Title:
Can lexical/semantic skills differentiate deaf or hard-of-hearing readers and non readers?
Authors:
Yoshinaga-Itano, Christine
Snyder, Lynn S.
Source:
Volta Review; Winter96, Vol. 98 Issue 1, p39, 23p, 11 charts
Document Type:
Article
Subject Terms:
*WRITTEN communication
Abstract:
Presents information from three studies which looked at the reasons for the semantic/syntactic abilities of written-language in the deaf or hard-of-hearing children. Ways to measure hearing impaired children inter- and intrasentential productivity; Semantical aspects of written language; Comparisons of the development of inter and intra-sentential semantics.
Full Text Word Count:
8658
ISSN:
00428639
Accession Number:
9706222524
Database:
Academic Search Complete

CAN LEXICAL/SEMANTIC SKILLS DIFFERENTIATE DEAF OR HARD-OF-HEARING READERS AND NONREADERS?

This article describes three studies, The first attempts to demonstrate that semantic analyses of written narratives are more sensitive assessments of students with hearing losses' language ability than traditional approaches. Results of a factor analysis indicate that inter- and intrasentential semantic/syntactic productive written-language variables are more sensitive than other traditional psychoeducational assessment variables. The second study compares the written-language characteristics of writers matched by reading abilities alone and matched by reading ability and age. The third study compares the written,language, characteristics of deaf and hardof-hearing writers by method of communication (aural-oral versus simultaneous or total communication). No significant differences were found between the two groups on any language measures, indicating that critical questions concerning language development and deaf or hard-of-hearing students may be lexical/semantic expressive language rather than communication/instructional methodology.

The primary goal of this series of studies was to demonstrate that measures of deaf or hard-of-hearing children's inter- and intrasentential semantic/syntactic productive written-language abilities are sensitive to the population's extreme variability. If this assertion can be proven, then deaf or hard-of-hearing students' language abilities can readily be monitored and evaluated through written language. The notion of lexical/semantic language abilities can be expanded from defining lexical abilities as vocabulary knowledge alone to include semantic propositions, cohesive devices, and clause development. More importantly, intervention programs that focus on improving these semantic skills can be developed and implemented. In the 1970s, researchers focused on developing transformational grammar structures in deaf or hard-of-hearing students' language (Quigley, Steinkamp, Power, & Jones, 1978). Though considerable attention has been given to intervention programs devised to remediate these syntax problems, the average academic achievement levels of deaf or hard-of-hearing students have remained the same for many decades (Kretschmer & Kretschmer, 1978; Osberger, 1986). Research attention was turned to lexical/semantic issues in the 1980s and 1990s; however, research results indicate that there is much to learn.

In recent years, many researchers and educators of deaf or hard-of-hearing students have agreed that semantic aspects of written language may be more sensitive indices of students' achievement than language measures of syntax (Davis, Shepard, Stelmachowicz, & Gorga, 1981; Davis, Elfenbein, Schum, & Bentler, 1986; Osberger, 1986; Yoshinaga-Itano, Downey, & Snyder, 1990). It has been established that semantic aspects of written language (i.e., structure and cohesion of narrative discourse) are the most robust predictors of reading comprehension (Kintsch, 1974, 1977; Thorndyke, 1977), readability of written work (Kintsch & Vipond, 1979), and written composition (Bereiter & Scardamalia, 1987; Glenn & Stein, 1980; Kintsch, 1991) in the normally hearing population. In addition, these semantic aspects have proven to be sensitive indicators of developmental change in normally hearing students' reading comprehension abilities (Mandler, 1978; Mandler & Johnson, 1977; Stein & Glenn, 1979) and productive written-language skills (Bereiter & Scardamalia, 1987; Glenn & Stein, 1980). Research on language characteristics of deaf or hard-of-hearing students with severe to profound sensorineural hearing losses indicates that expressive lexical/semantic skills appear to be the most sensitive to deaf or hard-of-hearing students' variable performance. Specifically, research has found that expressive one-word vocabulary and verbal intelligence scores from the Wechsler Intelligence Scale for Children-Revised (WISC-R) (Wechsler, 1974) are the most sensitive indicators for oral-aural mainstreamed 16-and 17-year-old students (Geers & Moog, 1987, 1989). Subtests from the verbal subscale of the WISC-R are the most sensitive indicators for mildly to moderately hearing-impaired mainstreamed students (Davis et al., 1986). Expressive one-word vocabulary, analogies, antonyms, and synonyms from Woodcock & Johnson's Psychoeducational Battery (WJPEB) (1979) are most strongly related to reading ability and academic achievement in severely to profoundly hearing-impaired students ages 4 to 21 in a residential school for the deaf (Davis et al., 1986). If semantic aspects of language do, indeed, discriminate nonachieving from achieving deaf or hard-of-hearing students (Geers & Moog, 1987; Gormley & McGill-Franzen, 1978; LaSasso & Davey, 1987; Moores, 1987), these aspects should constitute a critical consideration in estimating students' progress. With this in mind, the following three questions were posed about deaf or hard-of-hearing students' written language:

(1) What is the relationship between inter- and intrasentential semantic aspects of compositional written language and other psychoeducational variables?

