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Reading and Comprehension in Hearing and Hearing Impaired Children

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READING AND COMPREHENSION

IN HEARING AND HEARING IMPAIRED CHILDREN

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GLOSSARY

American Sign Language (ASL): The language of the Deaf culture: a visual language distinct from English and having its own structure, morphology, semantics, syntax, and phonology.

Bottom-up processing: The sequential process of letter recognition, word decoding and ultimately, the recognition of individual sight words.

Comprehension: An understanding of the meaning of what is read or heard.

Confabulations: Errors of memory involving insertions of information not included in the passage previously read or heard.

Distortions: Inaccuracies of memory for a passage previously read or heard.

Reading achievement: The reading competence of an individual student in relation to his/her age and grade level, as identified by the school.

Reading potential level: The level of complexity of information that can be comprehended by an individual when it is presented in a spoken format as in a listening comprehension test.

Reading skills: The mechanical skills involved in the reading process, such as scanning, letter recognition, etc.

Regular written English: The written language of speaking people: A printed language with specific structural rules of morphology, syntax, and phonology.

Top-down processing: The use of contextual or schematic cues to decode a word and/or determine its meaning in relation to the rest of the passage.

CHAPTER I

INTRODUCTION

Reading and Comprehension

in Hearing and Hearing Impaired Children

Children who can hear grow up in a world where sound continually gives them information about what is going on around them. Sounds selectively draw their attention and teach them about their world. As these children grow, sound grows into intelligible language, and this becomes an important means of expression, communication, and learning. In particular, sound is considered to be an important ingredient in learning to read and in achieving reading proficiency (Crowder, 1982; Goswami, 1991; Goswami & Bryant, 1990; Perfetti, 1985).

Children who have hearing impairments cannot rely on sound in the same way to help them gain information about their world. Regardless of how or when they develop their hearing impairment, they must develop a different means of expressing themselves, communicating, and learning. Hearing impaired (HI) children who acquire their hearing impairment before they go to school, especially if they occur before they learn any intelligible spoken language, also have difficulty learning to read (Crowder, 1982; Goswami & Bryant, 1990). Some HI children learn a first language that is based on their

tactile and visual senses. Not only is this language independent of sound, it does not use the same syntactic rules as spoken or written English (Isenhath, 1990; Lane & Grosjean, 1980). These children essentially learn a first language that is tactile, visual, and has specific syntactic rules. For some of these children this language is American Sign Language (ASL), while for others it is an idiosyncratic, or pidgin language. However, when they begin school, they must learn a second language, that of the hearing world. This is difficult because this 'new' language relies heavily on sound and on a different set of syntactic rules. This may contribute to the often delayed acquisition of and lack of proficiency in reading skills by HI children.

In general, comprehension of written words and whole passages can take place either by recognizing individual words and the meanings associated with them or by instantiating a schema for the theme of a sentence or passage so that certain words and phrases are expected. The recognition of individual sight words is known as bottom-up processing, and, after practice, takes place with little or no effort. The use of contextual or schematic cues to decode a word and/or determine its meaning is known as top-down processing. This is a more arduous task, and one that is assisted by grapho-phonetic cues. That is, if a reader can determine the sound of a word from the shape and sounds of its constituent parts, it may be easier to determine its meaning. Although current theories of

the development and teaching of reading in hearing children stress an interactive, concept-driven, top-down kind of processing (Stanovich, 1980), bottom-up processing still must take place (Banks, Gray, & Fyfe, 1990). Once words are no longer novel, top-down processing, or sight reading, guides the process of reading. Bottom-up processing, or decoding, becomes automatic for those familiar words. The interaction and relative dependence on top-down or bottom-up processing is quicker and easier for good readers than for poor ones (Stanovich, 1980), and quicker and easier for hearing readers than for HI ones (Banks et al., 1990).

Reading achievement, measured by both standardized tests and by class achievement, has a direct, inverse relationship to hearing loss or impairment (Trybus & Karchmer, 1977). That is, hearing students are usually better and more advanced readers than are HI students of the same age. One of the reasons for this difference may be the differences in the syntax of regular written English compared to that of American Sign Language - the manual communication system that most HI children use (Isenhath, 1990; Johnson, Liddell, & Erting, 1989; Liddell, 1980; Robbins & Hatcher, 1981). The syntax of regular written and spoken English is different and more formalized than the syntax of ASL.

Despite the difference in complexity in the syntax of regular written English text versus that of signed ASL, (Isenhath, 1990; Johnson, et.al., 1989; Liddell, 1980), it is

unclear what relationship these variables have to comprehension of written text. It is also unclear how the rate and ease of acquisition of reading skills and ultimate proficiency is related to comprehension in either hearing or HI readers. That is, the reading skills of age-matched hearing and HI readers are quantitatively different, but there is little evidence about the comprehension skills of reading-level-matched hearing and HI readers.

