Hearing-impaired speakers' sensitivity to listeners' communicative abilities

Jan E. Bryggman

The University of Montana

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HEARING-IMPAIRED SPEAKERS' SENSITIVITY
TO LISTENERS' COMMUNICATIVE ABILITIES

By

Jan E. Bryggman
B.A., University of California, 1979
Presented in partial fulfillment of the
requirements for the degree of
Master of Arts
UNIVERSITY OF MONTANA
1981

Approved By:

Barbara A. Bain
Chairman, Board of Examiners

Dean, Graduate School

12-11-81
Date
Pragmatics concerns how language is used within a social context. Context affects the type of communicative interchange and involves factors such as listener situations. Depending on the sensitivity of speakers to the communicative abilities of their listeners, the nature of the conversation might be affected. Speaker sensitivity within the hearing-impaired population is the focus of this study.

Eighteen hearing-impaired subjects participated in this study. Each subject interacted with three listeners of varying communicative abilities. This study analyzed the subjects' communication according to four specific measurements regarding oral word intelligibility and the amount of speech in relation to sign.

The results indicated that although the subjects' oral word intelligibility did not vary significantly across listener conditions, the other communicative measures did vary significantly demonstrating that the subjects altered their communication according to listener abilities. The results of this study emphasize the need for the hearing-impaired population to be exposed to listeners of varying communicative abilities.
ACKNOWLEDGMENTS

The writer expresses her thanks to her thesis committee Barbara Bain, Barbara Blomgren, Nancy Connell, Charles Parker, and Wesley Shellen for sharing their insight and enthusiasm. The time and efforts of Bill Davis, Robert Demming, Lucille Krajacich, and the staff and students at the Montana State School for the Deaf and Blind are also greatly appreciated. Lastly, the writer thanks Lynn Harris for cheerfully accepting the task of being a fellow observer.
"Do not pray for easy lives; pray to be stronger men.

Do not pray for tasks equal to your powers;

pray for powers equal to your tasks.

Then the doing of your work shall be no miracle,

but you shall be a miracle.

Every day you shall wonder at yourself,

at the richness of life which has come

by the grace of God."

Phillip Brooks
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CHAPTER I

INTRODUCTION

A century old debate between manualists and oralists has evolved into an oral-only and oral-plus (oral plus fingerspelling and/or sign, etc.) issue as pure manualists are no longer prevalent (Moores, 1978). A trend towards teaching total communication (Total) to the hearing impaired [1] population has resulted from this methodological controversy (Lloyd, 1973). With the increasing popularity of Total, a need to alter the communicative focus in hearing impaired populations has become apparent (Bowe, 1973). Rather than advocating a single method, the philosophy of total communication stresses the speaker's selection of a preferred method dictated by individual differences and individual needs (Lloyd, 1973). Selection of the optimal means of communication, allows flexibility within communicative interactions and sensitivity to both the speaker's and the listener's abilities. The general purpose of this study was to investigate the sensitivity of the hearing impaired population to their listeners' communication abilities.

1. Wilbur in addition to other authors cited have used the term "deaf" synonymously with the term hearing impaired. For the purposes of consistency and clarity the term hearing impaired will be used throughout this paper.
Review of the Literature

Total Communication

Total communication, first introduced in 1964 (Lieth, 1978), is defined as:

...the right of a deaf child to learn to use all forms of communication available to develop language competence at the earliest possible age... Total Communication includes the full spectrum of language modes: child devised gestures, formal sign language, speech, speech-reading, fingerspelling, reading, and writing. (Denton, 1972, p.53)

Maximum use of residual hearing through the use of amplification devices is also incorporated in Total to strengthen speech and speechreading skills (Kent, 1973); however, amplification alone does not appear to suffice for speech improvement. Wilbur (1979) stresses that intensive speech training has no substitute for teaching speech skills within total communication. He explains that the hearing impaired individual does not receive adequate speech input through simultaneous signing and speaking, and that the division of attention between manual reading and speech reading is less effective than intensive speech training in facilitating speech skills. A renewed commitment towards helping hearing impaired children develop speech skills to their full communicative potential is necessary (Moores, 1978). Educational programs advocating Total should provide modality
specific instruction (i.e. intensive speech training) rather than treating all the modes as a whole (i.e. sign, speech, reading, and writing concurrently) and expecting optimum improvement within each mode. Moores (1978) discusses the lack of educational programs which adequately meet the needs of speech instruction within the realm of total communication. Philosophies and/or techniques of teaching speech to the hearing impaired have varied not only between educational programs but within individual educational programs (Vorce, 1971). Although various educational approaches advocate the efficacy of different instructional approaches for speech, no studies have compared the effectiveness of different techniques or methods of teaching speech to the hearing impaired and therefore, a need for research is suggested (Moores, 1978). Research on the qualitative and quantitative aspects of the speech of hearing impaired children or the specific characteristics of the use of speech by hearing impaired children is equally scarce.

Use of Speech by Hearing Impaired

As Vorce (1971) indicated, between the time of the Hudgins and Numbers study in 1942 to the publication of her overview in 1971 no well-controlled studies of hearing impaired speech were conducted over large populations (Moores, 1978). The Hudgins and
Numbers study characterized hearing impaired speech as generally arhythmic, poorly phrased, monotonic, and lacking pitch; the Vorce (1971) overview, addressed the issue of speech curricula. Nickerson (1975) summarized the status of literature in regards to hearing impaired speech:

It is well known that the speech of the deaf tends not to be very intelligible, and it is possible to list a variety of things that are wrong with it, ... but nobody can yet say very precisely how much each of these deficiencies contributes to its overall lack of intelligibility or its generally poor quality.