(2) When deaf or hard-of-hearing students are matched on general reading ability, what do compositional written-language skills reveal?

(3) Does communication method (oral-aural or simultaneous communication) affect productive lexical/semantic compositional written language?

Little is known about the relationship of specific compositional writtenlanguage variables to the ability to read in the deaf or hard-of-hearing population. Recently, several researchers have attempted to investigate these relationships. Geers and Moog (1989), in a study of profoundly deaf adolescents who were educated using oral communication methods, found that assessments of reading and writing were highly related.

Additionally, assessments of oral expressive and receptive language were the strongest predictors of reading and writing achievement when including other variables such as age of identification, performance intelligence score (IQ), socioeconomic status, degree of hearing loss, and speech intelligibility. Unfortunately, in the Geers and Moog (1989) study[5] the variables were so closely related that it was impossible to differentiate lexical/semantic variables from syntactic variables. Perhaps these findings indicate that, when oral-aural deaf or hard-of-hearing students are highly successful in their language learning, little difference is found between syntactic and semantic variables, particularly when these skills are measured at the end of students' educational programs. Davis et al. (1986), Geers and Moog (1989), and Kroese, Lotz, Puffer, and Osberger (1986) suggest that expressive language measures of lexical/semantic abilities may be the most sensitive language development measures and, thereby, provide clues for improving reading comprehension. In chapter 1 of this monograph, Yoshinaga-Itano, Snyder, and Mayberry describe analyses of inter-and intrasentential semantic variables, such as propositional and text cohesion analyses, and their relationship to syntactic elements measured by T-unit analysis, and posit that these are crucial to understanding how language develops in the deaf or hard-of-hearing population. The studies reported here sought to determine whether clause development, propositional usage, and cohesive tie analysis measures represent unique aspects of written language not currently tapped by traditional evaluations of deaf or hard-of-hearing students' language. It was also critical to demonstrate that these measures are sensitive to the extreme variability that characterizes deaf or hard-of-hearing students' language and are, in fact, more sensitive and informative than other diagnostic tools currently used to evaluate these students' language competence. There is evidence that the deaf or hard-of-hearing student population may have a characteristic bimodal distribution: students who exhibit language characteristics similar to their normally heating peers and students who appear to plateau in language abilities after ages 12 to 13 according to standardized measures of language and academic achievement. Many language tests used to evaluate deaf or hard-of-hearing students' skills have shown such small gains in adolescent deaf or hard-of-hearing students that differentiation of language skills at this age has been difficult to illustrate (Quigley et al., 1978). Such slight improvement in syntactic skills may mask larger semantic gains.

Phase I: The Relationship Semantic Aspect of Written Language and Other Variables Thought to Influence Academic Achievement

The studies reported in this article looked at the relationship between inter- and intrasentential semantic/syntactic compositional written-language variables and other psychoeducational variables: general reading ability as measured by a standardized cloze technique from the WJPEB; speech intelligibility measured by A Speech Intelligibility Test for Deaf Children (the Clarke test) (Manger, 1972); and receptive comprehension of syntax measured by the Test of Auditory Comprehension of Language (TACL) (Carrow-Woolfolk, 1973) and the Test of Syntactic Abilities (TSA) (Quigley et al, 1978); better ear puretone average (PTA) hearing levels (American National Standards Institute [ANSI], 1970); IQ represented predominantly by the WISC-R; chronological age; and hours of special education services. The assessment instruments, chosen when the data was collected in 1978, 1979, and 1980, could be administered easily to deaf or hard-of-hearing students of all ages regardless of instructional and communication method. A factor analysis was used to determine the relationship among these assessments and their sensitivity to the extreme language skills variability in the deaf or hard-of-hearing population.

Method

Participants

Deaf or hard-of-hearing participants for this study included 31 school-aged students between ages 10 and 15. Only 31 of the original 49 students had complete records and information for all participant selection variables. The youngest participants did not demonstrate language skills adequate for TSA administration, which accounts for some missing data. All students demonstrated greater than 65 dB better ear PTA hearing levels (ANSI, 1970).

All participants' ages at hearing loss onset were prior to 18 months. Therefore, all students were considered prelingually deaf or hard of hearing. All hearing losses were sensorineural.

With the exception of corrected vision, participants were free of other sensory disabilities. School records indicated that 80% of the deaf or hard-ofhearing students had IQs of at least 83 on the performance scale of the WISCR; the other 20% were within the same range on other performance tests of intelligence commonly administered to deaf or hard-of-hearing students.

