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ITS RELATIONSHIP TO MATERNAL USE OF MANUAL COMMUNICATION

The University of Arizona

PH.D. 1984

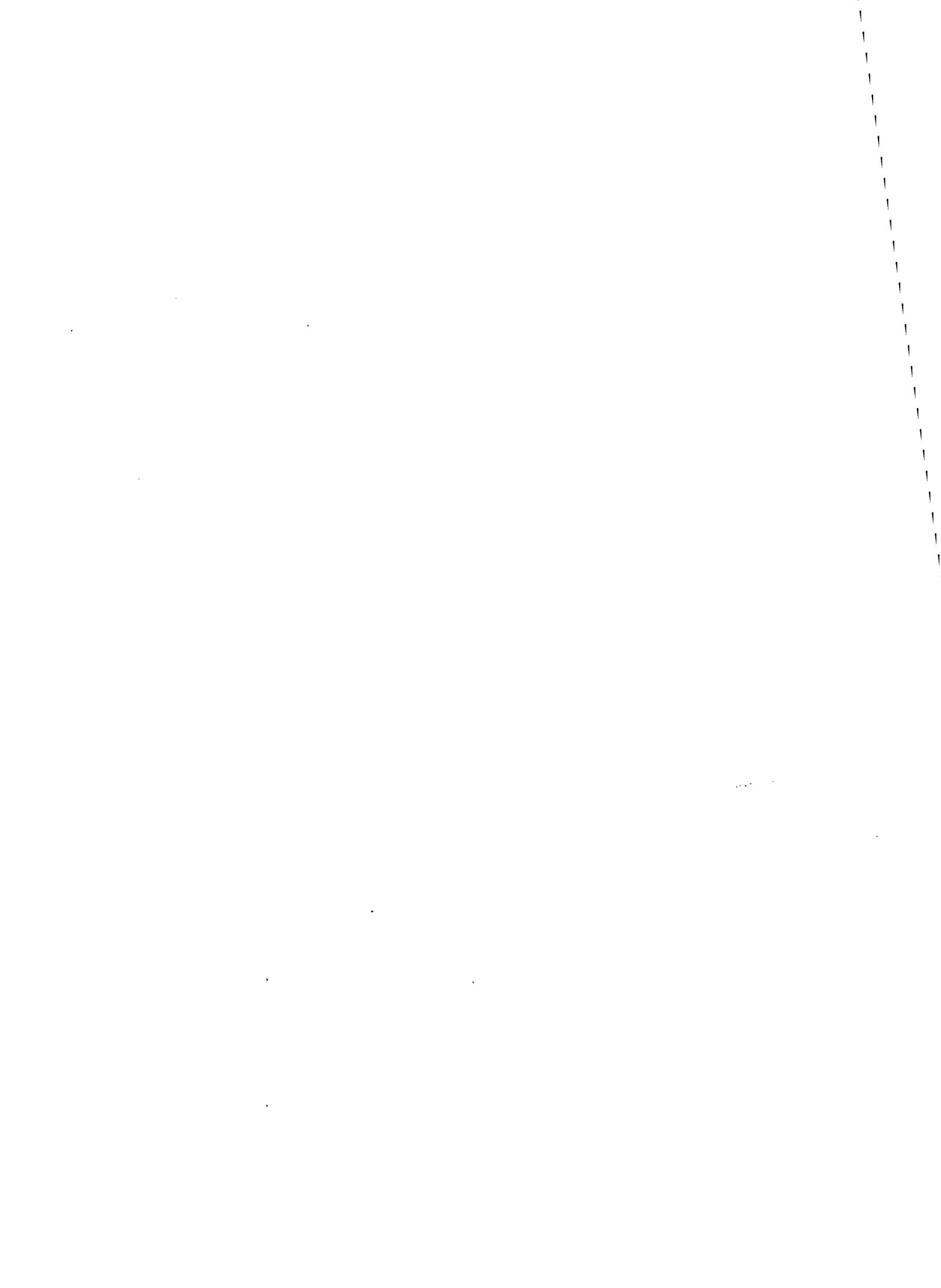
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READING COMPREHENSION OF PRELINGUALLY DEAF ADOLESCENTS AND
ITS RELATIONSHIP TO MATERNAL USE OF MANUAL COMMUNICATION

by

Charlene Marie Chipps Kampfe

A Dissertation Submitted to the Faculty of the

DEPARTMENT OF REHABILITATION

In Partial Fulfillment of the Requirements
For the Degree of

DOCTOR OF PHILOSOPHY

In the Graduate College

THE UNIVERSITY OF ARIZONA

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THE UNIVERSITY OF ARIZONA
GRADUATE COLLEGE

As members of the Final Examination Committee, we certify that we have read
the dissertation prepared by Charlene Marie Chipps Kampfe

entitled READING COMPREHENSION OF PRELINGUALLY DEAF ADOLESCENTS AND
ITS RELATIONSHIP TO MATERNAL USE OF MANUAL COMMUNICATION

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SIGNED: Charles Mann Clipp Karpf

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ABSTRACT

The purpose of this study was to examine the relationship between hearing mothers' methods of communication with their prelingually deaf children, and those children's reading comprehension scores, as measured by the Stanford Achievement Test, Special Edition for Hearing Impaired Students, 1973 (SAT-HI).

The subjects of this study were 201 prelingually deaf students from six randomly selected residential schools for the deaf from throughout the United States. All subjects had hearing losses of 91dB (ANSI) or greater, had lost their hearing before age three, used some form of manual communication as their primary method of learning and communicating, were ages 11.25 through 19.83, had been enrolled for at least the past three years in residential schools which subscribed to the total communication philosophy, had no additional handicapping conditions, had natural mothers who were able to complete the Mother's Questionnaire, came from families who used English as the primary spoken language, and had parents whose hearing was normal.

Questionnaires were sent to schools and mothers to obtain information regarding the dependent variable (reading comprehension scores); the primary independent variables (methods of communication used by mothers, ages of the children when signing mothers began to use manual communication, and skill levels of mothers who used manual communication); and a number of secondary independent variables.

The data were analyzed by several statistical procedures. The secondary variables were analyzed using Pearson correlation coefficients, multiple ANOVA's and cross-tabulations among groups. The primary independent variables were analyzed using multiple regression analysis and analysis of covariance. Based on the findings of the analysis of the secondary variables, chronological age and non-verbal IQ acted as covariates.

Results indicated that, for the subjects of this study, the method of communication used by mothers of prelingually deaf children had no significant relationship with their children's reading comprehension scores.

Of the subjects whose mothers used manual communication, no significant relationship was found between reading comprehension and the ages of the children when their mothers began to sign with them. Conversely, a significant relationship was found between reading comprehension scores and skill levels of mothers as reported by both mothers and schools.

Because of questionable validity of some of the measures, difficulties in interpretation of the ANCOVA, inability to control for ethnic background, limitations in subject selection, and the small number of subjects in Group 1; the findings of this study should be considered to be speculative, at best.

CHAPTER 1

INTRODUCTION

Profound deafness in early childhood has been found to have a significant negative impact on later academic achievement (Babbini and Quigley, 1970; Boatner, Note 1; Furth, 1966; Gentile and DiFrancesca, 1969; Jensema, 1975b; Trybus and Karchmer, 1977). These findings are particularly evident with regard to reading achievement (Babbini and Quigley, 1970; DiFrancesca, 1972; Gentile, 1973; Ries, 1973; Trybus and Karchmer, 1977; Wrightstone, Aronow and Moskowitz, 1962).

Researchers have consistently found that deaf students are reading at levels well below hearing students of similar ages. Average reading levels of students aging 16 and over have been found to vary from grade 3 through grade 5.9 (Babbini and Quigley, 1970; Furth, 1966, 1971; Gentile and DiFrancesca, 1969; Trybus and Karchmer, 1977; Wrightstone et al., 1962).

Findings regarding the academic level of deaf students are mirrored by their academic growth rates, in that they have been found to advance at much slower rates than hearing students (Babbini and Quigley, 1970; Furth, 1966; Jensema, 1975b; Trybus and Karchmer, 1977). It has been estimated that they advance at rates of less than one-half grade level per year in overall academic achievement, and less than one-third grade level per year in reading and language achievement (Babbini and Quigley, 1970; Trybus and Karchmer, 1977). The growth

rate for reading appears to subside as deaf students reach adolescence (Moore, 1981). Furth (1966), for example, reported that students were found to advance at less than one grade level in reading over a five year period from age 11 to age 16. Myklebust (1964) and Goetzinger and Rousey (1959) found this leveling off to occur at ages 13 and 14 respectively.

Interestingly, deaf students have been found to function at lower levels in reading comprehension than they function in knowledge of the formal rules of language (i.e., spelling, punctuation and capitalization) (DiFrancesca, 1972; Trybus and Karchmer, 1977). A potential explanation may be that capitalization, spelling and punctuation are of a technical nature, while paragraph meaning requires inferential thinking and generalization (DiFrancesca, 1972).

Reading comprehension is believed to be potentially the most critical area of school achievement for any group of students (Trybus and Karchmer, 1977). It is thought to be the "essence of the reading process" (Stoodt, 1981, p. 162), and a necessary tool for helping students obtain information from textbooks in a variety of areas of study such as science, health, and history (Dishner, Bean and Readence, 1981; Singer and Donlan, 1980). Reading comprehension has also been found to be important to daily living and working activities of the adult (Ahmann, 1975; Harris and Associates, 1970; Northcutt, 1975; Stoodt, 1981). Because reading comprehension is needed in both childhood and adulthood, it is vital that parents of deaf children become aware of variables which contribute to poor reading achievement, and,

if possible, make environmental changes to counteract the negative effects of these variables.

It is assumed that early language deprivation resulting from difficulty in communicating with others has been the primary variable/cause of the low reading achievement of deaf students (Brasel and Quigley, 1975, 1977; Hart, 1978). The critical period for language development is thought to be from birth to about age 5 or 6 (Brasel and Quigley, 1977; Furth, 1964; Hart, 1978; Mindel and Vernon, 1971). Without the ability to hear during this period of time, and without some means of communicating with others, deaf children typically arrive at age 5 with much lower levels of skill in functional language than normal hearing children (Brasel and Quigley, 1975, 1977; Furth, 1966, 1971; Hart, 1975, 1978; Schein and Delk, 1974). Because language skills provide the foundation on which reading will later develop (Brasel and Quigley, 1975; Hart, 1978; Quigley and Kretschmer, 1982), this language deficit results in the lack of ability to develop reading skills at the level of hearing students of similar ages (Brasel and Quigley, 1975, 1977; Furth, 1966; Hart, 1975, 1978; Quigley and Kretschmer, 1982).

Historically, one of the major issues regarding the development of academic, speechreading and speech skills of deaf students has been whether or not to use manual communication (Jensema and Trybus, 1978). This issue has been so widely discussed that it has been labeled the oral-manual controversy (Moores, 1981). This controversy can generally be described as the difference in opinion between two groups: 1) those

who believe that skills in functional speech, speechreading and acoustics will minimize the handicap of deafness, and that using manual communication may adversely affect the development of these skills (Oralists); and 2) those who believe that using manual communication will contribute to these skills and will also contribute to the psychological development of deaf children (Manualists) (Meadow, 1968; Mindel and Vernon, 1971; Stuckless and Birch, 1966).

Moore (1981) has traced the beginning of this controversy to the eighteenth century when Abbé Carlos Miguel de l'Epee (1712-1789) of France and Samuel Heinicke (1729-1784) of Germany disagreed on methodology. Abbé de l'Epee had been working with large numbers of deaf persons in Paris using their natural gesture system and "methodical signs" which he had developed to supplement their natural signs (Moore, 1981).

Heinicke and Jacob Periere (1715-1790) made strong personal attacks on de l'Epee and his assistant, Abbé Stark, regarding the use of "methodical signs" and the lack of speech and speechreading training in their program. When de l'Epee invited the two men to visit his school, they refused the offer and continued to criticize his methods (Garnett, 1968). This was the beginning of a controversy which would continue through the present day (Arnold, 1984).

The controversy was expanded as other countries became involved. The manual approach was predominant in the United States, and by 1860, there were 22 manually oriented schools in operation. These schools resisted the development of orally oriented schools until

1867, when the first oral school was opened in Massachusetts (Oyer and Hardick, 1976). Finally, in 1880, the International Congress of Educators of the Deaf in Milan, Italy proclaimed the oral method to be superior to the manual method by a vote of 116 to 16 (Berger, 1972; Moores, 1981). The United States voted with the minority for manual communication (Berger, 1972).

Although the controversy seemed settled internationally, it was still active in the United States (Moores, 1981). Alexander Graham Bell and Edward Minor Gallaudet continued to have serious personal and professional disagreements regarding the best approach to educating the deaf (Boatner, 1952; McClure, 1969). Their fighting created two strongly opposing points of view with followers, journals, schools and organizations taking sides (Moores, 1981).

During the first half of the twentieth century, the strongest faction became the group advocating the pure oral approach. Programs for the deaf followed this approach for nearly all children through age 10. "The goal of education was 'Normality'" (Moores, 1981, p. 200). If the children did not speak well enough to become part of the "hearing world" by age 11, they were then exposed to manual communication (Moores, 1981, p. 200).

An underlying factor during this period was that, although educators stressed the pure oralist approach, the majority of deaf persons in the United States were using American Sign Language (ASL) (Moores, 1981). American Sign Language (ASL), as defined by Moores (1981), is a modified version of the French sign language which was

brought to the United States in the early 1800's by Laurent Clerc and Thomas Hopkins Gallaudet. ASL is often referred to as Ameslan or the native language of the deaf (Moore, 1981).

Although the deaf community continued to use ASL, the oral approach remained the dominant method of communication in educational programs for the deaf. In the 1960's however, individuals from the United States and Russia began to challenge this position (Moore, 1981), and the controversy became active again.

A review of the literature shows that this controversy has been one of the most emotionally charged topics regarding the education of the deaf (Berger, 1972; Farwell, 1976; Moore, 1981; Oyer and Hardick, 1976). Most writings are biased, giving personal opinions and using references which are also personal opinions (Moore, 1981; Nix, 1975). Many reference citations are used incorrectly to support one point or another (Nix, 1975). Essentially then, the majority of the literature regarding the oral-manual controversy is "wisdom writing" which is not supported by research findings (Jensema and Trybus, 1978).

With manualists and oralists so emotionally involved, it is not difficult to understand why a body of objective research has not been produced. In an effort to bridge the gap between the manual and oral philosophies, and to take advantage of the positive aspects of each; another concept, most often called total communication, has been suggested by educators. Broadly defined, this concept is a philosophy which stresses using whatever method of communication which works with the child (Berger, 1972; Moore, 1981). It includes the use of speech,

speechreading, amplification, made-up signs, sign language, finger-spelling, pantomime, and writing (Alexander, 1978; Oyer and Hardick, 1976).

Moore (1981) suggests that the traditional methods controversy no longer exists because there are no longer any educators who stress the pure manual approach. Rather, he states that most manualists might now be considered total communication advocates who believe that both acquisition of speech and psychological development of the child are of primary importance. Presently then, the controversy is more typically between those who advocate for a pure oral approach and those who advocate for the use of manual communication together with the use of amplification, speech, speechreading, reading and writing (Berger, 1972; Moore, 1981).

This controversy, although an educational one, has had great impact on the choices hearing parents have made regarding the method of communication used with their deaf children. Since hearing parents have not typically been familiar with deafness before having a hearing impaired child (Altschuler, 1974; Sisco and Anderson, 1980), they have had to rely on others to guide them. It is assumed that the philosophies (oral or manual) of the professionals working with them have had strong effects on parents' decisions regarding which method of communication to use. Unfortunately, however, neither philosophy has been supported by a body of research, forcing parents to make choices based on personal opinions rather than on the findings of carefully controlled research.

Statement of the Problem

The present study is concerned with the method of communication used with prelingually deaf children and its relationship to their later reading comprehension skills. The primary question is whether prelingually, deaf adolescents whose parents are hearing and whose mothers used manual communication with them before age 5 obtain significantly different reading comprehension scores than prelingually, deaf adolescents whose parents are hearing and whose mothers did not use manual communication with them before age 5.

This study will not examine the influence of the oral or manual approach in educational programs for the deaf. Rather, it will investigate the relationship between reading comprehension and maternal method of communication.

Significance of the Problem

Approximately 90 percent of the parents of hearing impaired children do not have a hearing deficiency (Altschuler, 1974; Northern and Downs, 1974; Schein and Delk, 1974). When hearing parents first learn that their children have hearing impairments, they are required to make many decisions. One is whether or not to use manual communication with their children. In order to make knowledgeable decisions, these parents need accurate information about the potential effects of various methods of communication on their children's psychological development. One important area of development is academic achievement. In spite of the need for information regarding the relationship

between academic achievement and method of communication used with deaf children, very few definitive findings exist in the literature.

Research has shown that profound deafness has a significant negative impact on reading achievement (Babbini and Quigley, 1970; DiFrancesca, 1972; Furth, 1966; Gentile, 1973; Ries, 1973; Trybus and Karchmer, 1977; Wrightstone, et al., 1962). One national study found that deaf students at ages 15.5 through 16.5 received mean reading scores equivalent to grade level 3.5, with half the students reading at grade level 3.4 or lower (Furth, 1966). Another national study found that half the students aging 18 and 19 read at less than fourth-grade reading level (Trybus and Karchmer, 1977).

These findings are particularly important in view of the need for reading as an adult. The United States Bureau of Census defines functional literacy as the ability to read at the fifth grade reading level (Stoodt, 1981). According to Robinson (1963), adults reading at this level are "just able to read essential information for daily living and working at low levels" (p. 417). Adults reading at grade levels four or below are considered to be "barely able to contend with the adult reading material available" (p. 417). Examples of these reading materials are ballots, highway signs, supermarket flyers, bank loan information, Medicaid forms and flyers, income tax forms, driver's license applications, nutritional information on packaged foods, newspapers, magazines, instructions for use of appliances, and warranty information regarding purchases (Ahmann, 1975; Harris and Associates, 1970; Stoodt, 1981).

Reading levels for various occupations are much higher than the functional level defined by the Bureau of Census. Sticht (1975) indicates that a seventh grade level is the minimum requirement for an army cook, an eighth grade level is needed for a repairman, and a twelfth grade level is required for a supply specialist. It can be expected that professional occupations such as nurse, doctor, teacher, psychologist, or administrator would require at least equal or higher reading levels than the jobs studied by Sticht.

Northcutt (1975) found 65 specific reading competencies which were necessary for adult success. Poor reading performance was found to relate to poverty level or less income, low level of education, unemployment and low level employment. Given this relationship, it is not surprising that the prevocationally deaf adult population is typically underemployed, has a lower average income and has a lower level of education than the hearing population. Nor is it surprising that a disproportionately large percent of deaf adults are in non-transit operator and craftsman positions, leaving a very small percent of deaf adults in professional positions (Schein and Delk, 1974).

Since early profound deafness has been found to have a negative influence on reading comprehension (Trybus and Karchmer, 1977), and since reading has been purported to be a necessary skill for both educational and occupational functioning (Ahmann, 1975; Harris and Associates, 1970; Northcutt, 1975; Stoodt, 1981; Trybus and Karchmer 1977; Uden, 1970), it will be important for parents to know whether the method of communication they use will have a positive or negative

impact on their deaf children's reading abilities. In spite of the need for this information, there are few research studies regarding the relationship between reading comprehension and early communication methods used by hearing parents with their profoundly deaf children.

