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AN ABSTRACT OF THE THESIS OF Cathleen Pew Edwards for the Master of Science in Speech Communication, with an emphasis in Speech-Language Pathology, presented May 31, 1989.

Title: A Comparative Analysis of the Expressive Acquisition of Locative and Directional Prepositions Between Severely-to-Profoundly Hearing Impaired Children Utilizing Total Communication and the Oral/Aural Approach.

APPROVED BY THE MEMBERS OF THE THESIS COMMITTEE:

Joan McMahon, Chairperson

Robert L. Casteel

Maxine L. Thomas

Prepositions are not only important in functional syntax; they also relate meanings associated with the concepts of place and time (Washington & Naremore, 1978). Furthermore, prepositions are critical in such everyday activities as producing and comprehending directions, using

maps and diagrams, and in the fields of mathematics and music (Cox & Richardson, 1985). Inefficient use or misuse of prepositional spatial terms may hinder a child's progress in many areas. Expressive acquisition of function words, which include prepositions, has been described as significantly delayed in the hearing impaired populations (Cooper & Rosenstein, 1966).

The purpose of this study was to conduct a comparative preposition analysis between hearing impaired children using two different modes of communication. The question this researcher sought to answer was: Do 54 severely-to-profoundly hearing impaired children in this study using total communication differ in the expressive acquisition of 17 locative and directional prepositions from 35 hearing impaired children in a previous study (Warlick, 1983) using oral/aural communication?

The total communication (TC) subjects were from programs incorporating signed exact English. The subjects were between the ages of 4 years, 0 months and 12 years, 6 months and were selected for this study on the basis of chronological age, congenital or prelingual deafness prior to age 2 and lack of multiple handicapping conditions. The 17 prepositions were tested in the same manner as specified by Warlick (1983), except the mode of communication used and elicited was TC instead of oral/aural (OA). The test utilized objects which were placed in a designated position

(e.g., "behind the garage"). Responses were scored as correct only if the target preposition was produced.

There were no statistically significant differences between the TC and OA subjects in the expressive acquisition of prepositions. Performance of both groups on the test improved with age, indicating a developmental trend. The mean scores for the locative and directional prepositions also increased with age. In the TC group, younger subjects produced more directional than locative prepositions; this was reversed, however, for the oldest TC subjects. In contrast, the OA subjects produced more directional than locative prepositions at all age levels. Although the means for directional prepositions between the TC and OA groups were similar, the standard deviations were higher in the TC group, which indicates that there was more variance among the TC group when correctly expressing directional prepositions.

A COMPARATIVE ANALYSIS OF THE EXPRESSIVE ACQUISITION
OF LOCATIVE AND DIRECTIONAL PREPOSITIONS BETWEEN
SEVERELY-TO-PROFOUNDLY HEARING IMPAIRED
CHILDREN UTILIZING TOTAL COMMUNICATION
AND THE ORAL/AURAL APPROACH

by

CATHLEEN PEW EDWARDS

A thesis submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE
in
SPEECH COMMUNICATION:
with an emphasis in
SPEECH-LANGUAGE PATHOLOGY

Portland State University

1989

TO THE OFFICE OF GRADUATE STUDIES

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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

INTRODUCTION

Studies concerning the language acquisition of deaf children have indicated specific areas of difficulty (Gustason, Pfetzing, & Zawolkow, 1980). These difficulties include the omission or incorrect use of necessary function words (Gustason et al., 1980; Myklebust, 1964). Prominent among function words are prepositions. Prepositions integrate the cognitive functions of semantic and syntactic relations associated with the concepts of place and time (Washington & Naremore, 1978).

Educators and researchers have had a history of controversy concerning which method of communication best facilitates the language acquisition of the deaf child. The two primary communication systems presently used with the deaf population are total communication which incorporates aural, manual, and oral methods and the oral/aural approach which uses amplification, speech, and lipreading without manual cues (Garretson, 1976; Jordan, 1982).

The primary language development of hearing impaired children is influenced by the nature of language input

(Spoken English or American Sign Language) and the nature of communication used (total communication or oral/aural) (Quigley & Paul, 1984). Researchers have indicated that hearing impaired children using the oral/aural approach to language are similar in sequence to hearing children in syntactic knowledge and semantic usage, but are delayed (Kretschmer & Kretschmer, 1978; Quigley & Paul, 1984). Whereas studies concerning the language development of hearing impaired children utilizing the total communication approach indicate a smaller, yet similar vocabulary composition to hearing children of comparable ages (Collins-Ahlgren, 1974; Griswold & Commings, 1974). Total communication is effective for primary language development if teachers and parents use developmental structures similar to normal hearing children (Quigley & Paul, 1984).

Studies comparing the production of English language in the oral/aural and total communication populations vary in their results. Geers, Moog, and Schick (1984) concluded that total communication did not enhance the development of spoken English. They further concluded that children using total communication did not learn simple sentence structures sooner than oral/aural populations. Other studies supporting total communication indicate the importance of signing to the hearing impaired child's overall speech and language development (Gardner & Zorfass, 1983; Grove, O'Sullivan, & Rodda, 1970; Quigley & Paul, 1984). It has been suggested

that children using total communication may acquire prepositions closer in age to normal hearing children than children using the oral/aural method (Collins-Ahlgren, 1975; Griswold & Commings, 1974).

Examining the expressive acquisition of prepositions as used by the total communication population and comparing those results with the oral/aural population may aid in determining which mode of communication better facilitates the acquisition of expressive prepositions in the hearing impaired population.

STATEMENT OF PURPOSE

The purpose of this study was to conduct a comparative analysis of expressive prepositions between hearing impaired children utilizing the total communication approach with hearing impaired children using the oral/aural approach to communication. Specifically, results from this study which examined expressive prepositions used by hearing impaired children 4 years, 0 months to 12 years, 6 months of age with a severe-to-profound loss using the total communication approach were compared with results from the Warlick (1983) study, which examined expressive prepositions used by hearing impaired children of the same severity and age group using the oral/aural approach to communication.

The question this study sought to answer was: Do severely-to-profoundly hearing impaired children using the

total communication approach differ in the expressive acquisition of 17 locative and directional single word prepositions from a similar group of children using the oral/aural approach to communication?

DEFINITION OF TERMS

For the purpose of this comparative study, the following operational definitions were utilized:

Classification of hearing loss for children:

15-30 dBHL - mild; 31-50 dBHL - moderate; 51-80 dBHL - severe; 81-120 dBHL - profound (Northern & Downs, 1974).

Directional prepositions: Prepositions denoting a change in direction or condition (Wiig & Semel, 1976).

Locative prepositions: Prepositions denoting a geographical or physical location of persons, objects, or events (Wiig & Semel, 1976).

Multiply handicapped: An individual having more than one disability simultaneously (Nicolosi, Harryman, & Kresheck, 1978). Any hearing impaired child with the additional handicaps of mental retardation, cerebral palsy, or blindness is defined as multiply handicapped in the present study.

Oral/aural approach: The use of amplification, speech, and lipreading without manual cues (Jordan, 1982).

Severe-to-profound hearing impairment: An average unaided hearing loss of 70 dBHL or greater in the better ear

when obtaining thresholds for 500, 1000, and 2000 Hz to establish a pure tone average (Warlick, 1983).

Total communication: A philosophy incorporating oral, aural and manual modes of communication to enhance receptive and expressive skills of the hearing impaired (Garretson, 1976; Nicolosi et al., 1978).

CHAPTER II

REVIEW OF THE LITERATURE

Educators have attempted to apply the linguistic bases of normal language acquisition, which include cognition, syntax and semantics, to the acquisition process of hearing impaired children (Schirmer, 1985). Prepositions are especially important for understanding the cognitive and linguistic abilities of both the normal hearing and hearing impaired as they are a means of relating the syntactical and semantic components of language (Washington & Naremore, 1978).

In describing the primary language development of hearing impaired children, Quigley and Kretschmer (1982) stated that the nature of language input and specific communication mode used by the hearing impaired must be examined. Quigley and Paul (1984) explained that examining the type of communication used is imperative in determining what similarities and differences exist in the primary language development among the hearing impaired and normal hearing children.

COMMUNICATION SYSTEMS OF THE DEAF

The various language and communication systems currently used by the hearing impaired population and the educators of the deaf are as follows.

Oral/Aural English

The oral/aural method is the use of amplification, speech, and lipreading without manual cues (Jordan, 1982). Aural development and speech development are seen as the foundations of verbal learning, allowing primary (spoken) and secondary (reading) language forms to develop in a similar manner to hearing children (Quigley & Paul, 1984).

American Sign Language (ASL or Ameslan)

ASL is a form of manual communication used by a large majority of the hearing impaired population which is comprised of hand and arm shapes, positions, and movements as a language (Quigley & Paul, 1984). ASL has its own processes of word formation and semantic variation and is not derived from any spoken language (Bellugi & Klima, 1972). ASL coexists with English in a bilingual environment which allows the influence of fingerspelling, initialization of signs, and the influence of English word order (Northern & Downs, 1974). English represents a concept by the spoken word, whereas ASL represents a concept by a sign or gesture (Bornstein, 1973).

Manually Coded English

The most common form of manually coded English is producing signs in English order without an inflectional system and fingerspelling those words or concepts without a sign equivalent (Quigley & Paul, 1984). Five methods of manually coded English currently discussed in the literature are as follows.

Fingerspelling. A means of representing the 26 letters and Arabic numerals of written English with one-to-one correspondence using hand configurations (Quigley & Paul, 1984).

Seeing Essential English (SEE I). This sign system was originated by David Anthony in 1962 and uses modifications of ASL to resemble English while emphasizing complete word order (Northern & Downs, 1974). The program uses ASL and invented signs to represent grammatical word forms or parts such as roots, suffixes, and prefixes (Northern & Downs, 1974; Quigley & Paul, 1984). The signs are used in combinations to form any desired word. To reflect English syntax, verb tenses are clearly indicated and irregular verb forms have signed representation (Northern & Downs, 1974).

Signed Exact English (SEE II). Gustason, Pfetzing, and Zawolkow (1980) stated that the goal of this program is for hearing impaired children to "become truly bilingual in their use of ASL and English" (p. 11). SEE II uses signs

which represent words rather than roots, as well as basic affixes (Northern & Downs, 1974).

Signed English. Bornstein (1973) developed this program to cover the needs of syntax and the vocabulary used with deaf children ages 1 to 6 years. ASL signs are used in conjunction with the English inflectional system (Bornstein, 1973).

Pidgin Sign English. ASL signs are used in English word order but with limited use of the English inflectional system (Quigley & Paul, 1984). The grammars of ASL and English are both reduced (Nicolosi, Harryman, & Kresheck, 1978).

Total Communication

Garretson (1976) stated advocates of the manual approach began a philosophical framework in the 1950s for the use of a multiple communication approach. Total communication can be seen as a revivalist term for the older simultaneous method of combining oral and manual methods of communication (Savage & Savage, 1981). In May 1976, The Conference of Executives of American Schools for the Deaf Committee (CEASD) at Rochester gave the following definition for total communication:

Total communication is a philosophy incorporating appropriate aural, manual, and oral modes of communication with and among hearing impaired persons. (Garretson, 1976, p. 91)

A major controversy currently exists among educators of the hearing impaired concerning which method of communication better facilitates the cognitive and linguistic abilities of the deaf child, total communication or the oral/aural method. As the literature indicates, language is inextricably linked with communication (Quigley & Paul, 1984).

