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AN ABSTRACT OF THE THESIS OF JoAnn Warlick for the Master of Science in Speech Communication, with an emphasis in Speech-Language Pathology, presented June 6, 1983.

Title: The Expressive Acquisition of Locative and Directional Prepositions by Severely-to-Profoundly Hearing Impaired Children.

APPROVED BY MEMBERS OF THE THESIS COMMITTEE:

Robert L. Casteel, Chairperson

Shari Kazdoy

Cathleen L. Smith

Prepositions are important for the syntactical structure of the sentence and also to relate meaning, particularly meaning associated with concepts of place and time (Washington and Naremore, 1978). Expressive acquisition of function words, including prepositions, is significantly delayed in the hearing impaired population (Cooper and Rosenstein, 1966). Yet, acquisition sequence for expressive prepositions has not been

determined for this population.

The purpose of this study was to investigate the oral expressive acquisition of locative and directional single word prepositions in severely-to-profoundly hearing impaired children. The question this study sought to answer was: At what age levels are seventeen locative and directional single word prepositions expressively acquired by severely-to-profoundly hearing impaired children?

Thirty-five severely-to-profoundly hearing impaired children between the ages of 4 years, 0 months and 12 years, 6 months selected on the basis of chronological age, lack of multiple handicapping conditions and acquisition of hearing impairment prior to two years of age participated as subjects in this study. The seventeen prepositions were tested utilizing common objects placed in various positions in association with verbal commands. Responses were scored as correct if they contained the targeted preposition. Responses involving synonymous prepositions, substitutions, omissions and two consecutive unintelligible utterances were scored incorrect, but written down for evaluation.

Subject performance on the test as a whole improved with age. Mean scores for both locative and directional prepositions also increased with age. For the nine locative prepositions, significant differences were found between the collapsed age group of 4, 5, 6 year olds and the groups of 7 to 8 year olds, 9 to 10 year olds and 11 to 12 year olds. For the eight directional prepositions, significant differences were found only between the 4, 5, 6 year old group and the 11 to 12 year old group. From the results of this investigation, it appears that several directional prepositions are the first to be acquired by this severely-to-profoundly hearing impaired sample. Subjects expressed 25 to 30 percent more

directional prepositions at ages 4, 5, and 6 years. The difference between the two preposition types narrowed to 10 percent at 7 and 8 years and to 2 percent or less from 9 years through 12 years of age.

This severely-to-profoundly hearing impaired sample demonstrated omission, substitution and intelligibility type errors. Some of the errors exhibited are found early in the course of normal language development, while others appeared to be random in nature and could not be classified.

THE EXPRESSIVE ACQUISITION OF LOCATIVE AND DIRECTIONAL
PREPOSITIONS BY SEVERELY-TO-PROFOUNDLY
HEARING IMPAIRED CHILDREN

by

JOANN WARLICK

A thesis submitted in partial fulfillment of the
requirements for the degree of
MASTER OF SCIENCE IN SPEECH COMMUNICATION:
with an emphasis in
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1983

TO THE OFFICE OF GRADUATE STUDIES AND RESEARCH:

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CHAPTER I

INTRODUCTION AND STATEMENT OF PURPOSE

Introduction

In normal language development, cognitive processes lay the foundation for both meanings and forms of spoken utterances (Slobin, 1973). Production of an intelligible utterance involves lexical meanings and structural meanings (Hart and Rosenstein, 1964). For functional speech, both content words (nouns, verbs, adjectives) and function words (prepositions, conjunctions) must be acquired (Washington and Naremore, 1978). Prominent among function words are prepositions. Prepositions are important for the syntactical structure of the sentence and also to relate meaning, particularly meaning associated with concepts of place and time (Washington and Naremore, 1978). Thus, the expression of prepositions involves an integration of cognitive and linguistic skills.

It would be expected that the interfacing of these skills demonstrated in the expressive use of prepositions would develop later than other structures in the sequence of normal language development. The delay exhibited by the hearing impaired population may be even more significant and possibly disordered in nature. Some research data point to the similarities between deaf and normally hearing children in the developmental sequence of sentence forms and concepts. In contrast, other research reveals use of certain language forms in the deaf that is unlike that of normally hearing children at any age. While the data supporting

both positions remain inconclusive, it can be deduced that comprehension and use of function words, including prepositions, is significantly delayed in the hearing impaired population (MacGinitie, 1964; Cooper and Rosenstein, 1966; Odom, Blanton and Nunnally, 1967). Difficulties may originate in semantic, syntactic and cognitive areas.

Where the normal hearing child is capable of making abstract judgments as early as seven years of age, the hearing impaired child, particularly the severely-to-profoundly impaired child, remains restricted to making more concrete semantic judgments (Green and Shepherd, 1975). Despite this restrictive semantic system, deaf children appear to acquire lexical meaning more easily than structural meaning (Hart and Rosenstein, 1964). The delayed competence of morphology, syntax and function words in the deaf population causes a delay in their use of sentence forms (Hart and Rosentstein, 1964).

It has been suggested that both linguistic and nonlinguistic development are based on cognitive processes (Menyuk, 1976). The literature is not in agreement in how it views the deaf child's cognitive system. In some areas of cognitive development, deaf children appear to function equal to their hearing peers; in others they are significantly delayed; and in still others they excel (Menyuk, 1976). One viewpoint considers the deaf child's cognitive system as similar, although perhaps delayed, to that of hearing children (Furth, 1966). Best and Roberts (1976) found early cognitive development of hearing impaired children to proceed normally through Piaget's sensorimotor stage. They concluded that cognitive skills based on active interaction with the environment develop similarly in the hearing impaired and hearing children. Hearing impaired children, however, showed a discrepancy from normals in cognitive development

dependent upon a verbal interaction with the environment. A second viewpoint considers the minimal auditory input during the critical period of language development to result in significantly altered cognitive abilities that are qualitatively different from normally hearing children (Myklebust, 1960; Tomlinson-Keasey and Kelly, 1978). The nature of the cognitive system of hearing impaired children may influence their expressive acquisition of prepositions.

It is clear that the hearing impaired child's language is significantly delayed when compared to that of the normally hearing child. Not as well understood is the specific role of cognition in the language development of this population. The use of prepositions involves an integration of linguistic and cognitive skills, indicating a need for the study of prepositions in the hearing impaired. No research to date has outlined the acquisition of expressive prepositions in the hearing impaired population. Such information could have implications for intervention as well as add to the understanding of linguistic and cognitive development in the hearing impaired.

Statement of Purpose

The purpose of this study was to investigate the oral expressive acquisition of locative and directional single word prepositions in severely-to-profoundly hearing impaired children.

The question this study sought to answer was:

At what age levels are seventeen locative and directional single word prepositions expressively acquired by severely-to-profoundly hearing impaired children?

Definition of Terms

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

Directional Prepositions: prepositions denoting definite or indefinite change in direction or condition (Wiig and Semel, 1976).

Locative Prepositions: preposition denoting a definite or indefinite static position or state with respect to location, quality, condition or position (Wiig and Semel, 1976).

Multiply Handicapped: any child with more than one disabling condition. For the purposes of this study, any hearing impaired child with the additional handicaps of cerebral palsy, blindness or mental retardation will be defined as multiply handicapped.

Oral/Aural Approach: a methodology for teaching the hearing impaired consisting of lipreading, auditory training, speech, written expression, reading and use of common gestures (Chasen and Zuckerman, 1976).

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 (PTA).

CHAPTER II

REVIEW OF THE LITERATURE

The expression of prepositions involves an integration of syntactic, semantic and cognitive skills. Deaf children may experience particular difficulty assimilating these skills to adequately use prepositions expressively. Each of these areas will be considered as they relate to the expressive acquisition of prepositions in deaf children.

Use of Function Words in Deaf Children's Language

For operable speech, children must acquire both content words (nouns, verbs, adjectives) and function words (prepositions, conjunctions) (Washington and Naremore, 1978). Content words are concrete referents which carry the meaning of a sentence. Function words are smaller units that tie the communication of the sentence together. Deaf children traditionally communicate in telegraphic speech, often omitting function words (Brannon and Murry, 1966). Difficulty with function words, as well as morphology and syntax, have caused delayed use of sentence forms in the deaf population (Hart and Rosenstein, 1964; MacGinitie, 1964; Cooper and Rosenstein, 1966; Odom, Blanton and Nunnally, 1967).

There are several viable explanations as to why structural aspects and function words of the sentence are difficult for the deaf child. To obtain meaning from a spoken utterance, the deaf child must integrate information received from nonverbal situational cues, facial expressions of the speaker and lipreading words (Hart and Rosenstein, 1964). These

visual cues are used to fill in the missing phonological, morphological and syntactical information. Unfortunately, visual information lacks the clarity and repetition of information received aurally (Hart and Rosenstein, 1964). Thus, despite the repetitive nature of function words, the deaf child is exposed to a small part of the linguistic information hearing children receive.