A number of studies have attempted to analyze this relationship, but because of the difficulty in obtaining subjects whose hearing parents used manual communication with them at an early age, and because of the lack of control of a variety of secondary variables such as hearing status of parents, most do not provide definitive results which can be applied to hearing parents (Brasel and Quigley, 1975, 1977; Meadow, 1967, 1968; Quigley and Frisina, 1961; Stevenson, 1964; Stuckless and Birch, 1966; Vernon and Koh, 1970). Only a few studies can be used for this purpose (Babb, 1980; Conrad, 1977; Jensema and Trybus, 1978; Morrison, 1982), and only one of these (Babb, 1980) can be applied directly to the question of the relationship between hearing parents' early method of communication with their deaf children and those children's later reading skills.

Because of the lack of meaningful studies regarding this relationship, hearing parents are having to make decisions based on very little information. If, in fact, the method of communication used with deaf children before age 5 is related to later reading comprehension skills, it is vital that research be undertaken to discover this. Until research findings are available, parents will be forced to make decisions about the communication methods they use with their children

without really knowing which method will have a positive effect on the ability of their children to read.

The primary purpose of this study is to add to the existing literature regarding the relationship between reading comprehension of prelingually deaf adolescents and the method of communication used with them by their hearing parents.

Definition of Terms

Hearing Impairment: This term encompasses all hearing losses from mild through profound (Moores, 1981).

Deaf: For the purposes of this study, this term will be used for a profound hearing loss. It will be defined as unaided audiological findings of 91 db (ANSI, ISO) or greater in the better ear averaged across the frequency range of 500, 1000, 2000 Hz (Quigley and Kretschmer, 1982).

ANSI: American National Standards Institute. This institute was previously named the American Standards Association (ASA), but in the 1960's, it was renamed the American National Standards Institute (ANSI). It is responsible for overseeing the various standards set in the United States.

ISO: International Standards Organization. This institute is located in Switzerland and is responsible for collecting standards used by several nations (Murra, 1962). This organization and the ANSI use the same standard for audiometric zero (Newby, 1979).

Prelingual Hearing Impairment: A hearing loss which occurred before the age of 3 (DiFrancesca, 1972; Jensema, 1975a; Ries, 1973).

This term refers to a loss which occurred at an age prior to the development of language and speech (Moores, 1981; Schein and Delk, 1974).

Prevocational Deafness: A hearing loss which occurred prior to the age of 19 (Schein and Delk, 1974).

Manual Communication: This broad, generic term will be used when discussing the entire range of manual systems used by persons who are deaf. It will include both sign language and fingerspelling exclusive of signs.

Sign Language: This broad term will be used when discussing the various kinds of communication systems using signs and the manual alphabet. The term will include American Sign Language, Ameslan, ASL, Signed English, Siglish, simultaneous communication, total communication, Pidgin Signed English, Seeing Essential English (SEE I), and Signing Exact English (SEE II).

Fingerspelling Exclusive of Signs: This term will be associated with the use of the manual alphabet without the use of signs. Typically, fingerspelling is accompanied by speech. Another term often used for fingerspelling is manual English. The Rochester Method and Neo-Oralism are also associated with this term. These are teaching methods using fingerspelling and speech, exclusive of signs (Berger, 1972; Moores, 1981).

American Sign Language (ASL, Ameslan): This method of communication is the oldest and most widely used system of the adult deaf in the United States (Moores, 1981). Fant (1972) describes the system

as one which does not use the copula, the; does not follow English word order; and provides much information through body posture, facial expression and context. Based on Bloomfield's (1933) theory that a language must be spoken to be considered a legitimate language, ASL was not accepted as a language during the early part of the twentieth century. In 1958, however, Stokoe (Note 2) examined the system using linguistic tools and found that it met the requirements for a separate language (Moores, 1981).

Signed English (Siglish): This term is confusing because it has been defined in many ways by many writers. It is often defined as a system which displays all aspects of English by using both signs and fingerspelling. The emphasis is conceptual (Bornstein, Saulnier and Hamilton, 1980). For the purposes of this study, all sign language systems using English word order will be included in this category (SEE I, SEE II, simultaneous communication, Pidgin Signed English).

Seeing Essential English (SEE I): This method of communication was developed by David Anthony in 1971. His major purpose was to provide a system which could facilitate the teaching of English grammar. Eighty percent of the vocabulary is from ASL. SEE I uses ASL "root words"; and adds suffixes, prefixes, contractions and verb inflections. It does not stress concepts (Berger, 1972; Moores, 1981).

Signing Exact English (SEE II): This system was developed by Gustason, Pfetzing and Zawolkow in 1972 and appears to be related to SEE I. Sixty-one percent of the signs are from ASL, twenty-one percent are new signs and eighteen percent are modified ASL signs. This system

emphasizes the word rather than the concept. It stresses the use of one sign for all meanings of a word, with the logic that this is the way persons speak (Moores, 1981).

Pidgin Signed English: This system is a variety of sign language used between hearing speakers and deaf persons who typically use ASL. It is used as a second language for both groups. It uses ASL signs and follows English word order (Woodward, 1973; Woodward and Markowitz, Note 3).

Total Communication: Total communication has been thought to be an extension of the simultaneous method (Moores, 1981). Although there is not full agreement on a definition, it is typically defined as an educational philosophy which stresses the use of whatever method of communication which works best with the child (Berger, 1972; Moores, 1981). It includes training in a variety of methods of communication including speech, speechreading, amplification, made-up signs, sign language, fingerspelling, pantomime, reading, and writing (Alexander, 1978; Berger, 1972; Moores, 1981; Oyer and Hardick, 1976). For a good total communication program, there must be proper diagnosis, qualified teachers, proper use of amplification, good models for sign language, and a unified implementation of the system (Alexander, 1978). Oyer and Hardick (1976) state that total communication may well be the link between the oralist and manualist philosophies.

Parents and many professionals often erroneously use the term, total communication, when referring to some form of Signed English. If mothers indicate on the questionnaires that they use total

communication, it will be assumed that they are referring to some form of Signed English.

Qualifications and Limitations of the Study

1. The present study was not concerned with evaluating the oral or manual methods of teaching deaf children. The results should not be generalized to these philosophies. Rather, the study was concerned with the relationship between reading comprehension and the method of communication used by hearing mothers with their prelingually deaf children.

2. Strict definition of subject criteria was used to control for a variety of secondary variables. As a result, the findings of the study can not be generalized to aspects of variables which have been eliminated. Hence, the findings can not be generalized to students 1) with less severe losses than 9ldB (ANSI, ISO), 2) who attend part-time or integrated school programs, 3) who attend schools which use the oral only approach, 4) who have additional educationally significant handicapping conditions, 5) whose present primary method of communication is speech and speechreading, 6) who lost their hearing at age three or after, 7) whose parents are deaf, and 8) whose natural mothers no longer live in the children's homes.

Conversely, findings can be generalized to deaf students 1) whose degree of loss is 9ldB (ANSI, ISO) or greater, 2) who have attended a total communication oriented residential school for at least the past three years, 3) who have no additional educationally significant handicapping conditions, 4) whose primary method of communication

is some form of manual communication, 5) whose parents are hearing, and 6) who lost their hearing before age three, and 7) whose natural mothers live in the children's homes. Any statements regarding the findings of this study must be confined to students meeting these qualifications.

3. The study has examined reading comprehension skills, and has made no assumptions regarding the relationship of mothers' methods of communication to social or emotional development of prelingually deaf children.

4. The Maternal Questionnaire was a self-report instrument. Throughout this study, then, the qualifier "as reported" must be considered when reviewing the data. As in Jensema and Trybus (1978), the assumption is that parents and school personnel answered the questions as honestly and as accurately as possible. The validity of some of the measures, however, is in question.

5. Various levels of the 1973 Stanford Achievement Test, Special Edition for Hearing Impaired Students (SAT-HI) were used to measure reading comprehension. Although several researchers from the Office of Demographic Studies, Gallaudet College, Washington, D. C. have indicated that it is appropriate to compare all levels using a scaled score (Jensema, 1975b; Jensema, Shildroth and O'Rourke, n.d.; Trybus and Karchmer, 1977), it is possible that slightly different types of skills or different measures of those skills will be associated with the different levels of the test. It is also possible that states use somewhat different methods of administering the SAT-HI.

6. Maternal emotional reaction to their children's disabilities was only partially controlled for. Hearing parents have been found to react differently to their children's hearing impairments than deaf parents do (Corson, 1974; Neuhaus, 1969). By selecting only children with hearing parents, it is expected that the subjects were somewhat more homogeneous on this variable than if children with both types of parents were selected. This provided only partial control for parental emotional reaction, however, because the variance within this hearing parent group was not controlled.

7. The method of communication used by fathers of deaf children was not analyzed. All findings must therefore be qualified as relating only to maternal method of communication with their children.

8. Mothers who do not use manual communication were not subdivided into various levels (i.e., extensive training in the oral approach versus no training in the oral approach). All findings regarding this group must be qualified as including various levels of oral oriented communication.

9. No effort was made to control for the working status of mothers during the early years of their children's lives. Although, this variable may have some relationship to the children's early language development, the present study will not be able to determine how much influence this variable has had on the children's later reading comprehension.

10. No effort was made to determine the marital status of the mothers, therefore although this variable may have some relationship to

deaf children's reading comprehension skills, it was not controlled for in the present study.

11. No effort was made to obtain information regarding birth order. This variable was therefore not controlled.

12. Socioeconomic level was only partially controlled for. While the educational level of both parents was controlled, the family income and job status were not.

13. Because of the complex interactions involved in ethnic background, this variable was only partially controlled.

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter presents a review of the literature relevant to this study. The review is divided into two sections. The first section deals with studies which have analyzed the relationship between academic achievement of hearing impaired children and method of communication used with them by their parents. The second section deals with secondary variables which might also have a relationship to academic achievement of hearing impaired children.

Academic Achievement and its Relationship to Communication Methods

Reading achievement is the most severely affected area of academic achievement of deaf children (Babbini and Quigley, 1970; DiFrancesca, 1972; Gentile, 1973; Meadow, 1967, 1968; Ries, 1973; Trybus and Karchmer, 1977; Wrightstone et al.; 1962). For this reason, much of the research regarding the relationship between method of communication and academic achievement examines only reading ability. Many studies, however, also include mathematical and overall academic achievement. Because the ability to read may have a relationship to other academic skills, and because some studies report findings for only general academic achievement, this review will include all areas of academic achievement as measured by a variety of achievement tests. The emphasis, however will be on reading achievement.

Studies Using the Hearing Status of Parents to Identify Signers and Non-signers

Studies which are most closely related to the present research are those which have examined the influence of the type of communication used by parents with their deaf children on later academic achievement. Many of these studies have compared deaf children of deaf parents to deaf children of hearing parents. This approach was taken because, in the past, most deaf parents used manual communication with their children from birth, while most hearing parents did not (Brasel and Quigley, 1975, 1977; Meadow, 1967, 1968; Quigley and Frisina, 1961; Stuckless and Birch, 1966; Vernon and Koh, 1970).

Quigley and Frisina (1961) conducted one of these early studies using the hearing status of parents to delineate between signers and non-signers. Day students of residential schools were selected to control for the school environment, and to maximize the influence of the home environment. Deaf students of deaf parents were found significantly superior in vocabulary. This group was also found to be superior in overall educational achievement, but the difference here was not significant.

Stuckless and Birch (1966) used a matched pair design to compare deaf children of deaf parents (early manual group) to deaf children of hearing parents (oral group). Children were initially screened for hearing losses of 70 dB or greater with onsets of loss prior to age two. These children were matched on the basis of sex, type of school attended, age of entrance into school, chronological age, mental ability, integrity of the central nervous system and

socioeconomic level. The Elementary Reading Subtest of the Metropolitan Achievement Test, and a teacher rated written language test were used to evaluate the students. Like Quigley and Frisinas' study, deaf students of deaf parents (early manual group) were found to receive higher scores than those of hearing parents (oral group). All differences in Stuckless and Birchs' study of language skills were found to be statistically significant.

Meadow (1967, 1968) used a matched-pair design similar to Stuckless and Birch (1966), comparing deaf children of hearing parents (oral group) to deaf children of deaf parents (early manual group). Children were matched on the basis of sex and age. Other variables such as IQ, degree of residual hearing, size of family and socioeconomic level of parents were partially controlled for through additional matching.

Based on the results of the Stanford Achievement Test, the children of deaf parents (early manual group) were found to achieve at significantly higher levels of reading, arithmetic and overall grade average than the children of hearing parents (oral group). The greatest difference was found in reading, with the manual group reading on an average of 2.10 years higher than the oral group.

Vernon and Koh (1970) studied students with genetic hearing losses of 70 dB or greater. Subjects were matched on the basis of non-verbal intelligence, sex, chronological age, and years of school since age five years, six months. Deaf students of deaf parents (early manual group) received significantly higher scores than deaf students

of hearing parents (early oral group) in paragraph meaning, word meaning, reading average and general average of the Stanford Achievement Test. Vernon and Koh suggested that these findings were especially impressive since the hearing parents had higher educational levels and had given their children more preschool education than the deaf parents had.

Brasel and Quigley (1975, 1977) conducted a study using four subgroups of deaf children. The Manual English Group (ME) was composed of children whose deaf parents demonstrated written English competence and who used Manual English with their children since infancy. The Average Manual Group (AM) included children of deaf parents having poor use of written Standard English, and who used American Sign Language with their children since infancy. The Average Oral Group (AO) was composed of children with hearing parents who did not use sign language, and who had provided little or no special preschool oral training to their children. The Intensive Oral Group (IO) included those with hearing parents who had provided a great deal of oral preschool training to their children. Socioeconomic level, chronological age, age at onset of loss, degree of hearing loss and multi-handicapping conditions were controlled for through selection of subjects. Performance IQ was also partially controlled for. The Test of Syntactic Ability and the Paragraph Meaning, Word Meaning, Language and Spelling subtests of the Stanford Achievement Test were used to study the influence of early methods of communication.

A combination of the two manual groups with deaf parents (ME and AM) significantly out-performed the combined two oral groups with hearing parents (IO and AO) on all measures. Individually, the Manual English Group (ME) received significantly higher scores than either of the two oral groups (IO or AO) in five of the six test groups of the Test of Syntactic Ability, and significantly out-performed these two oral groups as well as the Average Manual Group (AM) in all four subtests of the Stanford Achievement Test. In other words, children with deaf parents significantly out-performed children of hearing parents; and children of deaf parents who used manual English out-performed all the other three groups.

The previously discussed studies are traditionally cited as evidence that early use of manual communication will lead to improved academic achievement for deaf children. There is a problem with this logic, however. Although all of these studies have demonstrated that children of deaf parents who use manual communication receive higher academic achievement test scores than children of hearing parents who do not use manual communication, the findings do not necessarily support the notion that manual communication in early childhood leads to superior academic achievement. The two groups of children (those with deaf parents and those with hearing parents) differ in many ways in addition to method of communication used with their children. These differences, as discussed in the second section of this review, may also have an influence on academic achievement. Unless all these differences are controlled for, findings regarding the relationship

between method of communication and academic achievement may be spurious (Hoffmeister and Wilbur, 1980; Jensema and Trybus, 1978; Karchmer, Trybus and Paquin, Note 4; Nix, 1975).

A review of the literature using the hearing status of parents to identify signers and non-signers shows that although these researchers have attempted to control for many of the differences between the two groups, none have controlled for all the variables around which these two groups differ. Conclusions drawn about the relationship between method of communication used with deaf children and their academic achievement scores should therefore be viewed with caution.

Studies Identifying Method of Communication used by Parents without Relying on Hearing Status of Parents

Only a small group of studies have analyzed the relationship between parental method of communication and academic achievement without using the hearing status of parents to define signing and non-signing groups (Babb, 1980; Corson, 1974; Jensema and Trybus, 1978; Morrison, 1982). Because other methods of defining signing vs. non-signing groups were used by these studies, their findings will perhaps be the most relevant to the question being addressed by the present research.

In a national study, for example, Jensema and Trybus (1978) used a somewhat different method of grouping parents. Instead of identifying deaf parents as signers and hearing parents as non-signers, the researchers asked all parents to report whether or not they presently used manual communication, and placed them in signing and

non-signing groups accordingly. In so doing, hearing and deaf parents could be in either signing or non-signing groups. The study controlled for hearing level, family income, hearing aid use at home and in the dormitory, preschool attendance and present educational program. The Reading Comprehension, Vocabulary, Mathematics Concepts and Mathematics Computation subtests of the Special Edition for Hearing Impaired Children of the 1973 Stanford Achievement Test (SAT-HI) were used to evaluate the students.

As with the studies previously discussed, children with one or both hearing impaired parents received higher mean scores than children with no hearing impaired parents. In contrast to these studies, however, Jensema and Trybus did not make the assumption that their findings supported the notion that manual communication was a primary contributing factor to the superior achievement of children of hearing impaired parents. When comparing children based on the type of communication used by the parents alone, no significant relationship was found between method of communication and academic achievement.

This lack of relationship was further noted when the inter-relationship between hearing status of parents and the method of communication was examined. Families of two hearing impaired parents were found to rely heavily on signs and to use little speech, while mixed families with one hearing and one hearing impaired parent relied heavily on speech and used very little sign language. The families of hearing parents ranked somewhere between these two groups in use of manual communication and speech with their children. Thus, although

the two groups of families with at least one hearing impaired parent used greatly different methods of communication from each other, their children academically out-performed the children of hearing parents who ranked somewhere between the two groups with regard to the use of manual communication and speech with their children. These findings led Jensema and Trybus to conclude that "variations in communication methods, specifically in the amount of speech used and the amount of sign used, have little relationship with achievement scores" (p. 19).

Morrison's (1982) study resulted in similar findings. Using the Stanford Achievement Test for the Hearing Impaired (SAT-HI), he found no relationship between reading comprehension and method of communication used in the home or in the school. He did find, however, that uniformity of the type of communication used in the home, by the school and by the student had a positive relationship to reading comprehension skills.

An earlier study also found no significant difference between children of signers and non-signers (Corson, 1974). As a part of a broader study, Corson included two groups of deaf children with deaf parents (one group using manual communication, the other using the oral method of communication). As with most studies, both these groups of children of deaf parents received higher scores in reading and arithmetic achievement than groups whose parents were hearing. When comparing the two groups of children of deaf parents, however, no significant differences were found between those whose parents used manual communication and those whose did not. Based on these findings,

Corson concluded that parental attitude, rather than method of communication, was related to academic achievement.

By way of contrast, some studies have found a relationship between the academic achievement of deaf children and the method of communication used with them by their parents. As noted earlier, Brasel and Quigley (1975, 1977) found that among deaf parents who used manual communication, those with good command of the English language and who used manual English with their children since infancy tended to have children who received significantly higher reading (paragraph meaning and word meaning), language and spelling scores than those who had poor command of the English language and who used American Sign Language. The researchers concluded that the type of manual communication used (i.e., manual English) may have a positive relationship to the deaf child's reading and language development.

Several longitudinal studies have also offered some support to the use of manual English with deaf children. These studies have reported that children whose parents and/or school programs use some kind of manual English tend to develop English language skills at higher levels than other deaf children of similar ages (Bornstein et al., 1980; Champie, 1981; Collins-Ahlgren, 1975). Their assumption is that these higher language skills will lead to higher degrees of reading ability.

Babb (1980) reported similar results when comparing three groups of children with hearing parents. One group was exposed to an oral preschool approach (IO), while the other two groups were exposed

to preschool programs which used Signing Exact English. The two groups enrolled in the Signing Exact English programs were divided according to whether their parents used that system of communication (SEE_w), or whether they did not (SEE_{wo}). The children were tested using the Test of Syntactic Ability and the Paragraph Meaning, Word Meaning, Language and Spelling subtests of the Stanford Achievement Test. Results indicated that Signing Exact English, when used by both the parent and the teacher (SEE_w), yielded higher results than the oral method of communication. The importance of parental use of Signing Exact English, along with the school, was supported when the results showed that without parental use of Signing Exact English (SEE_{wo}), students in classrooms using this method of communication did no better than students in classrooms using the oral method of communication.