Last, all deaf or hard-of-hearing participants attended public day schools in Colorado and used either oral-aural or total communication methods. There were more male students than female students as is characteristic of the U.S. deaf or hard-of-hearing population. (Jensema & Trybus, 1978).

Materials

Students were asked to write the best stories they could about the Accident/Emergency picture from the Peabody Language Development Kit (1977). The directions used to elicit written-language samples are described in detail in Yoshinaga-Itano & Downey (1992). The rationale for choosing this narrative task is discussed in chapter 1 of this monograph. The TACL; the Clarke test; the TSA; the WJPEB paragraph comprehension, proofing, and calculation subtests (Woodcock & Johnson, 1979); the Vineland Social Maturity Scale (the Vineland scale) (Doll, 1965); and the total number of special education hours during a 6-month period were reported by the primary service provider For the purposes of this study, the WJPEB proofing and calculation subtests and the Vineland scale (Doll, 1965) were not included in the factor analysis study. The means and standard deviations of test score results by age are shown in Tables 1 and 2.

Deaf or hard-of-hearing students have been assessed through a variety of reading measures: story retelling, silent reading from the Stanford Achievement Test (Center for the Assessment of Demographic Studies, 1991), speed reading, and reading comprehension of syntactic forms. Kroese et al., (1986) found a significantly high correlation (r=.82) between the Stanford Achievement Test--passage comprehension (SAT-PC) (Madden, Gardner, Rudman, Karlsen, & Merwin, 1972) and the WJPEB paragraph comprehension subtest, a cloze assessment of reading level. Therefore, since the purpose was not to investigate reading process or strategies, but to obtain a level of general reading ability, a cloze procedure was used in this study. Because the entire population of students with hearing losses in Colorado was assessed, it was necessary to choose a time-efficient, standardized measurement of reading.

Procedures

A group of 50 educators of deaf or hard of hearing students, audiologists, and speech-language pathologists with experience working with deaf or hardof-hearing students was selected by the state representative of special education to test the deaf or hard-of-hearing students. Yoshinaga-Itano trained the testers through a series of five workshops to administer the written-language test and all other standardized instruments. The testers assessed approximately 700 deaf or hard-of-hearing students; the 49 study participants were those who satisfied the selection criteria For more detailed information regarding participant selection and testers see chapter 1 of this monograph.

The TACL was administered either orally as standardized or in sign language, using the system that each deaf or hard-of-hearing student used instructionally. The Clarke test was administered and scored as standardized. The TSA and the WJPEB paragraph comprehension, proofing, and calculation subtests also were administered. After consulting one of the WJPEB authors, additional training items were added to the

WJPEB paragraph comprehension subtest to ensure that the youngest children understood the task. In addition, students were asked to write stories with the Peabody Language Development Kit's Accident/Emergency picture to elicit written-language samples in the same way they are obtained for the Picture Story Language Test (Myklebust, 1965b). All participants were tested individually.

Data Reduction

All standardized tests were scored by the testers as required by each individual assessment. The Clarke test was scored by listeners not familiar with the speech characteristics of deaf or hard-of-hearing speakers.

The written-language sample was coded for words per T-unit (WPTU), number of major propositions (propositions including predicates and arguments), number of minor propositions (connectives and modifiers), number of total cohesions, and number of collocation cohesions (systematic semantic relationships between words). These variables were found to significantly distinguish the writing of normally hearing and deaf or hard-ofhearing students (Yoshinaga, 1983).

Yoshinaga-Itano and a graduate research assistant coded the writtenlanguage sample for deaf or hard-of-hearing participants; 90% agreement was obtained on a 10-story sample before coding proceeded. Coding for the propositional analysis was based on requirements delineated by Turner and Greene (1978) and intercoder reliability was established at r=.96. Text cohesion coding was based on criteria developed by Halliday and Hasan (1976) to analyze written texts. Intercoder reliability for text cohesion analysis was r=.93. All written attempts were coded, with the exception of unintelligible responses. WPTU were coded according to the requirements described by Hunt (1965). A detailed description and sample of the analysis procedures are described in chapter 1 of this monograph. Since the database was quite large, spot reliability checks were made periodically to ensure coding reliability.

Data Analysis

Data obtained from the semantic, T-unit, and cohesive tie analyses and data obtained from the standardized tests were entered into a factor analysis. A first principal component factor analysis was applied with a varimax rotation, using the Biomedical Computer Program 4M (Dixon & Brown, 1979).