In contrast, Ivimey and Lachterman (1980) discount a "perceptual difficulty hypothesis" which suggests that unstressed, fleeting and weakly articulated elements are evidence of the difficulties of lipreading. They noted that the preposition "to" is equally difficult to detect whether it appears in directional phrases ("to school"), datives ("give it to John") or as a particle ("I want to go"). Yet Ivimey and Lachterman noted that deaf children acquired the locational form before the dative while the particle form appeared much later. Rather than the deaf children demonstrating a "perceptual difficulty," the problem appeared to be one of "concreteness, demonstrability and ease of conceptualization."

Deaf children in Brannon and Murry's (1966) study tended to begin and end sentences with few errors compared to the large number of errors which occurred in the middle of the sentence. They obtained fifty-utterance language samples from normally hearing children (mean age 12 years, 6 months) and hard of hearing and deaf children (mean age 12 years, 6 months). Most of the sentences spoken by the hearing impaired groups were simple, active, declarative types in the form of subject, verb and object. The vocabulary that could expand on this overused pattern was most likely to appear in the middle of the sentence. Sentence expanders, including prepositions, were clearly under poor control in the deaf child's language.

Brannon (1968) found that hearing impairment interfered more with the learning of function words than of content words. He concluded that facility with function words was related to the degree of hearing loss. In proportion to total word output, deaf children (with a mean hearing loss of 82 dBHL at 500, 1000 and 2000 Hz) seemed to underuse prepositions, quantifiers and indefinites. The hard of hearing children (with a mean hearing loss of 52 dBHL) used these forms significantly more often, although were still deficient compared to the normal control group.

The correlation between use of function words and degree of hearing impairment could be attributed to the characteristics of function words themselves. Function words, on an average, are shorter in length than content words (Miller, Newman and Friedman, 1958). Because of their redundant nature in language, function words are not primarily stressed. Understressing causes function words to be quieter and shorter in duration, possibly resulting in increased difficulty for the hearing impaired population. Berg (1976) suggested that one result of degree of hearing loss on language (particularly vocabulary development) was that unstressed words may be omitted from the language of severely hearing impaired children.

Sentence structure and vocabulary in the deaf have been considered stereotypical and include many grammatical errors (Bloom and Lahey, 1978). Myklebust (1960) noted that the deaf tended to omit many abstract or functional words which had no tangible referents. Simmons (1962) found the written and spoken language of the deaf deficient in function words, adjectives and adverbs. Thus, the diversity of vocabulary in the deaf is not as great as in hearing individuals, even when taking into account a lower quantity of verbalization (Simmons, 1962; Brannon, 1968). Brannon

(1968) characterized the telegraphic language of the deaf as lacking in abstract words with an overuse of nouns and verbs. Wells (1942) placed vocabulary words on a continuum from concrete to abstract. He found that differences between deaf and hearing subjects' knowledge of vocabulary increased as the level of abstractness increased. Tweney, Hoemann and Andrews (1975) also found that deaf subjects varied from hearing subjects in their facility with lexical items, but attributed these differences to the amount of experience the subjects had with the lexical items, rather than their concrete or abstract nature. Thus, deaf subjects had more difficulty understanding words with which they had less experience (e.g., onomatopoeic words such as swish, hiss, splat, etc.).

In contrast to the research previously cited, MacGinitie (1964) hypothesized that the ability of the deaf to use function words may be no more delayed than their general ability to use words expressively. Their frequent omission of function words may reflect an economy of effort, rather than an inability to use these types of words. MacGinitie concluded that, although deaf children omitted certain word classes (function words) when asked to write a composition, they were more able to use function words when the context called for them. This was true when a simple context was provided. This study found no significant differences in the pattern of difficulty of various word classes for deaf and hearing children. Deaf children's ability to use particular classes of words simply varied from their habitual usage. The conclusions of this study differ from those of previously cited research which suggested that deaf children tend to be deficient in the use of certain word classes.

Thus, difficulty with use of function words could be due to the deaf child missing the information auditorily while attempting to fill in

gaps with insufficient visual cues. The tendency of deaf children to make errors in the middle of sentences, where function words appear, is also a problem. Increased hearing impairment has a greater effect on facility with function words than on content words, possibly due to their shorter length and redundancy in the language resulting in understressing. The linguistic complexity, abstract nature and lack of experience with function words, as well as an economy of effort have been suggested as further explanations for the deaf child's difficulty with the use of function words, including prepositions. Additionally, function words frequently have no inherent meaning, but serve as syntactical glue to form the structure of the sentence.

Syntactic Aspects in Deaf Children's Language

The linguistic meaning of any utterance consists of the lexical meanings of individual words plus the structural meanings (Fries, 1952). In order for an utterance to be intelligible, it must contain both lexical meanings and structural meanings (Hart and Rosenstein, 1964). One of the primary means of expressing grammatical relations is through prepositions (Washington and Naremore, 1978). Receptive and expressive facility of prepositions requires both syntactical and semantic skills. Studies with normally hearing children show that they are able to integrate semantic and syntactic components of language by 2 or 3 years of age (Bloom and Lahey, 1978). Deaf children however, have demonstrated difficulty in assimilating semantic and syntactic components of language (Hart and Rosenstein, 1964).

Research has shown that deaf children, for the most part, acquire syntactical structures in the same developmental sequence as hearing

children, although at a much slower rate (Quigley, Power and Steinkamp, 1977; Gaffney, 1977 as cited in Geffner and Freeman, 1980; Kretschmer and Kretschmer, 1978). Quigley et al. (1977) compared the syntactic knowledge of 10 to 18 year old deaf children with that of 8 to 10 year old hearing children. Although they observed some disordered syntactic structures used by the deaf subjects, none of these structures were common to all the subjects. Additionally, most of the irregular syntactical forms were used by less than half of the deaf subjects.

Deaf children have demonstrated more difficulty decoding linguistic meanings derived from structural aspects of language than from word meanings (Hart and Rosenstein, 1964). Geffner and Freeman (1980) administered the Assessment of Children's Language Comprehension (ACLC) and the Syntax Screening Test to a group of 6 year old deaf children. Results of the ACLC indicated that the deaf children had the least difficulty comprehending nouns, followed in order by verbs, adjectives and prepositions. Structurally, the noun-noun and noun-verb (two critical elements) were the easiest to comprehend while the noun-verb-preposition-noun (four critical elements) was the most difficult. Rank order of complexity for both vocabulary and structure complexity followed a normal developmental sequence. Difficulties with these forms could have been due to the length of the stimulus, the structure type, or a combination of these factors. As the number of critical elements on the ACLC increased from one to four, the semantic complexity increased. Simultaneously, syntactic relationships emerged that the child had to understand to accurately complete the task. The 6 year old deaf children studied by Geffner and Freeman demonstrated more difficulty with items requiring syntactic rather than semantic knowledge.

Similar results have been found with 12 year old deaf children. On a multiple choice language test, Odom et al. (1967) found that deaf children had more difficulty recognizing and restoring syntactic (function) words than semantic (content) words.

Semantic Aspects in Deaf Children's Language

Despite the reported superior performances of deaf children on test items requiring semantic rather than syntactic knowledge, the deaf used a restricted semantic system as compared to normals (Green and Shepherd, 1975). Deaf individuals used a limited vocabulary (Cooper and Rosenstein, 1966) and were redundant and less flexible than hearing individuals in their use of words (Walter, 1978). Walter suggested that deaf children's difficulty with syntactical structures could, in part, be due to a lack of educational emphasis on lexical aspects of language. It was hypothesized that students could not use grammar without knowing the meanings of words. It may be necessary to specifically teach deaf students semantic categories and gradually refine this knowledge into adult syntactical forms (Hasenstab and Bevilacqua, 1980).

Odom et al. (1967) compared syntactical and semantic skills in the language of the deaf. They administered two types of sentence completion tasks to deaf and hearing children. Overall, the deaf children's performance on both tasks was below that of the hearing children. The first task followed a multiple choice format. On the multiple choice test, 18 year olds made fewer correct choices when prepositions or conjunctions were required when compared to nouns, verbs and adjectives. The deaf subjects were able to identify when a preposition was required, but had difficulty choosing the semantically correct word. Odom et al.

hypothesized that the ability to identify when a preposition was required on the multiple choice task could be due to intensive and specific training in parts of speech.