As is apparent from the above discussion, little is known or understood about the speech of the hearing impaired. To stress a need for further research in the area of speech of the hearing impaired is not to advocate the use of speech to the exclusion of other means of communication but rather to specify one area reflective of the overall need for research within total communication (Lloyd, 1973). A need also exists for research in the area of pragmatics or how the hearing impaired use language within a social context. Context affects the type of communicative interchange and involves factors such as physical environments, conversational goals, and listener situations. For example, the communicative abilities of a listener might affect the nature of a conversation depending on the speaker's
sensitivity to the listener's needs.

**Speaker Sensitivity**

*Normal-hearing Speakers.* A speaker's sensitivity to his listener's needs may be reflected in various areas of his communication. Specifically, speech modifications have been shown to reflect speaker sensitivity. Research on normal-hearing individuals suggests that "speech modifications are based on more than syntactic rules for grammatical modification; they are based on the speaker's perceptions of what is appropriate to the listener's inclination to listen and ability to comprehend." (Rees, 1976). Rees points out that this sensitivity to listener needs is demonstrated by children and adults. Gleason (1973) found that children make stylistic adaptations according to the age and familiarity of the listener. Gleason attributes these adaptations to the adults' models of varying speech patterns with different listeners. Shatz and Gelman (1973) also found that modifications of speech occur as a function of the listener's age. Specifically, they noted that variations included different utterance lengths and types of constructions. Sachs and Devin (1973) had similar findings and concluded that:

...modifications of speech style to a younger listener are not dependent on cues in the immediate situation, but represent some
abstract knowledge of appropriateness of speech to listener.

In addition, Bloom and Lahey (1978) discussed Schiff's research (1976) concerning the sensitivity of two-year-olds to their listeners' needs. Schiff found that normal hearing children who were born to deaf parents used more oral language and longer utterances with the hearing adult than with their deaf mothers and used more manual signing and deaf-like distortions in their speech to their deaf mothers than to the hearing adults.

Schiff's research demonstrates that two-year-olds have the ability to alter their communicative patterns depending on the hearing status of the listener. The four studies agree that children develop sensitivity to listener needs; however, Sachs and Devin as well as Shatz and Gelman disagree with Gleason's conclusion that children's exposures to the adults' models are responsible for the development.

**Hearing Impaired Speakers.** In accord with the philosophy of total communication the hearing impaired will select their own preferred means of communication. As Lloyd (1973) points out, an individual may learn a particular form of communication (i.e. speech) and rely on it occasionally or he may rely on it in every situation. Specifically, how the speech of the hearing
impaired may vary in different situations is not known since "information on the use of speech by deaf individuals in natural situations is almost completely anecdotal" (Moores, 1978). However, one study examined the relation of speech to other modes of communication within varying contexts. The study, by Libbey and Pronovost (1980), investigated the adaptation of communication modes and styles according to varying situations and listeners. Modes and styles included sign, fingerspelling, writing, interpreter, and speech. Data was based on self-reports of hearing impaired adolescents and indicated that speech was the predominant expressive mode although somewhat decreased with hearing impaired friends. This research supports the theory of speaker sensitivity to listener abilities. Arnold and Tremblay (1979) studied interactions between hearing impaired pre-schoolers and their normal-hearing peers. Hearing impaired children showed no preference between normal and hearing impaired peers but were least preferred by the normal-hearing children. The authors suggest that normal-hearing children may have chosen interactions which were socially reinforcing (ability to understand and be understood); however, the hearing impaired children may lack experience and consequently not understand the difference between communicative partners (i.e. did not understand that other children could not hear). The Arnold and
Tremblay (1979) study raises the question of whether these hearing impaired pre-schoolers would eventually develop the same sensitivity to listener needs as the hearing impaired adolescents of the Libbey and Pronovost (1980) study appeared to have developed. More specifically, the possible reflection of this sensitivity in the speaker's speech would be of interest because the speaker's reaction to a communication mode gives a listener cues for an interaction (Lloyd, 1973).

**Summary and Research Questions**

In summary, hearing impaired individuals trained strictly in sign language do not possess the same opportunities to use speech as individuals trained in total communication. Total communication purports to allow the development of a full range of communicative skills. Generally, this study attempted to determine whether the use of speech by hearing impaired children trained in total communication varies according to the listener's communicative abilities. The specific research questions were as follows:

1. Do the speakers' percentages of intelligible oral words vary significantly with different communicative abilities of listeners?
2. Do the speakers' percentages of oral words without signs vary significantly with different communicative abilities of listeners?

3. Do the speakers' percentages of signs without oral words vary significantly with different communicative abilities of listeners?

4. Do the speakers' percentages of simultaneous communicative units (oral words and sign) vary significantly with different communicative abilities of listeners?
CHAPTER II

METHOD

The study was conducted at the Montana State School for the Deaf and Blind and involved an interactive task. Each subject interacted with three listeners who each had different communicative abilities in regards to sign and speech.