Results and Discussion

Thirty-one participants with complete files participated in this study. Missing data included students in the 10-year-old group who did not have sufficient reading skills to take the TSA. Since the data analyzed were part of a larger data set of approximately 700 deaf or hard-of-hearing students, some students did not have complete information on each of the 12 variables and were, therefore, eliminated from the computer analysis. Twelve variables were included in the factor analysis: (1) better ear PTA, (2) speech intelligibility, (3) IQ, (4) age, (5) hours of special education services, (6) TSA, (7) TACL, (8) WPTU, (9) number of major propositions, (10) number of minor propositions, (11) total cohesions, and (12) number of collocation cohesions. The results of the factor analysis yielded four factors, accounting for 77% of the variability within the deaf or hard-of-hearing sample. Only rotated factor loadings greater than .500 are reported. Variables with loadings equal to or greater than .500 are considered to be important variables comprising that factor. Table 3 shows the sorted rotated factor loadings for each variable included in Factors I to IV.

Factor I: The Semantic Component

Factor loadings are found in Table 4. Factor I, the semantic component, accounted for 36% of the variance in the sample. The variables identified as representative of this factor are (1) total cohesions (factor loading=.962), (2) major propositions (factor loading=.922), (3) minor propositions (factor loading=.909), and

(4) number of collocation cohesions (factor loading=.775). All other variables had factor loadings less than .500. Although WPTU (factor loading=.308) is clearly not the same index as measures of narrative discourse or text cohesion, there appears to be a relationship between this syntactic measure and Factor I, the semantic component.

Factor II: The Syntactic Component

Factor II, the syntactic component, accounted for 19% of the variance. The variables that comprised this factor are: (1) WPTU (factor loading=.797), (2) TSA (factor loading=.775), (3) TACL (factor loading=.796), and (4) hours of special education (factor loading=-.598)

Factor II included expressive written syntactic ability, receptive written syntactic ability, and receptive oral-aural/total communication syntactic ability. The number of hours of special education services was inversely related to Factor II, indicating that the higher the level of achievement on the syntax/ morphology language variables, the fewer hours of service provided. Three variables were not part of Factor II, because their factor loadings fell below .500 but, nevertheless, demonstrated a relationship to Factor II greater than .250. The three variables were: (1) minor propositions, (2) number of collocation cohesions, and (3) speech intelligibility. Therefore, Factor II, representing the syntactic component, appeared to have some relationship to narrative discourse, text cohesion, and speech intelligibility. Factor III: The Hearing/Speech Component

Factor III, the hearing/speech component, accounted for 9% of the variance. Only two variables were included in this factor. They were: (1) better ear PTA (factor loading=.889), and (2) speech intelligibility (factor loading= -.846). Predictably, an inverse relationship was found between hearing and speech ability, indicating that as hearing loss increased, speech ability decreased and vice versa.

Factor IV: The Cognitive Performance Component

Factor IV, the cognitive performance component, accounted for 9% of the variance within the sample. The three variables identified as incorporating this factor are: (1) IQ (factor loading=.825), (2) hours of special education (factor loading=-407), and (3) age (factor loading=-.765). The unusual negative factor loading of -.765 for the variable age is explained by the particular makeup of the deaf or hard-of-hearing sample. The mean IQ scores for the deaf or hard-of-hearing sample decreased somewhat with age, although the scores were all within normal limits. 14-year-old students had slightly lower mean IQ scores than 10-year-old students. There was a negative relationship between hours of special education and Factor IV and a positive relationship with IQ. As IQ scores increased, hours of special education service tended to decrease. Since an IQ score of 83 or above was a participant selection criterion, the phenomenon that students with higher intelligence scores received fewer hours of special education intervention appears related to the fact that, at the time of testing, more funds were available for younger students in Colorado. Younger students in this study had slightly higher mean IQ scores than older students.

Interestingly, age was not highly related to semantic language, syntactic language, or hearing/speech components. In addition, IQ represented a separate factor, not related to semantic, syntactic, or hearing/speech components.

In summary, the variance within the deaf or hard-of-hearing sample was captured by the semantic written-language measures (narrative discourse and text cohesion). This component is clearly separate from the syntactic component, which is the language aspect most commonly measured in the deaf or hard-of-hearing population. However, some relationship between the two components does exist. Together, the language components accounted for 55% of the variance within the sample. Hearing/speech abilities play a role in the larger amount of variance in the deaf or hard-of-hearing sample but are not highly related to the language components. Together language, hearing, and speech account for 68% of the variance within the deaf or hard-ofhearing sample. IQ also was identified as an important variable but was not as discriminating as language or hearing/speech abilities.

This study's results indicate that semantic written-language variables do not simply repeat information already available about deaf or hard-ofhearing students. The factor analysis illustrates that propositional use and text cohesive device variables do provide additional information to what is currently known about deaf or hard-of-hearing students' language skills. In fact, these semantic written-language variables are more sensitive to variability in the deaf or hard-of-hearing population than other currently used measures. The factor analysis divided semantic and syntactic factors into two distinct but related units. The syntactic measure of clause development, while more versatile than other currently used measures, was comparable to both oral (TACL) and written syntax (WPTU) instruments, as shown by Factor II.