The second task Odom et al. (1967) utilized was a "cloze" procedure in which the child was presented with a reading passage where every third, fourth or fifth word was deleted. The task was to produce (recall) an appropriate word to fill in the blank. The performance of deaf students (mean age of 16 years) was compared with hearing students matched for chronological age and a reading grade equivalent (mean age of 15 years). The deaf showed a significantly greater deficit in the cloze procedure, especially on syntactic classes of words (articles, auxiliaries, prepositions, and conjunctions). The deaf children's ability to select the correct class of function word increased when more contextual cues were available. They demonstrated no changes, however, in predicting the exact word required to fill in the blank. In contrast, the performance of the hearing groups was not aided in either respect by increased context. Apparently, the deaf subjects in this sample required more contextual cues to select syntactic words correctly than were needed to choose appropriate semantic words.

Thus, the deaf subjects demonstrated knowledge of the class of word required in a sentence, but did not understand the use or meaning of specific functor words (Odom et al., 1967). Bloom and Lahey (1978) suggested that deaf children learn about structural aspects of language as they are written, but perhaps do not learn language as a "vehicle for coding content or for a particular use." This may, however, be a result of training methods used with the deaf rather than an effect of hearing loss on language skills.

Ivimey and Lachterman (1980) noted that deaf children in their sample appeared to have learned some prepositions as part of a larger verbal unit. Certain combinations such as "fall down," "fall over" and "climb up" appeared to function as giant vocabulary words. Thus, one child's use of the sentence, "He not fell down up the tree," was not a confusion between "down" and "up." Rather, "fall down" functioned as a unit with no directional reference plus "up" indicating where the action originated.

Ivimey and Lachterman (1980) found that deaf subjects used "under" and "on" as these prepositions are used in English, while "near" often replaced "in front of" and "behind." "Near" was considered a superordinate concept which included the subordinate concepts "in front of," "beside" and "behind." Ivimey and Lachterman concluded that the more general concept (near) would be expected to be used more often than the specific concepts (in front of, beside, behind).

Brenza, Kricos and Lasky (1981) instructed 13 to 14 year old orally trained severely and profoundly hearing impaired children to construct written sentences using each of the concepts from the Boehm Test of Basic Concepts. Subjects omitted prepositions in 7 percent of the sentences. In addition, subjects exhibited syntactic deviancy through the juxtaposition of prepositions in sentences (e.g., "The car through in the garden.").

The greatest percentage of deaf children in Myklebust's (1960) study of written language samples, demonstrated omission errors. Omission of essential words were noted more frequently than the use of incorrect words or the addition of excessive words. Ivimey and Lachterman (1980) also noted the omission of many prepositions, auxiliaries and modifiers from the language of the deaf. They suggested that such omissions

resemble the telegraphic language of young, normally hearing children.

In summary, prepositions are important in functional syntax, as well as to relate meaning, especially meaning associated with place and time (Washington and Naremore, 1978). Syntactic structures develop similarly for deaf children as for hearing children, but at a greatly delayed rate (Quigley et al., 1977). While syntactical structures are more difficult, the deaf are also restricted in their use of the semantic units of language (Green and Shepherd, 1975). With increased contextual cues, deaf children tend to improve in correct use of both structural and lexical aspects of language (Odom et al., 1967). Yet deaf children are clearly delayed in their ability to integrate, understand and use the more complex syntactic and semantic relationships of language. Ways in which syntactic and semantic capabilities may influence the deaf child's acquisition of prepositions have been discussed. Additionally, the deaf child's cognitive capabilities need to be considered.

Cognitive Aspects of Deaf Children's Language

It has been suggested that both linguistic and nonlinguistic development are based on cognitive processes (Menyuk, 1976). Children's language growth relies on the successful integrating of nonlinguistic and linguistic experiences. Perceptual/cognitive strategies are utilized in mastering the grammatical/semantic components of complex forms of language, including prepositions (Kretschmer, 1976). Thus, cognitive abilities of the deaf must be considered in overall language acquisition and specifically in the acquisition of prepositions. The literature concerning the cognitive abilities of the deaf population is not in agreement, dividing into two basic theories (Kretschmer and Kretschmer, 1978). One

viewpoint considers deaf children as potentially normal in all respects, including cognition, with the exception of auditory processing (Furth, 1966). In contrast, the second theory considers hearing impairment to significantly alter cognitive processing abilities (Myklebust, 1960).

Proponents of the first theory have contended that the deaf child's cognitive and nonverbal capabilities will result in normal, although delayed, language development if adequate linguistic experience is acquired (Furth, 1966). Furth (1961) hypothesized that deaf children should not differ from their normally hearing peers on conceptual tasks unless the hearing child has the advantage of specific language experience related to the task. Despite a lack of verbal skills, deaf children have demonstrated the ability to progress to age appropriate cognitive skills as measured by their ability to perform Piagetian tasks (Furth, 1966). This research has shown that deaf children without a formal communication structure are capable of high-level problem solving. Nevertheless, Watts (1979) cautioned that we still have no reliable tests to distinguish "reasoning from the language in which reasoning is thought to occur."

Several researchers have supported, at least partially, Furth's premise that the deaf child possesses a basically intact cognitive system. Best and Roberts (1976) found that 2 to 3 year old deaf children progressed normally through the period of sensorimotor development. Like Piaget, Best and Roberts considered the child's active interaction with the environment to be more important than language abilities in the progression through the sensorimotor period of early cognitive development. Completion of the sensorimotor stage of cognitive development is considered a foundation for future stages. Best and Roberts concluded that cognitive

abilities dependent on an active interaction with the environment develop similarly in deaf and normally hearing children. A difference between deaf and hearing groups was noted, however, on cognitive development dependent on verbal interaction with the environment. It was found that deaf children performed below their hearing peers on cognitive tasks requiring verbal interactions.

Rosenstein (1964) has suggested that deaf children are able to reason and conceptualize on nonverbal levels. He found that deaf children appear to grasp concepts nonverbally, functioning without the need for a verbal label. As a result, difficulties can arise in teaching concepts, including prepositions, to deaf children. Rosenstein emphasized the need to teach deaf children to associate the verbal labels with the concept. This skill would enable deaf children to utilize a more efficient way of organizing interactions with their environment.

Watts (1979) found that deaf children, ages 10 to 16, were able to carry out conservation and spatial thinking tasks despite the absence of verbal language. It was suggested that spatial understanding probably was a result of actively handling spatial situations in everyday life.

In summary, proponents of this first theory have concluded that deaf individual's capacity to complete conceptual tasks may not be generally impaired, but rather may be dependent on the extent of their language experience (Furth, 1961; Watts, 1979). Thus, deaf children's cognitive structures, from which their language derives, may develop in the same sequence as hearing children with only a mild delay.

In contrast, proponents of the second theory have suggested that a hearing impairment significantly alters processing abilities (Myklebust, 1960). This may result in the use of cognitive strategies which are

developmentally different from normally hearing children. Language learning with an altered cognitive base may result in a different form of language comprehension and usage than found in normally hearing children (Kretschmer and Kretschmer, 1978).

Tomlinson-Keasey and Kelly (1974) analyzed deaf children's thought processes in relation to Piaget's theory of cognitive development. They concluded that the absence of auditory feedback from deaf children themselves and their environment influences how they organize their sensorimotor world. Deaf children do not utilize the auditory modality and, therefore, do not organize their environment in an auditory way. Thus, deaf children develop cognitive structures which do not depend primarily on auditory cues in order to process the environment. Rather, their cognitive structures depend on visual, tactile, gestural and olfactory cues.

Tomlinson-Keasey and Kelly (1974) drew three conclusions from a structural analysis of the development of thought processes in deaf children. First, the deaf child was capable of developing adequate sensorimotor and concrete operational structures with the available modalities to process information. Predictably, the deaf child will develop the concept of object permanence as well as make simple transformations from the concrete world to a symbolic system. Secondly, the deaf child may have problems separating symbols from their images, which will decrease his or her potential for later abstractions. Finally, deaf children may be deficient in grasping abstractions since they have little experience processing stimuli that are outside of their visual proximity. Tomlinson-Keasey and Kelly suggested that practice in labeling objects the child can't see helps the hearing child to move from the concrete to the abstract.

Indeed minimal exposure to a symbolic world, during the critical years of language acquisition, may alter the entire information processing system. Tomlinson-Keasey and Kelly (1978) concluded that the "limited accessibility to auditory symbols during the prelinguistic years, yields an information processing system that is significantly and systematically different from that of hearing children." While hearing children process visual and auditory information simultaneously, deaf children process most information through a visual mode. Thus, due to the diminished auditory input, deaf children may not be transforming information into verbal communication in the same way as hearing children (Tomlinson-Keasey and Kelly, 1978).

In summary, the specific role of cognition in the language development of the deaf is not agreed upon in the literature. One theory has considered the deaf to be deficient only in auditory processing while possessing normal cognitive capabilities (Furth, 1966). In contrast, other researchers have considered the minimal auditory input during the critical period of language development to result in significantly altered cognitive abilities (Myklebust, 1960; Tomlinson-Keasey and Kelly, 1978).