EXPRESSIVE LANGUAGE ACQUISITION OF THE DEAF

Language has been defined by Bloom and Lahey (1978) "as a code whereby ideas about the world are represented through a conventional system of arbitrary signals" (p. 4). This definition is not limited to spoken language of the normal hearing child but includes the oral/aural hearing impaired population and the sign system implemented by the total communication population as well (Quigley & Paul, 1984). The literature will be examined to determine the expressive language acquisition and developmental trends of the hearing impaired using the oral/aural method and total communication.

✓ Language Acquisition of the Oral/Aural Population

The oral/aural development of three deaf children from birth to 5 years of age was investigated by Mavilya and Mignone (1977). Their study found babbling to begin at 6 months, a 2- to 3-month delay as compared to normal

hearing children. They produced one and two words at 24 months, began voicing with other deaf children at 30 months, used three to four words around 3 years, and began approximating adult speech at age 5 years.

In examining the language acquisition of older oral/aural hearing impaired children, Presnell (1973) evaluated the receptive and expressive syntactic abilities of 47 severely-to-profoundly hearing impaired children, ages 5 to 13 years, with the Northwestern Syntax Screening Test (NSST) (Lee, 1969). She compared these results with Lee's (1969) normative data of 344 normal hearing children, ages 3 to 7 years, 11 months. Presnell (1973) reported that the rate of improvement in receptive and expressive test scores in relation to increase of chronological age was not as pronounced for hearing impaired as reported for normal hearing children. Furthermore, Presnell (1973) indicated that a rapid growth in syntactical abilities of the hearing impaired occurred between 5 and 9 years of age. In contrast, Lee (1969) stated that by 3 years, 11 months, over half of the 40 subjects comprehended and produced the syntactical structures with 90% accuracy, and by 7 years, 11 months, all of the 34 subjects obtained a perfect score.

In a further study of older hearing impaired children ages 4 to 15 years, Geers and Moog (1978) investigated the spontaneous and imitated language of 52 subjects. The tests administered were the Developmental Sentence Analysis (DSA)

(Lee, 1974) and the Carrow Elicited Language Inventory (CELI) (Carrow, 1974). The DSA was normed on 200 normal hearing children between the ages of 2 to 6 years, 11 months (Lee, 1974). Geers and Moog (1978) reported that 56% of the 52 hearing impaired children tested obtained developmental sentence scores below that of the average normal hearing 3-year-old. The CELI was normed on children between the ages of 3 to 6 years (Carrow, 1974). Geers and Moog found that 51% of the hearing impaired subjects made more errors than the average 3-year-old from the normative data. In correlation with the Presnell study, the most rapid language development occurred between 4 and 9 years of age. This is in contrast with the normative data provided by Carrow (1974) which indicated that the most rapid developmental growth occurred between 2 and 3 years of age and became progressively smaller with an increase of age.

In their review of the literature regarding oral/aural language development, Kretschmer and Kretschmer (1978) indicated that syntactic knowledge and semantic usage is consistent in some ways with normally hearing children. Quigley and Paul (1984) concluded from their review of the literature that the primary language development of children using the oral/aural approach to communication is similar in sequence but significantly slower in acquisition as compared to hearing children.

Language Acquisition of the Total
Communication Method,

Studies concerning the language development of hearing impaired children trained in the total communication approach indicate a similar, yet smaller, vocabulary composition than hearing children of comparable ages (Collins-Ahlgren, 1974; Griswold & Commings, 1974). When compared to hearing children ages 1 year, 9 months to 4 years, 6 months, the hearing impaired children using total communication have been found to use similar proportions of nouns, verbs, adjectives, and prepositions. However, hearing impaired children rarely used connectives, articles, or auxiliary verbs (Collins-Ahlgren, 1974; Griswold & Commings, 1974).

McIntire (1974), in his study of one hearing impaired child using total communication, reported the child produced 20 signs at 10 months and two-sign constructions at 16 months of age, which is 8 months earlier on the average than similar constructions in spoken language. He attributed the early emergence of sign to greater control of the hand as an expressor and to the complete visibility of the features of signs as compared to speech sounds. Wilbur (1979) further explained that the emergence of signs before words may "relate to the earlier development and control of hand muscles than vocal musculature and to the notion that signs are motorically simpler to produce" (p. 56).

Schlesinger and Meadow (1972), in a study of four children with severe-to-profound hearing impairments, ages 15 months to 3 years, 10 months, found that both the number of spoken words and the lipreading abilities increased with sign language acquisition. They found the children's language to develop in the same pattern as normal children.

Quigley and Paul (1984) concluded from their review of the literature that total communication is effective for primary language development of hearing impaired children if parents and teachers use structures following the developmental patterns of normally hearing children.

COMPARING THE ORAL/AURAL AND TOTAL COMMUNICATION METHODS

Geers, Moog, and Schick (1984) completed a study which compared the production of selected English language in the oral/aural (OA) and total communication (TC) populations. The authors administered the Grammatical Analysis of Elicited Language-Simple Sentence Level (GAEL-S) which examined the oral, manual, and combined productions of 159 TC and 168 OA children ages 5 years, 0 months to 8 years, 11 months. Geers et al. reached the following conclusions: (a) most of the children in TC programs did not simultaneously talk and sign; the signed productions were superior to their spoken productions; (b) the overall combined signed and spoken productions of TC children did not differ

significantly from spoken productions of OA children; (c) the spoken productions of OA children exceeded the TC children in 80% of the grammatical categories examined; and (d) profoundly hearing impaired children from both OA and TC groups do not acquire language at a rate comparable to their normally hearing peers. This study further determined that hearing impaired children, ages 5 to 9 years, from both the OA and TC programs did not reach the level of normally hearing 4 year old children. The study also concluded that manually coded English did not enhance the development of spoken English and the children did not learn simple sentence structures sooner than the OA population.

In contradiction of the Geers et al. (1984) study, Gardner and Zorfass (1983) found that signing enhanced the hearing impaired child's speech and language development. These authors examined the language acquisition of one prelingually hearing impaired child who had a bilateral severe-to-profound sensorineural hearing loss. The child was reportedly diagnosed with the hearing loss at 12 months of age and was in a TC program from 13 months to 3 years of age. The subject in this study began using signs at 14 months and had a signing vocabulary of 50 words at 23 months. The authors suggested these words were comparable to the first 50 words of hearing children. By age 34 months, the subject reportedly comprehended and expressed negatives, prepositions, pronouns and questions. Gardner

and Zorfass (1983) further indicated the subject's oral speech developed at a slower rate. He had no oral vocabulary at 17 months. The subject began imitating oral expressions at 20 months and it "was not until he was 22 months of age (8 months after he began to sign)" that voicing appeared simultaneously with sign (p. 22). The authors stated that by 30 months, signs were rarely used and communication was primarily oral. Gardner and Zorfass (1983) concluded in their study that signing enhanced residual hearing by providing meaning to the incoming sound. The authors stated that signing facilitated language development which in turn enhanced the OA capabilities of their subject. The authors further concluded that "an early total communication environment with strong signing and speech input fosters the development of an oral child" (p. 23).

In order to understand the expressive acquisition of language, specifically prepositions, in the hearing impaired population, normal acquisition of prepositions must be examined. Normal language development provides the base of reference against which to evaluate the communicative functioning of children (Rees, 1980).

NORMAL ACQUISITION OF PREPOSITIONS

Language is composed of content words and function words. Content words have been defined as concrete referents such as nouns, verbs, adverbs, and adjectives which

carry the thought and meaning of the sentence (Brannon, 1968). Function words form the skeletal framework of the sentence and account for over one half of the spoken utterances (Brannon, 1968). Prominent among function words are prepositions. Prepositions serve as one of the primary means of expressing relations in English (Washington & Naremore, 1978). Prepositions such as "in," "on," "between," "above," and "below" are relational in that they represent an arrangement in which one object appears in a particular spatial relation to another (Bloom & Lahey, 1978). As a part of their relational function, prepositions may also denote position, direction, manner, and time (Wiig & Semel, 1976). Because prepositions are generally concerned with the relationship between referents rather than with the referents themselves, considerable potential for ambiguity and confusion in these terms exist (Cox & Richardson, 1985).

Washington and Naremore (1978) have explained the importance of prepositions:

These words are important in functional syntax and relate meaning as well, especially meanings associated with the concepts of place and time. Because prepositions represent a chief means of expressing such concepts, an establishment of the ages at which children are able to use these terms is important for understanding children's development of both linguistic and cognitive skills. (p. 153)

Brown (1973), in his study of normal language development, found the prepositions "in" and "on" to be the first prepositions learned. Locative prepositions have been

defined by Wiig and Semel (1976) as "prepositions used to denote a geographical or physical location, such as persons, objects, or events" (p. 326). Directional prepositions are defined as "prepositions noting a change in direction or condition" (p. 51).

Menyuk (1971) indicated that pre-school children tend to omit prepositions since function words are weakly stressed in conversation and therefore are not as easily recognized as content words (Brown & Bellugi, 1964). Menyuk (1971) further reported kindergarten age children substitute prepositions as a result of overgeneralization, while first grade children use prepositions redundantly.

THE USE OF PREPOSITIONS IN THE HEARING IMPAIRED POPULATION

The absence of normal auditory acuity during language acquisition affects the ability of the hearing impaired child to acquire function words, such as prepositions (Myklebust, 1964; Shokes, Cohen, & Brumfield, 1978). The literature has indicated that, although function words are the most frequently occurring words in the English language, hearing impaired children tend to omit them from their language while using a higher proportion of nouns (Brannon, 1968; Collins-Ahlgren, 1975; Moores, 1978; Myklebust, 1964; Tate, 1980). Function words may be omitted from the hearing impaired population's language as they do not have concrete

referents (MacGinitie, 1964; Myklebust, 1964). Hart and Rosenstein (1964) indicated that hearing impaired children using the OA approach perceived only the content words in an utterance while misunderstanding the function words, which included prepositions. The authors further suggested that sign languages omitted many of the function words which affected the acquisition of structural meanings in the hearing impaired child.

Tate (1980) examined a group of 28 hearing impaired children 6 to 15 years of age with moderate hearing losses. These subjects were trained in the OA method of communication. The author found that, as with normal hearing children, the hearing impaired subjects in her study used a "high proportion of nouns" at a younger age and tended to omit other parts of speech, such as prepositions, adverbs, articles, verbs, conjunctions, and adjectives (p. 198). Tate (1980) found that by 8 years of age the subjects began to produce proportionally more function words in relation to content words, which follows normal developmental trends of hearing children.

Warlick (1983), in her study of 35 severely-to-profoundly hearing impaired children using the OA approach to communication, found that these subjects were significantly delayed in the acquisition of directional and locative prepositions as compared to normal hearing children.

Collins-Ahlgren (1975) examined the expressive vocabulary of two profoundly hearing impaired children using TC. She reported they had acquired the locative prepositions "in" and "on" by 32 to 33 months of age, which is 2 months behind the normal acquisition of these prepositions.