Methods for Assessing Reading Comprehension

Another question related to reading abilities in the HI centers on the relationship between syntax and comprehension. This is important because ASL and both written and spoken English have different syntactic rules. A number of studies have investigated reading comprehension differences between hearing and HI readers, and several have tried to track the development of an understanding of written English syntax in HI children (Banks, et al., 1990; McGill-Franzen & Gormley, 1980; Robbins & Hatcher, 1981; Stanovich 1980). They have used a number of different methodologies to do this. The most common ways are with standardized informal reading inventories (which are not normed for the HI) and with the cloze procedure.

The cloze procedure is a method many educators choose to explore the dynamics of the relationship between reading and comprehension (Davey, LaSasso & Macready, 1983; Fischler, 1983; Kelly & Ewoldt, 1984; LaSasso, 1980; McKnight, 1989;

Reynolds, 1986; Robbins, 1983). This procedure is both an efficient and an effective method for providing information about the ability of readers to use contextual cues for sentence completion. A cloze passage is constructed from a passage of slightly over 250 words. The title and the first sentence are left intact, and every fifth word thereafter is replaced with a numbered blank until 50 blanks are embedded into the text. The final sentence or remainder of the paragraph after the 50 blanks are inserted is reproduced intact. The passage should be administered with liberal time constraints.

In traditional scoring of these passages, responses that match the missing words verbatim are counted as correct, and a score of 22 or more correct answers per passage indicates the students' competence at the reading level of the passage (Bormuth, 1968). The cloze procedure is traditionally used in three different ways, however, it may be used in research to identify differences in reading skills between groups of readers. Traditional uses of the cloze procedure include its use in determining the readability of a passage for a particular group or individual, determining the reading levels of a group of students in a content area textbook, or determining general instructional reading levels for an individual or a group.

When verbatim cloze answers of hearing and HI readers are scored, hearing readers have a higher percentage of accurate

answers. However, when the scoring procedures of the cloze task are altered by changing the criteria for a semantically or syntactically acceptable response for both groups of readers, there is less difference between the groups (Davey, et al., 1983; Fischler, 1983; Kelly & Ewoldt, 1984; LaSasso & Swiako, 1983; Robbins, 1983).

One method of changing the task demands of the cloze procedure has been documented by Robbins (1983). She altered the presentation of the cloze task to include appropriate pictures of ASL signs to appear above each of the written English words. In the traditional cloze task, the written text is included in the presentation, but a signed-English picture is not. These familiar signs aided the HI readers' completion of the cloze task and contributed to a greater number of correct answers to subsequent comprehension questions than in the traditional cloze task. Robbins pointed out, however, that the task still presents limitations to the HI reader because the pictures are void of the dynamic information provided by viewing a person signing in real time.

Another criticism of Robbins' (1983) study might be that she did not take into account the difference in syntax between traditionally written English and ASL. Banks et al. (1990) presented young adolescent, HI readers with cloze passages written in British Sign Language (BSL) syntax word order and in regular written English. They assessed the comprehension of the subjects by having them recall the passages in writing,

and then had them complete cloze passages from the previously read passages. While HI readers' verbatim cloze performance was better on the passages written in BSL than those written in regular written English, it was still worse than that of hearing readers. In addition, when the recall passages were scored as another measure of comprehension, those of HI readers had a greater number and a greater variety of distortions. Distortions were described as inaccuracies that broke the story line, confabulations, and temporal inversions.

Based on this information about both cloze and recall performance of HI readers, Banks et al. (1990) concluded that HI readers do engage in reconstructive processing of ideas in recall of a story, but that they have difficulties with comprehending story schema resulting in impoverished story recall. While they indicate that this reading strategy may be the result of the methods used to teach reading, the results still indicate that the larger idea of the text is more difficult for HI readers to grasp than it is for hearing readers, and that this difficulty may be due to the difference in syntax between BSL and regular written English.

In addition to changing the demands of the cloze task for HI readers in order to make it more sensitive to the comprehension strategies they use, changes in the scoring criteria for the cloze task have also been investigated. Kelly and Ewoldt (1984) used the cloze procedure to measure criterion-related validity of a novel reading program for HI

students. They used a nonverbatim method for scoring cloze passages developed by Lindberg (1977) as well as using the traditional verbatim scoring method. The nonverbatim scoring strategy involves giving credit for words that are syntactically and semantically correct in addition to credit given for verbatim responses. In order to be acceptable, words needed to be either meaningful in the passage or meaningful in the sentence and in syntactically acceptable English form or syntactically acceptable ASL form. This nonverbatim cloze scoring procedure revealed the extent to which particular comprehension and completion strategies were in use by HI readers. They found that nonverbatim scores on the cloze procedure agreed with scores on the Stanford Achievement Test for the Hearing Impaired (SAT-HI) (this is a school administered nationally standardized test with separate norms for the HI) and with scores of story recall.