It has been demonstrated that deaf children are delayed in their ability to integrate semantic and syntactic components of language. It remains unclear whether deaf children are functioning with a cognitive system that is: (1) similar, yet perhaps delayed, to that of hearing children or (2) different in nature to that of hearing children. The expression of prepositions involves an integration of syntactic, semantic and cognitive skills. The characteristics of these systems in deaf children may have implications for their acquisition of prepositions.

CHAPTER III

METHODS

Subjects

Thirty-five severely-to-profoundly hearing impaired students from Tucker Maxon Oral School, the Portland Regional Program for the Deaf and the Southern Oregon Regional Program for the Deaf participated as subjects in this study. Subjects ranged in age from 4 years, 0 months to 12 years, 6 months. The number of students meeting the selection criteria in each age group was as follows: 3-7 to 4-6 years, one subject; 4-7 to 5-6 years, two subjects; 5-7 to 6-6 years, six subjects; 6-7 to 7-6 years, four subjects; 7-7 to 8-6 years, three subjects; 8-7 to 9-6 years, four subjects; 9-7 to 10-6 years, six subjects; 10-7 to 11-6 years, seven subjects and 11-7 to 12-6 years, two subjects. From this point forward, subjects' ages will be referred to according to their rounded age equivalents. For example, subjects falling between the ages of 6 years, 7 months and 7 years, 6 months will be referred to as 7 year olds.

Each subject met the same criteria. All subjects used an oral/aural mode of communication. Subjects were either congenitally deaf or prelingually deafened with onset of hearing impairment occurring prior to two years of age. Each subject had 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. Multiply handicapped children with cerebral palsy, blindness or mental

retardation in addition to hearing impairment were excluded from the study. Parent permission for participation in the study was obtained for each subject. Subjects who were 7 years or older also signed the permission form, indicating their consent to participate in the study.

Screening Procedure

Supervisors for the Tucker-Maxon Oral School and the Portland and Southern Oregon Regional Programs for the Deaf approved a single form which included the following: (1) a letter to parents describing the study, (2) a brief questionnaire requesting case history information concerning age of onset of hearing impairment and (3) consent form to participate in the study and for access to audiological information through the school staff (see Appendix A). Teachers determined which students in their classroom were without multiple handicapping conditions according to case history information and standardized assessments on file. Questionnaire and consent forms were sent home with these students. Children with returned forms and affirmation to proceed participated in the study.

Unaided audiological evaluations completed within the last year were used to document degree of hearing impairment. Two students without current audiograms received a pure tone audiometric assessment of 500, 1000 and 2000 Hz to determine consistency with their most recent audiological evaluation. These rechecks were administered in a quiet room at the students' schools.

Instrument

Common objects in association with commands were used to elicit seventeen common single word prepositions. Locative and directional

prepositions were selected according to Wiig and Semel's (1976) classification. Test items were adapted from the Vocabulary Comprehension Scale (Bangs, 1975) and the Expressive Preposition Test (Hustead, 1974) (see Appendix B). Prepositions tested were those established receptively by 5 years (Bangs, 1975) and expressively by 8 years of age (Hustead, 1974) in normal children.

The examiner placed objects in a designated position (e.g., "between the cars") and then asked the subject to expressively identify the location or direction of the object. Materials used to elicit expressive use of the prepositions were toy vehicles (car, airplane), a toy dog and a man, a play garage, steps and a ladder. Wherever possible, objects were placed in logical positions (e.g., "car in the garage"). Responses were scored "correct" if they contained the appropriate prepositions.

Reliability

Four hearing impaired subjects participated in a pilot study. These subjects met criteria for hearing impairment, lack of multiple handicapping conditions and parent permission to participate.

The examiner administered the expressive preposition assessment and recorded responses. Each session was video and audio taped. Examiner judgments were compared with those of two professionals familiar with interpreting the expressive oral language of the hearing impaired. Judges were provided with instructions for scoring the subjects' responses (see Appendix C). Inter-judge reliability was established at +.99. To establish intra-judge reliability, the examiner and judges evaluated 25 percent of each subject's responses, presented in random order from the video tapes, one week after the initial presentation. Intra-judge

reliability for test-retest was established at 100 percent. Following training, these levels of inter- and intra-judge reliability were established on the first run.

Procedures

The assessment was administered in a quiet room in the subjects' own schools. The examiner sat next to the subject at a table. The following procedure was carried out for each subject. First, the examiner checked the working condition of the child's hearing aid. The battery was checked with a voltage meter and replaced with a new battery if necessary. Next, the examiner conversed with the subject for several minutes to put him/her at ease. The examiner established eye contact with the subject prior to any instruction. The examiner then pointed to and named each of the objects used in the test. Next, the examiner gave the following general instructions for the test: "I'm going to put these toys in different places. Then, I'll ask you to tell me where they are."

The seventeen item test was presented and audio recorded. Each response was judged as "correct" or "incorrect." Each subject was given one trial to complete each of the test items. Responses were scored as "correct" if they contained the targeted preposition. If the response was synonymous to the target preposition (such as "in back of" rather than "behind"), the subject's response was scored as "incorrect," but written down for future evaluation. If the response was not understood by the examiner, the response was recorded as unintelligible and the examiner said, "I didn't understand you" and repeated the stimulus question. If the second response was also unintelligible, the item was scored as "incorrect." All subjects' responses were written down for future

evaluation.

Analysis of the Data

Subjects were divided into four collapsed age groups for statistical analysis of the data. Group 1 consisted of nine subjects 4, 5 and 6 years of age. Group 2 was made up of seven subjects who were 7 to 8 years of age. Group 3 consisted of ten subjects ranging in age from 9 to 10 years, while Group 4 was made up of nine subjects ranging in age from 11 to 12 years. The percentage of subjects at each age level that correctly expressed each preposition was determined. An intra-group analysis and an inter-group analysis of the subjects' responses to locative and directional preposition test items were analyzed by a trend analysis of variance (Anova). Additionally, two t tests, a Least Significance Difference (LSD) and a Scheffé procedure, were computed for all pairs of means.

CHAPTER IV

RESULTS

The purpose of this study was to investigate the oral expressive acquisition of locative and directional single word prepositions in severely-to-profoundly hearing impaired children. The question this study sought to answer was: At what age levels are seventeen locative and directional single word prepositions expressively acquired by severely-to-profoundly hearing impaired children?

Thirty-five severely-to-profoundly hearing impaired children ranging in age from 4 years, 0 months to 12 years, 6 months were tested. Subject performance on the test as a whole improved with increased age (see Figure 1). The lowest total preposition score out of a possible seventeen points was one (6 percent), while the highest score was fourteen (82 percent). The mean score for the thirty-five children was 9.23 or 54 percent.

According to a trend analysis of variance, there was a significant linear trend in the data with respect to increase in age. The comparisons among four collapsed age groups of total locative and directional preposition scores were highly significant beyond the .001 level ($p < .0001$) with an F ratio of 25.764. The test of the quadratic term did not attain significance (see Table I). Thus, these data can be explained by a slightly curved developmental line.

The scores of Group 1 (4 to 6 year olds) for locative and directional prepositions ranged from one to ten with a mean of 5.78 and a

Figure 1. Ranges and means of seventeen locative and directional prepositions in thirty-five children ranging in age from four to twelve years.

standard deviation of 3.23. Group 2 (7 to 8 year olds) scores ranged from four to fourteen with a mean of 8.86 and a standard deviation of 2.97. Group 3 (9 to 10 year olds) scores were only slightly higher with a range of eight to fourteen, a mean of 10.00 and a standard deviation of 2.11. Group 4 (11 to 12 year olds) scores were similar with a range of

TABLE I
TREND ANALYSIS OF VARIANCE OF THE SEVENTEEN
PREPOSITIONS BY COLLAPSED AGE GROUPS

	D.F.	SS	ms	F	P
Between Groups	3	188.8698	62.9566	8.819	.0002*
Linear Term (weighted)	1	183.9227	183.9227	25.764	<.0001*
Deviation from Linear	2	4.9471	2.4736	.346	.7099(NS)
Quadratic Term	1	1.4430	1.4430	.202	.6561(NS)
Deviation from Quadratic	1	3.5041	3.5041	.491	.4888(NS)
Within Groups	31	221.3016	7.1388	--	--
Total	34	410.1714	--	--	--

* Significant

NS Not Significant

seven to fourteen, a mean of 12.11 and a standard deviation of 2.37 (see Table II, Figure 2).

After finding significant differences among collapsed age groups according to a trend analysis of variance, two t tests were computed to determine the level of significance for all pairs of means in each of the four age groups. Since each age group contained a different N, a Least Significant Difference (LSD) procedure, a lenient test, was conducted, as suggested by Nie, Hadlai, Jenkins, Steinbrenner and Bent (1975). For the total scores of locative and directional prepositions, comparisons between Group 1 and Groups 2, 3 and 4 were all significant at the .05 level.