Griswold and Commings (1974) compiled a list of vocabulary used by 19 pre-school profoundly hearing impaired children in a TC program. The children's ages ranged from 1 year, 9 months, to 4 years, 6½ months, with an average age of 3 years, 5 months. In their completed sample, the prepositions used most were "on" (58%) followed by "in" (47%), "off" (37%), "under" (37%), "out" (32%), and "with" (26%), respectively. The authors determined that these are the prepositions the hearing child discriminates and expresses first, indicating a delay was not present.

In summary, prepositions are an important aspect of the hearing impaired children's language as they integrate the cognitive functions of semantic and syntactic relations. Examining the acquisition of prepositions as used by the TC population and comparing those results with OA population may aid in determining which communication system better facilitates language acquisition in the hearing impaired population.

CHAPTER III

METHODS

SUBJECTS

The methods used in the present study are a replication of the Warlick (1983) study with the exception that the subjects used TC rather than the OA approach. This procedure was utilized to allow for a comparison of data.

Fifty-four severely-to-profoundly hearing impaired children from TC programs using SEE II) in Los Angeles and Ventura, California participated in this study. The subjects ranged in age from 4 years, 0 months to 12 years, 6 months. Six subjects meeting specific criteria were evaluated in each age group.

With the exception of the mode of communication, all subjects met the following criteria as specified in the 1983 Warlick study: congenital or prelingual deafness prior to age 2; hearing impairment in the severe-to-profound range with an average unaided loss of 70 dBHL or greater in the better ear for thresholds of 500, 1000, and 2000 Hz; no multihandicapping conditions of cerebral palsy, blindness, or mental retardation; and parent or guardian permission to participate in the study.

SCREENING PROCEDURES

Supervisors and teachers involved in educational settings in Los Angeles and Ventura, California which incorporated the TC approach, specifically SEE II, approved a parent questionnaire and consent form which included a request for case history information concerning the age of onset of the hearing impairment and the age the subject received amplification. A description of the study was included in the parent questionnaire (see Appendix A). The teachers in the hearing impaired educational settings determined which students were without multiple handicapping conditions according to information obtained by the case history information and standardized evaluations on file. The forms to be signed by the parents or guardians were sent home with the children meeting criteria. Those children returning the signed consent form were used in the study.

Aided and unaided audiological screenings were administered at 500, 1000, and 2000 Hz to determine the threshold level in each hearing situation.

INSTRUMENTS

Common objects were used to elicit nine locative and eight directional single word prepositions. Test items were those adapted by Warlick (1983) from the Vocabulary

Comprehension Scale (Bangs, 1975) and the Expressive Preposition Test (Hustead, 1974) (see Appendix B).

The examiner placed objects in a designated position (e.g., "behind the garage") and using TC, a combination of oral and SEE II signed command, asked the subject to expressively identify the location or direction of the object through the use of TC while incorporating SEE II, their normal expressive mode. Materials to elicit expressive use of prepositions were identical to those used in the Warlick (1983) study and were as follows: toy vehicles (car, airplane), a toy dog and a man, a play garage, steps, and a ladder. The objects were placed in logical positions as specified by Warlick (e.g., "car in the garage"). Responses were scored as being correct only if the target preposition was used.

RELIABILITY

Four hearing impaired subjects, using the TC method, specifically SEE II, participated in a pilot study to determine test reliability. The subjects met the criteria for hearing impairment, lack of multiple handicapping conditions, and parent permission to participate.

The examiner administered the expressive preposition assessment and recorded responses, videotaping each session. Inter-judge reliability was established by comparing examiner judgments with two interpreters familiar with SEE II

and TC used by the hearing impaired population. Procedures to establish intra-judge reliability were identical to those specified in the Warlick study (see Appendix C). Inter-judge reliability was established at $+ .90$. The examiner and judges evaluated 25% of each subject's responses which were presented randomly from the videotapes 1 week after initial presentation. Following a training period, intra-judge reliability for test-retest was established at 100%.

PROCEDURES

The assessment occurred in a quiet, familiar room in the subject's own school. Eye contact was established during conversation in order to form a rapport between the subject and examiner. The hearing aid batteries were checked with a voltage meter before the assessment began. Batteries were available for replacement if necessary.

Using SEE II in conjunction with TC while sitting at a table across from the subject, the examiner named each object used in the test. The examiner then gave the following instructions: "I want you to tell me where the toy is; for example, the man is on the car."

The subject was given one trial to complete each of the 17 test items with the scoring recorded as "correct" or "incorrect." If a target preposition was not used by the subject, the examiner scored the answer as incorrect.

Responses synonymous to the preposition were considered incorrect and written down for further evaluation.

ANALYSIS OF THE DATA

The procedures for analyzing the data were similar to the 1983 Warlick study. For statistical analysis, the subjects were placed in four collapsed age groups: Group 1 (18 subjects), ages 4 to 6 years; Group 2 (12 subjects), ages 7 to 8 years; Group 3 (12 subjects), ages 9 to 10 years; and Group 4 (12 subjects), ages 11 to 12 years, 6 months. The percentages of subjects at each age level which correctly expressed each preposition was determined and results were compared with Warlick's OA population. An intra-group analysis and an inter-group analysis of the subjects' responses to locative and directional preposition test items were made by a trend analysis of variance (ANOVA). Additionally, two t tests, a lenient Least Significance Difference (LSD), and a rigorous Scheffé Procedure were computed for all pairs of means.

CHAPTER IV

RESULTS

The purpose of this study was to conduct a comparative analysis between hearing impaired children using two different modes of communication. The question this researcher sought to answer was: Do 54 severely-to-profoundly hearing impaired children using TC differ in the expressive acquisition of 17 locative and directional single word prepositions from a similar group of 35 children using OA communication?

The subjects were 54 hearing impaired children divided into four different age groups: Group 1, 4 to 6 years; Group 2, 7 to 8 years; Group 3, 9 to 10 years; and Group 4, 11 to 12 years. As seen in Table I, an ANOVA indicated a significant linear trend in the data with respect to age, indicating the data are on a slightly curved developmental line. This developmental line indicates that the older subjects expressed more prepositions than the younger subjects. The comparisons among the four age groups of the 17 total locative and directional preposition scores were significant beyond the .001 level ($p < .0001$) with an F ratio of 18.195. This compared to the Warlick study which indicated a linear trend with a significant level beyond

TABLE I
A COMPARISON OF ANOVAS OF THE SEVENTEEN PREPOSITIONS
BY COLLAPSED AGE GROUPS IN TWO STUDIES:
EDWARDS AND WARLICK^a

	D.F.	SS	MS	F	p
Between groups					
Edwards	3	228.8148	76.2716	7.017	.0005*
Warlick	3	188.8698	62.9566	8.819	.0002*
Linear term (weighted)					
Edwards	1	197.7840	197.7840	18.195	.0001*
Warlick	1	183.9227	183.9227	25.764	<.0001*
Deviation from linear					
Edwards	2	31.0309	15.5154	1.427	.2495**
Warlick	2	4.9471	2.4736	.346	.7099**
Quadratic term					
Edwards	1	29.9461	29.9461	2.755	.1032**
Warlick	1	1.4430	1.4430	.202	.6561**
Deviation from quadratic					
Edwards	1	1.0847	1.0847	.010	.7534**
Warlick	1	3.5041	3.5041	.491	.4888**
Within groups					
Edwards	50	543.5000	10.8700	---	---
Warlick	31	221.3016	7.1388	---	---
Total					
Edwards	53	770.3148	---	---	---
Warlick	34	410.1714	---	---	---

Note: Warlick figures from Warlick (1983, p. 26).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

*Significant ($p < .05$).

**Not significant.

.001 ($p < .001$) with an F ratio of 25.764. In both studies, the quadratic term was not significant (see Table I).

As with the Warlick study, subject performance on the test as a whole improved with increased age (see Figure 1). The lowest total preposition score out of a possible 17 points was 0 and the highest score was 15 (88%). The mean score for the 54 subjects was 8.65 or 54%. Warlick reported that the 35 subjects in her study had a low total preposition score of 1 (6%), a high score of 14 (82%) and a mean score of 9.23 or 54%.

The data were further examined for ranges, means and standard deviations (Table II and Figure 2). The overall 54 subjects had a range of 0 to 15, a mean of 8.65 and a standard deviation of 3.74. In comparison, Warlick's 35 subjects yielded a range of 1 to 14 with a mean of 9.23 and a standard deviation of 3.47. In the present study the means of the four groups were as follows: Group 1 (5.83), Group 2 (9.16), Group 3 (10.33) and Group 4 (10.67). Warlick's means of the OA subjects also increased with age: Group 1 (5.78), Group 2 (8.86), Group 3 (10.00) and Group 4 (12.11).

Two t tests, the lenient LSD and the rigorous Scheffé, were computed to determine the level of significance for all pairs of means in each of the four age groups. For the total scores of the locative and directional prepositions, the LSD found comparisons between Group 1 and Groups 2, 3,

Figure 1. A comparison of ranges and means of seventeen locative and directional prepositions in two studies: Edwards (fifty-four children ranging in age from four to twelve years) and Warlick (thirty-five children ranging in age from four to twelve years). Warlick figures from Warlick (1983, p. 25).

TABLE II

A COMPARISON OF RANGES, MEANS AND STANDARD DEVIATIONS
OF SEVENTEEN LOCATIVE AND DIRECTIONAL PREPOSITIONS
IN TWO STUDIES: EDWARDS AND WARLICK^a

Combined Age Groups	N	Range	Mean	Standard Deviation
1 (4,5,6)				
Edwards	18	0-12	5.83	3.29
Warlick	9	1-10	5.78	3.23
2 (7,8)				
Edwards	12	4-14	9.17	3.36
Warlick	7	4-14	8.86	2.97
3 (9,10)				
Edwards	12	4-15	10.33	3.61
Warlick	10	8-14	10.00	2.11
4 (11,12)				
Edwards	12	7-14	10.67	1.89
Warlick	9	7-14	12.11	2.37
Total				
Edwards	54	0-15	8.65	3.74
Warlick	35	1-14	9.23	3.47

Note: Warlick figures from Warlick (1983, p. 27).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

Figure 2. A comparison of ranges and means of seventeen locative and directional prepositions in the four collapsed age groups of two studies: Edwards (fifty-four children ranging in age from four to twelve years) and Warlick (thirty-five children ranging in age from four to twelve years). Warlick figures from Warlick (1983, p. 28).

and 4 at the significant .05 level. Warlick reported comparisons at the .05 level between the same groups as well as a significant comparison (.05) between Groups 2 and 4.

The Scheffé Procedure indicated significant differences at the .05 level between Group 1 and 3 and between Group 1 and 4. These significances between groups were the same as reported by Warlick.

LOCATIVE PREPOSITIONS

An ANOVA for locative prepositions indicated that as with the Warlick study there was a significant linear trend in the data with respect to increase in age. The comparisons between the four age groups for locative prepositions were highly significant ($F [1,53] = 21.607, p < .0003$). Warlick's four age groups were also significant at ($F [1,34] = 30.316, p < .0001$). These results indicate that the significances of difference are slightly more pronounced in Warlick's study than the present study (see Table III).