Additionally, both syntactic and semantic language abilities were distinct from the hearing/speech abilities factor. In this sample of deaf or hard-ofhearing students, age and IQ accounted for very little variability in the population. It is important to note that all deaf or hard-of-hearing students in this study had IQ scores of at least 83. If students with IQ scores less than 83 had been included, the authors believe there would have been a stronger relationship between language skills and IQ scores. Since not all participants had IQ scores from the WISC-R, this also may have influenced the results. However, Golgar and Osberger (1986) found similar results in a population of students with severe to profound hearing losses educated in a residential school for the deaf. The WISC-R IQ score, Hiskey Nebraska Test of Learning Aptitude (1966), and the Leiter International Performance Scale (1959) did not have a significant relationship to language variables, only to visual perception variables.

If diagnostic tools' purpose is to differentiate the high degree of variability of language skills in the deaf or hard-of-hearing population, then more emphasis must be placed on semantic language variables. It is possible that measures of receptive or expressive vocabulary[36] whether in the oral/total communication or written modes, may be more similar to the semantic than the syntactic component of language. Such a measure was not available for this analysis. Additionally, these data underscore the idea that discussion of hearing impairment and language must clearly separate semantic and syntactic abilities, since they are not the same aspect of language. Similarly, neither auditory acuity nor speech intelligibility are synonymous with deaf or hardof-hearing students' facility in written language.

Phase II: A Comparison of Inter- and Intrasentential Semantic and Syntactic Written-Language Variables When Participants Are Matched According to General Reading Ability

In light of the findings from the previously described factor analyses and recent characterizations of the relationship between written composition and reading comprehension, the investigators asked an additional question: What can written-language abilities reveal about reading comprehension abilities? If a significant relationship exists between reading and writing abilities, written-language studies may provide a vehicle for investigating syntactic and semantic language processes. Characteristics of written-language development may provide clues about undeveloped hierarchical semantic and syntactic language abilities that interfere with reading comprehension.

Yoshinaga-Itano et al. demonstrate in chapter 1 of this monograph that when deaf or hard-of-hearing and normally hearing students are matched on age, intelligence, race, sex, and urban/semi-urban status, there is a significant difference in their written use of clause development and types of propositions and text cohesive devices and in total number of words. Students with normal hearing generally outproduced their deaf or hard-of-hearing peers.

To adequately study reading ability and its relationship to written-language skills, it was important to match deaf or hard-of-hearing students with normally hearing students on all other factors, including reading level.

The low level of reading competence of many of the deaf or hard-ofhearing students, described in chapter 1 of this monograph, contributed strongly to the difficulty of matching the entire sample by reading level and age. This has been a chronic problem in the study of deaf or hard-of-hearing students (Conrad, 1979). Since the average reading comprehension of deaf 18-year-olds remains at the mid-fourth-grade level (Karchmer, 1991), it is not surprising that most studies comparing deaf or hard-of-hearing students and normally hearing students on reading skills match deaf students with younger normally hearing students. Gaines, Mandler, and Bryant (1981) used this type of matching procedure for their two groups and found no difference in language development performance.

While such participant selection practices have been mandated by deaf or hard-of-hearing students' seriously depressed reading scores, one wonders what effect, if any, age differences played between the two groups. Further, though semantic aspects of linguistic competence have been hypothesized to be the most relevant features contributing to the differentiation of readers and nonreaders in the deaf or hard-of-hearing population, minimal information is available concerning semantic relationship development (Kluwin, 1979).

This study included two experiments. The first compared writtenlanguage abilities of 9 normally hearing students matched with 9 deaf or hardof-hearing students on age and reading scores. The second compared written-language abilities of 8 deaf or hard-of-hearing students with 8 younger normally hearing students who had similar reading scores.

Thus, the purpose of these studies was to investigate the relationship between inter- and intrasentential semantic / syntactic variables in deaf or hardof-hearing and normally hearing students' writing when matched by reading ability. It was hypothesized that written-language measures, particularly those that measure semantic language abilities, are highly related to reading comprehension and that more knowledge concerning these language abilities might shed light on why deaf or hard-of-hearing students encounter so many difficulties learning to read.

Method

Participants

In the first study[9] deaf or hard-of-hearing students ages 10 to 14 were matched with 9 normally hearing students from a larger participant pool described below, by age and WJPEB paragraph comprehension subtest scores. In the second study, 8 deaf or hard-of-hearing students (12,13,and 14 years of age) were matched to 8 normally hearing students (9 and 10 years of age) by WJPEB paragraph comprehension subtest scores. Students matched by age and reading ability all demonstrated at least third-grade reading levels.