TABLE II

RANGES, MEANS AND STANDARD DEVIATIONS OF
SEVENTEEN LOCATIVE AND DIRECTIONAL
PREPOSITIONS

Age Group	N	Range	Mean	Standard Deviation
1	9	1-10	5.78	3.23
2	7	4-14	8.86	2.97
3	10	8-14	10.00	2.11
4	9	7-14	12.11	2.37
Total	35	1-14	9.23	3.47

Comparisons between Group 2 and Group 4 were also significant at the .05 level. Additionally, the Scheffé procedure, a rigorous test, was completed (Nie et al., 1975). This analysis found significant differences ($p < .05$) only between Groups 1 and 3 and between Group 1 and 4.

Locative Prepositions

The data were divided into two groups in order to analyze the acquisition of locative and directional prepositions in relation to collapsed chronological age groups. Two tests of homogeneity of variance were computed in this program for locative prepositions. Cochran's C obtained a value of .4038, which was not significant ($p < .343$). Bartlett-Box F obtained a value of .731, which was also not significant ($p < .533$). These results indicate that the data met the assumptions of analysis of variance that there was a homogeneity of variance among the four age

Figure 2. Ranges and means of seventeen locative and directional prepositions in thirty-five children in four collapsed age groups four to twelve years.

groups. This assumes that, with respect to everything but age, the subjects were drawn from the same population.

According to a trend analysis of variance for locative prepositions, there was a significant linear trend in the data with respect to increase in age. The comparisons of locative preposition scores in collapsed age groups were highly significant ($F[1,34] = 30.316, p < .0001$). The test for quadratic term, however, did not achieve significance. Thus, although the scattergram of scores showed a slight curve with increased age, it was not enough to achieve a quadratic term (see Table III).

The total scores for the nine locative prepositions for the thirty-five children ranged from zero to eight, with a mean of 4.54 and a standard deviation of 2.38. With a possible score of nine for locative prepositions, the scores for Group 1 ranged from zero to five with a mean of 2.00 and a standard deviation of 1.87. The scores of Group 2 ranged from one to eight with a mean of 4.29 and a standard deviation of 2.29. The scores of Group 3 ranged from three to eight with a mean of 5.30 and a standard deviation of 1.57. The scores of Group 4 were slightly higher, ranging from four to eight with a mean of 6.44 and a standard deviation of 1.33 (see Table IV, Figure 3).

The lenient LSD and the rigorous Scheffé t tests were also computed for locative prepositions across the four collapsed age groups. The LSD found comparisons between Group 1 and Groups 2, 3 and 4 to be significant at the .05 level. Comparison between Group 2 and Group 4 was also significant at the .05 level. The Scheffé procedure found comparisons between Group 1 and 3, and between Group 1 and 4 to be significant at the .05 level.

The percentage of subjects at each age level that correctly

TABLE III

TREND ANALYSIS OF VARIANCE OF NINE LOCATIVE
PREPOSITIONS BY COLLAPSED AGE GROUPS

	D.F.	SS	ms	F	P
Between Groups	3	96.9349	32.3116	10.461	.0001*
Linear Term (weighted)	1	93.6371	93.6371	30.316	.0001*
Deviation from Linear	2	3.2978	1.6498	.534	.5916(NS)
Quadratic Term	1	2.4820	2.4820	.804	.3769(NS)
Deviation from Quadratic	1	.8158	.8158	.264	.6109(NS)
Within Groups	31	95.7508	--	--	--
Total	34	192.6857	--	--	--

* Significant

NS Not Significant

expressed each preposition was determined. The locative preposition "under" was correctly expressed 100 percent of the time beginning at 7 years of age. Subjects expressed "in" with 100 percent accuracy beginning at 8 years of age, except for one 10 year old subject who missed the item due to an omission error. "On" was expressed by 100 percent of the subjects beginning at 9 years, with the exception of one 11 year old who substituted "in" for "on." Eight year old subjects expressed the locative preposition "behind" correctly 100 percent of the time, dropping to

TABLE IV

RANGES, MEANS AND STANDARD DEVIATIONS
OF NINE LOCATIVE PREPOSITIONS

Age Group	N	Range	Mean	Standard Deviation
1	9	0-5	2.00	1.87
2	7	1-8	4.29	2.29
3	10	3-8	5.30	1.57
4	9	4-8	6.44	1.33
Total	35	0-8	4.54	2.38

Figure 3. Ranges and means of nine locative prepositions in thirty-five children in collapsed age groups from four to twelve years.

75, 67 and 71 percent respectively at 9, 10 and 11 years of age, recovering to 100 percent accuracy by 12 years of age. Of the five 9, 10 and 11 year olds who missed this item, two produced unintelligible responses and three substituted the synonym "in back of" for "behind." The locative prepositions "in front of," "beside" and "between" were expressed by 100 percent of the subjects only in the 12 year old group. The locative prepositions "above" and "below" were never expressed by 100 percent of the subjects in any age group.

Directional Prepositions

Two tests of homogeneity of variance were also computed and achieved for directional prepositions. Cochran's C obtained a nonsignificant value of .3786 ($p < .484$). Bartlett-Box obtained a value of .721, which was also nonsignificant ($p < .539$).

According to a trend analysis of variance for directional prepositions, there was a significant linear trend in the data with respect to increase in age. The comparisons of directional prepositions scores in collapsed age groups were significant ($F[1,34] = 10.314$, $p < .05$). This significance level was lower than that achieved for locative prepositions. The test for quadratic term was not significant (see Table V). Similar to locative prepositions, the scores for directionals can be represented by a slightly curved line.

Total scores for the eight directional prepositions for the thirty-five children ranged from one to seven with a mean of 4.69 and a standard deviation of 1.35. The scores for Group 1 ranged from one to five, with a mean of 3.78 and a standard deviation of 1.48. Group 2 scores ranged from three to six, with a mean of 4.57 and a standard deviation of .98.

TABLE V
TREND ANALYSIS OF VARIANCE OF EIGHT DIRECTIONAL
PREPOSITIONS BY COLLAPSED AGE GROUPS

Between Groups	3	16.1730	5.3910	3.684	.0223(NS)
Linear Trend (weighted)	1	15.0946	15.0946	10.314	.0031*
Deviation from Linear	2	1.0784	.5392	.368	.6948(NS)
Quadratic Term	1	.1400	.1400	.096	.7592(NS)
Deviation from Quadratic	1	.9384	.9384	.641	.4294(NS)
Within Groups	31	45.3698	1.4635	--	--
Total	35	61.5429	--	--	--

* Significant ($p. < .05$)

NS Not Significant

The scores for Group 3 were slightly higher, ranging from four to six, with a mean of 4.70 and a standard deviation of .95. Group 4 scores ranged from three to seven, with a mean of 5.67 and a standard deviation of 1.32 (see Table VI, Figure 4).

For directional prepositions, both the lenient LSD and the rigorous Scheffé t tests found comparisons between Group 1 and Group 4 to be significant at the .05 level. No other group comparisons attained significance.

The percentage of subjects at each age level that correctly expressed each directional preposition was determined. The directional

TABLE VI
RANGES, MEANS AND STANDARD DEVIATIONS
OF EIGHT DIRECTIONAL PREPOSITIONS

Age Group	N	Range	Mean	Standard Deviation
1	9	1-5	3.78	1.48
2	7	3-6	4.57	.98
3	10	4-6	4.70	.95
4	9	3-7	5.67	1.32
Total	35	1-7	4.69	1.35

Figure 4. Ranges and means of eight directional prepositions in thirty-five children in collapsed age groups from four to twelve years.

preposition "down" was expressed with 100 percent success at all age groups. "Up" was expressed by 100 percent of the subjects beginning at 8 years of age. Only two subjects out of thirty-five missed the "up" item, with a 7 year old missing the item due to an unintelligible response. Subjects correctly expressed the preposition "around" 100 percent of the time from 7 years through 12 years of age. The preposition "over" was correctly expressed 100 percent of the time from 6 years through 8 years, dropping to 50 percent accuracy at 9 years, 67 percent at 10 years, 86 percent at 11 years, recovering to 100 percent accuracy at 12 years of age. The errors made by the 9, 10 and 11 year olds were omissions ("dog jumping fence") and substitutions (e.g., "on/over"). The directional preposition "out of" was expressed by 100 percent of the 9 year olds, decreasing to 83 and 86 percent respectively by 10 and 11 year olds, returning to 100 percent accuracy by 12 years of age. The majority of errors for "out of" were omissions ("take the car") or literal explanations of the examiner's action ("you pick up the car"). The preposition "to" was expressed 100 percent of the time only by the 12 year old subjects. The directional prepositions "into" and "away from" were never expressed 100 percent of the time by any of the age groups.