The lenient LSD and the rigorous Scheffé t tests were computed for the locative prepositions across the four age groups in order to compare results with the Warlick study. The LSD found comparisons between Group 1 and Groups 2, 3, and 4 to be significant at the .05 level. Warlick reported the same comparisons at the .05 level as well as a comparison between Group 2 and 4. The Scheffé Procedure found comparisons between Group 1 and Groups 2, 3 and 4 at the .05

TABLE III
A COMPARISON OF ANOVAS OF NINE LOCATIVE PREPOSITIONS
BY COLLAPSED AGE GROUPS IN TWO STUDIES:
EDWARDS AND WARLICK^a

	D.F.	SS	MS	F	p
Between groups					
Edwards	3	91.3889	30.4630	7.669	.0003*
Warlick	3	96.9349	32.3116	10.461	.0001*
Linear term (weighted)					
Edwards	1	80.0222	80.2222	20.195	.0000*
Warlick	1	93.6371	93.6371	30.316	.0001*
Deviation from linear					
Edwards	2	11.1667	5.5833	1.405	.2547**
Warlick	2	3.2978	1.6498	.534	.5916**
Quadratic term					
Edwards	1	8.8597	8.8597	2.230	.1416**
Warlick	1	2.4820	2.4820	.804	.3769**
Deviation from quadratic					
Edwards	1	2.3070	2.3070	.580	.4496**
Warlick	1	.8158	.8158	.264	.6109**
Within groups					
Edwards	50	198.6111	3.9722	---	---
Warlick	31	95.7508	---	---	---
Total					
Edwards	53	290.0000	---	---	---
Warlick	34	192.6857	---	---	---

Note: Warlick figures from Warlick (1983, p. 30).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

*Significant ($p < .05$).

**Not significant.

level. Warlick's subjects had comparisons between Group 1 and Groups 3 and 4.

The total scores for the nine locative prepositions for the 54 children ranged from 0 to 8, with a mean of 4.33 and a standard deviation of 2.34. Warlick's 35 subjects ranged from 0 to 8, obtaining a mean of 4.54 and a standard deviation of 2.38 (see Table IV and Figure 3). The means of the four age groups were as follows: Group 1 (2.55), Group 2 (4.75), Group 3 (5.16), and Group 4 (5.75). Warlick's means also increased with age: Group 1 (2.00), Group 2 (4.29), Group 3 (5.30), and Group 4 (6.44).

DIRECTIONAL PREPOSITIONS

An ANOVA for the eight directional prepositions indicated a significant linear trend with respect to increase in age. The comparisons of the directional prepositions in the four age groups proved to be significant beyond the .01 level ($F [1,53] = 8.407$, $p < .0055$). These results compared with Warlick's four age groups ($F [1,34] = 10.314$, $p < .0031$). These results again indicate that the significance of difference is slightly more pronounced in the Warlick study. Both studies indicate that the significance level for the directional prepositions was lower than that of the locatives. As with the Warlick study, the test for quadratic term was not significant (see Table V). The

TABLE IV

A COMPARISON OF RANGES, MEANS AND STANDARD
DEVIATIONS OF NINE LOCATIVE PREPOSITIONS
IN TWO STUDIES: EDWARDS AND WARLICK^a

Combined Age Groups	N	Range	Mean	Standard Deviation
1 (4,5,6)				
Edwards	18	0-7	2.55	2.01
Warlick	9	0-5	2.00	1.87
2 (7,8)				
Edwards	12	0-8	4.75	2.38
Warlick	7	1-8	4.29	2.29
3 (9,10)				
Edwards	12	1-8	5.16	2.17
Warlick	10	3-8	5.30	1.57
4 (11,12)				
Edwards	12	4-8	5.75	1.22
Warlick	9	4-8	6.44	1.33
Total				
Edwards	54	0-8	4.33	2.34
Warlick	35	0-8	4.54	2.38

Note: Warlick figures from Warlick (1983, p. 31).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

Figure 3. A comparison of ranges and means of nine locative prepositions in the four collapsed age groups of two studies: Edwards (fifty-four children ranging in age from four to twelve years) and Warlick (thirty-five children ranging in age from four to twelve years). Warlick figures from Warlick (1983, p. 31).

scores for the directional prepositions can be represented by a slightly curved developmental line.

The lenient LSD found comparisons between Group 1 and Groups 3 and 4 at the .05 significance level. The rigorous Scheffé indicated that no two groups were significantly different at the .05 level. Because the Scheffé is a more reliable test, its results are probably more accurate. Warlick stated the LSD and Scheffé t tests both found comparisons between Group 1 and Group 4 to be significant at the .05 level with no other group comparisons attaining significance.

The total scores for the eight directional prepositions for the 54 children ranged from 0 to 8 with a mean of 4.31 and a standard deviation of 1.88. In comparison, Warlick's 35 subjects ranged from 1 to 7 with a mean of 4.69 and a standard deviation of 1.35 (see Table VI and Figure 4).

The means of the four age groups from the present study increased with age with the exception of Group 4. The results were as follows: Group 1 (3.28), Group 2 (4.41), Group 3 (5.17) and Group 4 (4.91). These results were comparable to Warlick's subjects: Group 1 (3.78), Group 2 (4.57), Group 3 (4.70) and Group 4 (5.67).

TABLE V
A COMPARISON OF ANOVAS OF THE EIGHT DIRECTIONAL
PREPOSITIONS BY COLLAPSED AGE GROUPS IN TWO
STUDIES: EDWARDS AND WARLICK^a

	D.F.	SS	MS	F	p
Between groups					
Edwards	3	32.5372	10.8457	3.4961	.0221*
Warlick	3	16.1730	5.3910	3.684	.0223**
Linear term (weighted)					
Edwards	1	26.0802	26.0802	8.407	.0055*
Warlick	1	15.0946	15.0946	10.314	.0031*
Deviation from linear					
Edwards	2	6.4568	3.2284	1.041	.3607**
Warlick	2	1.0784	.5392	.368	.6948**
Quadratic term					
Edwards	1	6.2289	6.2289	2.008	.1627**
Warlick	1	.1400	.1400	.096	.7592**
Deviation from quadratic					
Edwards	1	.2279	.2279	.074	.7875**
Warlick	1	.9384	.9384	.641	.4294**
Within groups					
Edwards	50	155.1111	3.1022	---	---
Warlick	31	45.3698	1.4635	---	---
Total					
Edwards	53	187.6481	---	---	---
Warlick	35	61.5429	---	---	---

Note: Warlick figures from Warlick (1983, p. 33).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

*Significant ($p < .05$).

**Not significant.

TABLE VI

A COMPARISON OF RANGES, MEANS AND STANDARD DEVIATIONS
OF EIGHT DIRECTIONAL PREPOSITIONS IN TWO
STUDIES: EDWARDS AND WARLICK^a

Combined Age Groups	N	Range	Mean	Standard Deviation
1 (4,5,6)				
Edwards	18	0-6	3.28	1.78
Warlick	9	1-5	3.78	1.48
2 (7,8)				
Edwards	12	3-7	4.41	1.50
Warlick	7	3-6	4.57	.98
3 (9,10)				
Edwards	12	2-7	5.17	2.00
Warlick	10	4-6	4.70	.95
4 (11,12)				
Edwards	12	2-8	4.91	1.73
Warlick	9	3-7	5.67	1.32
Total				
Edwards	54	0-8	4.31	1.88
Warlick	35	1-7	4.69	1.35

Note: Warlick figures from Warlick (1983, p. 34).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

Figure 4. A comparison of ranges and means of eight directional prepositions in the four collapsed age groups of two studies: Edwards (fifty-four children ranging in age from four to twelve years) and Warlick (thirty-five children ranging in age from four to twelve years). Warlick figures from Warlick (1983, p. 34).

LOCATIVE AND DIRECTIONAL PREPOSITIONS

As with the Warlick study, the 54 subjects' mean scores for both locative and directional prepositions increased with age (Table VII). The nine locative prepositions mean scores increased from 2.00 at 4 years of age to 6.50 at 12 years of age. The eight directional mean scores increased from 2.83 at 4 years to 6.50 at 10 years and reducing to 4.83 at 12 years. In comparison, Warlick's study indicated mean scores for the nine locative prepositions increased from 0.00 at 4 years to 7.50 at 12 years. The eight directional mean scores increased from 2.00 at 4 years to 6.50 at 12 years of age.

Figure 5 indicates the acquisition curve for directional prepositions was steeper than the locatives with the exception of the 12-year-olds, where the percentage of locative prepositions exceeds the directionals. The 54 subjects expressed 13 to 19% more directional prepositions than locatives at ages 4, 5 and 6 years. The difference between the two types narrowed to between 2 and 5% at ages 7, 8 and 9 years. From 9 to 12 years of age, the differences between locative and directional prepositions was between 5 and 16%, with the 16% difference occurring at 12 years of age, where more locative than directional prepositions were produced. In comparison, Warlick stated her subjects expressed 25 to 30% more directional prepositions than locatives at ages 4,

TABLE VII

A COMPARISON OF SUBJECTS AT EACH AGE LEVEL WHO CORRECTLY
EXPRESSED EACH OF THE SEVENTEEN PREPOSITIONS

	Age								
	4	5	6	7	8	9	10	11	12
<u>Edwards--Locative</u>									
	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6
Under	2	5	3	5	5	5	6	5	6
In	2	4	4	4	4	5	6	6	6
On	2	2	4	4	5	3	5	4	6
Behind	1	2	4	5	3	2	3	1	5
In front of	2	3	1	3	3	3	6	5	4
Beside	0	0	0	4	2	1	5	1	4
Between	1	0	0	3	3	4	5	4	6
Above	2	0	0	3	1	0	2	1	2
Below	0	0	1	0	0	0	1	2	0
Subtotal	12	16	17	31	26	23	39	29	39
Mean score	2.00	2.67	2.83	5.17	4.33	3.83	6.50	4.83	6.50
<u>Warlick--Locative</u>									
	N=1	N=2	N=6	N=4	N=3	N=4	N=6	N=7	N=2
Under	0	0	4	4	3	4	6	7	2
In	0	1	4	3	3	4	5	7	2
On	0	0	4	3	1	4	6	6	2
Behind	0	0	4	2	3	3	4	5	2
In front of	0	0	1	2	2	2	2	6	2
Beside	0	0	0	1	1	3	4	5	2
Between	0	0	0	1	0	1	3	5	2
Above	0	0	0	1	0	0	1	2	1
Below	0	0	0	0	0	0	1	0	0
Subtotal	0	1	17	17	13	21	32	43	15
Mean score	0	.50	2.83	4.25	4.33	5.25	5.33	6.14	7.50

TABLE VII

A COMPARISON OF SUBJECTS AT EACH AGE LEVEL WHO CORRECTLY
EXPRESSED EACH OF THE SEVENTEEN PREPOSITIONS
(continued)

	Age								
	4	5	6	7	8	9	10	11	12
<u>Edwards--Directional</u>									
	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6	N=6
Down	3	3	6	6	6	6	6	6	6
Up	4	3	4	5	3	4	6	6	4
Around	3	5	5	5	6	3	6	6	5
Over	3	1	5	5	2	2	6	4	2
Out of	2	5	2	4	5	5	5	6	4
To	1	2	2	3	2	2	5	4	3
Into	0	0	0	0	0	0	0	0	2
Away from	1	0	0	1	0	1	5	1	1
Subtotal	17	19	24	29	24	23	39	33	27
Mean score	2.83	3.17	4.00	4.83	4.00	3.83	6.50	5.50	4.50
<u>Warlick--Directional</u>									
	N=1	N=2	N=6	N=4	N=3	N=4	N=6	N=7	N=2
Down	1	2	6	4	3	4	6	7	2
Up	1	1	6	3	3	4	6	7	2
Around	0	1	4	4	3	4	6	7	2
Over	0	1	6	4	3	2	4	6	2
Out of	0	0	4	2	2	4	5	6	2
To	0	0	1	0	0	0	2	3	2
Into	0	0	0	0	0	0	0	2	0
Away from	0	0	0	1	0	0	0	0	1
Subtotal	2	5	27	18	14	18	29	38	13
Mean score	2.00	2.50	4.50	4.50	4.67	4.50	4.83	5.42	6.50

Note: Warlick figures from Warlick (1983, p. 36).