While cloze procedures have been altered syntactically and visually, they have all been presented in written or printed form. Results of these passages indicate an instructional level for reading written text, but probably underestimate comprehension abilities. LaSasso and Swiako (1983) recommend that any reading inventory given to HI children include an assessment of the reading potential level, or listening level. They describe this level as "the highest level at which a student can demonstrate comprehension through retelling, probing, and direct questioning when not permitted

to refer back to the text" (p. 451). In other words, the reading potential level refers to the level of complexity an individual is able to understand when the information is read to him or her. While she reports that from her experience, reading potential level is equivalent to silent reading level in HI students, she attributes this to the limitations and differences in the syntactic structure of written and spoken English versus that of ASL that students typically use to communicate (LaSasso, 1980). Her hypothesis is informed by her teaching experience, but has not been empirically tested to date.

Focus of the Present Study

The present investigation incorporated the methods of the cloze task with the concept of assessing reading potential level in an attempt to provide a means for evaluation of the optimal comprehension level of both hearing and HI readers. Specifically, both written and video taped (aural or signed) media were used to assess reading comprehension.

Three specific hypotheses were examined in the present study. These hypotheses were as follows:

1.) Groups are expected to differ in the pattern of their performance on cloze tasks presented in different media conditions.

a.) HI readers are expected to have relatively higher verbatim and nonverbatim cloze scores in a video (aural or signed) cloze task than in a written cloze task because the

aural or signed medium is consistent with their primary form of communication.

b.) Hearing readers are expected to have opposite results, that is, to score relatively higher (for verbatim and nonverbatim cloze) on written versus video cloze passages.

c.) In addition, since HI readers are hypothesized to lag behind their peers in standard reading skills, their performance on the video cloze passage is expected not to differ significantly from the performance of their hearing, same-reading-level peers on the written cloze passage.

2.) In both groups, the measure of recall of the story will correlate better with the cloze score on the more familiar medium.

a.) HI readers are expected to have higher recall scores on video passages than on written passages.

b.) Hearing readers are expected to have higher recall scores on written than on video passages.

3.) Since tests are often used to classify children for reading groups, useful information can be gained by exploring the correlations between performance on reading tests and on verbatim and nonverbatim scoring of cloze passages.

a.) Scores on a standardized test, such as the Stanford Achievement Test (SAT) California Achievement Test, or Iowa Basic Skills Test (IOWA), are expected to correlate well with cloze scores on written passages, and not as well with cloze scores on video passages.

b.) Standardized, quantitative measures of written vocabulary, such as the Gates-MacGinitie Reading Test (GM) (MacGinitie, Kamons, Kowalski, MacGinitie, & Mackay, 1978), are expected to correlate well with scores on written cloze passages, (LaSasso & Davey, 1987) and measures of spoken or signed vocabulary should correlate well with scores on spoken or signed cloze passages, respectively.

CHAPTER II

METHOD

<u>Subjects</u>

Twenty-one students participated in this study. Group 1 consisted of 7 HI children, who use total communication - simultaneous spoken and manual language with hearing aids - as their primary means of communication and who are reading at the 3rd grade level or better, (as identified by their school). Group 2 consisted of 7 hearing children matched to Group 1 on their reading level. Group 3 consisted of 7 hearing children matched in age to the HI children. Grade equivalence for reading levels was determined from scores on school-administered standardized tests (CAT, SAT-HI, and Iowa Basic).

<u>Materials</u>

Materials for Selection

Scores on the reading comprehension subtest of the school administered standardized test were obtained from student records in the schools (with parents' permission) in order to select and appropriately match participants for the study. The GM (MacGinitie et al., 1978) vocabulary subtest was also administered to all groups in order to assess lexical knowledge. It took about 30 minutes for each student to

complete. In addition, two vocabulary lists of twenty items each from the <u>Steiglitz Informal Reading Inventory</u> (SIRI) (Stieglitz, 1992) were translated into both spoken and manually signed form. Each child completed one written and one spoken or signed list. These lists were used to assess listening vocabulary. Lists were administered after the cloze passages and each took about five minutes per child. Instructions were given to the HI children in simultaneous spoken and signed English.

Materials for Cloze Passages and Reading Comprehension

Four cloze passages were developed from a basal reader text not in use in the students' classrooms. In order to avoid a possible ceiling effect, passages were taken from the fourth grade level book <u>Barefoot Island</u> of the Ginn and Company series (Clymer, Venezky, & Indrisano, 1984). Two were taken from the beginning of the book and two from the end to balance the expected difficulty of the passages. Each student completed two passages, which took about 30 minutes per child. These passages were reproduced in print for silent completion and in aural and manual form on videotape for oral and manual completion. Each aural passage took about 20 minutes to complete and manual passages took about 25 minutes apiece to complete. Instructions were given to the HI children in simultaneous spoken and signed English.