Subject Criteria

The subjects were eighteen hearing impaired individuals selected from the students enrolled at the Montana State School for the Deaf and Blind. For inclusion in the study, the subjects met the following criteria:

1. Hearing acuity between 55 dB to 95 dB hearing level (re. ANSI 1969 standards) in the better ear as determined by averaging air conducted pure tone thresholds over the speech frequencies.

2. Educational exposure to total communication at least two years at Montana State School for the Deaf and Blind.
3. Non-verbal intelligence within normal limits as determined by school record reports.

4. No known neurological involvement or handicaps other than hearing that were present would affect the subjects ability to perform the experimental task.

Additional information regarding parents' hearing status, nature of subjects' hearing losses, subjects' use of amplification, subjects' ages and sex were obtained to describe the subjects in more detail (this description is located in Appendix A).

Procedure

All subjects were instructed as to the nature of their task by the same normal-hearing adult trained in total communication. The instructions (Appendix B contains the instructions) were selected in consultation with a woman fluent in American Sign Language (ASL) in order to avoid potential biasing effects (i.e. affect the amount of speech and/or sign within the conversation) and remained constant across subjects. Initially, the subject familiarized himself/herself with four sets of pictures. Following this, the subjects were instructed to tell the listener about the pictures or to tell a story about the pictures (order of presentation of all pictures remained constant for all
subjects). The stimuli were 1" by 9" laminated pictures from National Geographic. Each subject was informed that s/he had ten minutes for the task. A timing device indicated the passage of time and was in view for each subject. Each subject repeated the task on three consecutive days, each time with a different listener.

Listeners were comprised of one hearing-impaired adult trained in Total (HIT) using sign and speech, one normal-hearing adult trained in Total (NHT) using sign and speech, and one normal-hearing adult using oral only (NHOO), all of whom were familiar to the subjects at the time of data collection. Prior to data collection, a familiarization task was employed in order to familiarize the subjects with the third listener as no subject had previously met this listener. The listeners remained constant for all subjects and were of the same sex and approximate age (Appendix C contains listener descriptions). Each listener participated in a training session (Appendix D contains composition of training session) prior to the experiment regarding his/her role in the interaction. The listeners were instructed to interject a comment or a question after every two speaker utterances (an utterance marked by a pause of three seconds or longer), alternating questions and comments. The listener avoided parallel responses in order to evoke further
explanation from the subject. Facial expressions as listener feedback and responses to subjects' questions were allowed. Thus the listeners' roles were to increase subject output and at the same time maintain a natural interaction.

**Measurement**

The interaction was recorded by both video and audio equipment. A Sony 1/2" reel to reel video recorder and microphone and Sony V-32 video tapes for helical scan recorders were utilized. The audio recorder was a Hitachi recorder (Model No. TRQ-299) with a high quality microphone (Sony F500S) and Memorex High Bias tapes. Due to difficulty aligning the audio tape output with the video output for analysis purposes, audio-video tape was the only recording source utilized during data collection.

For each subject in each of the three listener conditions, the conversational samples were analyzed according to four categories: 1. Percentage of intelligible oral words. 2. Percentage of oral words without signs present. 3. Percentage of signs without oral words present. 4. Percentage of simultaneous communicative units.

Detailed descriptions of the above categories are located in Appendix E. Only the portions of the samples between the third
and the eighth minute were categorized.

**Experimental Design**

Intragroup counterbalancing was employed in an attempt to control sequencing effects (Christensen, 1980). Six possible orders of speaker-listener interaction were possible; this order was repeated among subjects (thus # of subjects was a multiple of 6). As a result of the counterbalancing, each listener participated in one-third of the total testing each day.

The research was a 3x6 mixed design with repeated measures on the last factor. Data were analyzed by the Ullrich-Pitz Analysis of Variance (ANOVA) (Ullrich, 1981) to determine if a significant difference existed between treatment groups. As "a posterior" comparisons, Tukey Honestly Significant Difference (Tukey HSD) tests (Kirk, 1968) were employed to determine the significant listener differences for each of the three significant measurements. Additionally, Mann-Whitney U Tests (Bruning & Kintz, 1977) were performed to determine any significant differences between samples of different age groups.
CHAPTER III

RESULTS

Reliability

Intraobserver and interobserver reliability measurements were conducted after the data collection of all 18 speaker interactions was completed. The samples were randomly selected utilizing a random numbers table. Two sets of interactions (2 speakers' interactions, each with 3 listeners) were categorized by the experimenter and another individual to determine interobserver reliability. The observer was trained prior to conducting reliability measures (Appendix F contains composition of training session). Additionally, the experimenter provided intraobserver reliability by a repeated measure on one sample of data. Interobserver reliability was conducted to determine the degree to which one could generalize from the experimenter scores to another observer's scores (Wiggins, 1973). Intraobserver reliability was conducted to determine the experimenter's consistency of judgments across samples. Event recording was the method of data collection for both reliability measures, and session reliability was calculated according to percentage agreement (Hartmann, 1974). The results appear in Tables 1 and 2.
TABLE 1.
INTEROBSERVER PERCENTAGE AGREEMENT
RELIABILITY MEASURE*