^aEdwards (54 total communication subjects); Warlick (35 oral/aural subjects).

Figure 5. A comparison of the percentages of locative and directional prepositions correctly expressed in two studies: Edwards (fifty-four TC children ranging in age from four to twelve years) and Warlick (thirty-five OA children ranging in age from four to twelve years). Warlick figures from Warlick (1983, p. 37).

5 and 6 years, 10% at 7 and 8 years and 2% or less from 9 to 12 years of age.

PERCENTAGE OF EXPRESSED PREPOSITIONS

The data were also examined to determine the percentage of correctly expressed prepositions from the group of 54 children and compare these results with the Warlick study.

Figure 6 indicates that the total percentage of correctly expressed locative and directional prepositions in the 54 TC subjects was from 4 to 89%. This range contrasted with the 35 OA subjects which was from 3% to 100% correctly expressed prepositions.

The order of correctly expressed locative and directional prepositions in the TC subjects was as follows:
 "down" (89%), "around" (81%), "under" (78%), "in" (76%),
 "up" (72%), "out of" (70%), "on" (65%), "over" (56%), "in
 front of" (56%), "between" (48%), "behind" (48%), "to"
 (44%), "beside" (31%), "above" (20%) and "away from" (19%),
 "below" (6%) and "into" (4%).

The 35 OA subjects correctly expressed the prepositions in the following sequential order: "down" (100%),
 "up" (94%), "around" (89%), "under" (86%), "in" (83%),
 "over" (80%), "on" (74%), "out of" (71%), "behind" (66%),
 "in front of" (49%), "beside" (46%), "between" (34%), "to"
 (23%), "above" (14%), "into" (6%), "away from" (6%), and
 "below" (3%).

Figure 6. A comparison of the percentages of severely-to-profoundly hearing-impaired subjects correctly expressing each of the seventeen locative and directional prepositions in two studies: Edwards (fifty-four children) and Warlick (thirty-five children). Warlick figures from Warlick (1983, p. 38).

CHAPTER V

DISCUSSION

The present study conducted a comparative analysis between hearing impaired children using two different methods of communication. The question this study sought to answer was: Do 54 severely-to-profoundly hearing impaired children in this study using TC differ in the expressive acquisition of 17 locative and directional prepositions from 35 hearing impaired children in a previous study (Warlick, 1983) using OA communication?

There were no statistically significant differences between the TC group and Warlick's OA group in the expressive acquisition of 17 prepositions. For example, both the TC and OA subjects had more statistical differences between Group 1 and Groups 3 and 4, which indicates that more growth occurred between 7 and 8 years of age. However, Group 1 in both studies acquired less prepositions than the older subjects which follow normal developmental patterns exhibited in hearing children, but at a markedly delayed rate. Furthermore, the mean scores for the collapsed age groups in both hearing impaired populations were very comparable. In correlation with the Warlick study, the acquisition curve

for locative prepositions produced by the TC subjects was steeper than for the directional prepositions. Mean scores for the locative and directional prepositions increased with age in both the TC and OA populations, indicating the hearing impaired subjects followed normal developmental patterns.

There were more variances in the percentage of the 17 prepositions acquired between age groups in the TC subjects than indicated in the OA group. These differences can be attributed to the variance of scores between peers in each group. For example, the 7-year-old TC subjects obtained a mean of 10.00 while the 8- and 9-year-olds had means of 8.33 and 7.67, respectively. The 10-year-old subjects scored the highest on the test, yielding scores from 9 to 15 out of 17 prepositions and a mean of 13.00. The 11- and 12-year-olds' means decreased to 10.33 and 11.00, which was comparable to the 7-year-old group. Although all of the subjects tested in the TC study had severe-to-profound hearing losses, it must be noted that there was a large range of hearing losses within the subjects which may have resulted in variances among peers. For example, five out of the six 9-year-old subjects were evaluated at the House Ear Institute in Los Angeles, California prior to having surgery for the Cochlear Implant Device. Their unaided hearing losses were in the profound range with losses ranging from 100 to 120 dBHL when tested at thresholds of 500, 1000 and 2000 Hz. The

10-year-old subjects were from hearing impaired classrooms in the public schools, and their hearing losses ranged from 70 to 105 dBHL, with two subjects having losses at 70 dBHL, two subjects having losses averaging 105 dBHL and one subject with an average hearing loss of 91 dBHL.

In comparison to the Warlick study, ranges of scores in the TC population were also wider than would be expected in a homogenous group. For example, one 4-year-old subject with an average hearing loss of 80 dBHL expressed seven out of nine locative prepositions and five out of eight directional prepositions, which yielded a total score of 12 out of 17. This subject's total score was equal to the mean obtained by the 10-year-olds. Furthermore, two 9-year-old subjects and one 12-year-old subject yielded a total preposition score of 4, 5 and 7 out of 17 prepositions, respectively, which was equal to the mean of the 4-year-olds.

It appears that there was more variance among the TC subjects than the OA subjects within the same age groups. Warlick reported only two subjects who varied from their peers. One 7-year-old correctly expressed 14 out of 17 prepositions, which was equal to the mean obtained by 10-, 11- and 12-year-old subjects. However, an 11-year-old subject expressed 7 out of 17, equalling the mean of the 6-year-olds. In both studies, the large variances between subjects might indicate the need for larger samples in each age group in addition to more specific hearing impaired

groups, such as severe or profound, to compensate for inter-subject variability.

COMPARING THE EXPRESSIVE ACQUISITION OF INDIVIDUAL PREPOSITIONS

For purposes of the present comparative study, a preposition was considered acquired when correctly expressed by 80% of the subjects in an age group. Warlick's data were examined and interpreted in the same manner for comparative purposes. The following exceptions were made: Warlick (1983) stated that since her study had only one 4-year-old, the directional prepositions "down" and "up" were not considered acquired until 6 years of age; the directional preposition "away from" was not considered acquired by the 10-year-old TC subjects, as only 16% of the 11- and 12-year-olds (one out of six subjects) produced this target preposition (see Figure 7).

The TC and OA subjects demonstrated a similar trend in the expressive acquisition of 12 out of the 17 individual prepositions. Two prepositions, the directional "down" and the locative "over," were acquired by 6 years of age in both studies. Furthermore, the directional prepositions "into" and "away from," in addition to the two locative prepositions "above" and "below," were never acquired by either the TC or OA subjects. One directional preposition ("up") and five locative prepositions ("behind," "in," "on," "in front

Figure 7. A comparison of the age of acquisition of seventeen locative and directional prepositions with 80% accuracy in two studies: Edwards and (fifty-four severely-to-profoundly hearing impaired TC subjects) and Warlick (thirty-five severely-to-profoundly hearing impaired OA subjects). Warlick data from Warlick (1983).

of," "beside") were acquired at approximately the same age by both groups, although the TC group was slightly advanced over the OA group in four of the six prepositions. Of the remaining prepositions, two locatives ("under" and "between") and two directionals ("around" and "to"), were acquired by the TC group 2 years sooner than the OA group, while one directional preposition ("out of") was acquired 4 years earlier by the OA group than the TC group.

Although there appear to be differences in the acquisition of prepositions within the two hearing impaired groups, it must be noted that the percentages are similar at each age level. This acquisition difference between TC and OA may be a result of the small N in each study or differences among subjects in both groups as to degree of hearing loss.

In summary, Warlick's 35 OA subjects acquired the expressive locative and directional prepositions with 80% accuracy for 13 of the 17 prepositions: "down," "up," "over," "under," "around," "in," "behind," "on," "out of," "in front of," "beside," "between" and "to." In contrast, the 54 TC subjects exhibited the following expressive acquisition of prepositions with 80% accuracy: "around," "under," "out of," "down," "over," "behind," "up," "on," "in," "in front of," "beside," "between," and "to." The following prepositions were not acquired by 12 years of age by either the TC or OA subjects: "away from," "above,"

"below," and "into." It should be noted that 83% of the 10-year-old TC subjects correctly produced "away from."

CLASSIFICATION OF ERRORS

Warlick (1983) indicated three error types were produced by the 35 OA subjects. She classified these as being omissions, substitutions and intelligibility type errors. Errors of omission and substitution were exhibited by the 54 TC subjects; there were no intelligibility errors, as any oral inaccuracies were clarified by signing. Warlick reported that 5 of the 35 OA subjects produced unintelligible responses. She stated that "there was a decrease in unintelligible items with increase in age; there were twelve unintelligible responses made in Group 1, eight in Group 2, six in Group 3 and zero in Group 4" (p. 40).

Omissions

In correlation with the Warlick study, omission errors were identified at all age levels and for both the directional and locative prepositions. Brannon (1968) suggested that hearing impaired children tend to omit prepositions from their language while using a higher proportion of nouns which follow normal developmental patterns. Prepositions, which are function words, may be omitted from the hearing impaired language as they do not have concrete references (MacGinitie, 1964; Myklebust, 1964).

Warlick (1983) reported that the 35 OA subjects did not exhibit more omission errors than other error types. This was also found in the present study of 54 TC subjects. In both studies, subjects produced significantly more substitution type errors.

Substitutions

The hearing impaired subjects using TC exhibited the same substitution errors as the OA subjects; they were: synonymous, antonymous, superordinate ("by") for subordinate ("in front of") and random substitutions which did not fit into other categories.

The same sign was often used interchangeably among the TC subjects for the locative preposition "above" and the directional preposition "over." Warlick referred to this phenomenon as a "synonymous substitution" and scored it as incorrect. However, since the literature has indicated many signs have more than one meaning and using the sign "over" for "above" synonymously is not incorrect, it was determined that if the correct voiced production was used in correlation to the target preposition, the signed production of "over"/"above" was acceptable and scored correctly (Fant, 1983; Riekehoff, 1978). Twenty-six percent of the 54 subjects produced the sign "above" and vocalized "over" for the preposition "above" (unacceptable response), while 43% of the subjects produced the sign "above" in conjunction

with the correct verbal production of "over" (acceptable response). Twenty percent of the subjects spoke and signed "above" simultaneously (acceptable response), and 50% either omitted or substituted the target preposition "above" with a random substitution (unacceptable response).