Procedure

Screening Procedures

The GM (MacGinitie et al., 1978) vocabulary test was administered to match the groups on age and reading level. The tests were hand-scored using the directions provided in the scoring manual. The written list of vocabulary words was presented to students for silent work. The student's task was to define or give a synonym for each word presented. Answers were coded for accuracy by two independent raters with the use of a dictionary or thesaurus, as necessary. Answers to the word lists were coded on a 4-point scale as follows: 0 points if no answer given (not including missing data); 1 point for an attempted but wrong answer; 2 points for a reasonable guess, but still missing information; and 3 points for a correct answer. Inter-rater reliability for the word lists was very good: for List A, Pearson's r = .976, for List B Pearson's r = 1.00. A mean of the scores from the two raters was used in subsequent analyses.

Procedures for Assessing Reading and Comprehension

Each of the 21 subjects completed all four stories and both word lists. Twelve subjects completed stories 1 and 2 and List A in written format. The same twelve were to have also completed stories 3 and 4 and List B in video format. Of these, all twelve completed story 3 but only 11 completed story 4 and List B. One subject was called away from testing before completion of story 4 and List B. Nine completed

stories 1 and 2 and List A in video format and stories 3 and 4 and List B in written format. The distribution of media conditions within all groups was the same (written, n = 4; video, n = 3). The non-equivalence of the media conditions was unintentional and due to a photocopying accident.

The written format consisted of two regular written English cloze passages. Instructions were to review the entire passage once before filling in any of the blanks, and then to complete it. No time limits were placed on completion of the passage. Each hearing child completed two spoken cloze passages and each HI child completed two manually signed cloze passages.

After both cloze passages were collected, the student was instructed to tell the experimenter what s/he recalled from the passage. If the passage was written, the student wrote down what s/he recalled. If the passage was signed, the recall was signed, and if the passage was spoken, the recall was spoken. The student's recall information was transcribed and coded to count the number of ideas recalled from the passage. Based on Banks et al. (1990) and on a preliminary content analysis, six recall elements were coded: details, emotions, actions, summary statements, errors and confabulations. Recall protocols were scored by two independent coders and inter-rater reliability of these constructs across both raters was good, Pearson's r = .97 or better. In further analysis, an average of the scores from

the two raters was used.

Both the aural and the manual cloze passages were presented on video tape. Each passage was played twice. The first time it was played with short pauses and a sign held up by the storyteller on the tape to indicate the need for a word insertion so that students would be able to develop an idea of the context, duration, and pace of the passage. The tape was rewound and played a second time. During the second playing, the child was prompted to answer during the pause and his/her answer was recorded on video and on paper.

Scoring of both the written passages, and the video-taped cloze passages resulted in two scores per passage, per student - a verbatim cloze score and a nonverbatim cloze score. For each passage, a verbatim cloze score was computed in order to determine if the passage was at the student's instructional reading level (Bormuth, 1968). Independent reading level is defined by Bormuth (1968) as achieving a verbatim cloze score between 58% and 100%, Instructional reading level between 44% and 57%, and Frustration level between 0% and 43%. Instructional reading level is optimal for books used in a classroom setting. Unfortunately, in trying to avoid a ceiling effect by choosing a more advanced book, this study encountered a floor effect. Table 1 details the range of verbatim cloze scores for each of the four stories for each media condition for the entire sample, and indicates how many children per story fell into specific reading levels as

described above. The majority performed at Frustration level.

Table 1.--Verbatim Cloze Reading Levels by Story and by Media

Medium	Reading levels		
Written	Independent	Instructional	Frustration
Story 1 range = 14-52	0	2	10
Story 2 range = 16-66	1	4	7
Story 3 range = 8-70	5	1	3
Story 4 range = 2-64	1	6	2
Video			
Story 1 range = 0-30	0	0	9
Story 2 range = 0-34	0	0	9
Story 3 range = 2-44	0	1	11
Story 4 range = 0-26	0	0	11

Answers for each passage for each student were also
scored by two coders in terms of syntactic and semantic
acceptability (Lindberg, 1977) within the contexts of the
sentence and of the passage in order to derive nonverbatim
cloze scores. More students performed at the Independent and
Instructional levels, but particularly for the video
condition, the majority performed at the Frustration level.
Inter-rater reliability for all the stories was good

(Pearson's r = .94 or better). The mean score for each subject was computed from the scores given by two different raters. This mean score was used in further analysis. Table 2 reports the scores for the nonverbatim codes.