<table>
<thead>
<tr>
<th>LISTENER CONDITION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAMPLE I</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LISTENER HIT a</td>
<td>100.00</td>
<td>100.00</td>
<td>99.86</td>
<td>90.48</td>
</tr>
<tr>
<td>LISTENER NHT b</td>
<td>86.52</td>
<td>77.02</td>
<td>77.71</td>
<td>94.53</td>
</tr>
<tr>
<td>LISTENER NHOO c</td>
<td>82.13</td>
<td>80.65</td>
<td>79.83</td>
<td>99.19</td>
</tr>
<tr>
<td>SAMPLE II</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LISTENER HIT</td>
<td>93.85</td>
<td>93.82</td>
<td>74.78</td>
<td>99.43</td>
</tr>
<tr>
<td>LISTENER NHT</td>
<td>81.78</td>
<td>81.43</td>
<td>86.70</td>
<td>99.95</td>
</tr>
<tr>
<td>LISTENER NHOO</td>
<td>89.47</td>
<td>100.00</td>
<td>95.56</td>
<td>99.84</td>
</tr>
</tbody>
</table>

a) HIT signifies the hearing-impaired listener utilizing Total (oral & sign)
b) NHT signifies the normal-hearing listener utilizing Total (oral & sign)
c) NHOO signifies the normal-hearing listener utilizing oral only

*: Measures are described in Appendix E.
<table>
<thead>
<tr>
<th>LISTENER CONDITION</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>LISTENER HIT</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>LISTENER NHT</td>
<td>96.71</td>
<td>86.87</td>
<td>92.75</td>
<td>99.43</td>
</tr>
<tr>
<td>LISTENER NHOO</td>
<td>99.26</td>
<td>97.26</td>
<td>87.57</td>
<td>99.90</td>
</tr>
</tbody>
</table>
As indicated by the tables, interobserver reliability ranged from 74.78 percentage agreement to 100.00 percentage agreement. Intraobserver reliability ranged from 86.87 percentage agreement to 100.00 percentage agreement.

**Experimental Results**

This study investigated four specific questions. The behaviors analyzed were oral-word intelligibility, the amount of oral words in relation to signs and the converse, and the amount of simultaneous communicative units employed by hearing impaired subjects during varying listener conditions. The research was organized on the basis of these behaviors and the computations were performed with the Ullrich-Pitz Analysis of Variance (ANOVA) (Ullrich-Pitz, 1981) with significance at the .05 level. This section will present the statistical analyses and the quantitative findings of the experiment. The raw data used to perform the various analyses is presented in Appendix G.

**Percentage of Intelligible Oral Words.** A two-way Analysis of Variance (ANOVA) for related groups was used to compare oral word intelligibility across the three listener conditions. No significant differences in the percentage of intelligible oral words were found. The results of the ANOVA are indicated in Table 3. For a graph of the means, see Appendix H.
TABLE 3.

ANALYSIS OF VARIANCE FOR INTELLIGIBLE ORAL WORDS

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>SUMS OF SQUARES</th>
<th>MEAN SQUARES</th>
<th>DF</th>
<th>F</th>
<th>P</th>
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</thead>
<tbody>
<tr>
<td>BG</td>
<td>3646.19</td>
<td>1823.09</td>
<td>2</td>
<td>2.76</td>
<td>0.08</td>
</tr>
<tr>
<td>WG(error)</td>
<td>15867.70</td>
<td>661.15</td>
<td>24</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>19513.89</td>
<td>--</td>
<td>26</td>
<td>--</td>
<td>--</td>
</tr>
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</table>
Percentage of Oral Words Without Signs. As indicated by the results in Table 4, significant differences were obtained in the percentage of oral words without signs used by the subjects across the three listener conditions. Additionally, no order-listener interaction was present. The two-way ANOVA for related groups demonstrated that subjects used more oral words without accompanying signs with listeners NHT and NHOO than with listener HIT and that listener NHOO had the highest percentage in this communicative measure (Appendix H contains a visual representation of means).
**TABLE 4**

ANALYSIS OF VARIANCE FOR ORAL WORDS WITHOUT SIGNS

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>SUMS OF SQUARES</th>
<th>MEAN SQUARES</th>
<th>DF</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>BG</td>
<td>8045.23</td>
<td>4022.61</td>
<td>2</td>
<td>9.47</td>
<td>0.001</td>
</tr>
<tr>
<td>WG(error)</td>
<td>10191.10</td>
<td>424.66</td>
<td>24</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>18236.23</td>
<td>--</td>
<td>26</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
TABLE 5
TUKEY HONESTLY SIGNIFICANT DIFFERENCE TESTS FOR
ORAL WORDS WITHOUT SIGNS
TUKEY COMPARISONS (OBTAINED Q) ARE SHOWN.

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>MEAN</th>
<th>NHOO</th>
<th>NHT</th>
<th>HIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHOO</td>
<td>36.1683</td>
<td>--</td>
<td>3.83*</td>
<td>6.09*</td>
</tr>
<tr>
<td>NHT</td>
<td>17.5828</td>
<td>--</td>
<td>--</td>
<td>2.26</td>
</tr>
<tr>
<td>HIT</td>
<td>6.5933</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

P < 0.05; Q(0.05) = 3.53
Tukey Honestly Significant Difference tests (Tukey HSD tests) (Kirk, 1968) were employed to determine significant differences among the subjects’ means or to determine in which listener conditions the subjects responded significantly different from the others. Results of the Tukey test are summarized in Table 5. The results indicate that the means of the subjects with listener HIT (hearing impaired woman utilizing total communication) and listener NHT (normal-hearing woman utilizing total communication) were not significantly different. However, the subject means with listener NHOO (normal-hearing woman utilizing oral only) differed significantly from the subject means with both listener HIT and listener NHT.

