	8	18	26	3	1	4

APPENDIX J

SUMMARY DATA DEPICTING RAW SCORES AND PERCENTILE EQUIVALENTS FOR STUDENTS USING AN AURAL/ORAL APPROACH

APPENDIX J

SUMMARY DATA DEPICTING RAW SCORES AND PERCENTILE EQUIVALENTS FOR STUDENTS USING AN AURAL/ORAL APPROACH*

Subject Number	Age of Subject	First Test: Raw Score	Second Test: Raw Score	Mean Test Scores	Percentiles (BTBC): Means of Combined Test Scores		
					Kindergarten	Grade 1	Grade 2
1	13-4	22	18	20.0	5	1	1
2	7-8	27	27	27.0	15	1	1
3	6-11	24	21	22.5	5	1	1
4	13-1	23	28	25.5	10	1	1
5	13-1	18	18	18.0	3	1	1
6	11-10	33	32	32.5	30	3	1
7	10-2	20	13	16.5	3	1	1
8	7-8	16	18	17.0	3	1	1
9	11-0	40	46	43.0	85	35	10
10	8-2	17	18	17.5	3	1	1
11	12-3	16	15	15.5	3	1	1
12	9-9	41	40	40.5	70	15	3
13	8-1	21	15	18.0	3	1	1
14	12-2	17	17	17.0	3	1	1
15	12-8	23	23	23.0	5	1	1
Mean	10-5	23.87	23.27	23.56	16.40	4.33	1.73

*Middle socioeconomic level figures from normative data of the Boehm Test of Basic Concepts (BTBC) are presented for comparative purposes.

APPENDIX K

SUMMARY DATA DEPICTING RAW SCORES AND PERCENTILE EQUIVALENTS FOR STUDENTS USING A TOTAL COMMUNICATION APPROACH

APPENDIX K

SUMMARY DATA DEPICTING RAW SCORES AND PERCENTILE EQUIVALENTS FOR STUDENTS USING A TOTAL COMMUNICATION APPROACH*

Subject Number	Age of Subject	First Test: Raw Score	Second Test: Raw Score	Mean Test Scores	Percentiles (BTBC): Means of Combined Test Scores		
					Kindergarten	Grade 1	Grade 2
1	11-1	38	38	38.0	60	10	1
2	10-9	41	41	41.0	75	20	5
3	10-0	35	41	38.0	60	10	1
4	12-3	38	38	38.0	60	10	1
5	12-2	41	39	40.0	70	15	3
6	12-10	40	36	38.0	60	10	1
7	8-9	30	32	31.0	30	3	1
8	13-7	35	36	35.5	45	5	1
9	12-0	38	41	39.5	65	15	3
10	9-2	44	43	43.5	85	40	10
11	9-11	39	40	39.5	65	20	3
12	8-5	39	40	39.5	65	15	3
13	9-1	33	34	33.5	35	3	1
14	10-1	33	33	33.0	35	3	1
15	10-2	27	31	29.0	20	1	1
Mean	10-6	36.67	37.53	37.13	55.33	12.00	2.40

*Middle socioeconomic level figures from normative data of the Boehm Test of Basic Concepts (BTBC) are presented for comparative purposes.

APPENDIX L

NUMBER OF CORRECT RESPONSES FOR EACH SUBJECT BY GROUP (TOTAL COMMUNICATION AND AURAL/ORAL) FOR BOTH TEST ADMINISTRATIONS

APPENDIX L

NUMBER OF CORRECT RESPONSES FOR EACH SUBJECT BY GROUP (TOTAL COMMUNICATION AND AURAL/ORAL) FOR BOTH TEST ADMINISTRATIONS

Subject Number	First Test	Second Test
Total Communication Group		
1	38	38
2	41	41
3	35	41
4	38	38
5	41	39
6	40	36
7	30	32
8	35	36
*9	38	41
10	44	43
11	39	40
12	39	40
13	33	34
14	33	33
15	27	31
Mean	36.67	37.53
Aural/Oral Group		
1	22	18
2	27	27
3	24	21
4	23	28
5	18	18
*6	33	32
7	20	13
8	16	18
*9	40	46
10	17	18
11	16	15
*12	41	40
13	21	15
*14	17	17
15	23	23
Mean	23.87	23.27

*Indicates severe level of hearing loss.

APPENDIX M

SUMMARY DATA OF TEST ITEMS WHICH HAD ZERO OR HIGHLY LIMITED VARIANCE FOR SUBJECTS BY GROUP (TOTAL COMMUNICATION AND AURAL/ORAL)

APPENDIX M

SUMMARY DATA OF TEST ITEMS WHICH HAD ZERO OR HIGHLY LIMITED VARIANCE FOR SUBJECTS BY GROUP (TOTAL COMMUNICATION AND AURAL/ORAL)

Total Communication--First Test Administration

Item Number	Concept Tested	Percent Correct
1	Top	100%
2	Through	100%
5	Inside	100%
10	Around	93%
11	Over	93%
12	Widest	93%
13	Most	100%
14	Between	100%
16	Nearest	100%
18	Corner	93%
21	Row	100%
25	Half	93%
32	Not first or last	93%
34	Below	93%
35	Match	0%
36	Always	100%
40	Zero	93%
41	Above	100%
42	Every	93%
43	Separated	93%

Total Communication--Second Test Administration

Item Number	Concept Tested	Percent Correct
1	Top	100%
2	Through	93%
5	Inside	100%
8	Few	93%
10	Around	100%
11	Over	93%
12	Widest	93%
13	Most	93%
14	Between	100%
16	Nearest	93%
17	Second	100%
18	Corner	93%
21	Row	100%
25	Half	100%
30	Other	93%
32	Not first or last	93%
34	Below	93%
36	Always	100%
40	Zero	93%
41	Above	100%
42	Every	100%
43	Separated	93%

Aural/Oral--First Test Administration

Item Number	Concept Tested	Percent Correct
1	Top	93%
31	Alike	0%
40	Zero	93%
47	Equal	0%

Aural/Oral--Second Test Administration

Item Number	Concept Tested	Percent Correct
31	Alike	0%
47	Equal	0%

APPENDIX N

SUMMARY DATA, BY GROUP (AURAL/ORAL AND TOTAL COMMUNICATION) AND CATEGORY (SPACE, QUANTITY, TIME, MISCELLANEOUS) OF TEST ITEMS WHICH WERE ANSWERED INCORRECTLY, 15 TIMES OR MORE, OVER BOTH FIRST AND SECOND TEST ADMINISTRATIONS

APPENDIX N

SUMMARY DATA, BY GROUP (AURAL/ORAL AND TOTAL COMMUNICATION) AND CATEGORY (SPACE, QUANTITY, TIME, MISCELLANEOUS) OF TEST ITEMS WHICH WERE ANSWERED INCORRECTLY, 15 TIMES OR MORE, OVER BOTH FIRST AND SECOND TEST ADMINISTRATIONS

Concept: Space	Concept: Quantity	Concept: Time	Concept: Miscellaneous
Aural/Oral Group			
1. Next to	Some, not many	Beginning	Alike
2. Middle	Few	Never	Match
3. Farthest	Widest	Always	Skip
4. Over	Almost		
5. Behind	Half		
6. Row	As many		
7. Center	Medium-sized		
8. Side	Pair		
9. Below	Equal		
10. Right	Third		
11. Above			
12. Left			
13. In order			
Total Communication Group			
1. Right	As many Equal	Beginning Never	Alike Match Skip
Total Number of Concept Items Presented in Test			
23	18	4	5

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