Table 2.--Nonverbatim Cloze Reading Levels by Story and by Media

Medium	Reading levels		
Written	Independent	Instructional	Frustration
Story 1 range = 29-65	5	2	5
Story 2 range = 25-74	4	6	2
Story 3 range = 15-90	6	1	2
Story 4 range = 15-80	3	0	6
Video			
Story 1 range = 0-48	0	1	8
Story 2 range = 0-40	0	0	9
Story 3 range = 3-55	0	1	11
Story 4 range = 2-38	0	0	11

CHAPTER III

ANALYSES AND RESULTS

Testing Group Differences in Cloze Scores

In order to test the hypotheses of group differences in cloze scores due to differences in media, it was first necessary to determine that there were no differences due to the four different stories. To test this, two separate story (4) by media (2) by group (3) within subjects MANOVAs were performed, one with the verbatim cloze scores, and the other with the nonverbatim cloze scores. For both MANOVAs neither main effects for story nor interaction effects involving story were significant: for verbatim cloze scores, interaction effect Hotelling's t = .138, $F(12,104)$ = .597, p = .84, main effect Hotelling's t = .133, $F(6,104)$ = 1.15, p = .33; for the nonverbatim cloze scores, interaction effect Hotelling's t = .137, $F(12,104)$ = .595, p = .84, main effect Hotelling's t = .069, $F(6,104)$ = .595, p = .73.

As expected, this information indicated that there was no difference between stories, so the story factor was ignored in subsequent analyses. Two media by group ANOVAs were performed, one with the verbatim cloze score and the other with the nonverbatim cloze score. Means for the 3 groups by the 2 media are presented in Tables 3 (verbatim cloze scores)

and 4 (nonverbatim cloze scores). Contrary to expectation, no significant interaction effect was present in either case. However, in both analyses, there was a significant main effect of both group and media. For the verbatim cloze scores, groups were significantly different $F(2,15) = 4.63$, $p = .03$, HI mean = 20.86, Reading matched $\bar{X}$ = 33.43, Age matched $\bar{X}$ = 39.43. The effect of different media was also significant $F(1,15) = 18.97$, $p = .001$, Written $\bar{X}$ = 40.83, Video $\bar{X}$ = 18.44.

Although the interaction effect was not statistically significant, the pattern of the cell means suggests that with a larger sample size the interaction could approach significance. To further investigate the relationship between the group and the media variables, an exploratory follow-up oneway ANOVA with Duncan multiple range test revealed that for stories in written format, there was no significant difference between groups at the $p = .05$ level, and for stories in video format the HI group performed worse than the other two groups, $F(2,6) = 30.70$, $p = .001$.

Table 3.--Verbatim Cloze Cell Means by Group and by Media

Medium	Written	Video
Group 1 (Hearing impaired)		
mean	34.50	2.67
standard dev.	15.52	4.67
Group 2 (Reading level matched)		
mean	41.50	22.67
standard dev.	18.21	4.62
Group 3 (Age matched)		
mean	46.50	30.00
standard dev.	8.22	4.00

For the nonverbatim cloze scores, groups were significantly different $F(2,15) = 6.61$, $p = .009$, HI $\overline{X} = 28.00$, Reading matched $\overline{X} = 42.71$, Age matched $\overline{X} = 51.14$, and the effect of different media was also significant $F(1,15) = 27.59$, $p = .001$, Written $\overline{X} = 52.58$, Video $\overline{X} = 24.66$. As for the verbatim cloze scores, the interaction effect was not statistically significant. However, the pattern of the cell means suggested that with a larger sample this interaction could approach significance.

To further investigate the relationship between the group and the media variables, an exploratory follow-up oneway ANOVA with Duncan multiple range test revealed that for stories in the written format there was no statistically significant difference, but in the video format the HI group again performed worse than the other two groups, $F(2,6) = 94.85$, p

= .001. The cell means for group by media performance for nonverbatim cloze scores are shown in Table 4.

Table 4.--Nonverbatim Cloze Cell Means by Group and by Media

Medium	Written	Video
Group 1 (Hearing impaired)		
mean	46.75	3.00
standard dev.	18.08	5.19
Group 2 (Reading level matched)		
mean	50.00	33.00
standard dev.	14.96	1.73
Group 3 (Age matched)		
mean	61.00	38.00
standard dev.	12.35	2.00

Testing Group Differences on Recall Measures

The second hypothesis tested concerned the degree of story recall by group affiliation. A group (3) by media (2) MANOVA was performed on 6 indices of recall. Testing for significance at the .10 level, there was a significant main effect for group, Hotelling's t = 2.72, $F(12,18)$ = 2.04, p = .08. Univariate follow-up F-tests revealed that the only statistically significant dependent variable was the number of actions recalled from a story, $F(2,15)$ = 3.32, p = .06, HI $\overline{X}$ = .29, Reading matched $\overline{X}$ = 1.04, Age matched $\overline{X}$ = 1.54.