Further support for the use of Signing Exact English by hearing parents was found when Babb compared the deaf children whose preschool and hearing parents both used this system (SEE_w) to Brasel and Quigleys' (1975) groups of children with deaf parents who used manual communication (AM or ME). These comparisons were made possible by using the same measuring instruments and subject selection procedures as Brasel and Quigley. Although deaf children of deaf parents typically receive significantly higher scores in reading and language achievement than deaf children of hearing parents, Babb did not find this when comparing these two groups. Instead, he found that deaf children whose hearing parents and preschools used Signing Exact English (SEE_w) received higher scores on every measure of reading and

language achievement than those of deaf parents who had been classified by Brasel and Quigley as Average Manual (AM). Two of these differences were statistically significant. He also found that although Brasel and Quigleys' Manual English group (ME) out-performed the SEE_w group on 10 of the 15 measures of the study, none of these differences were statistically significant. Babb's study, then, seems to show that a combination of parental and preschool use of Signing Exact English may do much to increase the academic achievement levels of deaf children of hearing parents.

In reviewing these studies, then, it can be concluded that deaf children of hearing impaired parents typically function at higher levels of academic achievement than deaf children of hearing parents, but that inconclusive evidence is available regarding the relationship between method of communication used with these children and their later academic achievement. While Corson (1974), Morrison (1982) and Jensema and Trybus (1978) have found no significant relationship; Babb (1980), using his and Brasel and Quigleys' data (1975, 1977), has offered some evidence that early use of sign language, particularly manual English, has a positive relationship to language and reading achievement.

Not only is the research inconclusive, but it has also left many areas untouched. One of the most important areas about which almost no research has been conducted is the relationship between deaf children's reading achievement and the method of communication used by their hearing parents. Since 90 percent of the parents of deaf children hear normally, and since children of these parents typically

read at significantly lower levels than children of deaf parents, there is a strong need for valid information regarding the impact of method of communication used by these parents with their children. In spite of this need, however, only one of the previously discussed studies (Babb, 1980) has compared communication systems used specifically by hearing parents with their deaf children.

The communication history of hearing parents and their children should also be examined. Age of the child when the parent began to sign, degree of signing skill of the parent, and type of manual method used by the parent and child should all be considered. These must be studied while controlling for a variety of variables which might also have some relationship to academic achievement. These variables are discussed in the second section of this literature review.

Secondary Variables Potentially Relating to Academic Achievement of Deaf Children

Methodological problems have been associated with much of the research regarding the relationship between academic achievement and the method of communication used with young deaf children. A primary problem has been failure to control for secondary variables which might also have a relationship to academic achievement (Jensema and Trybus, 1978; Karchmer et al., Note 4; Nix, 1975). The following variables are those which should be considered when conducting such studies.

Parental Hearing Status

Investigations which are especially lacking in control of secondary variables are those using the hearing status of parents to

identify groups of signers and non-signers. Studies of this type are based on the assumption that deaf parents use manual communication, while hearing parents do not. Because of this use or non-use of manual communication, parental hearing status is believed to provide a natural experimental subdivision for testing hypotheses regarding the relationship between academic achievement and parental method of communication (Meadow, 1968).

Although this assumption regarding the use of manual communication may be partially true, there are also many other variables on which these two groups differ (Hoffmeister and Wilbur, 1980; Jensema and Trybus, 1978; Karchmer et al., Note 4; Nix, 1975). Significant differences have been found between deaf children of deaf and hearing parents with regard to type of educational placement; degree of hearing loss; age at onset of loss; IQ; cause of loss; multi-handicapping conditions; hearing aid use; and family factors such as number of deaf siblings, income level, emotional adjustment to the child's deafness, and ethnic background (Balow and Brill, 1975; Corson, 1974; Karchmer et al., Note 4; Meadow, 1968; Mindel and Vernon, 1971; Neuhaus, 1969; Northern and Downs, 1974; Ousley, 1974; Schein and Delk, 1974; Schildroth, Note 5; Schlesinger and Meadow, 1972; Sisco and Anderson, 1980).

As noted in the first section of this review, significant differences between these two groups have also been found in academic achievement (Balow and Brill, 1975; Corson, 1974; Karchmer et al., Note 4; Meadow, 1967; Quigley and Frisina, 1961; Stevenson, 1964;

Stuckless and Birch, 1966; Taub, 1978; Trybus and Karchmer, 1977; Vernon and Koh, 1970). Because deaf children of deaf parents consistently receive superior scores in reading, mathematical concepts and mathematical computation, and because their parents typically use manual communication, many investigators assume that the manual communication used by these parents is the primary variable relating to their children's academic achievement.

Other researchers however, warn that many variables in addition to, or other than, method of communication may be interacting in complex ways, resulting in higher academic achievement for deaf children with deaf parents (Corson, 1974; Hoffmeister and Wilbur, 1980; Jensema and Trybus, 1978; Karchmer et al., Note 4; Nix, 1975; Sisco and Anderson, 1980). They argue that because there are many differences between the two groups, that deaf children of deaf parents should be considered a completely different population from deaf children of hearing parents (Hoffmeister and Wilbur, 1980), and that any research regarding the relationship between parental method communication and academic achievement will not yield valid results if these two groups are compared for that purpose.

Since it has been consistently demonstrated that deaf children of deaf parents are different from deaf children of hearing parents, and since the majority of parents of deaf children are hearing, it would seem more appropriate to compare deaf children of two groups of hearing parents; one group using manual communication and the other not using manual communication. This would provide control for a number of

variables: 1) directly and totally, for the hearing status of parents; and 2) indirectly and partially for age at onset, degree of hearing loss, IQ, family factors, multiple-handicapping conditions, use of hearing aids, cause of loss, and educational placement.

Chronological Age

Research has shown that deaf children progress at very slow rates in reading achievement (about one-third grade level or less per year) (Babbini and Quigley, 1970; Craig, 1964; Furth, 1966; Jensema, 1975a; Trybus and Karchmer, 1977). Although this rate is slow, one must control for age in some way when studying the relationship between academic achievement and parental method of communication (Jensema, 1975b).

Upper and lower age limits must also be set. Students at the age of 20 or older have been found to receive lower achievement scores than students who are 19 years of age. This is most apparent with regard to reading comprehension (DiFrancesca, 1972). These older students have also been found to have lower non-verbal IQ scores (Murphy and Trybus, 1975). It has been speculated that students who remain in special schools after age 19 are low achievers and should therefore be strictly controlled for in any research regarding academic achievement (Brasel and Quigley, 1975).

With regard to lower age limits, it has been suggested that, because of late starts in language development, younger deaf children (below ages 8 to 10) will produce less reliable academic achievement scores than older children (Jensema and Trybus, 1978; Wrightstone

et al., 1962). These children should be eliminated from any study of the relationship between reading achievement and method of communication used with the child.

Type of School Setting

The type of school the child attends is also thought to have a relationship to academic achievement. With few exceptions (i.e., Moores, Weiss, and Goodwin, 1974), research has shown that students in more integrated school programs (i.e., enrolled with hearing students) out-perform those in more segregated programs (i.e., enrolled in day or residential programs for the deaf) (Geers and Moog, 1978, Jensema, 1975b; Reich, Hambleton and Houldin, 1977; Ries, 1973, van den Horst, 1971). These differences are more pronounced in reading achievement than in arithmetic (Reich et al., 1977; Ries, 1973).

Similarly, children attending special programs for the deaf on a full-time basis usually receive lower scores than those attending on a part-time basis (Jensema, 1975b; Ries, 1973). This is especially evident with regard to reading (Ries, 1973).

Although significant differences exist, it is doubtful that the lower scores for more fully segregated students are totally the result of the programs themselves. These differences are more likely the result of the characteristics of the students who are enrolled in these settings (Jensema, 1975b; Reich et al., 1977). Students attending fully segregated programs are likely to have more severe losses, lower family education and income, a higher incidence of prelingual deafness, and a larger proportion of hearing impaired parents than those

attending a fully integrated program (Karchmer and Trybus, 1977; Karchmer et al., Note 4).

Regardless of the reasons, the findings are consistent. There are significant differences between students who attend special programs on a part-time and full-time basis, and there are significant differences between those who attend integrated and segregated programs. For this reason, the type of school attended should be controlled for when studying the relationship between academic achievement and parental method of communication.

Preschool

Until the past ten to fifteen years, almost all preschools for hearing impaired children have followed the traditional oral approach to education. Because of this, most early preschool studies have related to oral programs only. These oral programs can generally be described as those which stress the use of speech, speechreading and audition. They do not use manual communication, except perhaps for fingerspelling. These programs may or may not involve the child's physical attendance in the classroom. Some offer parental training only, via materials and/or classes (i.e., John Tracy Clinic materials), with the expectation that parents will train their children. Many programs provide both classroom training for the child and parental education.

Manual preschool programs have been in operation only during the more recent years. These programs can generally be described as those which stress manual communication as well as the use of speech,

speechreading and audition. They typically subscribe to the Total Communication philosophy, and attempt to involve parents in using sign language as well as speech with their children. Because these programs are relatively new, less research is available regarding their effectiveness.

The relationship between preschool and later academic achievement is not yet known. Some studies (Balow and Brill, 1975; Ries, 1973) have found that enrollment in school at an early age (i.e., before age five or six) may have a positive relationship to the deaf child's later academic achievement. Phillips (1963), on the other hand, found that oral preschool enrollment tended to offer an academic advantage in the earlier years of school, but by age 9, this advantage no longer existed. Similarly, others have found that oral preschool training has little or no relationship to later academic achievement (Brasel and Quigley, 1975, 1977; Craig, 1964; McCroskey, 1967; Rodda, Godsave, and Stevens, 1974; Vernon and Koh, 1971). Some have even found that non-preschool children of deaf parents who use manual communication receive significantly higher academic achievement scores than oral preschool children with normally hearing parents who do not use manual communication (Brasel and Quigley, 1975, 1977; Vernon and Koh, 1971). From a somewhat different point of view Trybus and Karchmer (1977) found that children who entered school at age five (5) received higher scores than those entering either before or after age five. Based on these findings, it appears that no definitive statement can yet be made

regarding the relationship between academic achievement and attendance or non-attendance in preschool programs.

It appears that the success of preschool programs may depend upon the interaction between a number of secondary variables. For example, parental involvement and the child's intelligence, social adjustment and sex have all been found to interrelate with academic achievement and preschool training (Babb, 1980; Rodda et al., 1974). Type of program also appears to be interrelated to the impact of preschool. Moores et al. (1974) found that programs which stressed classroom organization, classroom relationships, discipline, program structure, auditory training, and cognitive and academic growth were more likely to produce children with higher academic achievement scores than programs which did not stress these things.

The types of communication used in preschools may also be related to later academic achievement. Quigley (1969) found that children attending a program using the Rochester Method received significantly higher scores in academic achievement than those attending a traditional oral program. The Rochester method is an oral approach which incorporates the use of fingerspelling along with oral techniques.

Moores et al. (1974) also found a relationship between the types of communication used in preschool programs and children's later academic achievement. They found that a combination of oral and manual techniques (total communication) seemed to have a positive impact on academic achievement.

Babb (1980), on the other hand, found that the type of communication used in the preschool classroom (i.e., Signing Exact English versus oral programming), divorced of parental involvement, had no relationship to later academic achievement.

In spite of the inconsistencies in the findings of these studies, and in spite of the larger number of studies which have found no significant difference between those attending and those not attending preschool, the possibility that preschool might make a difference dictates that this variable be controlled for when studying the relationship between academic achievement and other variables.

Multiple Disabilities

Research has consistently shown a relationship between academic achievement and multiple disabilities. Although different additional handicapping conditions have been found to have different effects (Jensema, 1975a; Trybus and Murphy, 1974), it is clear that as the number of handicapping conditions increases, the level of academic achievement decreases (Jensema 1975a; Ries, 1973; Trybus and Karchmer, 1977; Trybus and Murphy, 1974).

Because multiple disabilities have consistently been found to have a negative relationship to academic achievement, this variable must be controlled for when studying reading comprehension.

Non-verbal Intelligence

With few exceptions (i.e., Rodda et al., 1974), non-verbal intelligence has been found to have a strong positive relationship to

the academic achievement of hearing impaired students (Babbini and Quigley, 1970; Conrad, 1977; Ousley, 1974; Ries, 1973; Savage, Evans and Savage, 1981). The relationship is so strong, that Savage et al. (1981) have indicated that non-verbal IQ, as measured by the Wechsler Performance Scale, is the best single predictor of academic achievement.

This relationship was found to be especially strong between non-verbal IQ and reading achievement (Savage et al., 1981). In their study, "very poor readers" were found to have a mean non-verbal IQ of 71.78, while the next higher level of readers (poor readers) had a mean IQ of 85.00. These findings are similar to those of Reis (1973) who found that deaf children with non-verbal IQ scores of 96 or better performed significantly higher in both paragraph meaning and arithmetic computation than those with non-verbal IQ scores of less than 96.

Based on these findings, this variable should definitely be controlled for when analyzing the relationship between academic achievement and method of communication used with deaf children.

Sex

Research has consistently found hearing impaired females to perform at higher levels than males (Babbini and Quigley, 1970; Brasel and Quigley, 1975, 1977; Craig, 1964; Jensema, 1975b; Ries, 1973; Trybus and Karchmer, 1977). This higher performance has been found to be especially evident with regard to reading achievement (Babbini and Quigley, (1970). Although the differences are usually not statistically

significant, the consistent superior performance of females requires that this variable be controlled for.

Ethnic Background

The few studies which have analyzed the ethnic background of deaf children in relation to academic achievement have found differences in favor of white deaf students (Jensema, 1975b; Trybus and Karchmer, 1977). It is suspected that many variables are involved when analyzing ethnic background. For example, black deaf children's parents and teachers have been found to use significantly less speech with them than white deaf children's parents and teachers use. There is also a slight trend for parents of black deaf children use more sign than parents of white deaf children use (Jensema and Trybus, 1978).

Other variables which have been found to have a relationship to ethnic background are socioeconomic level (Hairston and Smith, 1973; Schein and Delk, 1974), age at onset (Ries, Bateman and Schildroth, 1975; Schein and Delk, 1974), cause of loss (Ries et al., 1975) and additional handicapping conditions (Ries et al., 1975). These variables may also have a relationship to academic achievement.

Although ethnic background and its associated variables may have a relationship to academic achievement, controlling for it directly would be difficult because of the complexity of variables involved.

Degree of Hearing Loss

Findings regarding the relationship between academic achievement and degree of hearing loss have been inconsistent. Some studies have shown that as degree of loss increases, academic achievement decreases (Conrad, 1977; DiFrancesca, 1972; Jensema, 1975b; Karchmer, Milone and Wolk, 1979; Rodda et al., 1974; Trybus and Karchmer, 1977). In most of these studies, degree of loss has been found to relate more strongly to reading achievement than mathematical achievement (DiFrancesca, 1972; Jensema, 1975b; Karchmer et al., 1979; Trybus and Karchmer, 1977).

Other studies, however, have found no significant relationship between academic achievement and degree of loss (Babbini and Quigley, 1970; Murphy, 1979; Pfaster, 1980; Ries, 1973; Wrightstone et al., 1962); and some have even found that children with greater degrees of loss have higher academic achievement scores. These latter studies are those which compare deaf children of hearing parents to those of deaf parents. Although hearing losses have been found to be greater for children of deaf parents (Karchmer et al., Note 4), their mean academic achievement scores are typically higher than for deaf children of hearing parents (Karchmer et al., Note 4; Meadow, 1967; Quigley and Frisina, 1961; Stevenson, 1964; Stuckless and Birch, 1966; Trybus and Karchmer, 1977; Vernon and Koh, 1970). This implies that degree of hearing loss may not have as great an impact on academic achievement as other variables relating to hearing status of parents have.

The conflicting findings regarding the relationship between academic achievement and degree of hearing loss might, in some instances, have to do with arbitrary "cut-off" points set by the various researchers. For example, DiFrancesca (1972) found a significant difference between three (3) groups of subjects who were divided according to three (3) levels of loss (0-59dB, 60-98dB, 99+dB). Using the same group of subjects, but dividing them into two groups, Ries (1973) found no significant differences between those with losses of 85dB or greater and those with losses of less than 85dB. Ries suggests that the difference in findings is due to the difference in division points used by himself and DiFrancesca. He concludes that there is perhaps a significant difference between the two extremes of degrees of loss (mild and moderate versus severe and profound), but not among the more severe losses.

Although this explanation is enlightening, it does not account for the inconsistencies among all the various studies. For example, Conrad (1977) used an almost identical division point as Ries (1973), but found significant differences in reading scores between his two groups.

The mixed findings regarding this variable demonstrate that the influence of degree of hearing loss on the academic achievement of deaf children is not yet known. Because, however, a substantial proportion of these studies have found a significant relationship between the two variables (Conrad, 1977; DiFrancesca, 1972; Jensema 1975b; Rodda et al.,

1974), degree of hearing loss should be controlled for when studying the academic achievement of hearing impaired children.

Age of Onset of Hearing Loss

Although age at onset of hearing loss has traditionally been thought to correlate with language development and academic achievement (Brasel and Quigley, 1975; Gentile and DiFrancesca, 1969), studies specifically relating to age at onset have provided conflicting findings.

Some studies have found that students with earlier hearing losses receive significantly lower academic achievement scores than those who lose their hearing later in childhood (Furth, 1966, 1971; Trybus and Karchmer, 1977; Wrightstone et al., 1962). Jensema (1975b) also found a significant relationship between academic achievement and age at onset, but discovered that deaf students who became deaf after birth and up to age three (3) received the lowest academic achievement scores. Those who were born deaf received the next highest scores; and those who became deaf at age three or after received the highest scores. In contrast to these studies, Babbini and Quigley (1970), Morrison (1982), Ousley (1974), and Ries (1973) found no significant relationship between academic achievement and age at onset.

A partial explanation for the inconsistencies might have to do with the "cut-off" points used for age at loss. For example, Ries (1973) and Morrison (1982) used only two groups: those who were born deaf and those who became deaf after birth, while Jensema (1975b) distinguished between those born deaf, those who lost their hearing after

birth but before age three, and those who lost their hearing at age three or after. Another related explanation might have to do with the narrow range of ages at onset used by some researchers. For example, Ousley's (1974) range was as narrow as from birth to age two. Generalizing these findings to a wider range of ages at onset would result in invalid conclusions.

Although some studies have found no relationship between age at onset and academic achievement, there is some support for the notion that such a relationship exists. For this reason, age at onset should be controlled for when studying academic achievement.

Socioeconomic Level

Socioeconomic level, as measured by family income, educational level and/or occupational status, has typically been thought to have an impact on academic achievement. Research regarding hearing impaired children, however has not necessarily supported this notion. Although Ousley (1974) found a significant relationship between deaf children's socioeconomic levels and their reading and spelling achievement scores, Brasel and Quigley (1975) found no relationship between these two variables. Looking again at the differences between hearing and deaf parents, it is noted that deaf families typically have lower socioeconomic levels than hearing families (Brasel and Quigley, 1975; Schein and Delk, 1974), yet their deaf children consistently receive higher academic achievement scores than those of hearing parents (i.e., Balow and Brill, 1975; Trybus and Karchmer, 1977). This might be an

indication that socioeconomic level does not have as great an impact on the deaf child's development of academic skills as has been thought.

Because there is some question regarding this variable, additional research is necessary in order to determine whether socioeconomic level does or does not have a relationship to academic achievement of hearing impaired students. Until that time, it should be controlled for in research regarding academic achievement.