In order to determine whether different aged subjects related differently to the three listeners, the subjects were divided into two groups. The younger group of subjects was comprised of subjects 5 to 9 years of age and the older group was comprised of subjects 10 to 17 years of age. Mann Whitney U-Tests (Bruning & Kintz, 1977) were performed to determine any significant differences between the communication of the two groups. The statistics indicated that the subjects responded in the same manner to the listeners. No significant differences between age groups existed in the percentage of oral words used without signs.
Percentage of Signs Without Oral Words. A two-way ANOVA for repeated groups revealed a significant difference of the percentage of signs without oral words across the three listener conditions. No interaction was noted, only the significant main effect. The distribution of means can be viewed in Appendix H. Results of the analysis are included in Table 6.
TABLE 6

ANALYSIS OF VARIANCE FOR SIGNS WITHOUT ORAL WORDS

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>SUMS OF SQUARES</th>
<th>MEAN SQUARES</th>
<th>DF</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>BG</td>
<td>29865.00</td>
<td>14932.50</td>
<td>2</td>
<td>24.40</td>
<td>0.000</td>
</tr>
<tr>
<td>WG(error)</td>
<td>14686.20</td>
<td>611.93</td>
<td>24</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>44551.20</td>
<td>--</td>
<td>26</td>
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</tbody>
</table>
Tukey honestly significant difference tests for signs without oral words

Tukey comparisons (obtained q) are shown.

<table>
<thead>
<tr>
<th>condition</th>
<th>mean</th>
<th>nhoo</th>
<th>nht</th>
<th>hit</th>
</tr>
</thead>
<tbody>
<tr>
<td>nhoo</td>
<td>7.5489</td>
<td>--</td>
<td>0.15</td>
<td>8.63*</td>
</tr>
<tr>
<td>nht</td>
<td>8.4222</td>
<td>--</td>
<td>--</td>
<td>8.48*</td>
</tr>
<tr>
<td>hit</td>
<td>57.8672</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

\[ p < 0.05; q(0.05) = 3.53 \]
Subsequent Tukey HSD tests (Kirk, 1968) revealed that subject means with listener HIT differed significantly from the means of subjects with both listener NHT and listener NHOO, but there was not a significant difference between the subject means with listener NHT and listener NHOO. The results of the analysis are shown in Table 7.

When the data was further evaluated for age groups, the Mann Whitney U-Tests revealed no significant differences between age groups. Therefore, on the average, the subjects in the younger group altered their communicative approach in the same manner as the older subjects.

**Percentage of Simultaneous Communicative Units.** The measure of simultaneous communicative units reflected a significant difference in response to the varied listener conditions with no significant listener-order interaction. Appendix H contains a visual representation of the means. Results of the analysis by a two way ANOVA for related groups are listed in Table 8.
TABLE 8

ANALYSIS OF VARIANCE FOR
SIMULTANEOUS COMMUNICATIVE UNITS

<table>
<thead>
<tr>
<th>SOURCE</th>
<th>SUMS OF SQUARES</th>
<th>MEAN SQUARES</th>
<th>DF</th>
<th>F</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>BG</td>
<td>15211.80</td>
<td>7605.88</td>
<td>2</td>
<td>8.08</td>
<td>0.002</td>
</tr>
<tr>
<td>WG(error)</td>
<td>22581.10</td>
<td>940.88</td>
<td>24</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>TOTAL</td>
<td>37792.90</td>
<td>--</td>
<td>26</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>
The means of the subjects with listener NHT were significantly different from the means of the subjects with listener HIT. However, the means of the subjects with listener NHOO did not differ significantly from either those with listener NHT or with listener HIT. Consequently, the means indicate that the listeners hearing status seems to influence the subjects' pragmatic behaviors. The means of the subjects with listener NHT demonstrated the highest percentage of simultaneous communicative units among the three listener conditions. The results of the Tukey HSD tests (Kirk, 1968) are illustrated in Table 9.
TABLE 9
TUKEY HONESTLY SIGNIFICANT DIFFERENCE TESTS FOR SIMULTANEOUS COMMUNICATIVE UNITS

Tukey comparisons (obtained q) are shown.

<table>
<thead>
<tr>
<th>CONDITION</th>
<th>MEAN</th>
<th>NHOO</th>
<th>NHT</th>
<th>HIT</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHOO</td>
<td>66.517</td>
<td>--</td>
<td>2.64</td>
<td>3.04</td>
</tr>
<tr>
<td>NHT</td>
<td>85.608</td>
<td>--</td>
<td>--</td>
<td>5.68*</td>
</tr>
<tr>
<td>HIT</td>
<td>44.530</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
</tbody>
</table>

p < 0.05; q(0.05) = 3.53
As evidenced by the Mann Whitney U-Tests, no significant differences existed between age groups for the percentage of simultaneous communicative units. Thus, there appears to be no correlation between age group and the percentage of simultaneous communicative units used.

**Summary.** The measure of subjects’ intelligible oral words did not vary significantly across listener conditions. The other communicative measures did vary significantly demonstrating that the subjects altered their communication according to listeners’ communicative abilities.
CHAPTER IV

. DISCUSSION

General Conclusions

This study has demonstrated that hearing impaired speakers alter their communicative patterns according to the listener situation. Three of four communicative measures supported that hearing impaired speakers are sensitive to their listeners' communicative abilities.