There was also a significant interaction effect between group and media, Hotelling's t = 4.38, $F(12,18)$ = 3.28, p =

.01. The univariate follow-up F-tests showed that the number of actions recalled was significant $F(2,15) = 4.72$, $p = .02$. Table 5 reports cell means for the number of actions recalled by group and by media in both media conditions. An additional post hoc follow up ANOVA, with a Duncan multiple range test, showed that while for most of the recall codes there was no difference between groups, in the video condition, the Age matched group recalled significantly more of the story actions than did subjects in the other two groups, $F(2,6) = 6.00$, HI $\bar{X} = .33$, Reading matched $\bar{X} = .33$, Age matched $\bar{X} = 2.33$, $p = .03$. In the written condition, the Reading level matched group recalled more of the story actions. This difference was not statistically significant, $F(2,9) = 2.55$, HI $\bar{X} = .25$, Reading matched $\bar{X} = 1.75$, Age matched $\bar{X} = .75$, $p = .13$.

Table 5.--Cell Means for Recall of Story Actions by Group and by Media

Medium	Written	Video
Group 1 (Hearing impaired)		
mean	.250	.333
standard dev.	.500	.577
Group 2 (Reading level matched)		
mean	1.750	.333
standard dev.	1.258	.577
Group 3 (Age matched)		
mean	.750	2.33
standard dev.	.957	1.16

The effect for media did not reach significance, Hotelling's t = .88, $F(6,10)$ = 1.49, p = .27. However, univariate follow-up tests showed that there was a trend toward significance for the number of summary statements recalled, $F(1,15)$ = 3.08, p = .09, written $\bar{X}$ = .75, video $\bar{X}$ = 1.78. Perhaps with a larger sample size, the effect would approach significance.

Table 6 shows that none of the six recall measures for the entire group correlated significantly or in any consistent pattern with either verbatim or nonverbatim cloze scores in either medium. In addition, two correlations could not be computed. This may have been due to the small sample size and missing data from 4 subjects who refused to complete recall measures.

Table 6.--Pearson's r Correlation Coefficients for Recall by Cloze Scores for All Subjects

Medium	Written		Video	
	Verbatim cloze	Nonverb. cloze	Verbatim cloze	Nonverb. cloze
	n = 12		n = 9	
summary	.542	.516	.404	.349
confab.	-.060	-.140	not avail.	not avail.
action	.253	.273	.699	.558
emotion	.556	.399	-.455	-.513
errors	-.007	.096	.378	.352
details	.174	.251	.357	.264

Testing Relationship Between Reading Test Performances

and Cloze Test Performance

The third hypothesis tested was concerned with the relative strength of the correlation between standardized tests and written or signed cloze test scores. Reports of school-administered standardized tests were obtained for 18 of the 21 subjects. Since students came from different schools, all the students did not take the same test. Eighteen had scores from school administered standardized reading tests; eight had scores from the IOWA, 5 from the CAT, and 5 from the SAT-HI. Of the scores not available from the schools, two were from students in the HI group, and one from a student in the age matched group. Twenty completed the GM (MacGinitie et al., 1978). The missing score on the GM was from a student in the HI group. Normal curve equivalents were not available for the school administered tests, and the standardized and percentile scores on the different tests cannot be considered equivalent. However, since all of the tests are nationally normed, and the reading comprehension percentile score was the most common available score, it was chosen for use in subsequent analyses.

A correlation analysis was performed to investigate the relationship between percentile scores on standardized tests and verbatim and nonverbatim cloze scores in both media conditions. These correlations are reported in Table 7. Sores on both verbatim and nonverbatim coding of cloze tests

correlate significantly with percentile scores on the GM (MacGinitie et al., 1978), and with percentile scores on other, school administered standardized test (CAT, SAT-HI, IOWA). This suggests that the different tests are measuring the same construct of reading comprehension. There are two possible explanations for the non significant correlations between cloze score on the video conditions and percentile scores on standardized tests. Either the video condition is not measuring the same reading comprehension construct as the standardized tests or it is tapping a different construct. Additional work in this area is merited.

Table 7.--Pearson's r Correlation Coefficients for School-Administered Reading Tests by Cloze Scores

Test	GM percentile		Other percentile	
	Verbatim cloze	Nonverb. cloze	Verbatim cloze	Nonverb. cloze
Medium	n = 20		n = 18	
written	.819*	.804*	.745*	.725*
video	.757	.677	.613	.509

* p = .01

Another correlation analysis was performed to explore the relationship between standardized reading tests and written and signed vocabulary tests. List A and list B were significantly correlated, r = .843, p = .001, so they were averaged. Subsequent analyses used the mean score. The mean vocabulary lists score was not significantly correlated with

either percentile scores of the GM (MacGinitie et al., 1978), $r(16) = .527$, $p > .01$, or with percentile score on other standardized tests $r(16) = .502$, $p > .01$. Pearson's r correlation for the written medium was not significant either, by GM $r(8) = .354$, $p > .01$, or by other tests $r(8) = .486$. When presented in the video medium, mean vocabulary score was significantly correlated with GM percentile scores $r(7) = .792$, $p = .01$, but not with other tests $r(7) = .629$, $p > .01$. As indicated by earlier findings, this information indicates that the video condition may be measuring a different construct of reading than the more traditional written medium.