Deaf Siblings

Very little research exists regarding the relationship between number of deaf siblings and academic achievement of deaf children. Conrad and Weiskrantz (1981) have found that although deaf children of hearing parents typically receive significantly lower scores in academic achievement than deaf children of deaf parents, this did not occur when such deaf children had one or more deaf siblings. These findings suggest that having deaf siblings may, in some way, improve the chances of higher academic achievement for children of hearing parents.

These findings are partially supported by Kusche, Greenburg and Garfield (1983), who also studied the impact of deaf siblings on deaf children of hearing parents. These researchers found that deaf children with deaf siblings received significantly superior scores in language achievement than deaf children with no deaf siblings. No significant differences, however, were found for vocabulary or reading comprehension.

Although the findings of these two studies are not entirely consistent, they suggest the possibility that there is a relationship

between number of deaf siblings and academic achievement. For this reason, one should attempt to control for this variable when studying the academic achievement of hearing impaired children.

The present study has been designed to control, in some way, for each of the variables discussed in this section of the literature review. These controls will be discussed in Chapter 3.

Summary

Research has provided inconclusive information about the relationship between the method of communication used by hearing parents with their deaf children and those children's later reading comprehension skills. There is some evidence that a relationship exists, but because of conflicting findings and lack of control for variables which might also influence the development of reading skills, no definitive statement can be made regarding the most appropriate communication method for hearing parents to use with their deaf children.

In addition to the need for more information regarding the relationship between reading comprehension skills and the various methods of communication used by parents of deaf children, information is needed regarding whether parental skill level and/or age of the child when the parent began to sign is related to later reading skills. These questions have been partially addressed in the present study.

CHAPTER 3

THE STUDY

Research Question

The present study has attempted to answer the general research question: Do prelingually deaf adolescents whose parents are hearing and whose mothers use manual communication with them obtain significantly different reading comprehension scores than prelingually deaf adolescents whose parents are hearing and whose mothers do not use manual communication with them?

Null Hypotheses

The following null hypotheses were tested:

H1: There is no significant relationship ($p \leq .05$) between reading comprehension scores of prelingually deaf adolescents and the skill levels of the manual communication used by their hearing mothers.

H2: There is no significant relationship ($p \leq .05$) between reading comprehension scores of prelingually deaf adolescents and their ages when their hearing mothers began to use manual communication with them.

H3: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers do not use manual communication with their children (NMC), and a combination of those whose hearing mothers presently use manual communication (PMC) and those whose mothers used manual communication with them since before age 5 (MC5). (NMC = PMC + MC5)

H4: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers do not use manual communication with their children (NMC), and those whose hearing mothers have used manual communication with them since before age 5 (MC5). (NMC = MC5)

H5: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers do not use manual communication with their children (NMC), and those whose hearing mothers presently use manual communication, but did not begin until their children were age 5 or older (PMC). (NMC = PMC)

H6: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers presently use manual communication, but did not begin until their children were age 5 or older (PMC), and those whose hearing mothers have used manual communication with their children since before age 5 (MC5). (PMC = MC5)

Procedure

The following procedure was used:

1. A rough pilot study was conducted at the Arizona School for the Deaf and Blind to determine the number of students who would potentially meet the criteria set by the study, and the number of mothers who might use manual communication with their children before age five. The final proposal was prepared based on the findings of the pilot study.

2. Random sampling was used to obtain a list of residential schools for the deaf which would be asked to participate in the study. Thirteen (13) schools were initially selected from the total number of such schools with student populations of 275 or more. The names of the available schools were obtained from the April issue of the American Annals of the Deaf (1982). To avoid concentration in any one geographical area, the following limitations were imposed upon the final list: 1) no more than one school per state; and 2) no more than 50 percent of the schools were to be located in any one geographical region of the Bureau of Census (United States Department of Commerce, 1980).

3. Persons responsible for achievement testing in each school were contacted by telephone to assure that the schools used the Stanford Achievement Test, Special Edition for Hearing Impaired Students (SAT-HI) and to determine if the schools used some form of total communication in their classrooms.

Two of the institutions did not meet these criteria, and were therefore eliminated from the list of eligible schools. One other Southern school was eliminated because the remaining list of 11 institutions contained 6 Southern schools (more than 50 percent of the total list).

4. The administrative offices of each of the 10 remaining schools were requested, by mail, to participate in the study. The request followed the format of the Suggested Guidelines for Research in Educational Programs for the Deaf (Conference of Executives of American

Schools for the Deaf, 1979). This request form can be found in Appendix A.

Permission was asked for release of pertinent demographic data about students of that school. This information was located at the Office of Demographic Studies (ODS), Gallaudet College, Washington, D. C. A telephone follow-up was made approximately two weeks after the written request was sent.

Of the 10 schools contacted, 5 expressed an interest in participating in the study. Because none of these schools represented the Western states, additional selection was necessary. In order to obtain a western school, the required student population was reduced to 100, and a random selection was made of such schools. This resulted in the selection of one western school with an average student enrollment of 120.

The final list of schools included the Texas School for the Deaf, the Illinois School for the Deaf, the Western Pennsylvania School for the Deaf, the Tennessee School for the Deaf, the Montana School for the Deaf and Blind, and the Kansas State School for the Deaf.

5. The Office of Demographic Studies provided a list, "ODS List", which included the name, birthdate, sex and ethnic background of each student (listed by school) meeting the following criteria:

- A. Age: 12.00 through 18.00 at the time of the 1981-1982 Annual Survey of Hearing Impaired Children and Youth (Office of Demographic Studies, Note 6).

- B. Hearing Loss: Unaided audiological findings of 91 dB (ANSI/ISO) or greater in the better ear, averaged across the frequency range of 500, 1000, 2000 Hz.
- C. Age at Onset: Hearing loss occurred before age 3.
- D. No additional educationally significant handicapping conditions.

Item B of Table 1 shows that 587 students met these initial criteria. This is 30.2 percent of the average enrollment of the six schools.

6. The administrative office of each school identified one individual who would coordinate the data gathering activity within that school. In some cases the coordinator/liaison was paid on an hourly basis, by the researcher, to perform the functions listed in Appendix B.

7. In order to initially and roughly identify students whose hearing mothers used manual communication, the appropriate ODS List was sent by the researcher to each school. The schools were asked to identify children who had one or more hearing impaired parents and to place checks beside all students' names whose hearing mothers were believed to use manual communication. Table 1 indicates that 89 of the children had hearing impaired parents. These children were not used in this study.

Based on a pilot study and on percentages reported by Jensema and Trybus (1978), it was expected that 20 percent to 40 percent of the students with hearing parents would initially be identified as

Table 1. Number and Percents of Subjects by State

Region	NE	NC	NC	S	S	W	
State	PA	IL	KAN	TX	TN	MONT	Total
A. Average enrollment	354	362	283	447	379	120	1945
B. Subjects meeting initial criteria: ODS List (B/A)	108 (30.5)	097 (26.8)	114 (40.3)	163 (36.5)	086 (22.7)	019 (15.8)	587 (30.2)
C. Subjects with H.I. parents (C/B)	006 (05.6)	039 (40.2)	017 (14.9)	016 (09.8)	011 (12.8)	000 (00.0)	089 (15.2)
D. MQ and SQ sent (D/B)	074 (68.5)	037 (38.1)	045 (39.5)	097 (59.5)	067 (77.9)	013 (68.4)	333 (56.7)
E. MQ's received (E/D)	067 (90.5)	031 (83.8)	033 (73.3)	060 (61.9)	049 (73.1)	012 (92.3)	252 (75.7)
E1. Completed (E1/D)	067 (90.5)	031 (83.8)	032 (71.1)	060 (61.9)	047 (70.1)	012 (92.3)	249 (74.8)
E2. Wrong Address (E2/D)	000 (00.0)	000 (00.0)	001 (02.2)	002 (02.1)	000 (00.0)	003 (23.1)	006 (01.8)
F. SQ's received (F/D)	074 (100.0)	037 (100.0)	045 (100.0)	095 (97.9)	067 (100)	013 (100)	331 (99.4)
G. Subjects Eliminated (G/F)	020 (27.0)	011 (29.7)	14 (31.1)	58 (61.1)	23 (34.3)	4 (30.8)	130 (39.3)
H. Total Subjects meeting all criteria (H/A)	54 (15.3)	26 (07.2)	31 (11.0)	37 (08.3)	44 (11.6)	9 (07.5)	201 (10.3)

having mothers who used manual communication; and that very few of these mothers would have used manual communication with their children before age 5 (Group 3). Because the early signing group was expected to be small, it was important to attempt to identify all individuals belonging to this group. For this reason, all hearing mothers who were thought to use manual communication were asked to complete the Mother's Questionnaire.

The group of students whose hearing mothers did not use manual communication was expected to be proportionately large (60 percent to 80 percent). Because this group was expected to be large, a stratified random sample was planned to be drawn from it before questionnaires were sent. This procedure, as described in the project proposal, was expected to result in: 1) less disparity among groups; and 2) less time and expense in sending and receiving unneeded questionnaires.

When the schools returned the ODS lists, however, it was found that the number of students identified as potentially having mothers who used manual communication was much larger than had been expected. This unexpected finding created some selection problems. Since the proposal stated that all individuals whose mothers were thought to use manual communication should be included in the study, and since the schools were able to send questionnaires to only a limited number of subjects, the final number of potential non-signing mothers who were sent questionnaires was considerably smaller than the number of mothers who were thought to be signers.

At this point, the signing status of the mothers was as yet unverified. The questionnaires themselves were later used as the measuring instruments for identifying mothers who used manual communication.

8. School and Mother's Questionnaires were sent for 333 subjects. To encourage a high maternal response rate, the following was done: 1) Mother's Questionnaires were accompanied by self-addressed, post-paid envelopes; 2) mothers were assured of confidentiality; 3) local coordinator/liaisons provided direct contact with the mothers; 4) letters requesting maternal involvement were co-signed by the primary administrators of the schools (see Appendix C); and 5) a follow-up was conducted after approximately 50 percent of the questionnaires had been completed and returned to the researcher. Item E-1 of Table 1 shows this process resulted in an overall maternal return rate of 74.8 percent. Specific information regarding each state's return rate is also given in Table 1.

To encourage a high response rate from schools, the following was done: 1) the Suggested Guidelines for Research in Educational Programs for the Deaf (Conference of Executives of American Schools for the Deaf, 1979) were used (see Appendix A); 2) requests for assistance were co-signed by two professionals who had been superintendents of residential schools for the deaf and who were members of the Committee of Professional Preparation and Certification, Council on Education of the Deaf; 3) coordinator/liaisons were assigned from each school to search the files for data and to distribute and retrieve the

questionnaires from the teachers; and 4) each school was offered the results of the findings. Item F of Table 1 shows the resulting return rate for the Schools Questionnaires to be 99.4 percent.

9. Analysis was only possible for the data of students for whom both Mother's and School Questionnaires were received, and who met all criteria for the study.

Using the information from the Mother's and School Questionnaires, the following students were eliminated:

- A. Those with one or both parents who were hearing impaired.
- B. Those whose mothers were not the natural mothers.
- C. Those who had been at the present school or one like it for less than three years.
- D. Those whose present method of communication did not include manual communication.
- E. Those for whom SAT-HI scores were not available.
- F. Those who were age 20 or older upon administration of the SAT-HI.
- G. Those whose SAT-HI scores were in the guessing range.

Table 1, Item G, indicates that a total of 130 subjects were eliminated for one or more of the above reasons, leaving 201 subjects appropriate for the study. This is approximately 10.3 percent of the total average enrollment of the six participating schools, and 60.4 percent of the total subjects for whom questionnaires were sent.

10. Subjects were placed into groups by means of the method discussed under Description of Subjects.

11. Data analysis was performed by the Instructional Research and Development (IRAD) Office, University of Arizona, Tucson, Arizona.

12. The results of the study were shared with each of the participating schools.

Description of Subjects

Subjects include 201 deaf adolescents from six (6) total communication oriented residential schools for the deaf. Each subject has met the following criteria:

1. Age 11.25 through 19.83 at the time of administration of the Stanford Achievement Test, Special Edition for the Hearing Impaired (SAT-HI).

2. Unaided audiological findings indicate a loss of 91dB (ANSI/ISO) or greater in the better ear averaged across the frequency range of 500, 1000, 2000 Hz.

3. Prelingually deaf (hearing loss occurred before age 3).

4. Uses some form of manual communication as the primary method of communication and learning.

5. Both parents have normal hearing.

6. Mother is the natural mother.

7. Has been a student in a residential school during the most recent three years or longer.

8. Has taken the SAT-HI at some time from 1981 through 1983, and has received a score which was not in the "guessing range".

9. Has no additional educationally significant handicapping conditions. Students who have been reported to have the following

additional conditions (Office of Demographic Studies, Note 6) have been excluded from the study:

Legal Blindness - condition in which corrected vision in the better eye is less than 20/200, and/or a specialist designates legal blindness.

Uncorrected Visual Problem - uncorrected or uncorrectable visual problem, including blindness in one eye, muscular imbalance or paralysis, and retinitis pigmentosa.

Brain Damage or Injury - condition verified by abnormal EEG or physician's neurological findings.

Cerebral Palsy - . . . condition has been medically diagnosed.

Heart Disorder - malfunction of the heart which restricts physical functioning and requires monitoring by a physician.

Emotional/Behavioral Problem - condition in which inappropriate behaviors interfere with normal academic progress. These behaviors include passive/withdrawn; aggressive/abusive; rapid mood changes/sudden outbursts; bizarre, unexplainable action; and chronic, unfounded physical complaints and symptoms.

Specific Learning Disability - condition in which normal general intelligence is present, but specific learning deficits restrict accomplishments. These restrictions may be attributable to difficulty in visual/auditory perception, perceptual-motor functioning, as well as to a lack of control of attention, impulse, or motor function.

Other - this category would include any other observed condition which would restrict functioning, such as nutritional deficits, educational deprivation, neglect (p. 2).

Of the 201 total subjects, 180 were reported to have signing mothers, while 21 had non-signing mothers. Descriptive data regarding various subgroups of these subjects are provided in Tables 2 through 4.

Hypotheses 1 and 2 utilize data from the 180 subjects whose mothers use manual communication. Table 2 provides descriptive data

Table 2. Descriptive Data: Number of Subjects by Signing Status of Mothers

Descriptive Item	All Subjects (n = 201)	All Subjects with Signing Mothers (n = 180)
Subjects' Method of Communication:		
Sign language without speech	68	64
Sign language with speech (English word order)	111	95
Manual communication (Type Unspecified)	12	12
American Sign Language (ASL)	4	4
ASL and Signed English	4	3
Total communication	2	2
Method of Communication used by Mothers at the Present Time:		
Speech and speechreading	17	0
Sign language without speech	3	3
Sign language with speech (English word order)	120	120
Fingerspelling with speech and no signs	27	27
Gestures and made-up signs	2	0
Writing	1	0
Pantomime	1	0
Fingerspelling, signing, and writing	7	7
Total communication	23	23
Mothers' Skill Levels in Manual Communication:		
Speed		
Self-Rated		
Missing	22	1
1 Very slow	23	23
2 Slow	69	69
3 Average	78	78
4 Fast	9	9
5 Very fast	0	0
School-rated		
Missing	87	66
1 Very slow	12	12
2 Slow	42	42
3 Average	43	43
4 Fast	15	15
5 Very fast	2	2

Table 2--Continued, Descriptive Data: Number of Subjects by Signing Status of Mothers

Descriptive Item	All Subjects (n = 201)	All Subjects with Signing Mothers (n = 180)
Accuracy		
Self-Rated		
Missing	23	2
1 Many mistakes	27	27
2 Some mistakes	98	98
3 Few mistakes	42	42
4 Almost no mistakes	11	11
5 No mistakes	0	0
School-Rated		
Missing	88	67
1 Many mistakes	10	10
2 Some mistakes	49	49
3 Few mistakes	33	33
4 Almost no mistakes	19	19
5 No mistakes	2	2
Amount used with Child		
Self-rated		
Missing	24	3
1 Sometimes	58	58
2 Much of the time	37	37
3 Most of the time	38	38
4 All of the time	44	44
School-Rated		
Missing	86	65
1 Sometimes	43	43
2 Much of the time	36	36
3 Most of the time	20	20
4 All of the time	16	16
Age of Child when Mother began Using Manual Communication:		
Missing	24	3
Before age 2	9	9
Age 2	8	8
Age 3	16	16
Age 4	20	20
Age 5	34	34
Age 6	25	25
Age 7	15	15
Age 8 or older	50	50

Table 2--Continued, Descriptive Data: Number of Subjects by Signing Status of Mothers

Descriptive Item	All Subjects (n = 201)	All Subjects with Signing Mothers (n = 180)
Method of Manual Communication used by Mothers before their Children were Age 5:		
Missing	3	3
Did not sign before age 5	148	127
ASL	4	4
Signed English	33	33
Fingerspelling	7	7
Total communication	4	4
Fingerspelling, pictures and gestures	2	2
Mothers' Training/Experience in Manual Communication:		
Missing	26	5
1 Lowest	45	45
2	8	8
3	6	6
4	77	77
5	32	32
6	2	2
7 Highest	5	5
Chronological Age when took SAT-HI:		
Age 11	2	2
Age 12	11	11
Age 13	20	19
Age 14	24	24
Age 15	27	24
Age 16	29	26
Age 17	55	48
Age 18	28	23
Age 19	5	3
Sex:		
M	107	99
F	94	81

Table 2--Continued, Descriptive Data: Number of Subjects by Signing Status of Mothers

Descriptive Item	All Subjects (n = 201)	All Subjects with Signing Mothers (n = 180)
Ethnic Background:		
Missing	1	1
White	175	159
Other	25	20
Number of Deaf Siblings:		
None	170	150
1	24	23
2	6	6
3 or more	1	1
Primary Language Spoken in the Home:		
Missing	2	0
English	199	180
Age when Child began School of Any Type:		
Before age 5	170	155
Age 5	17	15
Age 6	9	5
Age 7	3	3
Age 8 or older	2	2
Attendance in Preschool for the Deaf:		
Missing	2	1
Yes	182	164
No	17	15
Preschool: Type of Communication Used:		
Missing	22	17
Speech and speechreading	109	99
Sign language only	3	3
Sign language with speech (English word order)	49	43
Fingerspelling and speech	5	5
Total communication	3	3
Speech and speechreading, then total communication	1	1
Sign language with speech, then speech and speechreading	6	6

Table 2--Continued, Descriptive Data: Number of Subjects by Signing Status of Mothers

Descriptive Item	All Subjects (n = 201)	All Subjects with Signing Mothers (n = 180)
Sign language and cued speech	2	2
Speech and speechreading, then fingerspelling	1	1
Preschool: Mothers' Visits with Staff:		
Missing	23	19
At least 1 time every week	111	102
At least 2 times every week	14	13
At least 1 time every month	22	19
Less than 1 time every month	26	22
Did not meet with teachers and staff	5	5
Level of Education Completed by Mother:		
Missing	2	1
Elementary	6	6
Junior high graduation	37	35
High school graduation	92	80
Some college or technical school	51	46
College degree	9	9
Graduate work	4	3
Level of Education Completed by Father:		
Missing	9	7
Elementary	11	11
Junior high graduation	42	39
High school graduation	69	61
Some college or technical school	45	40
College degree	16	14
Graduate work	9	8
IQ: Number of Years since Test Administration:		
Less than 1 year	62	56
1 - 1.99 years	53	45
2 - 2.99 years	25	24
3 - 3.99 years	34	31
4 - 4.99 years	11	10
5 - 5.99 years	11	10
6 - 6.99 years	4	4
7 - 7.99 years	1	0

Table 2--Continued, Descriptive Data: Number of Subjects by Signing Status of Mothers

Descriptive Item	All Subjects (n = 201)	All Subjects with Signing Mothers (n = 180)
IQ: Performance:		
130 or greater	0	0
120 - 129	4	4
110 - 119	19	18
90 - 109	103	92
80 - 89	46	42
70 - 79	22	18
69 or less	7	6
IQ: Verbal:		
Missing	173	155
130 or greater	1	1
120 - 129	0	0
110 - 119	0	0
90 - 109	2	1
80 - 89	9	7
70 - 79	12	12
69 or less	4	4

Table 3. Mean Skill Level Scores and Training/Experience Scores by Group

Descriptive Item	Group		
	1 NMC (n = 21)	2 PMC (n = 49)	3 MC5 (N = 28)
Child's age when mother began to sign	NA	6.31	3.00 ^a
Self-rating of mothers' skill levels in manual communication			
Speed ("1" low - "5" high)	NA	2.80	3.00
Accuracy ("1" low - "5" high)	NA	2.37	2.86
Amount ("1" low - "4" high)	NA	2.90	3.36
Level of mother's training/experience in manual communication ("1" low - "8" high)	NA	3.80	3.86
Schools' ratings of mothers' skill levels in manual communication			
Speed ("1" low - "5" high)	NA	2.77	2.75
Accuracy ("1" low - "5" high)	NA	2.65	2.81
Amount ("1" low - "4" high)	NA	2.29	2.25

^aEquals an approximation: any child whose mother signed with him at "younger than age 2," was given a value of "age 1" for this measure.