These students came from a larger sample of 49 deaf or hard-of-hearing students and 49 normally hearing students ages 10 to 15 who participated in an investigation of syntactic and semantic written-language variables (Yoshinaga, 1983). In the larger sample, students were matched by age, IQ sex, and urban/semi-urban status (Yoshinaga, 1983), It was, however, impossible to match the entire sample of 98 students on the basis of reading ability, since the range of reading skills in the deaf or hard-of-hearing sample was considerably limited when compared to the normally hearing sample. The vast majority of deaf or hard-of-hearing students' reading scores were between first- and third-grade achievement levels; however, the normally hearing sample demonstrated reading ability more consistent with their age and grade levels. Only about one sixth of the original deaf or hard-of-hearing sample had hearing peers matched by chronological age and reading scores.

The normally hearing participants comprised 9 of the 49 normally hearing, school-aged students matched for age, urban/semi-urban status, sex, and IQ scores who participated in the series of experiments reported in chapter 1. Hearing screenings conducted at the school confirmed the participants' hearing was in the normal range. The participants had no additional disabilities described in chapter 1 of this monograph. Yoshinaga-Itano determined this criterion based on WISC-R performance. These participants were students in Denver and its surrounding suburbs, as were the deaf or hard-of-hearing participants with whom they were matched.

All deaf or hard-of-hearing students were between ages 10 and 15 and had IQ scores of 80 or above. They had severe to profound sensorineural hearing losses in their better ears. Their hearing impairments were identified before 18 months of age and, therefore, they were presumed to be prelingually deaf. The students were free of any additional disabilities, according to their school records. They resided in either urban or semi-urban areas of Colorado and were educated in public day schools.

Materials

The students were asked to write the best stories they could about the Accident/Emergency picture of the Peabody Language Development Kit. A rapid assessment of general reading level, the cloze procedure in the paragraph comprehension subtest of the WJPEB, was administered to each participant. This subtest involves a reading assessment technique that requires students to respond with a single word to fill blanks in sentences.

Procedure

The reading assessment was administered according to its standardized procedures. Chapter 1 of this monograph describes the testers and their training for this assessment. The written-language sample was then elicited from the participants as described in Phase I of this chapter.

Data Reduction

All data reduction protocols were described earlier in this chapter.

Data Analysis

Participants in the first and second studies in this part of the investigation were matched based on chronological age and raw score on the WJPEB paragraph comprehension subtest and for only paragraph comprehension scores, respectively. Multivariate analyses of variance (MANOVAs) were applied to the written-language variables described earlier in this chapter.

Results and Discussion

Phase I

Yoshinaga (1983) found significant differences by age and hearing status when normally hearing and deaf or hard-of-hearing students were compared based on their use of propositions, cohesive ties, and clause development. Normally hearing students generally outproduced their deaf or hardof-hearing peers. However, when deaf or hard-of-hearing students were matched to their normally hearing peers based on reading ability and chronological age, the differences in the semantic and syntactic variables of the written-language performance between normally hearing and deaf or hardof-hearing students disappeared.

Not only were significant differences not found, but the means and standard deviations of the group were almost identical (see Tables 5 and 6). These included the following variables: total words; total propositions; total cohesions; WPTU; words per main clause; words per subordinate clauses; gerunds, participles, and absolute phrases; modals; prepositional phrases; number of be/have auxiliaries; number of adverbs of time; number of possessive pronouns; number of major propositions; number of minor propositions; reference cohesions; conjunction cohesions; collocation cohesions; ratio of semantic cohesions to total cohesions; ratio of major propositions to total propositions; and ratio of minor propositions to total propositions. These resuits clearly show a strong relationship between the abilities to read and write in normally hearing and deaf or hard-of-hearing students.

Phase II

Unfortunately, as mentioned before, it is almost impossible to find two groups of normally hearing and deaf or hard-of-hearing students who can be matched on both chronological age and reading ability. More commonly, deaf or hard-of-hearing students are matched with younger normally hearing peers who have similar reading levels.

When the deaf or hard-of-hearing students were matched with normally hearing peers according to reading ability but not age there was no significant effect of hearing status on analysis of proportions, analysis of types of cohesive devices and propositions, or analysis of total productivity. However, on analysis of clause development, a significant interaction was found between measure and hearing loss ($F(8,112)=2.52$; $p<.05$), indicating that some differences were present between the performance of the younger normally hearing students and the older deaf or hard-of-hearing students on individual language measures. The nature of this significant interaction was investigated through the Bonferroni t-test, a multiple comparisons post-hoc statistic. The older deaf or hard-of-hearing students produced more WPTU than the younger normally hearing students ($F(1,4)=6.87$; $p<.05$). Similarly, the older deaf or hard-of-hearing students also produced more words per main clause than the younger normally hearing students ($F(1,4)=6.10$; $p<.05$). The mean comparisons of the two groups are depicted in Tables 7 and 8.