Additional correlation analyses investigated the relationship between the vocabulary lists and cloze scores. The combined vocabulary list score correlated significantly with verbatim and nonverbatim cloze scores ignoring media and group, with verbatim cloze scores, $r(19) = .664$, $p = .01$ and with nonverbatim cloze scores, $r(19) = .671$, $p > .01$. Vocabulary scores did not correlate significantly with cloze scores in the written medium, verbatim scores $r(10) = .628$, $p > .01$, nonverbatim scores, $r(10) = .642$, $p > .01$. In the video medium, however, both scores correlated with vocabulary list scores, verbatim, $r(8) = .922$, $p = .001$, and nonverbatim $r(8) = .918$, $p = .001$. Again, this finding indicates that the video condition may be measuring a different construct of reading than the written medium.

CHAPTER IV

DISCUSSION

This study demonstrated that HI readers have worse reading comprehension than their age and reading level matched peers. Despite a number of methodological difficulties (small sample size, high degrees of variability, and subject refusal), the data show that HI readers performed more poorly on both verbatim and nonverbatim scored cloze passages, and that their performance on video taped cloze passages was particularly poor. Both hearing and HI readers benefitted from the nonverbatim scoring method, but the scores of the HI readers did not change as much as was expected - there were still significant group differences.

When story recall was tested for both media conditions, the HI group recalled fewer actions than the other two groups. There were no significant correlations between recall measures and cloze performance. For all subjects, written cloze scores correlated better than video cloze scores with both GM (MacGinitie et al., 1978) percentile scores and percentile scores on other school-administered standardized tests. Scores on the GM and scores on other standardized tests correlated significantly with cloze scores for tests administered in the written medium but not in the video

medium. Cloze scores were correlated with vocabulary lists from the SIRI (Stieglitz, 1992) only in the video medium.

Reading Comprehension Performance

As predicted, HI readers did not perform as well on written cloze tests as did their age matched or reading level matched peers. Although the interaction between group and media was not statistically significant, both group and media main effects were significant. Measured by cloze scores, the comprehension of the HI group was worse than that of the other two groups. Contrary to the prediction and to Robbins' (1983) conclusions, however, the HI group also performed relatively worse than the other two groups on the video taped task with signed English. This indicates that perhaps the task was more, rather than less, difficult for them than for students in the other two groups. As predicted, the hearing children, both in the age and in the reading matched groups, performed relatively better on the written passages than on the video taped aural passages.

A number of factors may be contributing to the poor performance of the HI students. First, while most children in classes for HI students know some signs, many of them are not particularly adept at signing because few of their friends and family members sign. It appears that signed interactions are limited primarily to those at school and with friends from school. Also, while teachers of the deaf sign while they teach, most schools follow the whole language approach, which

involves amplified hearing for the students via hearing aids, and simultaneous signed and spoken English. The video tapes constructed for this research were made with signed English passages, similar to what students are exposed to in the school setting, but without any concurrent speech. Therefore the audio, lip-movement, and facial expression cues familiar to HI students were absent on the videos.

Perhaps since few of these children get the opportunity to use the signs they know, they rely on these other, non-language cues, more than was first anticipated. While it was initially anticipated that ASL was a first language for these children and English a second, it may be that these children are to some extent bilingual, while at the same time lacking a true 'first' language. Future research with this group might ask teachers to assign a nominal category of signing expertise to each student (e.g., expert, good, fair, poor, no signs). These distinctions could then be used to covary out any differences due to differing facility with sign language.

Small sample size and a high degree of variability are also factors that may be contributing to the lack of significant results. Tables 3 and 4 in the previous section list standard deviations for cell means of verbatim and nonverbatim cloze score performance: they indicate considerable variability, particularly in the HI sample. With a larger sample size, it might be possible to identify different classes of readers (perhaps classify them on the

basis of reading levels, see Table 1 and 2) and use these scores to make group comparisons. This strategy would help to limit variability, making any group differences less likely to be due to artifact.

Recall Performance

It was predicted that subjects would have higher recall scores on tests administered in a familiar medium: HI readers were expected to have higher recall scores on video than on written passages, and hearing readers were expected to have higher recall scores on the written than on the video passages. The data show that there was an interaction between group and media for scores on one of the six indices of recall. Partly supporting the prediction, in the written condition the Reading matched group recalled more story actions, but this effect was not statistically significant. Contrary to the prediction, however, in the video condition the Age matched group recalled significantly more story actions than either the HI or the Reading matched group. The poor performance of the HI group, especially in the video condition was unexpected, since it was anticipated that that medium would be more familiar, and therefore easier to understand and remember. However, their performance on the cloze tasks demonstrated that stories in both conditions were difficult for them to understand, and it is impossible for one to remember what one cannot understand.