Examples of other synonymous substitutions in both studies included "by"/"beside," "in back of"/"behind," "in" or "inside"/"into," "under"/"below" and "middle"/"between." These errors produced could be a generalization of the correct target preposition. As Warlick (1983) indicated, these substitutions were appropriate in the context provided; therefore, the subjects in both studies demonstrated the ability to express the concept being tested even when the specific preposition was not used. This use of synonymous prepositions by both groups of hearing impaired subjects indicates a less flexible and limited use of language when compared to normal hearing children (Cooper & Rosenstein, 1966; Walter, 1978). Warlick reported that 86% of the 35 OA subjects substituted "under"/"below," even though the contrasting preposition "above" was administered in the stimulus. In contrast, 18 of the 54 TC subjects, or 33%, substituted "under" for "below." In relation to this type of error in both groups was the production of "on" for "above." Clark (1973) proposed that in normal language, the lexical item is composed of semantic features. Together

these features determine the meaning of a word and differentiate it from words that are related but not equal in meaning. For example, Clark (1973) stated these prepositions include the following set of common features: locative terms, vertical dimension and height. Two terms not equal in meaning must have at least one feature that differentiates the two prepositions (Clark, 1973). In the case of "above" and "on," as well as "under" and "below," the contact with the surface of an object is the differentiating feature. The hearing impaired subjects in both the Warlick study and the present study followed this normal pattern of development.

The literature further indicates these examples demonstrate the children's attempts to express meaning for which they had not yet acquired the appropriate lexical item (Odom, Blanton, & Nunnally, 1967). Menyuk (1971) also described this phenomenon in reference to the development of expressive prepositions in normal children. Another type of substitution error reported by Warlick was the production of "beside" or "by" for the locative "in front of." This substitution error is an instance where a superordinate concept, "by," was substituted for the subordinate concept "in front of" (Ivimey & Lachterman, 1980). The authors explain that the superordinate concept "by" or "near" is an overgeneralization of the more specific semantic term "in

front of." Only 2 of the 54 TC subjects produced this error.

Warlick stated that the hearing impaired subjects in her study exhibited "phonemically similar" substitution errors. She explained that these types of errors included the substitution of "in" for "on" and "behind" for "beside" and "between." Furthermore, she stated that subjects were making a generalized error of the acquired preposition "behind" or confusing the prepositions. These same types of errors occurred in the TC population. Because the signs for these prepositions are different and should give visual clarity to the meaning of the words, it does not appear that these errors are due to their phonemic similarity. Rather, it would seem that in both groups of hearing impaired subjects that it is a phenomenon of overgeneralization and can again be attributed to the overall restricted semantic system of all deaf children, regardless of the type of communication system used.

In the instance of "in"/"on," Messick (1988) explains that differences between a normal hearing child and the appropriate adult use occur when there is a mismatch or absence of critical semantic features. Messick (1988) further suggests that children tend to use hypothesis testing and overgeneralizations which causes them to use a term correctly in some situations and incorrectly in others. Therefore, a container such as a box may have been a better

stimulus item than a garage in order to elicit the expressive response "in" and "on" in the present study.

Antonym substitution errors were not as prevalent as substitution errors in both studies. Warlick reported that 18 out of the 35 subjects (51%) did not produce "in front of." Of those 18 subjects, 4 (22%) produced the antonym "in back of"/"in front of." Of the 54 TC subjects, 24 (44%) did not produce "in front of" correctly, and of those subjects 11 (46%) produced "in back of"/"in front of." In both studies, the correct production of "in front of" increased with age.

Normal hearing children learn these prepositions ("in front of" and "in back of") in several different stages (Johnston, 1984; Johnston & Slobin, 1979). Initially, children refer to these terms in relation to their own anatomical front and back (Kuczaj & Maratsos, 1975). The next stage of expressing these prepositions is to describe objects that have defined fronts and backs, such as a car, doll or television set (Johnston, 1984; Johnston & Slobin, 1979). The third stage of development in expressing "front" and "back" occurs in context without the intrinsic features (Johnston, 1984; Johnston & Slobin, 1979). The stimulus item used in the present study of hearing impaired children was a car; therefore, it would appear that these hearing impaired children were at the first stage when compared to normally hearing impaired children.

Other examples of antonym substitutions expressed by the TC group were as follows: "above"/"below" (five subjects), "over"/"below" (five subjects), "in"/"out" (one subject), "down"/"up" (one subject) and "out"/"in" (one subject). Again, it would appear that the relational aspect of the objects as well as the action performed affected the response given.

Finally, the 54 TC subjects and the 35 OA subjects produced similar substitution errors which could not be categorized. Warlick (1983) stated that these irrelevant responses may be a result of attending to the visual stimulus without consideration of the auditory stimulus provided by the examiner. Both groups of subjects may have responded with the concrete description of "what the object was doing," rather than attempting to express "where the object was located" (Warlick, 1983, p. 51). Some examples of the irrelevant response types used by both subjects were "dog look car/between," "going home/away from," and "walk car" and "he drive the car/to."

Warlick (1983) reported that speech intelligibility errors were a factor which may have negatively affected the performance of hearing impaired subjects in her sample. Because TC was used in the present study, speech intelligibility type errors were clarified by the signs that were examined thoroughly through the use of videotape.

In summary, subjects in both the TC and OA groups produced a variety of substitutions for targeted prepositions. These included: a) synonymous substitutions; b) opposite substitution errors; c) superordinate concept substitutions; and d) off-target substitutions which could not be classified. As Schirmer (1985) found in her study of 20 severely-to-profoundly hearing impaired preschoolers, many of the hearing impaired children from both Warlick's and the present study were developing a rule system consistent with patterns of normal language acquisition.

The age levels at which specific locative and directional prepositions were acquired in both the 54 TC and 35 OA subjects have been discussed as well as a comparison of error types. Furthermore, these data can be compared with the expression of the same prepositions in normally hearing subjects.

COMPARISONS TO NORMALLY HEARING CHILDREN

In addition to comparing the expressive acquisition of prepositions between two modes of communication used by the hearing impaired, specifically TC and OA, it is important to compare results with normally hearing subjects. A study by Washington and Naremore (1978) evaluated 80 normally hearing children, ranging in age from 3 years to 4 years, 11 months. The authors considered the prepositions as acquired if they were produced with 70% accuracy. The following locative

prepositions were acquired by 3 years, 5 months: "in," "on," and "under." By 3 years, 11 months, the locative preposition "behind" was produced, and by 4 years, 6 months the locative "beside" and the directional "around" were acquired. The locative preposition "between" was produced by 4 years, 11 months.

In comparison, Hustead (1974) tested 36 normally hearing subjects from 4 to 9 years of age in the acquisition of six locative ("in," "on," "behind," "under," "between," "beside") and four directional ("up," "out of," "around," "to") prepositions. The subjects in her study progressed from expressing 72% of the six locative prepositions at 4 years to 92% at 9 years of age. In contrast, the 54 TC subjects in this study and the 35 OA subjects from Warlick's (1983) study produced significantly reduced percentages on these same six prepositions (22% to 92% and 0% to approximately 98%, respectively) in hearing impaired children ages 4 to 12 years (see Figure 8).

Hustead (1974) reported the four directional prepositions ("up," "around," "out of," "to") were produced by the normally hearing subjects with 100% accuracy from 4 to 9 years of age, except for 96% at 5 years. In contrast, the TC hearing impaired subjects and the OA subjects again produced significantly reduced percentages on these four directionals (42 to 92% and approximately 25 to 85%, respectively) in subjects 4 to 12 years of age (see Figure 9).

Key: O—O Normally hearing subjects
 — TC hearing impaired subjects
 --- OA hearing impaired subjects

Figure 8. A comparison of the percent of six locative prepositions correctly expressed in three studies: Edwards (fifty-four severely-to-profoundly hearing impaired TC subjects ages four to twelve years), Warlick (thirty-five severely-to-profoundly hearing impaired OA subjects ages four to twelve years) and Hustead (thirty-six normally hearing subjects ages four to nine years). Warlick data from Warlick (1983, p. 45); Hustead data from Hustead (1974, p. 26).

Key: 0—0 Normally hearing subjects
 — TC hearing impaired subjects
 --- OA hearing impaired subjects

Figure 9. A comparison of the percent of four directional prepositions correctly expressed in three studies: Edwards (fifty-four severely-to-profoundly hearing impaired TC subjects ages four to twelve years), Warlick (thirty-five severely-to-profoundly hearing impaired OA subjects ages four to twelve years) and Hustead (thirty-six normally hearing subjects ages four to nine years). Note: In Warlick's original Figure 9, results of the four directional prepositions for the 12-year-olds was omitted; results here were derived from Warlick's Table 7. Warlick data from Warlick (1983, p. 46); Hustead data from Hustead (1974, p. 26).

Heckle (1975) evaluated 60 normally hearing children, ages 1 year, 6 months to 3 years, 6 months in the acquisition of the following prepositions: four locatives ("in," "on," "under," "behind") and four directionals ("up," "out of," "around," "to"). The sequence of prepositions in his study was as follows: "up" (2 years, 6 months) and "in" and "on" (3 years, 6 months). The subjects in his study produced the following prepositions with 50% accuracy: "under," "out of," "around," and "to" by 3 years, 6 months and "behind" was never produced.

Although the N and the age groups differed in the three studies of normal hearing children, a similar developmental pattern existed (Heckle, 1975; Hustead, 1974; Washington & Naremore, 1978). In all three studies, "in" and "on" were among the first prepositions acquired (ranging from 3 years, 5 months to 4 years). Washington and Naremore (1978) and Hustead (1974) reported that "under" occurred sequentially after "in" and "on." The hearing impaired subjects in both the TC and OA groups demonstrated delayed acquisition when compared to normals on all of the prepositions in common. For example, the TC and OA hearing impaired subjects did not produce "in" until 8 and 9 years, respectively, and "on" with 80% accuracy until 8 years of age. However, "around" and "under" were produced with 80% accuracy by the TC hearing impaired subjects at 5 years of age and the OA subjects at 7 years. Therefore, it is

apparent that the sequence of acquisition between the normals and hearing impaired subjects from both TC and OA varied.

In summary, when comparing the expression of locative and directional prepositions to that of normally hearing children, the 54 TC subjects and 35 OA subjects exhibited delayed acquisition (from 1 to 8 years on some prepositions) which decreased with age. Furthermore, the order of acquisition was similar between the TC and OA hearing impaired subjects, while it varied from the hearing groups.

CHAPTER VI

SUMMARY AND IMPLICATIONS

SUMMARY

Prepositions are not only important in functional syntax; they also relate meanings associated with the concepts of place and time (Washington & Naremore, 1978). Furthermore, prepositions are critical in such everyday activities as producing and comprehending directions, using maps and diagrams, and in the fields of mathematics and music (Cox & Richardson, 1985). Inefficient use or misuse of prepositional spatial terms may hinder a child's progress in many areas. Expressive acquisition of function words, which include prepositions, has been described as significantly delayed in the hearing impaired populations (Cooper & Rosenstein, 1966).

The purpose of this study was to conduct a comparative preposition analysis between hearing impaired children using two different modes of communication. The question this researcher sought to answer was: Do 54 severely-to-profoundly hearing impaired children in this study using TC differ in the expressive acquisition of 17 locative and

directional prepositions from 35 hearing impaired children in a previous study (Warlick, 1983) using OA communication?

The TC subjects were from programs incorporating SEE II. The subjects were between the ages of 4 years, 0 months and 12 years, 6 months and were selected for this study on the basis of chronological age, congenital or prelingual deafness prior to age 2 and lack of multiple handicapping conditions. The 17 prepositions were tested in the same manner as specified by Warlick (1983), except the mode of communication used and elicited was TC instead of OA. The test utilized objects which were placed in a designated position (e.g., "behind the garage"). Responses were scored as correct only if the target preposition was produced.