When reading was at the third-grade level or above and deaf or hardof-hearing students were matched to normally hearing students based on age and reading scores, all performance differences on written-language measures due to hearing Koss disappeared: however, when deaf or hard-of-hearing students were matched to younger normally hearing students solely based on their reading ability, they differed in number of WPTU and words per main clause. The older deaf or hard-of-hearing students produced significantly more WPTU and words per main clause than the younger normally hearing students. Thus, there was a close relationship between reading level as measured by the WJPEB paragraph comprehension subtest and measures of written language. In addition, there appeared to be a stronger relationship between reading level and the semantic written-language component than between reading level and the syntactic written-language component, since the syntactic component appeared highly related to age.

In conclusion, the findings of the analysis of clause development for the groups matched on the basis of reading alone provided results contradictory to the hypothesis that written-language and reading abilities are highly related regardless of age. It appears that written-language variables that measure syntactic skills are more closely related to age than to reading skills.

Phase III: The Relationship Between Productive Written Language Variables and Communication/ Instructional Methodology

Historically, researchers and educators have questioned the effect of differing communication methods on deaf or hard-of-hearing students' ability to acquire written language. The literature reveals widely discrepant findings.

Unfortunately, comparative studies have not been available on school-aged students. Students who are mainstreamed using oral-aural methodology (Geers & Moog, 1989); students who are enrolled in private oral residential schools (Geers, 1985); students partially included in typical classrooms and in simultaneous communication programs using Signing Exact English (SEE II) (Moeller & Johnson, 1989); deaf children of deaf parents, many of whom are educated in public residential schools for the deaf and use American Sign Language as their primary communication mode (Kamphe & Turecheck, 1987; Meadow, 1978); and students who are fully included in typical classrooms and were educated in an auditory-verbal method (Yoshinaga-Itano & Pollack, 1987) all demonstrate that, given the appropriate student and environmental variables, deaf or hard-of-hearing students can achieve at levels commensurate with normally hearing peers. Geers and Moog (1992) compared a sample of 227 16- to 17-year-old students with profound hearing losses from oral environments to 127 students from total communication programs. Participants matched by age, unaided residual hearing, and IQ showed that students from oral programs had more intelligible speech than did total communication students. However, the total communication students were from residential schools and from families representing a wide range of socioeconomic levels. The oral students were predominantly fully included in typical classrooms and from families with middle- and upper-middle-class income levels, and many had parents with advanced college degrees.

In light of these equivocal findings, it seemed that the data from the present investigation might clarify some of the issues. Further, since participants from this sample roughly apportioned themselves into the two dominant methodological approaches of choice in this decade, the sample offered an ideal opportunity to examine the effect of primary communicative method on the semantic and syntactic aspects of written language.

Method

Participants

46 of the 49 deaf or hard-of-hearing students communicated and were instructed through an oral-aural or simultaneous communication method. The communication methods of 3 participants were unreported. Twenty-one of the 49 students used sign language, speech, and audition to communicate. These students comprised a simultaneous/total communication group. Twenty-five of the 49 students used speech, auditory skills, and lipreading to communicate. These students comprised the oral-aural group. Data Analysis

A two-factor repeated measures analysis of variance using the Biomedical Computer Program was run to examine the effects of the between participants factor, methodological group, and the within participants factor, language measure. There were two groups: oral-aural and simultaneous communication. Five repeated measures written-language variables were examined: (1) WPTU, (2) total propositions, (3) total major propositions, (4) total minor propositions, and (5) total collocation cohesions.

Results and Discussion

The two-factor repeated measures analysis of variance yielded no significant differences for either the between participants factor of methodological group ($F(1,44)=.04$, $p=.84$) or the within participants factor of language measure ($F(4,176)=.02$, $p=.92$). The means of the groups were almost identical, as shown in Table 9. Other psychoeducational variables (IQ, age, and reading comprehension) also were similar. The only major difference between the two groups was the better ear PTA. The oral-aural group had better hearing than the total communication group. These data are depicted in Table 10.

These data indicate, then, that communicative methodology did not seem to be the significant factor in comparing students' written-language performance. Further, students did not differ in their performance on the writtenlanguage measure by individual measure, nor were there any significant interactions between group membership and written-language measure.

Summary and Conclusions

This investigation examined the relationship among the semantic aspects of written language and other psychoeducational variables, including reading and the effect of communication method on semantic and syntactic aspects of productive written language.