Recall of a story is a conventional classroom approach to

measuring the level of comprehension of a story, so this experiment predicted that recall measures would correlate with cloze scores (another measure of reading comprehension) on like media. In order to explore the relationship between recall measures and cloze scores, a correlation was performed. In the stories used in this experiment, none of the recall measures were significantly correlated with cloze scores on either medium. This indicates that if there is a relationship between the two different measures used to assess comprehension, the relationship is not a substantial one, nor is it one particularly sensitive to group differences.

These conclusions, however, are subject to the same caveats discussed in the previous section on cloze performance. Small sample size and high degrees of variability are factors that may have prevented obtaining viridical and reliable results. An additional area of concern for recall measures that was not evident for the cloze task is subject refusal. Three subjects (all HI) refused to even attempt to record their recall of the stories presented in written form. This may have been due to fatigue. The written cloze task was not timed, and in general, HI subjects took longer to complete it (mean time = 59 minutes) than their age matched ($\underline{X}$ = 21 minutes) and reading level matched ($\underline{X}$ = 32 minutes) peers. None of the subjects blatantly refused to attempt to recall any of the video taped stories, but unsystematic observations showed that, the HI students were

more likely than the other groups to require more prompting to recall any ideas. In general, it seemed for them that comprehension and subsequent recall of passages in either medium was difficult and they reported that they found any reading or test of reading frustrating.

Standardized Tests and Cloze Performance

Both cloze tests and standardized tests of reading are intended to measure the construct of reading comprehension. Scores on the GM (MacGinitie et al., 1978) and on other school-administered standardized reading tests were expected to correlate well with cloze scores on written passages and not as well with cloze scores on video passages. As predicted, both kinds of standardized reading tests correlated significantly with cloze scores on written passages, and did not correlate significantly with cloze scores on video passages. This evidence supports the assumption that written cloze tests measure the same construct of reading comprehension as do a number of standardized reading tests. It also suggests that the video cloze test is tapping a different construct, which was one of the assumptions of this project.

Scores on written and spoken vocabulary tests were expected to correlate well with the standardized tests and with cloze scores on like media. Vocabulary lists did not correlate significantly with standardized test scores. Contrary to the prediction, vocabulary list performance did

not correlate significantly with cloze test scores in a written medium, but was significantly correlated with cloze test scores in a video medium. This finding is counter intuitive in light of other findings which correlate written cloze tests significantly with standardized tests. Additional research to tease apart the differences in comprehension between written and video conditions is necessary.

This hypothesis was difficult to test for a number of reasons. This study was conducted during regular school days in the school setting. In the interests of removing students from their academic classes for as short an amount of time as possible, this study relied on the schools to provide the scores of annually administered, nationally standardized exams. Unfortunately, it appears that even within a particular geographic area, a number of different tests are used to assess students' reading ability. While it is reported that normal curve equivalents exist in order to make comparisons between tests possible, the appropriate conversion tables are only available from the test publishers, and generally not available except to schools administering the tests. Some of the publishers are amenable to collaboration with researchers, however, more of them are not willing to release any but the most cursory documentation regarding the scoring of their tests. This study, therefore, used the percentile scores acquired from the schools for all of the standardized tests used for comparisons, despite the lack of

information on concurrent validity of the test scores.

Since most tests, as well as their documentation, are generally not available, future research projects of this type may decide to use a standardized classification test of a different nature, for example the Wechsler Intelligence Scales for Children (WISC III) (Wechsler, 1991) or one or more of its subscales. This approach would provide national standard for comparison and correlation, as well as the benefit of being fairly novel to most children. Unfortunately, it would also require taking additional time away from the students' daily academic pursuits.

Conclusions

Overall, this study demonstrated that HI students have reading comprehension levels lower than those of their hearing peers. While reading level matching should have balanced the ability of the groups, differences were still apparent. The cloze method used to assess reading comprehension in this study was different than that used by the schools to classify students' reading levels, and it can be argued that it may be more sensitive to the reading difficulties faced by HI students.

Further research in this area should replicate this study with a larger sample size, test the effects of differences in ASL and English syntax on comprehension and recall, and address the question of how non-verbal cues may assist comprehension in HI readers. The whole language approach to

teaching HI students to read and express themselves is used in most HI and integrated (HI plus hearing children) classrooms. However, definitive evidence to indicate that this is the best single teaching/learning environment for HI students has not yet been empirically described.

In addition to the empirical questions raised by this work are interesting policy questions. One of the ongoing debates in education rages around evaluation of and materials for teaching students with special needs. Until more is known about the nature of reading comprehension and language use by HI readers, such as the information presented in this study, the debate will continue.

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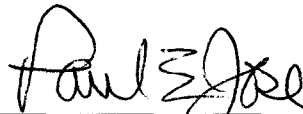Loyola University Chicago

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