Locative and Directional Prepositions

Mean scores for both locative and directional prepositions increased with age (see Table VII). For the nine locative prepositions, mean scores increased from 0.00 at 4 years of age to 7.50 at 12 years. For the eight directional prepositions, mean scores increased from 2.00 at 4 years of age to 6.50 at 12 years. As illustrated in Figure 5, the acquisition curve for locative prepositions was steeper than that for

TABLE VII

NUMBER OF SUBJECTS AT EACH AGE LEVEL
WHICH CORRECTLY EXPRESSED EACH OF
THE SEVENTEEN PREPOSITIONS

AGE (years)		4	5	6	7	8	9	10	11	12
		N=1	N=2	N=6	N=4	N=3	N=4	N=6	N=7	N=2
LOCATIVE	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
DIRECTIONAL	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

directionals. Subjects expressed 25 to 30 percent more directional prepositions than locatives at ages 4, 5 and 6 years. The differences between the two types narrowed to 10 percent at 7 and 8 years. From 9 years through 12 years of age, the differences between directional and locative prepositions narrowed to 2 percent or less. Another way to look at these

Figure 5. Percentage of locative and directional prepositions correctly expressed in thirty-five children ages four to twelve years.

data is to determine the percentage of correctly expressed prepositions out of the total group of thirty-five children.

Percentage of Expressed Prepositions

The total percentage of correctly expressed locative and directional prepositions is illustrated in Figure 6. The directional prepositions

Figure 6. Percentage of the thirty-five severely-to-profoundly hearing impaired subjects correctly expressing each of the seventeen locative and directional prepositions.

"down," "up" and "around" were correctly expressed respectively by 100, 94 and 89 percent of the thirty-five subjects. Two locative prepositions, "under" and "in" follow with 86 percent of the subjects expressing "under" and 83 percent using "in" correctly. The directional preposition "over" was expressed by 80 percent of the thirty-five subjects. A locative preposition "on" was correctly used by 74 percent of the subjects, while the directional preposition "out of" follows with 71 percent of the sample correctly expressing the item. Four locative prepositions follow in the sequence of correctly expressed prepositions. "Behind" was correctly expressed by 66 percent of the sample; "in front of," 49 percent; "beside," 46 percent and "between" was correctly expressed by 34 percent of the subjects tested. The directional preposition "to" was expressed by 23 percent of the thirty-five subjects. The locative preposition "above" was produced by 14 percent of the subjects. The directional prepositions "into" and "away from" were both produced by only two subjects or 6 percent of the sample. Finally, only one subject (3 percent) produced the locative preposition "below." These data were consistent with the order of acquisition determined by the percentage of expression at each age level.

Error Types

Subjects in this study demonstrated omission, substitution and intelligibility type errors. Up to four subjects exhibited omission type errors on eight of the seventeen prepositions.

Hearing impaired subjects in this study demonstrated four types of substitutions for targeted prepositions. The first type of substitutions used by this hearing impaired sample were synonymous to the targeted

prepositions. Examples of synonymous substitutions included: "by/beside," "over/above," "in back/behind," "in or inside/into," "under/below" and "in the middle/between." Eighty-six percent of the thirty-five subjects substituted "under" for "below," despite the contrast of "above" given in the stimulus. In contrast to synonomous substitutions, some subjects produced antonyms of the targeted preposition. Of the eighteen subjects failing to express "in front of," four subjects produced opposite substitution errors ("in back, behind/in front of").

Another substitution error demonstrated by this hearing impaired sample involved the substitution of "beside" or "by" for the locative preposition "in front of." Finally, subjects in this study produced substitution errors which appeared to be random in nature. For the locative preposition "between," five subjects produced irrelevant responses to the stimulus question (e.g., "the dog is looking the car," "he's going this car"). Several subjects also produced clearly off-target responses for the directional prepositions "to" (e.g., "he gonna go bye bye," "he drive the car") and "away from" (e.g., "going home," "man back that way.").

Finally, hearing impaired subjects demonstrated intelligibility type errors. Of the thirty-five children in this study, five children produced unintelligible utterances. These included a 5 year old (eight errors), a 6 year old (seven errors), a 7 year old (eight errors), and two 10 year olds (four and two errors). Sixty-one percent of the errors made by the 7 year old were due to unintelligibility. When looking at collapsed age groups, 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.

CHAPTER V

DISCUSSION

This study investigated the oral expressive acquisition of locative and directional prepositions in severely-to-profoundly hearing impaired children. Mean scores for both locative and directional prepositions increased with age. For locative preposition scores, significant differences were found between Group 1 (4, 5, 6 years) and Groups 2 (7 to 8 years), 3 (9 to 10 years) and 4 (11 to 12 years). For directional preposition scores, significant differences were found only between Group 1 and Group 4. As could be deduced from these data, the acquisition curve for locative prepositions was steeper than that for directionals. Additionally, more directional prepositions were acquired earlier than locative prepositions. Thus, several directional prepositions were the first to be acquired by this severely-to-profoundly hearing impaired sample. As illustrated in Figure 5, subjects expressed 25 to 30 percent more directional prepositions than locatives at ages 4, 5 and 6 years. The differences between the two types narrowed at 7 and 8 years. From 9 years through 12 years of age, the percent of directional and locative prepositions expressed were essentially the same.

The question this study sought to answer was: At what age levels are seventeen locative and directional prepositions expressively acquired by severely-to-profoundly hearing impaired children? In this study, the directional preposition "down" was expressed by 100 percent of the subjects at all ages. Since there was only one 4 year old and two 5 year

old subjects, it cannot be concluded that "down" is acquired at this early age. The directional preposition "up" was acquired by 6 years of age. "Up" was correctly expressed by 100 percent of the subjects from 6 years through 12 years, with the exception of one 7 year old who gave an unintelligible response. By 7 years of age, the directional preposition "around" and the locative preposition "under" were acquired. The locative preposition "in" was acquired by 8 years of age. By 9 years of age, the locative preposition "on" and the directional preposition "out of" were acquired. Due to isolated subjects' performances, the acquisition curves of the prepositions "in," "on" and "out of" dipped slightly after achieving 100 percent accuracy. These "dips," however, never descended below 83 percent accuracy.

Three locative prepositions (in front of, beside, and between) and one directional preposition (to) were expressed with 100 percent accuracy only by the 12 year old subjects. It is questionable if these prepositions could be considered acquired when taking into account the fact that this age group contained only two subjects. It can be postulated that individual differences of subjects affected results in this study more than they would with a larger N. A larger number of children need to be tested in each age group to compensate for inter-subject variability. A larger N may particularly be warranted in the 12 year old group.

The directional preposition "over" and the locative preposition "behind" did not follow expected acquisition curves. The preposition "over" was expressed by 100 percent of the 6, 7 and 8 year olds in this study. Correct expression of "over" dropped in the 9 and 10 year olds, rising to 86 percent accuracy at 11 years and 100 percent at 12 years of

age. The errors produced by the 9, 10 and 11 year olds were omissions ("dog jumping fence") and substitutions ("on/over"). Such variations in responses with increased age suggests that prepositions such as "over" may not be learned naturally, but rather may require specific language training (Hasenstab and Bevilacqua, 1980).

The locative "behind" was expressed by 100 percent of the 8 year olds in this study. Accuracy dropped, however, below the 80 percent level in 9, 10 and 11 year olds, recovering to 100 percent only at 12 years of age. Of the five 9, 10 and 11 year olds who missed this item, two produced unintelligible responses. Three subjects substituted the synonym "in back" for "behind," demonstrating expression of the concept even though the targeted preposition was not used.

Two locative prepositions (above and below) and two directional prepositions (into and away from) did not achieve 100 percent, or even 80 percent accuracy, by any age group. It can be concluded that these prepositions were not acquired by this hearing impaired sample by 12 years of age.

Ranges of scores were wider than would be expected in a homogeneous population, particularly with the scores of two subjects who performed at variance to their peers in the same age group. The first subject was a 7 year old who correctly expressed eight out of nine locative prepositions and six out of eight directional prepositions. This subject's total preposition score of fourteen out of seventeen was equal to that of several 10, 11 and 12 year old subjects. In contrast, an 11 year old correctly expressed only four out of nine locatives and three out of eight directional prepositions. This subject's total preposition score of seven out of seventeen was equal to the mean of 6 year olds. This

further indicates the need for a larger sample in each age group to compensate for inter-subject variability.

The age levels at which specific locative and directional prepositions were acquired have been discussed. Additionally, these data can be compared with the expression of locative and directional prepositions in normally hearing subjects.