There were no statistically significant differences between the TC and OA subjects in the expressive acquisition of prepositions. Performance of both groups on the test improved with age, indicating a developmental trend. The mean scores for the locative and directional prepositions also increased with age. In the TC group, younger subjects produced more directional than locative prepositions; this was reversed, however, for the oldest TC subjects. In contrast, the OA subjects produced more directional than locative prepositions at all age levels. Although the means for directional prepositions between the TC and OA groups were similar, the standard deviations were higher in the TC group, which indicates that there was more variance among

the TC group when correctly expressing directional prepositions.

RESEARCH IMPLICATIONS

If further research were to be conducted with hearing impaired children in relation to the expressive acquisition of prepositions, several factors should be considered in research design. First, in order to minimize the effects of an exceptionally high or low functioning subject, this comparative investigation of TC and OA subjects should be repeated with a larger N. Furthermore, the number of subjects in both the TC and OA studies should be identical in order to obtain greater comparative reliability.

A second variable to consider is at what age the subjects entered educational programs. Although the present study required the guardian of the hearing impaired subjects to specify the length of time their child had been enrolled in a TC program, this was not a variable in selection criteria as specified by Warlick (1983); therefore, a comparative analysis was not conducted between the TC and OA subjects. However, as discussed in Chapter 5, the 9-year-old TC subjects expressed considerably fewer prepositions than the 10-year-old subjects. This may have been a result of less exposure to TC, as the average length of time of the 9-year-olds in a TC program was 4 to 5 years whereas the 10-year-old subjects were enrolled for an average of 8 to

9 years. Warlick (1983) stated that the younger subjects in her study may have had an advantage of early educational training over subjects in the upper age range, as several of the OA 7- and 8-year-old subjects performed as well or better than several 9-, 10-, and 11-year-olds.

Thirdly, the age of amplification can negatively or positively affect the hearing impaired subject's performance when expressing prepositions. In the present study of 54 hearing impaired children using TC, one half received amplification between 18 and 30 months of age. Eleven subjects received amplification between 3 and 18 months, and 13 subjects received amplification between 30 and 48 months of age. As Warlick did not specify this factor in her selection criteria, no comparative analysis was made. However, if this comparative study were repeated, the age of amplification should be considered.

Warlick (1983) specified that the subjects have a hearing impairment in the severe-to-profound range, with an average unaided loss of 70 dBHL or greater in the better ear when obtaining thresholds for 500, 1000 and 2000 Hz. Since the present study was a comparative analysis, the same criteria were used. However, if this study were to be repeated, a fourth variable would be to evaluate subjects' having either a severe or a profound hearing loss, as there is a large dBHL variance between each hearing loss. A severe hearing loss of 70 dBHL in the better ear when

obtaining thresholds for 500, 1000 and 2000 Hz results in more residual hearing than a profound hearing loss of 120 dBHL. For example, five out of the six 9-year-old subjects were evaluated at the House Ear Institute in Los Angeles, California prior to having surgery for the Cochlear Implant Device. Their unaided hearing losses were in the profound range, with losses ranging from 100 to 120 dBHL. In contrast, the 10-year-old subjects were from Hearing Impaired Classrooms in the public schools, and their hearing losses ranged from 70 to 105 dBHL. As previously stated, the 10-year-old subjects expressed considerably more prepositions than the 9-year-old subjects.

Further research in the expressive acquisition of prepositions in the hearing impaired population may investigate the following comparison: a) acquisition of locative and directional prepositions according to severity of impairment, comparing mild, moderate, severe and profound hearing impaired children's performance using either TC or OA communication; b) acquisition of prepositions in hearing impaired children of deaf parents in comparison to hearing impaired children of normal hearing parents, both utilizing TC; c) comparing comprehension and production of prepositions among hearing impaired children using TC and comparing those results with OA subjects; d) production of prepositions using various stimuli and contexts (elicited and spontaneous) to determine scope of linguistic performance among

hearing impaired children using either TC or OA communication; e) comparing the production of the prepositions in hearing impaired children older than 12 years, 6 months from both the TC and OA populations to determine if their performance in this area would further improve with increased age and experience with language, and at what age level all of the directional and locative prepositions from the present study are acquired.

CLINICAL IMPLICATIONS

The present study found that there were no statistically significant differences between the TC and OA subjects in the expressive acquisition of prepositions. As compared to normal hearing children, the correct use of prepositions was delayed by as much as 8 years regardless of communication system used by severely-to-profoundly hearing impaired children. These results demonstrate the need for teachers of the hearing impaired to implement lessons and programs to facilitate the acquisition of prepositions.

Messick (1988) has outlined an intervention program for the expressive development of spatial terms. Perhaps hearing impaired children would be more successful in the expressive acquisition of prepositions if teachers of the hearing impaired implemented a standard program based on normal language development, such as the concepts presented by Messick (1988). Before teaching spatial terms, the child

must have the underlying conceptual knowledge required for the acquisition of the target preposition (Messick, 1988). If the child does not have the prerequisite concept of prepositions, it is unlikely the term will be correctly produced (Messick, 1988). The normal hearing and hearing impaired child will learn prepositions more effectively if given a variety of visual and tactile stimuli in different contexts.

In both studies, it was noted that the target preposition was substituted with an incorrect preposition, for example: "above"/"over," "beside"/"between," "in"/"on" and "behind"/"front." Messick (1988) suggested initially choosing a target item that is not being currently used in order to expand the child's vocabulary rather than provide an alternative form of the preposition (such as "over"/"above"). It may be useful to contrast stimuli by using objects that promote the use of both concepts (table with drawer, box with a lid) in order to decrease the possibility of incorrectly using the two terms interchangeably (Messick, 1988).

The developmental order of acquiring prepositions should provide the guidelines for teaching these words to the normal hearing (Messick, 1988). In both the Warlick (1983) and the present study, it was noted that the hearing impaired children evaluated exhibited a different developmental sequence of expressive prepositions than normal

hearing children. Furthermore, the hearing impaired subjects from each study appeared to learn more directional prepositions at a younger age than locatives; however, this gap narrows by 7 to 8 years of age in the OA and TC groups. As previously stated, more locatives were produced by the 54 TC subjects at 12 years of age. Warlick (1983) stated that the hearing impaired child may be more successful in learning directional prepositional concepts at a younger age than locatives. Since the hearing impaired subjects in each study exhibited a similar developmental sequence of expressive prepositions, it is suggested that this sequence be followed by hearing impaired educators in the teaching of prepositions: "around," "under," "down," "up," "over," "behind," "in," "on," "out of," "above," "below," "into" and "away from." The two locative prepositions "above" and "below" and the two directional prepositions "into" and "away from" were never acquired by either group of subjects; therefore, these prepositions need to be implemented into the hearing impaired child's program. In teaching prepositions, communicative relevance to the child may facilitate the acquisition of these terms (Messick, 1988).

Prepositions are important in syntax in addition to semantics and several academic areas. When teaching prepositions to the hearing impaired, it is important to vary sentence structures in order to ensure the child will produce the correct preposition in all contexts and not only in

a structured setting. Messick (1988) stated that varying the stimuli decreases the chance of the child focusing on the referents rather than the relationships among the referents.

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APPENDIX A

PARENT QUESTIONNAIRE AND CONSENT FORM

Dear Parent or Guardian:

I am a speech-language pathologist doing research in Speech and Hearing Sciences in order to complete my master's thesis. This research is being directed by Professor Joan McMahon at the Speech and Hearing Sciences Program at Portland State University. The purpose of the study is to investigate the development of prepositions in the language of hearing impaired children using total communication and compare those results with a similar group of children using the oral/aural method of communication. This study is designed to help educators of the hearing impaired.

Participation in the project would require twenty minutes of your son/daughter's time during which (s)he will take a test on the use of prepositions. The examiner will place objects in various positions and ask, by use of total communication, your child to tell where they are located. The testing will take place at your child's school.

There are no risks involved in this study. Your child's name will not be used in any way in reporting the results. A copy of the study results will be on file with your child's school. You are free to withdraw your child from the study at any time. An audiogram, indicating degree of hearing impairment, will be obtained through the school staff.

If you have any questions, you may reach me during the evenings at (805) 643-9831. Any further questions may be directed to Dr. Victor Dahl, Office of Graduate Studies and Research, Portland State University, P.O. Box 751, Portland, Oregon 97207. If you would like your child to participate in the study, please answer the five questions below. Please sign the form, indicating approval, and return the form to school with your child tomorrow. Thank you for your cooperation.

Sincerely,

Cathleen Pew Edwards
Speech-Language Pathologist

Please answer the following questions regarding your child's hearing impairment:

- 1) Did your child's hearing loss occur before two years of age?

_____ YES _____ NO

- 2) When the formal diagnosis was made, did the professional (audiologist, pediatrician, etc.) indicate that your child's hearing loss occurred before two years of age?

_____ YES _____ NO

- 3) Do you know the cause of your child's hearing impairment?

_____ YES _____ NO

-
- 4) At what age did your child first receive amplification? _____

- 5) How long has your child been enrolled in a total communication program? _____

Please sign below to indicate your permission for your child to participate in this study.

Parent's signature _____ Date _____

Child's signature _____ Date _____

Child's birthdate _____

APPENDIX B

PROCEDURES AND STIMULI USED TO ELICIT THE SEVENTEEN PREPOSITIONS

TABLE VIII

PROCEDURES AND STIMULI USED TO ELICIT THE SEVENTEEN PREPOSITIONS

Procedure	Stimulus	Response	Classification
1. The examiner walks the man up the stairs.	What is the man doing?	Walking <u>up</u> the stairs.	Directional
2. The examiner places the car in the garage prior to beginning test. *leave car in	Where is the car?	<u>In</u> the garage.	Locative
3. The examiner takes the car out of the garage.	What did I do?	You took the car <u>out</u> of the garage.	Directional
4. The examiner places the man on the roof of the garage.	Where is the man?	<u>On</u> the roof.	Locative
5. The examiner walks the man down the ladder.	Where is the man going?	<u>Down</u> the ladder.	Directional
6. The examiner places a car behind the garage.	Where is the car?	<u>Behind</u> the garage.	Locative

TABLE VIII--Continued

Procedure	Stimulus	Response	Classification
7. The examiner points to the garage, then holds the airplane above the garage	Here is the garage. Where is the airplane?	Above the garage.	Locative
8. The examiner pushes the car around the garage.	Where am I pushing the car?	Around the garage.	Directional
9. The examiner makes the dog jump over the fence.	Where did the dog jump?	Over the fence.	Directional
10. The examiner walks the man into the garage.	Where is the man going?	Into the garage.	Directional
11. The examiner places a car beside the garage.	Where is the car?	Beside the garage.	Locative
12. The examiner points to the car, then walks the man to the car.	Here is the car. Where is the man going?	To the car.	Directional
13. The examiner places the dog under the car.	Where is the dog?	Under the car.	Locative

TABLE VIII--Continued

Procedure	Stimulus	Response	Classification
14. The examiner places the dog between two cars.	Where is the dog?	<u>Between</u> the cars.	Locative
15. The examiner places the dog in front of the car.	Where is the dog?	In <u>front</u> of the car.	Locative
16. The examiner walks the man to the car, then away from the car.	The man is going to the car. Now what is he doing?	Going <u>away</u> from the car.	Directional
17. The examiner holds the car above, then below the table.	The car is above the table. Now, where is the car?	<u>Below</u> the table.	Locative

APPENDIX C

INSTRUCTIONS TO JUDGES

You will be viewing and hearing each response two times. If the answer is correct, mark a 1 in the blank corresponding to that test item. If the subject begins to answer incorrectly on the first response and self-corrects, repeating the correct on the second answer, score the answer as "correct." For example:

Examiner: "Where is the car?"