Table 4. Descriptive Data: Number of Subjects by Group

Descriptive Item	Group		
	1 NMC (n = 21)	2 PMC (n = 49)	3 MC5 (n = 28)
Subject's Methods of Communication:			
Sign language without speech	4	17	9
Sign language with speech (English word order)	16	29	19
American Sign Language (ASL)	0	1	0
ASL and Signed English (different settings)	1	2	0
Method of Communication used by Mothers at the Present Time:			
Speech and speechreading	17	0	0
Sign language without speech	0	0	1
Sign language with speech (English word order)	0	41	19
Fingerspelling with speech and no signs	0	2	0
Gestures and made-up signs	2	0	0
Writing	1	0	0
Pantomime	1	0	0
Fingerspelling, signing and writing	0	2	1
Total communication	0	4	7
Method of Manual Communication used by Mothers before their Children were Age 5			
None	21	49	0
ASL	0	0	2
Signed English	0	0	18
Fingerspelling	0	0	4
Total communication	0	0	2
Gestures and made-up signs	0	0	1
Fingerspelling, pictures, and gestures	0	0	1
Chronological age when took SAT-HI:			
Age 11	0	0	1
Age 12	0	0	3
Age 13	1	6	3
Age 14	0	5	6
Age 15	3	7	4
Age 16	3	5	3

Table 4--Continued, Descriptive Data: Number of Subjects by Group

Descriptive Item	Group		
	1 NMC (n = 21)	2 PMC (n = 49)	3 MC5 (n = 28)
Age 17	7	11	7
Age 18	5	14	1
Age 19	2	1	0
Sex:			
M	8	28	16
F	13	21	12
Ethnic Background:			
White	16	44	27
Other	5	5	1
Number of Deaf Siblings:			
None	20	37	23
1	1	7	4
2	0	4	1
3 or more	0	1	0
Primary Language Spoken in the Home:			
Missing	2	0	0
English	19	49	28
Age when Child began School of Any Type:			
Before age 5	15	36	27
Age 5	2	10	1
Age 6	4	2	0
Age 7	0	0	0
Age 8 or older	0	1	0
Attendance in Preschool for the Deaf:			
Missing	1	1	0
Yes	18	43	27
No	2	5	1
Preschool: Type of Communication Used:			
Missing	5	7	1
Speech and speechreading	10	33	12
Sign language only	0	0	2
Sign language with speech (English word order)	6	7	8

Table 4--Continued, Descriptive Data: Number of Subjects by Group

Descriptive Item	Group		
	1 NMC (n = 21)	2 PMC (n = 49)	3 MC5 (n = 28)
Total communication (TC)	0	0	1
Speech with speechreading, then TC	0	0	1
Sign language with speech, (English word order) then speech and speechreading	0	1	3
Speech and speechreading, then fingerspelling	0	1	0
Preschool: Mothers' Visits with Staff:			
Missing	4	8	2
At least 1 time every week	9	26	20
At least 2 times every week	1	5	2
At least 1 time every month	3	3	2
Less than 1 time every month	4	6	2
Did not meet with teachers and staff	0	1	0
Level of Education Completed by Mother:			
Missing	1	1	0
Elementary	0	2	1
Junior high graduation	2	5	3
High school graduation	12	21	10
Some college or technical school	5	16	9
College degree	0	2	4
Graduate work	1	2	1
Level of Education Completed by Father:			
Missing	2	1	0
Elementary	0	5	0
Junior high graduation	3	10	7
High school graduation	8	17	8
Some college or technical school	5	11	6
College degree	2	3	3
Graduate work	1	2	4
IQ: Number of Years since Test Administered:			
Less than 1 year	6	18	10
1 - 1.99 years	8	10	7
2 - 2.99 years	1	5	2
3 - 3.99 years	3	10	3
4 - 4.99 years	1	4	2

Table 4--Continued, Descriptive Data: Number of Subjects by Group

Descriptive Item	Group		
	1 NMC (n = 21)	2 PMC (n = 49)	3 MC5 (n = 28)
5 - 5.99 years	1	2	3
6 - 6.99 years	0	0	1
7 - 7.99 years	1	0	0
IQ: Performance:			
Missing	0	0	0
130 or greater	0	0	0
120 - 129	0	0	1
110 - 119	1	8	1
90 - 109	11	24	12
80 - 89	4	10	8
70 - 79	4	3	5
69 or greater	1	4	1
IQ: Verbal:			
Missing	18	41	24
130 or greater	0	0	1
120 - 129	0	0	0
110 - 119	0	0	0
90 - 109	1	1	0
80 - 89	2	3	1
70 - 79	0	3	2
69 or less	0	1	0

for this group of subjects, as well as for the total number of subjects.

Hypotheses 3 through 6 utilize data from three smaller subgroups of the total number of subjects. These subgroups are identified as follows:

- Group 1. 21 students whose hearing mothers do not use manual communication with them (NMC).
- Group 2. 49 students whose hearing mothers presently use manual communication with them, but who did not begin to use it until their children were age 5 or older (PMC).
- Group 3. 28 students whose hearing mothers have used manual communication with them since before age 5 (MC5).

Group 1 includes all subjects whose mothers reported they used speech and speechreading only, gestures and made-up signs, writing or pantomime to communicate with their children.

Groups 2 and 3 include children for whom both the schools and the mothers reported that the mothers used manual communication with their children. No students are included whose mothers reported themselves as signing very slowly, making many mistakes, or signing only sometimes with their children. Table 3 compares the means of these groups on the following independent measures: 1) age of child when mother began to use manual communication, 2) mother's skill level as reported by the mother, 3) mother's training/experience level in manual communication, and 4) mother's skill level as reported by the school. Table 3 provides additional demographic characteristics by group.

Research Instrumentation

Four instruments were used for this research: the Mother's Questionnaire, the Mother's Short Form, the School Questionnaire and the Reading Comprehension Subtest of the 1973 Stanford Achievement Test, Special Edition for Hearing Impaired Students (SAT-HI). Copies of the three questionnaires are contained in Appendix D.

The Questionnaires

The questionnaires were color coded for easy sorting. The School Questionnaire was used to obtain: 1) data regarding the dependent variable (reading comprehension); 2) information regarding certain aspects of the critical independent variable (maternal method of communication); and 3) information regarding secondary independent variables.

The Mother's Questionnaire was used to obtain: 1) information regarding the critical independent variable (maternal method of communication); 2) information regarding the three aspects of this critical variable (quality of manual communication, age of the child when the mother began to use manual communication and type of manual communication used by the mother); and 3) data regarding various other secondary independent variables.

The Short Form provided data which were used to calculate reliability coefficients for: 1) mothers' self-ratings of their skill levels in manual communication; and 2) ages of their children when mothers began to sign.

The first drafts of the Mother's and School Questionnaires were patterned after the Special Studies Questionnaire and the Family Questionnaire of the 1974 Annual Survey of Hearing Impaired Children and Youth (Jensema and Trybus, 1978). These two first drafts were changed in a variety of ways based on a three phase review.

The purpose of the first phase was to examine the questionnaires for content validity. The questionnaires were reviewed by a specialist (Ed.D) in deafness with extensive experience as a superintendent of a residential school for the deaf, as a director of a rehabilitation counselor training program for the deaf and as a member of the Committee on Professional Preparation and Certification, Council on Education of the Deaf. Changes were made according to suggestions.

The second phase of the review was more extensive. Its purpose was to review the questionnaires for content validity, readability, length, statistical expediency, grammar, format, possible bias, wordiness, ambiguity, threatening questions, confidentiality and accuracy of descriptions of different methods of communication. Reviewers included persons with expertise in deafness and persons with expertise in other related areas. Those with expertise in deafness included a nationally certified interpreter for the deaf with many years of experience in teaching different methods of manual communication at The University of Arizona; three doctoral students in Rehabilitation Counseling of the Deaf Program at The University of Arizona; and three masters students in the same program (one was a mother of a deaf child enrolled in a residential school for the deaf, one was a state certified interpreter

for the deaf and one had been trained as a teacher of the deaf). Those with related expertise were a statistician, a specialist in general rehabilitation (Ph.D.) and a writer. Revisions were made according to suggestions.

In the third phase, the final drafts were reviewed by a six member faculty committee of The University of Arizona, Tucson, for clarity and content. Changes were made according to recommendations.

Concurrent Validity. Rough estimates of concurrent (criterion-related) validity were obtained via product-moment correlation coefficients between maternal self-ratings of their skill levels in manual communication and school ratings of mothers' skill levels. Of the 331 questionnaires received from the schools, 74 indicated that school personnel did not know how these mothers communicated with their children, and 15 did not answer the questions. This is 26.89 percent of the total number of questionnaires received from the schools. Only subjects for whom both schools and mothers provided information about the mothers' methods of communication could be used to obtain correlation coefficients (see Table 5 for numbers).

The first section of Table 5 lists the Pearson product-moment correlation coefficients for each measure of mothers' skill in manual communication. As the table shows, the correlation coefficients are quite low. Although two are significant at greater than .05, the shared variance (r^2) is low for all measures. The highest correlation (.26) means that only 7 percent of the variance of school ratings of

Table 5. Rough Validity Measures of Mothers' Skill Levels in Manual Communication Using Pearson Product-Moment Correlation Coefficients

Descriptive Item	Number of Subjects	Correlation Coefficients	Shared Variance (r^2)	Significance
Self-ratings (range 1-4) and school ratings (range 1-4)				
Speed	113	.26	.07	.006
Accuracy	113	.09	.01	.339
Amount	114	.22	.05	.019
Self-ratings (range 1-4) and levels of training/ experience in manual communication (range 1-7)				
Speed	174	.14	.02	.029
Accuracy	173	-.04	.00	.313
Amount	172	.29	.08	.001

mothers' skills can be accounted for by the variance in self-ratings of mothers' skills.

Partial explanations for these low correlations are: 1) school personnel unfamiliarity with the mothers' skill levels; 2) restricted range of skill ratings (no self-ratings for speed or accuracy were at the highest level, thus the range of all self-report measures was from 1 through 4); 3) the potential influence of school raters' personal relationships with mothers and students on their ratings of the mothers; 4) differences in definitions of skill levels; 5) differences in tendencies to generally rate mothers at higher or lower levels than they believe them to be; and 6) differences in tendencies to rate all mothers at average levels. Based on these potential problems, these correlation coefficients are suspected to be spuriously low, and should be interpreted with caution. In other words, they may not be accurate measures of the validity of the self-ratings of the mothers' skill levels.

Because these correlation coefficients are very low, however, the measurements of mothers' self-rated skill levels are questionable. The items above, as well as mothers' potential tendencies to rate themselves based on how they feel they "should" be signing with their children, might be reasons to distrust the validity of mothers' self-ratings and/or teacher ratings of mothers. All findings which relate to skill levels of mothers should therefore be considered tenuous, at best.

Concurrent validity was also measured by obtaining Pearson product-moment correlation coefficients between mothers' evaluations of their skill levels (MSL) and their training and/or experience in manual communication (MT/E). A total of 37 different types of responses were received regarding mothers' training and experience. These responses were rated on a scale from 1 to 7, independently, by the researcher and two (2) nationally certified interpreters for the deaf who were directors of interpreter training programs at The University of Arizona and at Pima College, Tucson, Arizona. A mean score was computed for, and assigned to, each of the response types. Appendix E lists the responses and the assigned rating for each. The second section of Table 5 shows the correlation coefficients between the various skill levels of the mothers and the amount/type of training/experience they had received in manual communication.

The assumption was that training and experience contribute to signing skills. This assumption, however was not supported by earlier research. Because of its tenuous nature, product-moment correlation coefficients were also obtained 1) between reading comprehension scores of the children and the amount of training/experience of the mothers (MT/E), and 2) between reading comprehension scores and self-rated maternal skill levels (MSL). Table 6 gives the correlation coefficients between these variables and the number of subjects used to obtain them. It was expected that, if the assumption was correct, the correlation coefficient between the amount of maternal training (MT/E) and children's reading comprehension scores would be similar to the

Table 6. Pearson Product-Moment Correlation Coefficients between Reading Comprehension Scores (RCS) and Variables regarding Mothers' Skill Levels in Manual Communication (MT/E)

Descriptive Data	Number of Subjects	Correlation Coefficients	Shared Variance (r^2)	Significance
RCS and Speed	179	.15	.02	.047
RCS and Accuracy	178	.18	.03	.017
RCS and Amount	177	.02	.00	.812
RCS and MT/E	175	.02	.00	.417

correlation coefficients between maternal self-rated skill levels (MSL) and the children's reading comprehension scores.

Comparisons of these correlation coefficients are depicted in Figs. 1, 2, and 3. Since the correlation coefficients in these figures are all low, it is impossible to draw any conclusions regarding their interrelationships. Perhaps the only conclusion that can be drawn is that the measures of skill level (MSL) and of training and experience (MT/E) are questionable.

Test-retest Reliability. Test-retest reliability, using Pearson product-moment coefficients, was estimated for two measures: 1) mothers' self-ratings of their manual communication skill levels (speed, accuracy, and amount); and 2) mothers' estimates of the ages of their children when they began to use manual communication with them.

This was accomplished as follows: approximately one to two months after the researcher received the Mother's questionnaires, 40 percent of all natural mothers who reported themselves as using manual communication with their children were randomly selected, by state, and asked to complete a short form of the Mother's Questionnaire. This Short Form included the two questions relating to maternal ratings of their skills and maternal estimates of the ages of their children when they began to use manual communication with them. These questions were worded exactly as they were in the long form of the Mother's Questionnaire. This form can be found in Appendix D.

Seventy-eight (78) mothers were sent Short Forms. Sixty (60) returned these forms. This is a response rate of 76.9 percent. Only

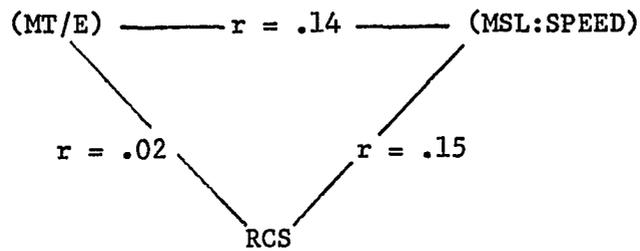


Fig. 1. Intercorrelations of self-rated skill level (MSL:SPEED), maternal training/experience (MT/E) and student reading comprehension score (RCS)

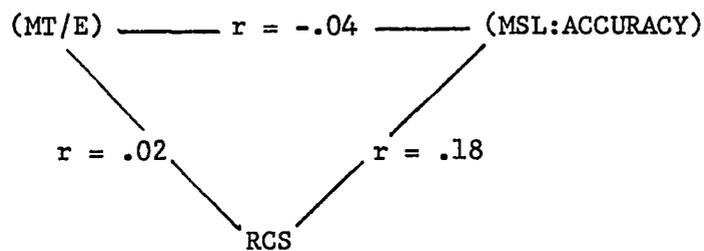


Fig. 2. Intercorrelations of self-rated maternal skill level (MSL:ACCURACY), maternal training/experience (MT/E) and student reading comprehension score (RCS)

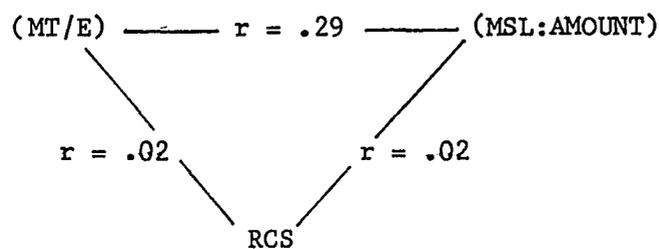


Fig. 3. Intercorrelations of self-rated maternal skill level (MSL:AMOUNT), maternal training/experience (MT/E) and student reading comprehension score (RCS)

the Short Forms for mothers whose children met all the criteria for the study could be used. The total number of Short Forms used to determine test-retest reliability for these measures is listed in Table 7. This table also indicates that the reliability of these measures was high, at a significance level of .001 for each. Shared variance between mothers' first and second ratings of their skills ranged from 55 percent to 66 percent. Shared variance between mothers' first and second ratings of their children's ages when they began to sign with them was 81 percent.

1973 Stanford Achievement Test, Special
Edition for Hearing Impaired Students (SAT-HI)

The Reading Comprehension Subtest of the 1973 Stanford Achievement Test, Special Edition for Hearing Impaired Students (SAT-HI) acted as the measuring tool for the dependent variable (reading comprehension).

Since 1968, the Office of Demographic Studies (ODS), Gallaudet College, Washington, D. C. has been involved in a national testing program to identify existing academic achievement tests which are suitable for hearing impaired students. Its goal has been to develop procedures, materials and norms to enhance the validity and reliability of existing academic achievement tests when used with the deaf population (DiFrancesca, 1972).

In 1968 and again in 1972, surveys indicated that the Stanford Achievement Test (SAT) was used more often with hearing impaired students than any other achievement test (Buchanan, 1973; DiFrancesca,

Table 7. Measures of Test-retest Reliability of Maternal Skill Levels and Age of their Children when Mothers began to use Manual Communication using Pearson Product-Moment Correlation Coefficients

Descriptive Item	Number of Subjects	Correlation Coefficients	Shared Variance (r^2)	Significance
Speed	54	.81	.66	.001
Accuracy	52	.77	.59	.001
Amount	52	.76	.55	.001
Age of Child	54	.90	.81	.001

1972). As a result, the ODS has been involved in a number of studies relating to this test and has made these findings available through special reports (Buchanan, 1973; DiFrancesca, 1972; DiFrancesca and Carey, 1972; Gentile and DiFrancesca, 1969, 1970; Jensema, 1975b; Jensema and Trybus, 1978; Ries, 1973; Trybus, 1973; Trybus and Karchmer, 1977).

In 1974, the ODS conducted the National Achievement Test Standardization Program. This program developed and standardized the SAT-HI (Trybus and Karchmer, 1977). The resulting test includes six levels of difficulty in all the academic subject areas covered by the regular edition. Special testing procedures and national norms, according to age, are available for hearing impaired students (Jensema et al., n.d.; Trybus and Karchmer, 1977).

Although multiple measures are available, scaled scores seem most appropriate for comparing reading scores of two students of the same age taking different batteries of the test (Jensema, 1975b; Trybus and Karchmer, 1977; Jensema et al., n.d.).