One measure of the subjects' sensitivity consisted of higher percentages of oral words without accompanying signs when they spoke with the two normal-hearing women (listeners NHT and NHOO) than when they spoke with the hearing impaired woman (listener HIT). Although one of the normal-hearing women (listener NHT) signed concurrently while speaking, the subjects communicative behaviors indicated that they assumed speech was more important for listener NHT and NHOO than for listener HIT. These results were further supported by the fact that subjects used more signs without accompanying oral words when conversing with listener HIT than when conversing with listeners NHT and NHOO. Thus, it is inferred that the subjects considered listener HIT's preferred mode of communication to be sign. Lastly, the subjects engaged in significantly more simultaneous communication during their
interactions with listener NHT than with listener HIT. The
difference between the amount of simultaneous communication used
with listener NHT and the amount used with listener NHOO was not
significant, but possibly with a larger number of subjects would
have achieved significance. These results suggest that the
subjects acknowledged listener NHT's competence in both sign and
speech; consequently, they altered their communicative patterns
accordingly.

The speakers' communication reflected their knowledge of the
listeners' communicative abilities based not only on the nature
of the experimental interactions, but on previous encounters with
listeners NHT and HIT. The type and degree of previous exposure
to listeners could have affected the results. As an initial
investigation into the area of speaker sensitivity among the
hearing impaired population, this study did not attempt to
control for previous listener exposure or for several other
factors. These variables and their implications for future
research need to be considered.

Possible Factors Affecting Results

Listener Familiarity. Although the subjects were familiar
with all the listeners prior to the experimental task, the type
and degree of familiarity varied (Appendix F contains listener
According to Gleason (1973), normal-hearing children make stylistic adaptations according to the familiarity of the listener. Additionally, Rees (1976) concluded that normal-hearing individuals modify their speech according to their perceptions of the listener's tendency to listen and ability to understand. Therefore, the subjects' varying types and degrees of familiarity with the listeners may have influenced them to alter their communicative patterns accordingly and consequently affected the results of this study. For example, if the subjects had been better acquainted with listener NHOO, possibly they would not have attempted to sign at all and the results would have been much more explicit. Concerning the type of familiarity, listeners HIT and NHT were staff members of the school and may have had some stimulus value for subjects' communicative patterns (i.e. increased intelligibility). Future research might attempt to include a more homogeneous group of listeners approximating the same degree of familiarity with the subjects.

**Listener Bias.** Listener HIT did not use her voice while conversing with three of the subjects. Although the conditions of those interactions were different from other subject interactions, the results did not appear to reflect a significant difference (Raw Data are located in Appendix G). Another
instance of listener bias occurred when a subject asked listener NHT whether she should use her voice. The listener responded that probably since there was a microphone in the experimental setting, the subject should use her voice. Although a bias was introduced, the results of the interaction did not appear to differ significantly from other results (Appendix G contains the raw data). However, the situation made evident the potential biasing effects of the microphone and the need for further consideration of the experimental setting.

Experimental Setting. The placement of the microphone in the immediate vicinity of the speaker and listener could have served as a prompt or cue for the subjects to use their voices and thus influenced the results of this study. Future studies should attempt to control for this variable possibly by utilizing a room with a built-in microphone although this might sacrifice the quality of the audio signal.

The experiment was conducted in the school setting which itself could have served as an additional stimulus for the use of speech in addition to sign. The experimenter noticed that when the subjects were in the dormitory, they rarely used their voices with hearing impaired friends; whereas, during the experiment, many of the same subjects used their voices to varying degrees while interacting with the hearing impaired listener. It is
hypothesized that research conducted in a more natural setting would only amplify the results obtained in this study.

**Speech Intelligibility.** The speakers' percentages of intelligible oral words did not differ significantly across the three listener conditions. One factor that might account for these results was that the subjects all had varying degrees of intelligibility. Some subjects had extremely poor intelligibility while others had good intelligibility. Therefore, some subjects' intelligibility did not vary significantly because initially their intelligibility was severely limited allowing little room for variability. Efforts to more accurately determine the variance of intelligible words would require additional subject controls. According to Hudgins and Numbers (1942), several factors affect the degree of intelligibility in the hearing impaired population. Although they stated that age is not necessarily a predictor, the amount of previous speech therapy, the amount of residual hearing and its use, the level of intelligence, and the degree of cultivation of the speech mode all affect intelligibility. As can be noted from the subject criteria and descriptions (Appendix A), this study's control for such variables was limited.

**Subject Variables.** As mentioned above, stringent subject controls were not utilized in this study. Ages ranged from 5
years of age to 17 years of age and although there were no significant differences between age groups, age differences may have occurred if the younger group had been larger and thus more representative. Alvy (1973), in his study of listener-adapted communications of normal-hearing children found that the type or quality of Listener Adapted communications differed according to age and social class. He also concluded that age, social class and sex were reflected in the frequency of use of Listener Adapted communications. Therefore, sex and social economic status are factors which deserved consideration in addition to age. Hearing losses ranged from 58 db HL to 93 db HL with varying levels of speech discrimination, and only 50 of the subjects were enrolled in speech therapy at the time of the experiment. Individual school records were insufficient to reveal information across subjects about previous speech therapy, intelligence levels, and degrees of social exposure. All of the variables mentioned may have affected the results of this study. However, although such variables somewhat limit the implications of this study, they also provide avenues for future research in this area of communication.