Subject: "Bes...I mean in the garage."

Examiner: "Tell me again."

Subject: "In the garage."

If the answer is incorrect, mark a 0 in the blank corresponding to that test item. Write down the subject's actual answer for future evaluation. If the subject's response is synonymous to the target preposition (e.g., "next to" rather than "beside"), score the item as "incorrect" (0), but write down the subject's actual response for future evaluation.

If you do not understand the response, mark a U in the blank for "unintelligible." If the second response is also unintelligible, score the item as "incorrect."

APPENDIX D

CLASSIFICATION OF RESPONSES FROM FIFTY-FOUR TOTAL
COMMUNICATION SUBJECTS FOR EACH OF THE SEVENTEEN
LOCATIVE AND DIRECTIONAL PREPOSITIONS

TABLE IX

4-Year-Olds

	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	dog--OM	+	fixing the car--OT	+	car--OT	dog--OT
In	NR	+	under--OT	under--OT	garage--OM	car--OT
On	NR	+	up high the roof --OT	+	top--OT	man--OT
Behind	NR	+	over there--OT	by--SYN	in--OT	car--OT
In front of	dog--OM	+	behind--ANT	+	car--OT	dog--OT
Beside	car--OM	next to--SYN	right there--OT	by--SYN	car--OT	NR
Between	dog--OM	+	looking for cars --OT	middle--SYN	car--OT	dog--OT
Above	NR	+	up there--OT	+	no airplane--OT	airplane--OT
Below	car--OT	under--SYN	bottom--OT	above--ANT	table--OT	under--SYN
<u>Directionals</u>						
Down	ladder--OT	+	+	+	NR	NR
Up	+	+	+	+	NR	NR
Around	car--OT	to garage--OT	+	+	+	car--OT
Out of	car--OT	NR	+	+	in--ANT	car--OT
To	NR	+	in the car--SYN	in the car--OT	NR	car--OT
Over	dog--OT	+	+	+	NR	man--OT
Into	man--OT	in--SYN	in--SYN	the garage--OM	man--OT	NR
Away from	car--OT	+	NR	home--OT	walk--OT	NR

TABLE IX--Continued

5-Year-Olds					
	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5
Locatives					
Under	+	+	+	+	car--OT
In	+	garage--OM	+	+	NR
On	up--OT	stand garage--OM	+	in--OT	out--OT
Behind	+	car go finish--OT	+	between--OT	NR
In front of	+	behind--ANT	+	by--SUP	car--OT
Beside	next to--SYN	go--OT	behind--OT	inside--OT	NR
Between	middle--SYN	car--OT	behind--OT	by--OT	car--OT
Above	over--SYN	garage up plane --OT	behind--OT	airplane on up--OT	NR
Below	down--OT	down--OT	above--ANT	she turn the car --OT	NR
Directionals					
Down	+	climb--OT	+	he climb--OM	man--OT
Up	walking--OM	slide--OT	walking--OM	+	+
Around	+	+	+	+	NR
Out of	+	go car--OT	+	+	+
To	in the car--OT	car in out--OT	+	on--OT	car--OT
Over	the fence--OM	jump--OM	behind--OT	jumping--OM	table--OT
Into	in--SYN	in--SYN	in--SYN	on--OT	home--OT
Away from	he's walking--OT	finish drive--OT	back to the house --OT	walking--OT	home--OT

TABLE IX--Continued

6-Year-Olds

	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	over--ANT	crash dog--OT	+	+	hit dog broken--OT	+
In	+	car garage--OM	garage--OM	+	+	+
On	top--OT	+	+	+	in climb--OT	+
Behind	by--OT	+	+	through the house --OT	+	+
In front of	back--ANT	behind--ANT	back--ANT	+	hit--OT	behind--ANT
Beside	by--SYN	to the car--OT	car by--SYN	left the house--OT	around--OT	behind--OT
Between	by--OT	going the car--OT	in--OT	middle--SYN	running--OT	behind--OT
Above	in on the airplane	to airplane garage	up--OT	over--SYN	in stay airplane	airplane in--OT
Below	over--ANT	under--SYN	table up--OT	under--SYN	table hit stop--OT	+
<u>Directionals</u>						
Down	+	+	+	+	+	+
Up	+	+	+	stepping--OM	+	+
Around	+	to the push car --OT	+	+	+	+
Out of	back--OT	on--OT	garage--OT	+	+	back go--OT
To	+	+	walk car away--OT	in--OT	in car--OT	in car--OT
Over	+	+	fence--OT	+	+	+
Into	in--SYN	go the garage--OM	in--SYN	in--SYN	home--OT	dcor--OT
Away from	back car--OT	to going the man car--OT	go home--OT	going back--OT	home--OT	there--OT

TABLE IX--Continued

7-Year-Olds

	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	+	+	car go drive--OT	+	+	+
In	+	+	garage--OM	under--OT	+	+
On	+	+	+	up the roof--OT	in--OT	in--OT
Behind	+	+	+	back--SYN	+	+
In front of	+	+	behind--ANT	car hit it--OT	+	behind--ANT
Beside	+	+	+	behind--OT	+	behind--OT
Between	middle--SYN	+	car drive--OT	+	+	middle--SYN
Above	+	+	the airplane crash --OT	on house up--OT	+	in up--OT
Below	above--ANT	NR	over--ANT	table up it--OT	under--SYN	car up the table --OT
<u>Directionals</u>						
Down	+	+	+	+	+	+
Up	+	+	on--OT	+	+	+
Around	+	+	+	+	+	in home--OT
Out of	+	+	go to drive--OT	+	+	car--OT
To	+	+	man go walk--OT	in--OT	+	in the car--OT
Over	+	+	+	jump fence--OM	+	+
Into	to in--OT	to--OT	to--OT	go house--OT	in--SYN	in--SYN
Away from	going to home--OT	going back to home --OT	man home--OT	go back it--OT	+	boy go home--OT

TABLE IX--Continued

8-Year-Olds						
	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	+	+	+	dead car crash--OT	+	+
In	+	+	+	garage--OM	+	garage--OT
On	+	+	+	top--OT	+	+
Behind	near garage--OT	going to house--OT	+	back--SYN	+	+
In front of	behind--ANT	by--SUP	+	dog car look crash --OT	+	+
Beside	car on blacktop --OT	by--SYN	+	back--OT	+	behind--OT
Between	+	the dog is in the car--OT	beside--OT	stand car two--OT	+	+
Above	over--SYN	going to the up --OT	on--OT	over--SYN	+	over--SYN
Below	car is down--OT	under--SYN	under--SYN	car fall car--OT	under--SYN	above--ANT
<u>Directionals</u>						
Down	+	+	+	+	+	+
Up	man slide stand --OT	on the steps--OT	+	+	+	+
Around	+	+	+	+	+	+
Out of	+	+	+	+	+	car stand--OT
To	+	in--OT	beside--OT	drive go--OT	+	behind--OT
Over	+	jump the fence--OM	fence--OT	fence is dog jump --OM	+	jump the table--OM
Into	to--OT	in--SYN	in--SYN	garage walk go--OT	to--OT	under--OT
Away from	man go home--OT	the man is out the car--OT	going to the house --OT	finish car--OT	he is going back home--OT	man in car--OT

TABLE IX--Continued

9-Year-Olds						
	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	+	+	NR	+	+	+
In	out--ANT	+	+	+	+	+
On	in--OT	over--OT	in--OT	+	+	+
Behind	car go--OT	+	back--SYN	beside--OT	by--OT	+
In front of	dog crash--OT	+	+	+	dog run chase--OT	behind--ANT
Beside	NR	+	behind--OT	by--SYN	near house--SYN	by--SYN
Between	middle--SYN	+	middle--SYN	+	+	+
Above	on--OT	over--SYN	up--OT	on--OT	up--OT	up--OT
Below	on--OT	under--SYN	under--SYN	above--ANT	under--SYN	above--ANT
<u>Directionals</u>						
Down	+	+	+	+	+	+
Up	+	NR	+	+	+	to man--OT
Around	back--OT	+	NR	+	+	behind--OT
Out of	+	+	+	+	+	car--OT
To	in--OT	in--OT	NR	+	going in car--OM	+
Over	fence--OT	+	dog jump fence--OM	+	fence jump--OM	dog is jump fence --OM
Into	to--OT	walk--OT	in--SYN	to in--OT	garage in--SYN	man go to garage --SYN
Away from	NR	NR	going to home--OT	+	go out--OT	man go back home --OT

TABLE IX--Continued

10-Year-Olds						
	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	+	+	+	+	+	+
In	+	+	+	+	+	+
On	up the house--OT	+	+	+	+	+
Behind	back--SYN	back--SYN	+	+	back--SYN	+
In front of	+	+	+	+	+	+
Beside	+	+	+	+	side--OT	+
Between	+	middle--SYN	+	+	+	+
Above	over--SYN	on--OT	+	+	around--OT	on--OT
Below	bottom--OT	+	under--SYN	under--SYN	bottom--OT	under--SYN
<u>Directionals</u>						
Down	+	+	+	+	+	+
Up	+	+	+	+	+	+
Around	+	+	+	+	+	+
Out of	+	+	+	+	back--OT	+
To	+	+	+	+	by--OT	+
Over	+	+	+	+	+	+
Into	in--SYN	in--SYN	in--SYN	in--SYN	in--SYN	in--SYN
Away from	+	+	+	+	back--OT	+

TABLE IX--Continued

11-Year-Olds						
	Subject 1	Subject 2	Subject 3	Subject 4	Subject 5	Subject 6
<u>Locatives</u>						
Under	+	+	below--SYN	+	+	+
In	+	+	+	+	+	+
On	+	+	top--OT	+	top--OT	+
Behind	back--SYN	back--SYN	+	back--SYN	back--SYN	back--SYN
In front of	+	+	+	before--OT	+	+
Beside	by--SYN	behind--OT	side--OT	near--SYN	near--SYN	+
Between	+	dog stand two cars --OM	+	+	+	middle--SYN
Above	in the air--OT	on top--OT	over--SYN	over--SYN	+	on--OT
Below	under--SYN	bottom--OT	+	over--ANT	under--SYN	+
<u>Directionals</u>						
Down	+	+	+	+	+	+
Up	+	+	+	+	+	+
Around	+	+	+	+	+	+
Out of	+	+	+	+	+	+
To	+	+	+	near--OT	in--OT	+
Over	on--OT	+	+	on--OT	+	+
Into	in--SYN	in--SYN	to in--OT	in--SYN	in--SYN	to--OT
Away from	+	man not going--OT	man get out of car --OT	man walk to house --OT	out--OT	out--OT

12-Year-Olds

*All responses are direct quotes.

No response: NR

OT = Off target
OM = Omission
SYN = Synonym
ANT = Antonym
SUP = Superordinate