These scaled scores were developed by Harcourt Brace Jovanovich, Inc. using Thurston's absolute scaling method (Jensema, 1975b). They are based on two anchor points which are equivalent to grade levels 3.2 and 8.2. A scaled score of 132 is equivalent to grade level 3.2 and a scaled score of 182 is equivalent to grade level 8.2. Fifty scaled score points lie between score 132 and 182. Each point represents one-fiftieth of five years growth of normal hearing children between grade levels 3.2 and 8.2. Generally, the closer a scale score

is to either anchor point, the more precisely it corresponds to the grade level it represents. Scaled scores which are higher, lower and between the anchor points will tend to be less precise (Trybus and Karchmer, 1977). The major advantage in using the scaled scores is that each score unit represents an equal interval of academic growth and therefore lends itself to statistical analysis (Jensema, 1975b).

Reading comprehension is one of the four subject areas which is tested at all six levels of the SAT-HI (Jensema, 1975b). Levels One and Two sample the following: 1) "comprehension of explicit meaning, i.e., the recall and identification of details and main ideas which have been clearly stated in the text"; and 2) "comprehension of implicit meaning, i.e., the use of context, and deductions made on the basis of stated facts" (Madden et al., 1972a, p. 24). Levels Three through Six sample the following skills: "1) comprehension of global meaning, 2) comprehension of the meaning of detailed information, 3) comprehension of implied meaning, 4) use of context for word and paragraph meaning, and 5) drawing inferences from what has been read" (Madden et al., 1972b, p. 30).

An assessment of construct validity of the Reading Comprehension Subtests found correlation coefficients of .60 to .65 with the Gates-MacGintie Reading Test (Allen and Karchmer, Note 7). In measuring the criterion related validity of these tests, La Sasso and Davey (Note 8) found them to have "significant, moderately high positive correlations" with six measures of reading comprehension and other reading comprehension related tasks (Abstract). Using the

Kuder-Richardson formula-20, the reliability of the Reading Comprehension Subtest was found to range from .80 for Level One to .91 for Level Six. This was interpreted as an indication of good to very good internal consistency (Jensema, 1978).

Design and Variables

The Dependent Criterion Variable

The dependent variable was the scaled score of the Reading Comprehension Subtest of the 1973 Stanford Achievement Test, Special Edition for Hearing Impaired Students (SAT-HI).

The Independent Variable

The research was an ex post factor/causal-comparative investigation of attribute variables as they related to reading comprehension (Ary, Jacobs and Razviah, 1979; Isaac and Michael, 1972). An attribute variable is a characteristic of the subject which can not be directly manipulated. It is a variable which the subject possesses before the study begins (Ary et al., 1979).

The critical independent attribute variable for this research was the type of communication used by hearing mothers with their pre-lingually deaf children. Subjects were subdivided into three levels of this variable: Group 1, deaf children whose hearing mothers do not use manual communication (NMC); Group 2, deaf children whose hearing mothers presently use some method of manual communication, but who did not use it with their children before age 5 (PMC); and Group 3, deaf

children whose hearing mothers have used some method of manual communication with them since before age 5 (MC5).

Other important aspects of this critical independent variable were 1) the quality of manual communication used by the mothers; 2) the age of the children when their mothers began to use manual communication (i.e., age 2, 3, 4); and 3) the type of manual system used by mothers (i.e., ASL, Signed English, Fingerspelling). These variables were measured through self-report on the Mother's Questionnaire.

Because ex post facto research lacks the control of experimental research, it is extremely important to control for secondary independent variables which might influence the dependent variable (Ary et al., 1979). If these secondary variables are controlled, and a relationship is found between the critical independent variable (method of communication used by the mother) and the dependent variable (reading comprehension), the research will have some evidence to support a causal inference (Ary et al., 1979).

One method of controlling for a secondary independent variable is to choose subjects who are homogeneous on that variable. This disentangles the critical independent variable from those variables which might effect the dependent variable (Ary et al., 1979). This method of control was used for the following secondary variables: age, degree of hearing loss, age at onset of loss, additional educationally significant handicapping conditions, hearing status of parents, present type of school attended, method of communication used in the school presently attended, signing status of the student, natural as opposed

to foster parent, sex of parent completing the questionnaire, and dominant language spoken in the home. Information regarding these variables was obtained from the Mother's and School Questionnaires and from the ODS.

Another method of controlling for secondary variables is to build them into the design through statistical analysis (Ary et al., 1979; Ferguson, 1981). Variables which were controlled in this way were: non-verbal IQ, sex, educational level of parents, preschool factors (attendance, amount of parental involvement), age of child when first started school of any type, number of deaf siblings in the family, and chronological age. This data was obtained through the Mother's and School Questionnaires, and the Office of Demographic Studies.

Treatment of the Data

Because of the complex interrelationships among the variables, the problem of attempting to determine the relationship between the dependent variable (reading comprehension) and the primary independent variable (method of communication used by the mother) is a difficult one (Jensema, 1975b; Jensema and Trybus, 1978; Ries, 1973; Trybus and Karchmer, 1977). This relationship can not be meaningfully studied without controlling for these interactions in some way (Jensema and Trybus, 1978). The major analysis was therefore in terms of analysis of covariance. In other words, the analysis of the relationship was calculated while controlling for the influence of secondary variables or covariates (Ferguson, 1981; Popham and Sirotnik, 1973).

Based on the literature, it was expected that the following secondary variables might have a relationship to reading comprehension: age, status of preschool attendance, parental involvement in preschool, communication philosophy of the preschool, number of deaf siblings, educational level of the parents, age when child began school, non-verbal IQ, sex, and ethnic background. Because the literature was conflicting regarding the influence of many of these variables, each was first analyzed to determine if it had a meaningful relationship to reading comprehension of the subjects of this study.

Pearson product-moment correlation coefficients were used to analyze secondary variables which were interval in nature. Multiple ANOVA's were used for secondary variables which were nominal. Secondary variables which were found to have meaningful relationships to reading comprehension and which were significantly different from group to group were treated as covariates in the major analysis of covariance. Based on these analyses, chronological age when the child took the SAT-HI and nonverbal IQ were used as covariates.

Two aspects of the critical independent variable were also analyzed. Step-wise multiple regression was used to analyze the relationship of reading comprehension to 1) the quality or skill level of mothers' manual communication and 2) the age of the children when mothers began to use manual communication. All subjects whose mothers reported using manual communication ($n = 180$) were included in these analyses.

CHAPTER 4

RESULTS AND DISCUSSION

Introduction

The purpose of this study was to examine the relationship between hearing mothers' methods of communication with their prelingually deaf children and those children's later reading comprehension skills. This chapter addresses the results of the study and includes a discussion of those results. The first section presents the results of the statistical analysis relating to each hypothesis. In order to assist the reader, each hypothesis has been restated with the presentation of the findings.

Results

Hypothesis 1: There is no significant relationship ($p \leq .05$) between reading comprehension scores of prelingually deaf adolescents and the skill levels of the manual communication used by their hearing mothers.

Step-wise multiple regression analysis was carried out, entering data from 180 subjects whose mothers reported they used manual communication with their children. Independent variables were age of child at administration of the SAT-HI (SATAGE); non-verbal IQ (NVIQ); self-rated maternal sign language skills (M:SPEED, M:ACCURACY, and M:AMOUNT); school rated maternal sign language skills (S:SPEED, S:ACCURACY, and S:AMOUNT); age of child when mother began to use

manual communication (MC:AGE); level of education completed by mother (M:ED); level of education completed by father (F:ED) and level of maternal training/experience in manual communication (MT/E). Reading comprehension (RCS), as measured by the SAT-HI, acted as the dependent variable. SATAGE was forced into the equation first, as a control measure.

All variables entered the equation except for S:SPEED, which had a final partial correlation coefficient with reading comprehension of only .01. This analysis, with all other variables included, was significant beyond level .001, with a multiple R of .56, an R square of .32, and an F ratio of 4.17. The final equation was as follows:

$$\begin{aligned} \text{RCS} = & (21.48) + (.19) \text{SATAGE} + (.36) \text{NVIQ} + (.21) \text{S:AMOUNT} + \\ & (.17) \text{F:ED} + (-.10) \text{MT/E} + (.08) \text{M:ACCURACY} + (-.11) \\ & \text{M:ACCURACY} + (.09) \text{M:SPEED} + (.04) \text{MC:AGE} + (.02) \text{M:ED} + \\ & (-.02) \text{S:ACCURACY} \end{aligned}$$

Of the measures selected above, non-verbal IQ was the best single predictor of reading comprehension scores. Of the variables directly relating to Hypothesis 1, five of the six measures of mothers' skill levels in manual communication entered the equation. This is an indication that manual communication skill levels of mothers, as measured by both mothers and schools, are definitely related to reading comprehension ability. Of these measures, the amount of time the mothers signed with their children, as measured by the schools (S:AMOUNT), was the best predictor of reading comprehension in this equation.

Simple correlation coefficients are listed in the correlation matrix presented in Table 8. This table shows that all coefficients were relatively low, and that mothers' signing skill levels, as measured by the schools, tended to have somewhat higher relationships with the children's reading comprehension scores than other measures of their skill levels. Because these correlation coefficients were higher, and because schools appeared to rate mothers differently than mothers rated themselves, the school ratings were included in the multiple regression analysis.

Although all individual correlation coefficients between skill levels and reading comprehension were relatively low; when they were combined with each other and with chronological age, non-verbal IQ, parental educational level, and age of the child when the mother began to sign, these variables were found to be significant predictors of reading comprehension scores as measured by the SAT-HI.

Based on these findings, Hypothesis 1 was rejected.

Hypothesis 2: There is no significant relationship ($p \leq .05$) between reading comprehension scores of prelingually deaf adolescents and the ages of the children when their hearing mothers began to use manual communication with them.

Based on the results of the multiple regression analysis discussed under Hypothesis 1, the age of the child when the mother began to use manual communication (MC:AGE) does not appear to relate significantly to reading comprehension skills. Because it is possible that overlap among variables could have decreased the final

Table 8. Simple Correlation Coefficients among Study Variables included in the Multiple Regression Analysis for 180 Prelingually Deaf Adolescents whose Mothers report using Manual Communication with them

RCS	1	2	3	4	5	6	7	8	9	10	11	12	13
1. RCS	1.00												
2. SATAGE	0.20	1.00											
3. NVIQ	0.40	-0.05	1.00										
4. M:SPEED	0.15	0.01	0.02	1.00									
5. M:ACCURACY	0.18	-0.03	0.06	0.54	1.00								
6. M:AMOUNT	0.02	0.04	0.09	0.46	0.27	1.00							
7. S:SPEED	0.24	0.16	0.13	0.26	0.13	0.28	1.00						
8. S:ACCURACY	0.21	0.09	0.10	0.22	0.09	0.12	0.78	1.00					
9. S:AMOUNT	0.30	0.16	0.13	0.27	0.12	0.22	0.78	0.73	1.00				
10. MC:AGE	0.07	0.06	0.07	-0.29	-0.08	-0.27	-0.05	-0.09	-0.08	1.00			
11. M:ED	0.29	-0.01	0.20	0.20	0.22	0.17	0.25	0.25	0.30	-0.04	1.00		
12. F:ED	0.25	0.02	0.22	-0.01	0.11	-0.02	0.26	0.36	0.30	-0.02	0.60	1.00	
13. MT/E	0.02	-0.05	0.11	0.14	-0.04	0.29	0.33	0.35	0.31	-0.15	0.34	0.25	1.00

contribution of MC:AGE to the equation, it is important to look at the original and partial correlations as each variable was added to the equation.

The simple correlation coefficient between reading comprehension (RCS) and MC:AGE was very low (.07). This means that only 1 percent of the variance in reading comprehension scores could be explained by this variable. When the variance of SATAGE was partialled out, the correlation coefficient became even smaller (.06). This is an indication that SATAGE and MC:AGE shared some variance in common. The relationship between RCS and MC:AGE became even smaller (.03) as the variance of non-verbal IQ was partialled out. After the variance of all other variables in the equation were partialled out, the final beta weight for MC:AGE was .04.

Results are consistent throughout the analysis. Age of children when the mother began to use manual communication has a very low positive relationship with reading comprehension skills of the children in this sample. Based on these findings, the null hypothesis was retained.

Hypotheses 3, 4, 5, and 6: Differences between groups.

In order to test the hypotheses dealing with the differences in reading comprehension scores between Groups 1, 2, and 3, analysis of covariance was conducted with covariates of non-verbal IQ and chronological age at the administration of the SAT-HI. The results of this analysis are presented in Table 9. As this table indicates, the

Table 9. Analysis of Covariance Summary of Reading Comprehension Skill Measures for Groups 1, 2, and 3

Source of Variation	df for Adjusted Sum of Squares	Adjusted Sum of Squares	Mean Squares	F	p
Between (main effects)					
Groups	2	1464.15	732.07	1.63	.202
NVIQ (Covariate)	1	5313.65	5313.65	11.81	.001
SATAGE (Covariate)	1	2193.09	2193.09	4.87	.030
Error (residual)	93	41859.61	450.10		
Total	97	50830.50			

F ratios for the covariates were significant beyond level .05, but the F ratio for groups was not significant.

The covariates collectively contributed to adjust the sum of squares of the analysis of variance, and resulted in adjusted mean squares and adjusted mean reading comprehension scores. Both the original means and the adjusted means (those free of the linear effect of the covariates) are listed in Table 10. The decrease in group differences in the adjusted means indicates that the original differences between the three groups were significantly due to the confounding effects of non-verbal IQ and the chronological age of the children when taking the SAT-HI. A multiple R of .42 was obtained for the three independent variables (chronological age, non-verbal IQ, and groups). This multiple R means that only 18 percent of the variance in reading comprehension scores is explained by these three variables.

Hypotheses 3 through 6 relate directly to the findings of this analysis of covariance. Findings for all are a direct function of the overall F test for groups, which was not significant. This indicates that there is no significant difference among groups.

Hypothesis 3: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers do not use manual communication with their children (NMC), and a combination of those whose hearing mothers presently use manual communication (PMC) and those whose mothers used manual communication with them since before age 5 (MC5). (NMC = PMC + MC5)

Table 10. Analysis of Covariance Summary of Original and Adjusted Reading Comprehension Score Means for Groups 1, 2, and 3

Groups	Original Means	Adjusted Means
1 (NMC)	154.43	150.96
2 (PMC)	144.51	144.79
3 (MC5)	146.54	148.63

Group 1 (NMC) received a higher mean score than Groups 2 and 3 combined (PMC + MC5). The overall F ratio for groups of the analysis of covariance was not significant, therefore no post hocs were performed. Based on this analysis, Hypothesis 3 was retained.

Hypothesis 4: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers do not use manual communication with their children (NMC), and those whose hearing mothers have used manual communication with them since before age 5 (MC5). (NMC = MC5)

Group 1 (NMC) received an adjusted mean reading comprehension score which was 2.33 points higher than Group 3 (MC5). This represents a difference of approximately .23 grade equivalent levels between the two groups.

The analysis of covariance produced an overall F ratio for groups which was not significant. Because of this, no post hocs were performed. Based on this F ratio, Hypothesis 4 was retained.

Hypothesis 5: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers do not use manual communication with their children (NMC), and those whose hearing mothers presently use manual communication, but did not begin until their children were age 5 or older (PMC). (NMC = PMC)

Group 1 (NMC) received an adjusted mean reading comprehension score which was 6.17 points higher than Group 2 (PMC), representing a difference between the two groups of approximately .62 grade levels.

Because the overall F ratio for groups of the analysis of covariance was not significant, no post hocs were performed. Based on this analysis, Hypothesis 5 was retained.

Hypothesis 6: There is no significant difference ($p \leq .05$) in reading comprehension scores between prelingually deaf adolescents whose hearing mothers presently use manual communication, but did not begin until their children were age 5 or older (PMC), and those whose hearing mothers have used manual communication with their children since before age 5 (MC5). (PMC = MC5)

Group 2 (PMC) received an adjusted mean reading comprehension score which was 3.84 points lower than Group 3 (MC5). This represents a difference between the two groups of approximately .38 grade level equivalents in reading.

The analysis of covariance produced an overall F ratio which was not significant, and no post hocs were performed. Based on the findings of this analysis, Hypothesis 6 was retained.

Other Findings

Other findings of interest involve the relationships of reading comprehension to the secondary variables of the study. Table 11 presents the results of eight one-way ANOVA's of the categorical variables.

Results show no significant differences between 1) students of mothers who use manual communication and those of mothers who do not (as reported by schools); 2) types of manual communication used by the mothers who signed with their children before age 5 (as reported by mothers); and 3) attendance or non-attendance in preschool programs for hearing impaired children (as reported by mothers).

Significant differences were found with regard to 1) method of communication used by special preschool programs, and 2) method of communication used by the students themselves. These findings are presented as follows:

1. Method of communication used by preschool programs, as reported by mothers. The initial ANOVA regarding method of communication used in preschools resulted in an F ratio which was not significant at level .05. Because this test was nearing significance, and because many of the cells contained very small numbers, a second ANOVA was performed which included only the two categories with large enough numbers to test them efficiently. In this second analysis of variance, students who attended preschool programs using speech and speechreading (n = 109) received significantly higher reading comprehension scores (RCS) than those who attended preschool programs which

Table 11. Analysis of Variance Summaries of Categorical Variables

Source of Variation		df	SS	MS	F	p
School's opinion of whether mother uses manual communication:						
A. Yes/No/Don't know	Between groups	2	1224.83	612.41	1.26	.2861
	Within groups	187	90894.97	486.07		
	Total	189	92119.79			
B. Yes/No	Between groups	1	800.51	800.51	1.77	.1855
	Within groups	146	66038.97	452.32		
	Total	147	66839.48			
Mother's method of communication before child was age 5:						
	Between groups	5	869.62	173.92	.37	.8673
	Within groups	61	28680.09	470.18		
	Total	66	29550.51			
Preschool:						
A. Yes/No/Don't know	Between groups	1	967.40	967.40	2.02	.1569
	Within groups	198	94860.58	479.09		
	Total	199	95827.98			
B. Methods of communication used:						
1. Between all methods	Between groups	8	6609.34	826.17	1.78	.0849
	Within groups	171	79573.65	465.34		
	Total	179	86182.99			
2. Between speech and speech-reading and signing with speech	Between groups	1	3613.77	3613.77	7.27	.0078
	Within groups	156	77510.44	496.86		
	Total	157	81124.21			

Table 11--Continued

Student's Method of Manual Communication:						
A. All methods	Between groups	5	9056.26	1811.25	4.09	.0015
	Within groups	196	86811.64	442.92		
	Total	201	95867.90			
B. Sign language only vs. sign language with speech	Between groups	1	6012.00	6012.00	12.74	.0005
	Within groups	178	83989.97	471.85		
	Total	179	90001.98			

Note. Based on 201 subjects

used sign language and speech ($n = 50$). The difference between the mean reading comprehension scores of those who attended preschools using speech and speechreading techniques (RCS mean = 149.3) and the mean scores for those who attended programs using sign language and speech (RCS = 138.78) and significant at level .0078.

2. Method of manual communication used by students. Initial findings showed highly significant differences in reading comprehension scores (RCS) between students who used various types of manual communication. Because the numbers of subjects were too small in most cells for further analysis, no post hocs were performed. Two of the types of manual communication (sign language only and sign language with speech) however, had large numbers. Instead of performing post hocs, these two were analyzed again, without the influence of the cells with small numbers. Results of the one-way ANOVA for these two signing methods showed that the 111 students who used sign language with speech (RCS mean = 149.71) received higher scores than the 68 students who used sign language only (RCS mean = 138.78). The difference was significant at level .0005.

Other variables such as verbal IQ, sex, ethnic background, number of deaf siblings, and age when the child began school were analyzed through Pearson product-moment correlation coefficients between these variables and reading comprehension scores for the 201 subjects of the study. Specific information regarding the number of

subjects in each category can be found in Table 1. The correlation coefficients for these variables are presented below.