Implications

The results of this study concur with literature on both hearing impaired and normal-hearing populations. Libbey and
Pronovost (1980) reported similar results finding that when speech was the predominant mode of the hearing impaired speaker, it was somewhat decreased with hearing impaired listeners. Thus, their study also lends support to the presence of speaker sensitivity among the hearing impaired population. Such findings are in accord with the literature on normal-hearing speakers' sensitivity to their listeners' needs. Rees (1976) discusses the sensitivity of children and adults to listener needs, and three additional studies confirm the ability of children to develop sensitivity to listener needs (Gleason, 1973; Sachs and Devin, 1973; Shatz and Gelman, 1973). In addition, Schiff (1976) reported the sensitivity of children to the communicative needs of adult listeners depending on whether the adult was normal hearing or hearing impaired. However, within the hearing impaired population a need exists for exposure to the various communicative modes and cultivation of those modes if children are to develop this sensitivity. The importance of such exposure is demonstrated by Arnold and Tremblay's study (1979) on the communicative interactions of hearing impaired pre-schoolers and their normal-hearing peers. The study indicated that young hearing impaired children might not understand that other children can hear and thus may not be sensitive to their listeners' needs. Such was not the case in the present
investigation. Two pragmatic aspects investigated were speaker's sensitivity to listener's hearing status and mode of communication. Hearing-impaired speakers appear to be more influenced by their listener's hearing ability than by their listener's mode of communication. Implications for future research would include exploring the possibilities of early intervention and the integration of hearing impaired children and normal-hearing children. Additionally, the age at which hearing impaired children develop sensitivity to their listeners would be of interest.

Conclusions

This study demonstrated that the use of speech by hearing impaired subjects did vary according to their listeners' communicative abilities. Subjects varied their speech output in relation to the use of sign according to their perceptions of listeners' abilities to use signs and/or speech.

The results of this study emphasize the need for the hearing impaired population to be exposed to listeners of varying communicative abilities. Their sensitivity to listeners' needs can be fostered by the commitment of parents and professionals. Brainerd (1976) suggests that within the realm of total communication, professionals must be responsible for helping hearing impaired children develop maximum communicative skills.
Without the commitment of parents and professionals, hearing impaired children may suffer communicative isolation unnecessarily.
APPENDIX A. Descriptive Information on Subjects

<table>
<thead>
<tr>
<th>SUBJECT#</th>
<th>AGE</th>
<th>SEX</th>
<th>ACUITY (dB HL)</th>
<th>LOSS</th>
<th>HEARING ONSET OF PARENTAL EXPOSURE</th>
<th>AMP. SPEECH</th>
<th>TOTAL USE</th>
<th>THERAPY</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>F</td>
<td>M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>12</td>
<td>F</td>
<td>90</td>
<td>10 mo.</td>
<td>H</td>
<td>H</td>
<td>10 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>7</td>
<td>M</td>
<td>58</td>
<td>9 mo.</td>
<td>H</td>
<td>H</td>
<td>4 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>15</td>
<td>F</td>
<td>80</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>12 yrs.</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>M</td>
<td>90</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>2 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>11</td>
<td>F</td>
<td>63</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>2 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>6</td>
<td>5</td>
<td>F</td>
<td>93</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>4 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>11</td>
<td>M</td>
<td>72</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>2 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>14</td>
<td>M</td>
<td>93</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>12 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>9</td>
<td>9</td>
<td>M</td>
<td>85</td>
<td>birth</td>
<td>D</td>
<td>D</td>
<td>6 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>13</td>
<td>M</td>
<td>72</td>
<td>birth</td>
<td>D</td>
<td>D</td>
<td>10 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>11</td>
<td>17</td>
<td>F</td>
<td>65</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>4 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>12</td>
<td>16</td>
<td>M</td>
<td>88</td>
<td>birth</td>
<td>H</td>
<td>H</td>
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<td>+</td>
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<td>13</td>
<td>7</td>
<td>M</td>
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<td>birth</td>
<td>H</td>
<td>H</td>
<td>4 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>14</td>
<td>17</td>
<td>M</td>
<td>82</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>6 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>15</td>
<td>7</td>
<td>M</td>
<td>77</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>4 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>16</td>
<td>15</td>
<td>M</td>
<td>92</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>5 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>17</td>
<td>15</td>
<td>M</td>
<td>85</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>5 yrs.</td>
<td>+</td>
</tr>
<tr>
<td>18</td>
<td>16</td>
<td>F</td>
<td>80</td>
<td>birth</td>
<td>H</td>
<td>H</td>
<td>12 yrs.</td>
<td>+</td>
</tr>
</tbody>
</table>

Hearing Acuity in the better ear as determined by averaging air conducted pure tone thresholds over the speech frequencies.

Parental Hearing being the father's (F) and mother's (M) current hearing status, either deaf (D) or hearing (H).

Exposure to Total at the School for the Deaf and Blind.

Amp. Use = Use of amplification

+ = current use of amplification/enrollment in speech therapy.
- = not currently using amplification/enrolled in speech therapy.
APPENDIX B. Instructional Sets

Day 1

Look carefully at all these pictures, then I want you to tell ______ all about the pictures.

"Pause Time"

Now tell ______ a story about the pictures. Don't tell her that this is a boat (indicating) and this is a man (indicating); that's boring. Tell ______ a story or what happened. Understand? Talk for 10 minutes (pointing to timer). I'll start the timer.