Comparisons to Normally Hearing Children

Performance of hearing impaired subjects on the expressive use of prepositions can also be compared to that of normally hearing subjects. Hustead (1974) tested the acquisition of six locative (in, on, behind, under, between, beside) and four directional (up, out of, around, to) prepositions used in an investigation with normally hearing children ages 4 to 9 years. She tested six subjects in each of the six age groups. For the locative prepositions, the normally hearing children progressed from expressing 72 percent of the prepositions at 4 years to 92 percent at 9 years of age. In comparison, the hearing impaired sample in this study produced significantly reduced percentages and a steeper curve of correctly expressed prepositions (see Figure 7).

The normally hearing subjects produced the four directional prepositions with 100 percent accuracy from 4 to 9 years of age, except for 96 percent accuracy at 5 years. Again, the progression of the hearing impaired subjects demonstrated delayed acquisition and a steeper curve of correctly expressed prepositions (see Figure 8).

Four directional prepositions (up, around, out of, to) and three locatives (in, on, under) were expressed by 100 percent of Hustead's subjects at 4 years of age. The locative "behind" was expressed 100

Figure 7. Percent of six locative prepositions correctly expressed by thirty-six normally hearing subjects ages four to nine years and thirty-five severely-to-profoundly hearing impaired subjects four to twelve years.

percent of the time at 5 years and "between" at 6 years of age. The locative preposition "beside" was never expressed with 100 percent accuracy at any age by the normally hearing subjects up to 9 years of age. Since Hustead's 4 year olds expressed the majority of these prepositions with 100 percent accuracy, sequence of acquisition cannot be compared to that

Figure 8. Percent of four directional prepositions correctly expressed by thirty-six normally hearing subjects ages four to nine years and thirty-five severely-to-profoundly hearing impaired subjects four to twelve years.

of the hearing impaired sample.

Heckle (1975), however, provided acquisition information not supplied by Hustead (1974). He tested the acquisition of four locative (in, on, under, behind) and four directional (up, out of, around, to) prepositions used in this study with normally hearing children ages 1 year, 6

months to 3 years, 6 months. He tested twelve subjects in each of five (six-month intervals) age groups. The directional preposition "up" was the first (of these prepositions in common) to be expressed by over 80 percent of the normal subjects beginning at 2 years, 6 months. The locatives "in" and "on" were next in the sequence of prepositions acquired (100 percent accuracy) by the normal subjects at 3 years, 6 months. The normally hearing subjects in Heckle's study did not acquire "under," "out of," "around" and "to" by 3 years, 6 months of age. Each of these prepositions, however, was expressed by at least 50 percent (N=12) of the subjects by 3 years, 6 months. The locative preposition "behind" was not expressed by any of the 3 year, 6 month year olds in Heckle's study.

The directional preposition "up" was also the first (of these prepositions in common) to be expressed with 100 percent accuracy by the hearing impaired subjects at 6 years of age. The hearing impaired subjects expressed the directional preposition "around" and the locative "under" with 100 percent accuracy at 7 years, followed by "in" at 8 years of age. The locative preposition "on" and the directional "out of" were expressed with 100 percent accuracy by 9 years of age by this hearing impaired sample. "Behind" was expressed by 100 percent of the hearing impaired subjects at 8 years with subjects in subsequent age groups producing synonymous or unintelligible responses. The directional preposition "to" and the locatives "between" and "beside" were expressed with 100 percent accuracy only by the two 12 year old hearing impaired subjects.

While the N in each age group of these studies varied, some general comparisons can be made. The hearing impaired subjects demonstrated delayed acquisition when compared to normals on all the prepositions in common. The gap between the normal subjects in Hustead's (1974) study

and the hearing impaired subjects in this study narrowed with increased age. The sequence of acquisition between the normals (Heckle, 1975) and the hearing impaired subjects varied. Most noticeable was that the hearing impaired subjects expressed the directional preposition "around" and the locative "under" before the normally early acquired locatives "in" and "on."

In summary, when comparing the expression of locative and directional prepositions to that of normally hearing children, the hearing impaired subjects exhibited delayed acquisition which decreased with age. Additionally, the sequence of acquired prepositions varied between the hearing and hearing impaired groups.

Classification of Errors

Overall, subjects in this study demonstrated errors which could not be categorized according to age level. The exceptions were the three 4 and 5 year olds who tended to repeat the stimulus item or produce general "giant word" responses such as "right there" or "over here." Omission, substitution and intelligibility errors occurred at most age levels. Intelligibility errors, however, decreased with age in this severely-to-profoundly hearing impaired sample. These three categories of errors will be explored individually.

Omissions

Omission errors occurred at all age levels and for both types of prepositions. This appears to be an illustration of telegraphic speech patterns which follow normal developmental patterns, yet at a delayed rate (Brannon, 1968). Myklebust (1960) found omission of function words

to be the most frequent type of error noted in his deaf subjects' written language. Subjects in this study, however, did not exhibit more omission errors when compared to demonstration of other types of errors. While Myklebust studied spontaneous deaf language through the written mode, this investigation looked at verbal expression in a structured task. Differences in the study designs could account for the varying results. Rather than producing a predominance of omission type errors, subjects in this study produced significantly more substitution type errors.

Substitutions

The first type of substitutions used by this hearing impaired sample were synonymous to the targeted prepositions. Examples of synonymous substitutions included: "by/beside," "over/above," "in back/behind," "in or inside/into," "under/below" and "in the middle/between." These prepositions functioned as appropriate substitutions in the context provided. Thus, subjects demonstrated ability to express the concept being tested even if the specific preposition was not used.

Tweney, Hoeman and Andrews (1975) attributed use of lexical items to the amount of experience subjects had with vocabulary words rather than to the words' concrete or abstract nature. While their study related to onomatopoeic words, lack of experience may inhibit use of unfamiliar vocabulary items as well. Thus, known prepositions that functioned adequately in a variety of contexts were used over synonymous, less familiar prepositions. Use of familiar words over unfamiliar words could also be attributed to the overall restricted semantic system of deaf children when compared to normally hearing children (Green and Shepherd, 1975). Thus, this may be an example of the limited, redundant and less flexible

use of vocabulary in hearing impaired children when compared to normal (Cooper and Rosenstein, 1966; Walter, 1978).

In contrast to synonomous substitutions, some subjects produced antonyms of the targeted preposition. For example, several subjects substituted "in back" or "behind" for "in front of." Wiig and Semel (1976) reported that confusions between opposites were prevalent in a learning disabled population. The possibility of subjects demonstrating a learning disability, in addition to hearing impairment, was not considered in the selection criteria of subjects in this investigation. Due to the inter-related nature of cognitive and linguistic functioning (Menyuk, 1976), a learning disability may have adversely affected subjects' abilities to express locative and directional prepositions.

Opposite substitution errors could also be attributed to orientation of the subject to the objects used to elicit the preposition. It has been demonstrated that normally hearing children learn the concepts "in front of" and "behind" in relation to their own bodies prior to learning these concepts in relation to objects (Kuczaj and Maratsos, 1975). Thus, the opposite substitution error by hearing impaired children could be a demonstration of an error seen within the course of normal language development of younger children.

Another substitution error demonstrated by this hearing impaired sample involved the substitution of "beside" or "by" for the locative prepositions "in front of." This substitution error could be an instance where a superordinate concept (by) was substituted for subordinate concept (in front of) as suggested by Ivimey and Lachterman (1980). Additionally, hearing impaired subjects exhibited substitution errors containing phonemically similar responses. These types of errors included

the substitution of "in" for "on" and "behind" for "beside" and "between." In the latter example, subjects were possibly making a generalized error of the already acquired preposition "behind," or confusing the prepositions due to the phonemic similarity of the prefix "be."

Finally, subjects in this study produced substitution errors which appeared to be random in nature and could not be categorized. For the locative preposition "between," five subjects produced irrelevant responses to the stimulus question (e.g., "the dog is looking the car," "he's going this car"). Several subjects also produced clearly off-target responses for the directional preposition "to" (e.g., "he gonna go bye bye," "he drive the car") and "away from" (e.g., "going home," "man back that way"). Such irrelevant responses may be a result of attending to the visual stimulus without consideration of the auditory stimulus provided by the examiner. Level of lipreading skill and use of residual hearing may also have an influence in these instances (Hart and Rosenstein, 1964). Finally, the hearing impaired subjects may have responded in a concrete manner to a stimulus which required use of an unknown concept. Thus, subjects responded with the concrete description of "what the object was doing," rather than attempting to express "where the object was located."

For the locative preposition "above," several subjects produced responses in which they appeared to be searching for the target preposition (e.g., "flying on the garage down there," "airplane go fly behind under the garage"). In these examples, as in Odom's et al. study (1967), subjects identified that a preposition was required, but had difficulty choosing the semantically correct word. These examples demonstrated the subjects' attempts to express meaning for which they had not yet acquired

the appropriate lexical items, a phenomenon described by Menyuk (1969) in reference to the development of expressive prepositions in normally hearing children.