Verbal IQ. Although Verbal IQ is considered to be an inappropriate measure of the intelligence level of deaf children, it does appear to have a high relationship with reading comprehension. The correlation coefficient between these two variables, based on 28 subjects for whom verbal IQ was reported was .76. This means that 58 percent of the variance of reading comprehension scores of these 28 subjects could be explained by verbal IQ.

Sex. A correlation coefficient of .10 was found between reading comprehension and the sex of the child. Females received slightly higher scores than males. This means that only 1 percent of the variance in reading comprehension can be explained by the sex of the subjects.

Ethnic Background. A correlation coefficient of $-.21$ was computed between reading comprehension scores and ethnic background, with white students reading at higher levels than students of other ethnic backgrounds. This means that 4 percent of the variance in reading comprehension can be explained by ethnic background.

Number of Deaf Siblings. A correlation coefficient of .13 was found between reading comprehension scores and number of deaf siblings. Higher reading comprehension scores were received by deaf children with deaf siblings. This means that 2 percent of the variance of reading comprehension can be accounted for by this variable.

Age when child began school. A correlation coefficient of $-.06$ was computed between reading comprehension scores and age when the child began school. This means that only .4 percent of the variance of reading comprehension can be accounted for by this variable.

Discussion

The purpose of this study was to examine the relationship of reading comprehension scores of prelingually deaf children and the method of communication used with them by their hearing mothers. The primary questions dealt with the relationship of reading comprehension scores to 1) whether or not mothers used manual communication with their children, 2) the age of the children when signing mothers began to use manual communication with them, and 3) the skill levels of mothers who used manual communication with their children.

The results of the study indicate that, for this group of students, the method of communication (manual communication versus non-manual communication) used by their hearing mothers has no significant relationship to reading comprehension scores. This was found both in the ANCOVA of the three groups of subjects studied in hypotheses 3 through 6 and in the one-way ANOVA of the categorical variable relating to mothers' methods of communication, as reported by the schools.

The ANCOVA, controlling for chronological age and non-verbal IQ, found no significant differences between children whose mothers do not use manual communication (NMC), children whose mothers presently

use manual communication, but did not begin until their children were age 5 or older (PMC), and children whose mothers began using manual communication with them before they were age 5 (MC5). Likewise, a one-way ANOVA of teachers evaluations of whether or not mothers used manual communication found no significant differences between the two groups.

These findings are consistent with the findings of Corson (1974), Jensema and Trybus (1978) and Morrison (1982). The implication is that reading comprehension scores of prelingually deaf children will not be affected by the method of communication used by their hearing mothers.

When considering only the students whose mothers use manual communication, age of the children when the mothers began to sign does not appear to make a difference in reading comprehension skills. Neither the multiple regression equation, nor the ANCOVA, which compared two groups of children of differing ages when their mothers began to use manual communication, found this variable to relate highly with reading comprehension scores. It appears that, based on consistent statistical findings, age when mothers began to sign with their prelingually deaf children has little effect on those children's abilities to achieve in reading.

Although age of the child when the mother began to use manual communication did not have a significant relationship to reading comprehension scores; skill level of mothers, as measured by both the mothers and the schools, did have such a relationship. Since no

previous studies have attempted to analyze this relationship, and since a variety of interrelated measures were entered into the equation, it is difficult to draw specific conclusions. Generally, as the skill level of the mothers increases, the reading comprehension level of their children also increases.

Caution must be taken when considering the findings of this study for the following reasons:

1. Limitations of the design. These are discussed in detail in Chapter 2 of this study.
2. Inconsistencies among states. It is obvious from examination of correlation coefficients by state, that, in some ways, the data is not accurate. There are differences across states with regard to a number of variables which were expected to be stable from state to state. The correlation coefficients between school rated and self-rated mothers' skill levels range from very low in one state to moderately high in another. Similarly, correlation coefficients range from .20 to .54 between reading comprehension and non-verbal IQ and from -.02 to .60 between reading comprehension and SATAGE.

These inconsistencies are indications that the measurements for maternal skills, non-verbal IQ and reading comprehension skills may have been applied differently in each state. This situation may have resulted in questionable data, not only for some of the independent variables, but also for the criterion variable.

3. Low validity of maternal skill levels. As discussed in the description of the questionnaires, the correlation coefficients

between school rated and self-rated mothers' skill levels are low, with the highest correlation sharing only 7 percent of the variance between school ratings and self-ratings. Any findings regarding skill levels of mothers must therefore be examined in light of these low correlation coefficients.

4. Interpretation problems of the ANCOVA. In using non-verbal IQ as a covariate, it is possible that the analysis may have removed some meaningful variability from the reading comprehension scores. In other words, parts of non-verbal IQ and reading comprehension may be measuring the same thing (i.e., ability to take a test, ability to follow directions, some general undefinable ability, etc.). By removing the variability of non-verbal IQ, the analysis may have inadvertently decreased meaningful variability of reading scores.

Non-verbal IQ may also be related to the method of communication used by mothers. If this is the case, the calculations of adjusted means will have removed part of the treatment effect.

The result of these two problems would be to reduce the ability to detect an influence of method of communication when it actually exists.

5. Problems with group identification. Group 1 (non-signing mothers) is composed of individuals whose mothers use speech and speechreading only, gestures and signs, writing, or pantomime to communicate with their deaf children. The mean reading comprehension score for the 17 children whose mothers use speech and speechreading is 159. The mean score for the two children who use gestures and

made-up signs is 141. The individual scores for the child whose mother uses writing and the child whose mother uses pantomime are 120 and 130 respectively. Clearly, the mean scores for the 17 children whose mothers use speech and speechreading is much higher than for the other 4 children in Group 1, and is considerably higher than the original means for Groups 2 (145) and Group 3 (147). If the 17 students whose mothers indicated that they used speech and speechreading with their children were the only students used in Group 1, this group would have had a larger mean reading comprehension score.

This problem, along with the small number of subjects in Group 1 ($n = 21$) may have resulted in spurious findings regarding the use or non-use of manual communication and its relationship to reading comprehension skills.

6. Practical versus statistical significance. When considering the issue of practical versus statistical significance, the differences among the three groups are more striking than they originally appear to be. According to previous studies, the average growth rate in reading for deaf adolescents is approximately .20 to .30 grade levels per year (Babbini and Quigley, 1970; Furth, 1966). In other words, .20 to .30 grade equivalents is equal to one year's growth in reading for the average deaf adolescent. Based on these figures, the apparently small grade equivalent differences among groups presented in Table 12 can be considered in a somewhat different light.

Using these practical differences as a tentative guide, and looking only at the means of the groups, without regard for standard

Table 12. Mean and Grade Equivalent Differences in Reading Comprehension Scores among Groups

Groups	Mean Differences	Grade Equivalent Differences
Group 1 (NMC) - Group 2 and 3 (PMC + MC5)	+4.77 ^a	+.48 ^a
Group 1 (NMC) - Group 3 (MC5)	+2.33	+.23
Group 1 (NMC) - Group 2 (PMC)	+6.17	+.61
Group 2 (PMC) - Group 3 (MC5)	-3.84	-.38

^aApproximation

error; Group 1 (children of non-signing mothers) may be approximately two years growth beyond Groups 2 and 3 combined (signing mothers), approximately one year's growth beyond Group 3 (early signing mothers), and from two to three year's growth beyond Group 2 (later signing mothers). When comparing the two signing groups, Group 3 (early signing mothers) may be from one to two years growth beyond Group 2 (later signing mothers).

Although the issue of practical significance sheds a somewhat different light on group differences, it really does not explain a great deal, because it has not considered standard error. Caution, therefore, must be taken when considering these practical differences. The ANCOVA has shown that the variance within groups (450) is quite large in relation to the variance between groups (732). This is an

indication that much of the variance was due to error, with perhaps a great deal of overlap in scores from group to group. Explaining the difference among mean scores only, then, would perhaps be meaningless.

7. Group 2 had a greater percent of students who had attended preschools stressing speech and speechreading than Groups 1 or 3. Since the students who had attended preschools using speech and speechreading received higher scores than those who had attended preschools using speech and sign language, Group 2 may have had a spuriously higher score due to this variable. If this variable had been controlled for, the reading comprehension score might have been adjusted downward, and the differences among groups might have been greater.

Conclusion

In summary, no statistical significant relationships were found between reading comprehension scores and method of communication used by mothers, or between reading comprehension scores and the ages of the children when their mothers began to use manual communication with them. A significant relationship was found, however, between mothers' skill levels in manual communication and their children's reading comprehension skills.

Based on the small number of subjects in Group 1 (those with non-signing mothers), subject selection problems, inconsistencies found among states, practical versus statistical significance, and interpretation problems of the ANCOVA, caution must be exercised when considering these results.

This study can be considered only a part of a larger body of research regarding the relationship between maternal method of communication and prelingually deaf children's reading comprehension skills. Because parents are in need of information regarding the types of communication most beneficial to the development of their deaf children, additional research needs to be conducted regarding this topic.

CHAPTER 5

SUMMARY AND RECOMMENDATIONS

Introduction

This chapter is presented in two sections. Section one is a general summary of the project. Section two is a list of recommendations for future research.

General Summary

A review of the literature has shown that prelingually deaf individuals read at significantly lower levels than their hearing peers. A long standing argument among educators has been whether or not parental method of communication with their children has a relationship to their reading comprehension skills. Research has provided conflicting findings regarding this relationship: some studies have found that manual communication leads to higher reading comprehension skills, while others have found that the method of communication makes no difference. Many of the studies, particularly those which found that reading comprehension was positively related to the use of manual communication, did not control for important secondary variables which might have had strong influences on reading comprehension skills. The present study expands on the earlier research, while attempting to control for secondary variables which might also be related to reading comprehension.

The Purpose

The purpose of this study was to examine the relationship between prelingually deaf children's reading comprehension skills and their mothers' methods of communication with them.

The Sample

Two-hundred-one prelingually deaf subjects participated in the study. All used some form of manual communication as their primary method of communication and learning, were ages 11.25 through 19.83, were students in residential schools for the deaf which subscribed to the total communication philosophy, had been in such schools for at least the past 3 years, had parents whose hearing was normal, had no additional handicapping conditions, and had natural mothers who were able to complete the Mother's Questionnaire.

The Procedure

Questionnaires were sent to mothers and schools to obtain data regarding the primary independent variables (maternal method of communication, age of their children when signing mothers began to use manual communication, and skill levels of mothers who used manual communication); a number of secondary independent variables; and the dependent variable (SAT-HI reading comprehension scores). Validity and reliability measures were obtained for skill levels of mothers; and a reliability measure was obtained for the ages of the children when their mothers began to use manual communication with them.

Statistical Treatment

The data were analyzed by two different statistical procedures. Step-wise multiple regression analysis was used to examine the predictive ability of the independent variables of 1) age of the children when mothers began to use manual communication; and 2) manual communication skill levels of the mothers, on the dependent variable, reading comprehension of deaf children.

Analysis of covariance was conducted to test for differences in reading comprehension scores among three subgroups of the subjects. These subgroups were identified as follows: Group 1, students whose mothers did not use manual communication with them (NMC); Group 2, students whose mothers used manual communication with them, but who did not begin to use it until their children were age 5 or older (PMC); and Group 3, students whose mothers had used manual communication with them since before age 5 (MC5). Based on Pearson correlation coefficients, one-way ANOVA's, and cross tabulations of the secondary variables, non-verbal IQ and ages when the children took the SAT-HI acted as covariates.

Results

Overall results indicated that, for these subjects, the method of communication used by mothers of prelingually deaf children had no significant relationship with their children's reading comprehension scores.

Of the subjects whose mothers used manual communication, no significant relationship was found between reading comprehension and

the age of the children when their mothers began to sign with them. Conversely, a significant relationship was found between reading comprehension scores and skill levels of mothers, as reported by both mothers and schools.

These results must be examined with caution because of a number of problems encountered in this study. The problems are: 1) limitations in subject selection; 2) low validity of the measurements of the mothers' skill levels; 3) the small number of subjects in Group 1 (MMC); 4) potential deviations in the measurement of reading comprehension and non-verbal IQ across states; 5) difficulties in interpretation of the ANCOVA; and 6) inability to totally control for ethnic background of subjects.

Recommendations for Future Research

Based upon the results of this research, and on the acknowledged limitations of the study, future research is suggested. It is recommended that:

1. Similar research be conducted with the addition of students who use the oral method to learn and communicate, and who are enrolled in mainstream programs which subscribe to the oral/aural approach.

The results of the present study can only be generalized to students who use manual communication as their primary method of communication and learning, and who are enrolled in residential schools which subscribe to the total communication approach.

It has been argued that successful oral students may be more likely to be enrolled in oral programs and/or mainstreamed programs

(Quigley and Kretschmer, 1982). For this reason, the more successful early oral students may not be included in this study. In order to allow a broader generalization of findings, future research should include students who use speech and speechreading to learn and communicate and who are presently enrolled in mainstream programs and/or schools which subscribe to the oral approach.

2. Similar research be conducted which incorporates a delineation of the levels and types of communication used by non-signing parents.

The present study concentrated on the various types of manual communication used by signing mothers. The non-signing mothers, however, were grouped together without regard for the amount of training they had received in the oral approach, or for the precise way they communicated with their children (i.e., speech and speechreading, writing, gestures, and made-ups signs). Because there appears to be a difference in reading comprehension skills among the children of the various categories of non-signing parents, future research should attempt to delineate these categories when studying the relationship between parental method of communication and dependent variables such as academic achievement. Brasel and Quigleys' study (1975; 1977) might be used as a model for identifying the various skill levels of oral communication.

3. Similar research be conducted which includes the type of communication used by both hearing mothers and hearing fathers with their prelingually deaf children.

A review of the literature shows that very little is known about the relationship between fathers' methods of communication and their deaf children's academic and social/emotional development.

Since mothers tend to sign more, and with greater skill, than fathers do (Bornstein et al., 1980); since mothers have, in the past, tended to spend more time with their children than fathers have; and since it was thought that it would be difficult to obtain a measurement of the communication method used by fathers, the present study attempted only to examine the method of communication used by hearing mothers with their prelingually deaf children.

In light of recent changes in fathers' roles, however, it will be important to study the relationship of their methods of communication to the academic, social, and emotional development of their deaf children.

4. Similar research be conducted using alternative methods of measuring parental skill levels in manual communication.

The present study utilized school and self-ratings to evaluate the manual communication skill levels of hearing mothers. Validity coefficients ranged from .09 to .26. Because of the inherent flaws of the self and school ratings in this study, other methods of measuring skill levels might have been more effective. Children's evaluations and/or independent observations and ratings of mothers' skills might have given different results. Until valid measures are developed, any findings regarding skill level will be speculative, at best.

Another important aspect of skill level should be measured when considering the quality of communication between the child and the

parent. Although the present study dealt only with the expressive skills of mothers, receptive skills are also important. These receptive skills could be measured by asking children to communicate something specific to their parents (i.e., a story) followed by some measurement of the parents' understanding. In evaluating parents' receptive abilities, care should be taken to avoid measuring their writing skills, memory, test anxiety, intelligence, etc. rather than what was intended to be measured.

In all of these measures, reliability and validity of each should be established.

5. Similar research be conducted which examines the relationship between mothers' training and/or experience in manual communication and their signing skill levels.

Although it has been assumed that training and experience in manual communication leads to higher levels of signing skills, the present study did not support this notion. Low correlation coefficients were found between mothers' manual communication skills (both self-rated and school rated) and their training and/or experience in sign language (see Appendix E for specifics). Since the validity of the evaluations of both skill levels and training and experience levels are highly questionable, however, no conclusions can be drawn from these findings.

Additional, and more specific, information is required regarding whether or not training makes a difference; and if so, what type of training contributes to better manual communication skills. This information is especially important in light of the positive

relationship between skill levels of mothers and reading comprehension scores of their children. Before this type of research can be conducted, however, objective, valid measures of both mothers' skill levels and training/experience levels must be developed.

6. Similar research be conducted with regard to the relationship between hearing parents' methods of communication and other dependent variables such as mathematics, writing, self-concept, locus of control, speech and speechreading skills, intelligence measures, understanding of the hearing world, social growth, work adjustment skills, and family life skills.

Since reading comprehension is just one aspect of an individual's life, its relationship to parent's methods of communication should not be generalized to other important areas of development. Other research is, therefore, needed to analyze the relationship between hearing parents' methods of communication and the above variables.

7. Similar research be conducted with the addition of secondary variables such as working status of the mother before and after the child enters school, marital status of the mother, and birth order of the child.

To date, no research regarding early method of communication or academic achievement of deaf children has included the above variables. Since it is possible that these might interrelate with the dependent and/or independent variables of this study, they may have had some influence on the findings.

Research regarding these variables would be valuable for the following reasons: 1) to demonstrate that they must be controlled for in future studies; 2) to give mothers more information regarding

decisions about whether or not to work; 3) to determine whether the child who is born first, second or third will need additional help in developing reading comprehension skills; and 4) to determine if the child of a single parent will need additional help in developing reading comprehension and other skills.

8. Additional research be conducted to examine the influence of deaf siblings in the prelingually deaf child's development.

Only two other studies have examined the influence of deaf siblings on the language development of the deaf child. Both have suggested that having deaf siblings is positively related to language development. The present study found a correlation coefficient of .13 between reading comprehension and number of deaf siblings. Although this relationship is relatively low, accounting for only 2 percent of the variance in the reading comprehension scores of this sample, it is an indication that some relationship exists. Further research is needed to determine how great a relationship exists, and whether or not relationships exist between number of deaf siblings and other areas of development of the deaf child.

9. Research be conducted to identify the characteristics of prelingually deaf children being raised by individuals who are not the natural parents.

Serendipitous findings of the present study found that, of the 249 questionnaires received from hearing mothers, 26 (10.44%) were returned by women who were not the natural mothers. Because the children of these parents were not to be included in this study, their mothers had been asked to return the questionnaires without completing

them. Fifteen of these women, however returned fully completed questionnaires, and three of these added letters regarding their relationships with their deaf children.

A review of the literature has provided no information pertaining to this group. With this relatively large percent of women who are not the children's natural mothers, it would seem an important group to learn more about.

APPENDIX A

SUMMARY OF PROPOSED RESEARCH PROJECT

SUMMARY OF PROPOSED RESEARCH PROJECT

This request follows the Suggested Guidelines for Research in Educational Programs for the Deaf (Conference of Executives of American Schools for the Deaf, 1979).

Request to conduct research in cooperation with:

A. SOURCE OF REQUEST

1. Principal investigator: Charlene M. Chipps Kampfe
2. Project title: Reading Comprehension of Prelingually Deaf Adolescents and Its Relationship to Maternal Use of Manual Communication
3. Person making request: Charlene M. Chipps Kampfe

Position: Student/Teaching Assistant

Address: Room 442
Department of Rehabilitation
College of Education
University of Arizona
Tucson, Arizona 85721

Telephone - work: 602-626-5208
602-626-1860

residence: 602-888-4605

4. This project is: Research conducted in partial fulfillment of the requirements for a Ph.D. degree

Department: Rehabilitation
Institution: University of Arizona

Name of research supervisor: Armin G. Turechek, Ed.D.
Name of research advisor: Ralph L. Hoag, Ed.D.
5. Support for project: a. Personal funds of the investigator

b. The project will be submitted to the Graduate College, University of Arizona and possibly to the Research Projects Branch, Special Educational Programs, Department of Education for possible funding.