Day 2

Remember these pictures? I want you to tell ______ about them. Tell ______ a story about the pictures or what happened in the pictures, just like you did yesterday, okay?

Day 3

This is the last day. I have the same pictures, but today I want you to tell ______ about them, okay?
APPENDIX C. Descriptive Information on Listeners

<table>
<thead>
<tr>
<th>LISTENER</th>
<th>AGE</th>
<th>SEX</th>
<th>SIGN DIALECT</th>
<th>FAMILIARITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIT</td>
<td>44</td>
<td>F</td>
<td>ASL &amp; PSE</td>
<td>Inter. &amp; Jr. High Teacher</td>
</tr>
<tr>
<td>NHT</td>
<td>32</td>
<td>F</td>
<td>PSE</td>
<td>Counselor in School Dormitory</td>
</tr>
<tr>
<td>NHOO</td>
<td>37</td>
<td>F</td>
<td>---</td>
<td>Familiarized thru Conversation</td>
</tr>
</tbody>
</table>

HIT being the hearing-impaired woman utilizing total communication (oral & sign).

NHT being the normal-hearing woman utilizing total communication (oral & sign).

NHOO being the normal-hearing woman utilizing oral only.

ASL = American Sign Language
PSE = Pidgin Signed English
APPENDIX D. Listener Training Session

1. Description of study's procedure and purpose allowing the listeners to understand their roles.

2. Discussion of listeners' roles;
   a) mode of communication
   b) degree of participation in conversation
   c) attempt to increase subject output and maintain a natural interaction by avoiding parallel talk, alternating comments and questions, and responding to subjects' questions either by facial expressions or verbal response when appropriate.
   d) avoidance of biasing effects (ie. comments concerning nature of the study).

3. Familiarization with the picture stimuli and their order of presentation.

4. Roleplay experimental task including hypothetical situations (ie. subject asks "What are we doing this for?" or "Should I use my voice?").
APPENDIX E. Definitions of the Experimental Measures

1. Percentage of intelligible oral words: The percentage of oral words used by the speaker that could be understood within the context of total communication (i.e., gestures and facial expressions) without relying on the signed component for meaning.

2. Percentage of oral words without signs present: The percentage of oral words that were utilized without concurrent signs. No judgment was made in respect to the appropriateness of sign, but rather the one to one correspondence of oral words to signs.

3. Percentage of signs without oral words present: The percentage of signs that were utilized without an accompanying oral word. No judgment was made in relation to the appropriateness of words to corresponding signs.

4. Percentage of simultaneous communicative units: The percentage of the total communicative units (signs and oral words) that were expressed simultaneously.

Oral words = intonation, vowel and/or consonant differentiations between verbalizations regardless of degree of intelligibility.

Signs = symbolic gestures and formal signs.
APPENDIX F. Observer Training Session

1. General description of the study's procedure in relation to the observer's task.

2. Familiarization with the picture stimuli and their order of presentation.

3. Explanation of the experimental measures and the associated behaviors.

4. Introduction to the method of recording behaviors (timing 5 minute sample and counting behaviors).

5. Discussion of categorization of various behaviors (i.e. pointing, head nods) that might be questionable.

6. Specific difficulties the experimenter experienced while observing were elaborated on to facilitate the process for the observer.
APPENDIX G. Raw Data

The following numbers are the raw data for this experiment. Each subject has two rows of data. The format for each subject is as follows: Row one—column 1 and 2 = subject number, 3, 4, and 6 = total number of signs for listener A; columns 7, 8, and 9 = total number of oral words used with listener A; columns 10, 11, and 12 = percentage of intelligible oral words used with listener A; columns 13, 14, and 15 = percentage of oral words without signs used with listener A; columns 16, 17, and 18 = the percentage of signs without oral words used with listener A; columns 19, 20, and 21 = percentage of simultaneous communicative units used with listener A; columns 22 through 51 provide information for the subject's performance with listener B following the same categories as were listed for listener A. The second row of numbers for each subject represents the subject’s performance with listener C. Again the order of categories remains the same.

```
01203166003.61001.20018.23089.43200205006.34005.85003.50095.31
12117001.8030.00001.65081.79
02147000000.0100.00000.0201258018.22022.87001.00086.71
150211088.63031.28003.33080.33
0316100000.0010.00000.0154171001.17011.70001.95092.92
121156005.7026.92006.56082.01
04130143096.50011.89003.08092.3112297100.00042.42000.58072.92
239321000.62025.60000.84000.85
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0608700000.0010.00000.0180200003.50013.50033.89091.05
113155027.10029.03002.66082.09
07136124021.70000.81010.48094.6207507723.38012.99013.33086.84
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037297096.63087.54000.00022.16
09182036000.00053.56081.32031.1914709505.26001.05036.05077.69
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233271092.62019.19006.01086.90
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APPENDIX H. Representation of Means

<table>
<thead>
<tr>
<th>Category</th>
<th>Percentage of Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intelligible Oral Words</td>
<td>NHT</td>
</tr>
<tr>
<td>Oral Words Without Signs</td>
<td>HIT, NHT, NHOO</td>
</tr>
<tr>
<td>Signs Without Oral Words</td>
<td>HIT, NHT, NHOO</td>
</tr>
<tr>
<td>Simultaneous Communicative Units</td>
<td>NHOO, HIT</td>
</tr>
</tbody>
</table>
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