To summarize, subjects in this study produced a variety of substitutions for targeted prepositions. These included: (1) synonymous substitutions, (2) opposite substitution errors, (3) superordinate concept substitutions, (4) phonemically similar substitutions and (5) off-target substitutions which appeared to be random in nature. The final type of error produced by subjects in this study were unintelligible responses.

Intelligibility

Intelligibility was a factor which affected the performance of hearing impaired subjects in this sample. Of the thirty-five children in this study, five children produced unintelligible utterances. When looking at collapsed age groups, 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. Thus, intelligibility appeared to be a factor through 10 years of age in this hearing impaired sample.

Unintelligible items appeared to be random in nature in terms of fatigue due to order of presentation. While unintelligible responses occurred in both earlier and later acquired prepositions, 54 percent of the unintelligible items involved four prepositions where acquisition by subjects in this study was questionable. These prepositions were "behind," "in front of," "between" and "into." Unintelligible responses particularly influenced the acquisition curve of the locative preposition "behind." The two out of six 10 year old subjects in error missed this

item due to unintelligible responses. This caused a dip in the acquisition curve due to intelligibility alone. Similarly, a 7 year old missed the directional preposition "up" due to unintelligibility. This occurred at an age that "up" had been expressed by 100 percent of the subjects in the previous age level.

In this investigation, responses were scored as incorrect if the subjects produced two successive unintelligible responses. Goda (1964) instructed her deaf subjects to write down responses in cases of unintelligibility. Watts (1979), however, described the ability to comprehend and use written language as an "acquired skill, which is not necessarily 100 percent related to general language comprehension." Thus, written responses appear to be an inefficient substitution for unintelligible verbal responses. There appears to be no clear solution to the problem of intelligibility in researching expressive language acquisition in the severely-to-profoundly hearing impaired population.

In summary, unintelligibility was an influential factor through 10 years of age and in the acquisition curve of four later appearing prepositions. Hearing impaired subjects in this study demonstrated omission, substitution and intelligibility errors. Some of the errors exhibited are found in the course of normal language development, while others appeared to be random in nature and could not be classified.

CHAPTER VI

SUMMARY AND IMPLICATIONS

Summary

Prepositions are important for the syntactical structure of the sentence and also to relate meaning, particularly meaning associated with concepts of place and time (Washington and Naremore, 1978). Expressive acquisition of function words, including prepositions, is significantly delayed in the hearing impaired population (Cooper and Rosenstein, 1966). Yet, acquisition sequence for expressive prepositions has not been determined for this population.

The purpose of this study was to investigate the oral expressive acquisition of locative and directional single word prepositions in severely-to-profoundly hearing impaired children. The question this study sought to answer was: At what age levels are seventeen locative and directional single word prepositions expressively acquired by severely-to-profoundly hearing impaired children?

Thirty-five severely-to-profoundly hearing impaired children between the ages of 4 years, 0 months and 12 years, 6 months selected on the basis of chronological age, lack of multiple handicapping conditions and acquisition of hearing impairment prior to two years of age participated as subjects in this study. The seventeen prepositions were tested utilizing common objects placed in various positions in association with verbal commands. Responses were scored as correct if they contained the

targeted preposition. Responses involving synonymous prepositions, substitutions, omissions and two consecutive unintelligible utterances were scored incorrect, but written down for evaluation.

Subject performance on the test as a whole improved with age. Mean scores for both locative and directional prepositions also increased with age. For the nine locative prepositions, significant differences were found between the collapsed age group of 4, 5, 6 year olds and the groups of 7 to 8 year olds, 9 to 10 year olds and 11 to 12 year olds. For the eight directional prepositions, significant differences were found only between the 4, 5, 6 year old group and the 11 to 12 year old group. From the results of this investigation, it appears that several directional prepositions are the first to be acquired by this severely-to-profoundly hearing impaired sample. Subjects expressed 25 to 30 percent more directional prepositions at ages 4, 5 and 6 years. The difference between the two preposition types narrowed to 10 percent at 7 and 8 years and to 2 percent or less from 9 years through 12 years of age.

This severely-to-profoundly hearing impaired sample demonstrated omission, substitution and intelligibility type errors. Some of the errors exhibited are found early in the course of normal language development, while others appeared to be random in nature and could not be classified.

Research Implications

If further research was to be conducted in this area, several factors should be considered in research design. First, due to the great amount of inter-subject variability and the heterogeneous nature of this population, this investigation should be repeated with a larger N to

minimize the effects of an exceptionally high or low functioning subject.

Secondly, the subject's performance may be positively or adversely affected by the age in which (s)he received amplification. Thus, "hearing aid age" should be considered in assessing oral-aural language skills in the severely-to-profoundly hearing impaired population, particularly in the younger ages. Further, the individual child's use of residual hearing would be likely to have an impact on his or her oral-aural language performance. Thus, aided audiograms, in conjunction with unaided audiograms may be an important variable to consider in the selection criteria of subjects or in evaluating results.

Thirdly, this investigation did not consider when the subjects entered into an educational program. The younger subjects in this study may have had an advantage of early educational training over subjects in the upper age range. It is unknown if this could have been a factor in several of the 7 and 8 year old subjects performing as well, or better than, several 9, 10 and 11 year olds.

Fourthly, the possibility of subjects exhibiting a learning disability, in addition to a severe-to-profound hearing impairment, was not controlled for in this investigation. Considering the inter-related nature of cognitive and linguistic functioning, particularly in spatial concepts such as prepositions, a learning disability could adversely affect performance on an expressive preposition task.

Finally, this investigation considered usage of a given word (locative and directional prepositions) in a given context. As suggested by Davis and Hardick (1981), this measures only one dimension of vocabulary knowledge. A more thorough investigation of the acquisition of prepositions in the severely-to-profoundly hearing impaired population

may investigate a broader scope of linguistic performance by utilizing various contexts provided by changes in stimuli and situation.

Further research in the expressive acquisition of prepositions in the hearing impaired population may investigate the following comparisons: (1) acquisition of definite and indefinite locative and directional prepositions; (2) acquisition of locative and directional prepositions in hearing impaired children using a total communication mode of communication in comparison to children using an oral-aural mode of communication; (3) acquisition of locative and directional prepositions according to severity of impairment, comparing mild, moderate and severely-to-profoundly hearing impaired children's performance; (4) acquisition of prepositions depicting time and manner; (5) use of prepositions in a broader scope of linguistic performance utilizing various stimuli and contexts.

Clinical Implications

From this investigation, it appears that severely-to-profoundly hearing impaired children learn several directional prepositions earliest in the sequence of acquisition. By 7 to 8 years of age, children acquire directional and locative prepositions at approximately the same rate. These results have clinical implications for the sequence in which prepositions are trained in severely-to-profoundly hearing impaired students. In the earlier stages of language learning, the hearing impaired child may be more successful in learning directional prepositional concepts. In contrast, more time may need to be allotted for training locative prepositions. This may be particularly true of those locatives which are acquired in close developmental sequence and which may be confused with one another. In this sample, the locative prepositions "behind," "in

front of," "beside" and "between" were substituted for one another and were expressed close to one another in the sequence of percentage of correctly expressed prepositions.

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APPENDIX A

PARENT QUESTIONNAIRE AND CONSENT FORM

Dear Parent or Guardian:

I am a Portland State University graduate student doing research in Speech and Hearing Sciences. The purpose of the study is to investigate the development of prepositions in the language of hearing impaired children. This study, hopefully, will help teachers of the hearing impaired.

Participation in the project would require thirty 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 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 can reach me in the evenings at 282-1721. If you would like your child to participate in the study, please answer the three questions below. Then, please sign, indicating your approval and return the form to school with your child tomorrow. Thank you for your cooperation.

Sincerely,

JoAnn Warlick
Graduate Student; Speech and Hearing
Sciences
Portland State University

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, physician, 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

If yes, please indicate cause: _____

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

Parent's signature _____ Date _____

Child's signature _____ Date _____
(if 7 years or older)

Child's Birthdate: _____

APPENDIX B

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?	In <u>the</u> 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?	On <u>the</u> 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
7. The examiner points to the garage, then holds the airplane above the garage.	Here is the garage. Where is the airplane?	<u>Above</u> the garage.	Locative
8. The examiner pushes the car around the garage.	Where am I pushing the car?	<u>Around</u> the garage.	Directional

PROCEDURE	STIMULUS	RESPONSE	CLASSIFICATION
9. The examiner makes the dog jump over the fence.	Where did the dog jump?	<u>Over</u> the fence.	Directional
10. The examiner walks the man into the garage.	Where is the man going?	<u>Into</u> the garage.	Directional
11. The examiner places a car beside the garage.	Where is the car?	<u>Beside</u> 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?	<u>To</u> the car.	Directional
13. The examiner places the dog under the car.	Where is the dog?	<u>Under</u> the car.	Locative
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 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 response 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."