B. GENERAL PROJECT DESCRIPTION

6. Purpose of the research: To determine if prelingually deaf adolescents whose parents are hearing and whose mothers use manual communication with them obtain significantly different reading comprehension scores than prelingually deaf adolescents whose parents are hearing and whose mothers do not use manual communication with them. To determine if the age at which the mother begins to use manual communication makes a difference. To determine if the quality of manual communication used by the mother makes a difference.
7. Outline of procedures: Eight residential schools with enrollments of at least 300 students will be asked to participate. The total number of students for whom information will be requested nationally will be approximately 400. The total number of students per school for whom information will be requested via questionnaires will be approximately 50 to 60.

The study will be an ex-post facto investigation of the relationship between maternal method of communication and reading comprehension of their prelingually deaf children. Because a variety of secondary independent variables have been found to have a relationship to reading comprehension, analysis of covariance will be used to control for these variables.

See attachment for further details regarding procedure.

C. REQUEST SPECIFIC TO THIS SCHOOL

8. Date the investigator plans to initiate project in this school: March, 1983 or as soon as the school agrees to participate in the study
9. Description of students/subjects from this school:

Students aging 12.0 through 18.0 at the time of the 1981-1982 Annual Survey of Hearing Impaired Children and Youth (ODS) and who meet the following criteria will be selected for the study:

 1. Unaided audiological findings indicate a loss of 9ldB (ANSI/ISO) or greater in the better ear averaged across the frequency range of 500, 1000, 2000 Hz
 2. Prelingually deaf (hearing loss before age 3)
 3. Use ~~some~~ form of manual communication as the primary method of communication and learning
 4. Both parents are hearing
 5. Has been a student in a residential school for at least 3 years
 6. Has no additional educationally significant handicapping conditions
10. Description of information required from school records or personnel:
 - A. From teachers:
 1. Opinion of student's primary method of communication
 2. Opinion of student's mother's method of communication with him/her
 3. Opinion of the mother's skill level in manual communication

B. From school records via liaison:

1. Length of time in a residential or day school
2. Intelligence test scores
3. 1982 Reading Comprehension Scores of the SAT-HI

11. A description of procedure and copies of the Mother's and School Questionnaires are attached.

Please note that the administrator will be asked to assign an individual who will act as the coordinator/liaison for this project. This individual will be paid on an hourly basis by the researcher/investigator to perform the functions listed in the procedure.

12. No time will be required by the subjects/students. Mothers will be asked to complete a 3 page questionnaire.
13. It is expected that the paid liaison will spend from 5 to 20 hours on the project.

It is expected that each teacher will spend about 10 minutes per student. Each school will be asked to provide information for about 50 to 60 students. $55 \text{ students} \times 10 \text{ minutes per student} = 9.16 \text{ hours}$

D. BENEFITS AND RISKS

14. Benefits: Since early profound deafness has been found to have a negative influence on reading comprehension, and since reading has been purported to be a necessary skill for both educational and occupational functioning, it will be important for hearing parents to know whether the method of communication they use will have a positive or negative impact on their deaf children's reading abilities.

This research will add to the small body of existing literature regarding the relationship between hearing parents' method of communication and their children's reading comprehension skills. It will aid hearing parents in making informed decisions about the method of communication they choose to use with their deaf children.

15. Risks: Since the students will not be contacted directly and since no treatment is involved, it is expected that there will be no risk to the subjects.
16. Human Subjects: The University of Arizona requires that all research be reviewed for protection of human subjects. This review involves an initial departmental review. The Departmental Committee determines whether the study will need to be reviewed by other Human Subjects Committees of the University.

This project has been submitted to the Departmental Review Committee. Each school will be furnished with the results of this review before the research is initiated.

E. AGREEMENT

In the event the project is approved for conduct in the school, the investigator agrees to the following conditions:

1. To adhere to the purpose and procedures of the project as approved by the school and to restrict the use of data gathered in cooperation with the school to this project.
2. To furnish the school with progress reports on request.
3. To provide the school with one copy of all publications, including dissertations, reports, articles, and papers, describing the completed project upon request.
4. To acknowledge the cooperation of the school in any published report of the project.
5. To give permission for the school to cite the ongoing or completed project in its own publications, with credit to the investigator.
6. To pay the liaison on an hourly basis for the work as coordinator.

Further, the investigator agrees to the following:

1. To comply with the Family Educational Rights and Privacy Act and amendments thereto.
2. To comply with federal regulations for the protection of human subjects.
3. To report only group data, and no information which can be traced directly or by inference to a specific student, family members of the student, or former school attended.
4. If student identification by name, social security number, or other means is necessary for bringing data together on a specific student, to remove this identification as soon as the data have been assembled, and under no condition permit this identification to be shared with other parties.
5. To destroy all materials gathered which contain personally identifiable information after the purposes for which the material was gathered have been completed.

Copies of the following are attached:

1. A more detailed description of the procedure
2. Copy of the Questionnaires
3. Vita of principal investigator

Charlene M. Chipps Kampfe
Charlene M. Chipps Kampfe, Investigator

Armin G. Turechek 3/4/83
Armin G. Turechek, Ed.D. Date
Major Research Advisor

Ralph L. Hoag 3/4/83
Ralph L. Hoag, Ed.D. Date
Research Advisor

APPENDIX B

LOCAL SCHOOL COORDINATOR/LIAISON FUNCTION

- A. Serve as the liaison between the school and the researcher.
- B. Sign the Oath of Confidentiality (attached) and returned it to the researcher.
- C. Receive the ODS list of student names provided by the researcher. Ask teachers or supervisors to indicate which children are thought to have mothers who use manual communication with them. This can be at any skill level from very poor to very good. Return the list to the researcher.
- D. Receive list of names and questionnaires for each student on this list.
- E. Send Mother's Questionnaire, letter of introduction and postpaid envelope to the mothers of students whose names appear at the top of the Mother's Questionnaire. Ask that the mothers complete the questionnaires and return them directly to the researcher, Department of Rehabilitation, University of Arizona by means of a self-addressed, postpaid envelope.
- F. Search through school records to complete Section II of the School Questionnaire.
- G. Ask the teacher who is primarily responsible for the student to complete Section III of the School Questionnaire.
- H. Collect School Questionnaires from teachers and return them to researcher at the Department of Rehabilitation, University of Arizona, Tucson.
- I. Receive, from researcher, a list of mothers who had not yet responded to Mother's Questionnaire. Sent a second questionnaire with a letter or telephone follow-up.
- J. Send the short forms of the Mother's Questionnaire to approximately 40 percent of the mothers who had indicated they used some type of manual communication with their children. Ask that the mothers complete the questionnaires and return them directly to the researcher, Department of Rehabilitation, University of Arizona by means of a self-addressed, postpaid envelope.

OATH OF CONFIDENTIALITY

Reading Comprehension of Prelingually Deaf Adolescents and
Its Relationship to Maternal Use of Manual Communication

School Liaison

I do solemnly swear that I will not reveal or discuss with anyone outside of this study any details of any individual's responses to questionnaires or any details of the data found in school records for the purposes of this study. All information regarding any individual will be held strictly confidential. I understand that it is unlawful to disclose any information for purposes other than this study.

Signed: _____

Date: _____

Witnessed by: _____

APPENDIX C

LETTER REQUESTING MATERNAL INVOLVEMENT IN STUDY

THE UNIVERSITY OF ARIZONA
Tucson, Arizona 85721
College of Education
Department of Rehabilitation

The University of Arizona is studying the types of communication mothers use with their deaf children. This research will be important to future parents and teachers when deciding which method of communication to use with children who are deaf.

You are one of about 400 mothers in the United States who have been chosen to participate in this important study. We would greatly appreciate it if you would fill out the enclosed questionnaire and send it to the Department of Rehabilitation, University of Arizona, Tucson, Arizona in the enclosed self-addressed, stamped envelope.

Any information you give will be held strictly confidential, and will be used only in summaries. Your name or your child's name will never be used in any reports or shared with anyone.

Your help is vital to this study and will be greatly appreciated. Please respond as soon as possible.

Sincerely,

Charlene M. Kampfe
Researcher, University of Arizona

APPENDIX D

SCHOOL QUESTIONNAIRE, MOTHER'S QUESTIONNAIRE
AND MOTHER'S QUESTIONNAIRE (SHORT FORM)

SCHOOL QUESTIONNAIRE

CONFIDENTIAL: All information which would permit identification of any individual or institution will be held strictly confidential and will be used only to prepare statistical summaries. The data will not be disclosed to others for any other purpose.

I. STUDENT'S NAME

II. SCHOOL COORDINATOR SECTION: This section of the questionnaire is intended to be completed by the local school coordinator for this survey.

The information to be obtained in this section is vital to the study. It will therefore be extremely important that the data are reported accurately and completely. Using school records, please complete each relevant item of each question.

If the information is not in the school records, please ask others who might be able to supply you with another resource for the information.

1. How long has the student identified above been enrolled in this school or another school of this type (ie. Residential school)?

Less than
3 years

3 years
or more

Do not
know

Other: Please
Explain

2. Please give the results of the student's most recent intelligence test.

A. Name of Test: _____

B. Date IQ test was administered: _____
Month Day Year

C. IQ Scores

Verbal (if applicable)

Non-verbal (THIS SCORE IS THE MOST IMPORTANT)

Total (if applicable)

(SQ2)

3. The information obtained from this page is the MOST IMPORTANT of the entire questionnaire. Please give the results of the student's most recent Reading Subtest score of the Stanford Achievement Test, Special Edition for Hearing Impaired Student (SAT-HI):

A. Date SAT-HI was administered: _____ (Do not give the results of the 1983 SAT-HI testing)
 (Month) (Day) (Year)

B. Age of student when the SAT-HI was administered: _____ Years _____ Months

C. SAT-HI READING COMPREHENSION SCORES:

Please check the appropriate box for the level of Reading Comprehension Subtest or the Reading Part B Subtest of the SAT-HI, and give the raw score and the scaled score for that specific test.

Only one box per column should be checked or filled in. All other boxes will remain empty.

LEVEL OF TEST (check on box)	RAW SCORE (fill in one box)	READING SCALED SCORE (fill in one box)
This is the level of the reading test taken	Raw scores are the # of correct scores (ie. 1 - 79)	If this score is not available, please put an "X" in the box. Do <u>not</u> compute it yourself. (ie. 63 - 221)
	Reading Part B	Reading Comprehension
<input type="checkbox"/> Primary (P-1)	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Level 2	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Level 3	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Level 4	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Level 5	<input type="text"/>	<input type="text"/>
<input type="checkbox"/> Level 6 (Advanced)	<input type="text"/>	<input type="text"/>

Thank you

(SQ3)

III. TEACHER SECTION: This section of the questionnaire is intended to be completed by the teacher who is primarily responsible for the student identified above. Please check the most appropriate box for each question. If the information is unavailable, please check the box "Do not know".

1. In your opinion, which method of communication does the student identified above use most often both in the classroom and out of the classroom?
- Speech and speechreading only
- Sign language only (can include fingerspelling, but little or no speech)
- Sign language with speech using English word order (can include fingerspelling)
- Fingerspelling and speech (with no signs)
- Other (Please specify) _____
- Do not know
2. In your opinion, does the mother of the student identified above use some form of manual communication with her child?
- Yes No Do not know
3. If the mother uses sign language or fingerspelling, how would you rate her skill level at this time?
- | <u>SPEED</u>
(check one box) | <u>MISTAKES</u>
(check one box) | <u>AMOUNT OF SIGNING WHEN</u>
<u>SHE IS WITH HER CHILD</u>
(check one box) |
|--|--------------------------------------|--|
| <input type="checkbox"/> Very slow | <input type="checkbox"/> Many | <input type="checkbox"/> Never signs with child |
| <input type="checkbox"/> Slow | <input type="checkbox"/> Some | <input type="checkbox"/> Sometimes signs with child |
| <input type="checkbox"/> Average Speed | <input type="checkbox"/> Few | <input type="checkbox"/> Signs much of the time with child |
| <input type="checkbox"/> Fast | <input type="checkbox"/> Almost none | <input type="checkbox"/> Signs most of the time with child |
| <input type="checkbox"/> Very fast | <input type="checkbox"/> None | <input type="checkbox"/> Signs all the time with child |
-

Please return this questionnaire to the local school liaison who gave it to you.

Thank you so much for participating in this research. Your input will be extremely valuable.

MOTHER'S QUESTIONNAIRE

CONFIDENTIAL: All information which would permit identification of any individual or institution will be held strictly confidential and will be used only in preparing statistical summaries. Information will not be shared with others for any other purpose.

NAME OF CHILD

INSTRUCTIONS FOR COMPLETING THIS QUESTIONNAIRE:

1. This form is to be completed by the child's mother.
 2. Please check the appropriate box for each question.
 3. If you are not the natural mother, please check this box and return this form to the University of Arizona in the enclosed envelope.
-

1. Does the child named above have any deaf brothers or sisters?

No Yes, one Yes, two Yes, three or more
2. How old was the child when he/she began school?

Before age 5 Age 5 Age 6 Age 7 Age 8 or older
3. How do you (the mother) communicate with your child?

Speech and speechreading (lipreading) only

Sign language only (can include fingerspelling)

Sign language with speech using English word order (can include fingerspelling)

Fingerspelling and speech (with no signs)

Other (Please specify) _____
- 4-a. If you (the mother) use sign language or fingerspelling with your child, how did you learn?

I went to classes at least 2 times a week.

I went to classes at least 1 time a week.

I went to classes at least 2 times a month.

I went to classes at least 1 time a month.

I learned on my own with a book.

Other. Please describe: _____

(MQ2)

4-b. If you (the mother) use sign language or fingerspelling with your child, how old was he/she when you started?

- Younger than age 2 Age 2 Age 3 Age 4
 Age 5 Age 6 Age 7 Age 8 or older

4-c. If you (the mother) used sign language or fingerspelling with your child before he/she was age 5, which of the following did you use at that time?

- American Sign Language, ASL, Ameslan
 I did not speak while signing
 I did not use English word order
 I used signs and fingerspelling
 Signed English, Siglish, Pidgin Signed English, SEE I, SEE II
 I used English word order
 I used signs and fingerspelling
 Fingerspelling
 I used English word order
 I did not use signs
 Other. Please describe: _____

4-d. If you (the mother) use sign language or fingerspelling with your child, how would you rate your skill level at this time?

- | SPEED
(check one box) | MISTAKES
(check one box) | AMOUNT OF SIGNING WHEN
YOU ARE WITH YOUR CHILD
(check one box) |
|--|--------------------------------------|--|
| <input type="checkbox"/> Very slow | <input type="checkbox"/> Many | <input type="checkbox"/> Never sign with my child |
| <input type="checkbox"/> Slow | <input type="checkbox"/> Some | <input type="checkbox"/> Sometimes sign with my child |
| <input type="checkbox"/> Average speed | <input type="checkbox"/> Few | <input type="checkbox"/> Sign much of the time with my child |
| <input type="checkbox"/> Fast | <input type="checkbox"/> Almost none | <input type="checkbox"/> Sign most of the time with my child |
| <input type="checkbox"/> Very Fast | <input type="checkbox"/> None | <input type="checkbox"/> Sign all the time with my child |

5. What language do you speak most in your home?

- English Spanish Other. Please describe: _____

6. Do you (the mother) have normal hearing? Yes No

7. Does the child's father have normal hearing? Yes No

(MQ3)

8-a. Did your child go to a special preschool for hearing impaired children?

Yes

No

8-b. If yes, for how many years did he/she go to a preschool? _____ Years

8-c. If your child went to a special preschool for hearing impaired children, what type of communication method did that school use?

Speech and speechreading (lipreading) only

Sign language only (can include fingerspelling)

Sign language with speech using English word order (can include fingerspelling)

Fingerspelling and speech (with no signs)

Other. Please describe: _____

8-d. If your child went to a special preschool for hearing impaired children, how often did you meet with teachers or other staff?

At least 1 time every week

At least 2 times every month

At least 1 time every month

Less than 1 time every month

I did not meet with teachers or other staff

9. What level of school did you and the child's father complete?

MOTHER

FATHER

None

None

Elementary

Elementary

Junior High Graduation

Junior High Graduation

High School Graduation

High School Graduation

Some College or Technical School

Some College or Technical School

College Degree

College Degree

Graduate Work

Graduate Work

Please return this questionnaire to the Department of Rehabilitation, University of Arizona, Tucson, Arizona, 85721 in the envelope which has been provided.

Thank you for your help in this research.

MOTHER'S QUESTIONNAIRE
Short Form

CONFIDENTIAL: All information which would permit identification of any individual or institution will be held strictly confidential and will be used only in preparing statistical summaries. Information will not be shared with others for any other purpose.

NAME OF CHILD

INSTRUCTIONS FOR COMPLETING THE SHORT FORM: This form is intended to be completed by the person who completed the longer Mother's Questionnaire approximately one month ago. This form is much shorter and will require much less time to complete.

The questions on this form are about the child identified above. Please check the appropriate box for each question.

1. If you (the mother) use sign language or fingerspelling with your child, how old was he/she when you started?

<input type="checkbox"/> Younger than age 2	<input type="checkbox"/> Age 2	<input type="checkbox"/> Age 3	<input type="checkbox"/> Age 4
<input type="checkbox"/> Age 5	<input type="checkbox"/> Age 6	<input type="checkbox"/> Age 7	<input type="checkbox"/> Age 8 or Older

2. If you (the mother) use sign language or fingerspelling with your child, how would you rate your skill level at this time?

SPEED (check one box)	MISTAKES (check one box)	AMOUNT OF SIGNING WHEN YOU ARE WITH YOUR CHILD (check one box)
<input type="checkbox"/> Very slow	<input type="checkbox"/> Many	<input type="checkbox"/> Never sign with my child
<input type="checkbox"/> Slow	<input type="checkbox"/> Some	<input type="checkbox"/> Sometimes sign with my child
<input type="checkbox"/> Average speed	<input type="checkbox"/> Few	<input type="checkbox"/> Sign much of the time with my child
<input type="checkbox"/> Fast	<input type="checkbox"/> Almost none	<input type="checkbox"/> Sign most of the time with my child
<input type="checkbox"/> Very fast	<input type="checkbox"/> None	<input type="checkbox"/> Sign all the time with my child

Please return this questionnaire to the Department of Rehabilitation, University of Arizona, Tucson, Arizona, 85721 in the envelope which has been provided.

Thank you so much for participating in this research. Your input will be extremely valuable.

APPENDIX E

MATERNAL TRAINING/EXPERIENCE IN
MANUAL COMMUNICATION

Mother's Questionnaire: Item 4a

Rating	Responses
0	Missing
1	From her child; on her own with a book; on her own with a book and from her child.
2	Classes at least one time a month; classes (but not finished) and from her child; classes (unspecified amount of time) and from her child; classes (unspecified amount of time); some classes (not much) and on her own with a book; on her own with a book, from her child, and from a study group.
3	Classes at least two times a month; classes at least one time a month and from her child; classes at least one time a month, on her own with a book, and from her child; classes (less than one year); on her own with a book, from her child, and from the deaf community.
4	Classes at least one time a week; classes at least one time a week and on her own with a book; classes at least one time a week, on her own with a book, and from her child; classes at least two times a month, on her own with a book, from her child, and from the deaf community; on her own with a book and from the deaf community; classes (at least one year).
5	Classes at least two times a week; classes at least two times a week and on her own with a book; classes at least two times a week and from her child; classes at least two times a week, on her own with a book, and from her child; classes at least one time a week and from her child; classes (at least two years); works with the deaf; works with deaf plus other experiences.

Rating

Responses

- 6 Classes at least two times a week, on her own with a book and from the deaf community; classes at least one time a week and from the deaf community; classes at least one time a week, on her own with a book, and from the deaf community; classes at least one time a week, on her own with a book, from her child, and from the deaf community; classes at least one time a week, on her own with a book, and works with the deaf community; classes (at least three years).
- 7 Classes at least two times a week and works with deaf people; classes (at least four years); classes (at least five years).

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