The primary contribution of the initial factor analysis in this investigation was its clear demonstration of the sensitivity of semantic written-language variables to variance in the deaf or hard-of-hearing population. These data support the contention that a new direction is warranted in the emphasis of written-language research for deaf or hard-of-hearing and normally hearing students. It is important to know that our ideas about written language must be expanded to include semantic aspects and that deaf or hard-of-hearing students' language competence is not yet completely understood. In fact, there remains, as yet, an unexplored region of study: emphasis on meaning of the whole, rather than dissecting parts. Kretschmer and Kretschmer (1978,1988) and de Villiers (1991) recommended more thorough investigation of semantic aspects of deaf or hard-of-hearing students' language. Such an emphasis on semantics could have significance for studies of reading, written language, and oral and signed language. Yoshinaga-Itano and Downey (1992) examined the prerequisite semantic characteristics of deaf or hard-of-hearing students' writing for inclusion of story-grammar proposition information. The study of story-grammar propositions was an outcome of the results of the studies reported in this chapter.

The second pair of analyses in which the deaf or hard-of-hearing students were matched, first for age and reading level then for reading level alone, yielded contradictory findings to commonly held assumptions that written-language and reading levels are highly related regardless of age. When participants were matched for age and reading level, no significant differences were found between the groups' performances. When they were matched for reading level, the groups differed significantly on the syntactic variables, which seem to mature with advancing age, regardless of reading ability. This interaction is of considerable interest, since it demonstrates the association of the semantic variables to reading comprehension, reinforcing our ideas about the nature of discourse processing. It suggests that the hallmarks of semantic maturity (i.e., increased number of propositions and cohesive devices) are related to advances in deaf or hard-of-hearing students' reading comprehension, just as they are in normally hearing students' (Scardamalia & Bereiter, 1984).

The findings of the final analysis reveal that, despite continuing claims made by advocates for oral-aural or simultaneous communication for the instruction of deaf or hard-of-hearing students, the instructional/communication method does not significantly affect students' performance in the lexical/semantic characteristics of their written language. It may be that productive written language is acquired in such a way that students need have only one well-formed language to acquire the written manifestation of the system. Further, since both the aural-oral and simultaneous communication methods map onto spoken English, both may provide students with sufficient bases from which to learn written English. On the other hand, experiments in which regular paragraph silent-reading comprehension is measured in a traditional text format with accompanying comprehension questions instead of using a cloze technique may yield different insights from those observed here.

The results support the idea that lexical/semantic expressive language characteristics may provide the most important information for improving reading comprehension ability in students with hearing losses (Davis et al., 1986; Geers & Moog, 1989; Kroese et al., 1986). Further in-depth study comparing lexical/semantic written-language variables with vocabulary knowledge and skills assessed by the WISC-R verbal scale may provide important information. Reading comprehension ability is significantly more complex than skills measured by general-ability cloze-type reading assessments. In-depth information about semantic aspects of reading comprehension should be compared with the development of inter- and intrasentential semantic variables but also should include variables that investigate written composition as a whole, such as story grammar.

Table 1. Means (Standard Deviations) of Test Scores by Age for: the TSA, the TACL, the WJPEB Paragraph Comprehension Subtest (WJPE13-PC), and the Clarke Test

Age in Years	TSA Mean (SD)	TACL Mean (SD)	WJPEB-PC Mean (SD)	The Clarke Test Mean (SD)
10	--	85.7 (10.0)	9.0 (4.2)	27.5 (34.3)
11	78.8 (21.4)	90.2 (2.9)	9.8 (2.4)	47.4 (45.0)
12	71.0 (27.3)	90.0 (8.4)	10.7 (4.2)	62.6 (30.4)
13	78.8 (22.0)	90.2 (7.6)	12.0 (4.6)	61.4 (27.8)
14	73.3 (24.6)	88.7 (10.3)	11.2 (4.2)	57.4 (30.2)

Table 2. Means (Standard Deviations) of Test Scores by Age for: the Vineland Scale, the WJPEB Proofing and Calculation Subtests, and Number of Hours of Special Education Services

Age in Years	The Vineland Scale	WJPEB Proofing Subtest	WJPEB Calculation Subtest	Number of Hours of Special Services
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
10	81.0 (4.3)	7.3 (7.7)	15.4 (4.6)	364.4 (167.5)
11	85.2 (6.3)	9.0 (5.7)	16.8 (2.2)	302.2 (185.3)
12	86.5 (3.9)	8.7 (3.6)	17.2 (5.1)	358.8 (166.7)
13	90.7 (4.6)	10.2 (3.9)	18.8 (6.3)	279.8 (189.8)
14	92.5 (32)	7.6 (4.6)	20.8 (3.5)	371.2 (324.9)

Table 3. Sorted Rotated Factor Loadings for Variables Comprising Each Factor (Factor Loadings Less than .250 are Reported as .000)

Variables	Factor I Semantics	Factor II Syntax	Factor III Hearing/ Speech	Factor IV Cognitive Performance
PTA	.000	.000	.889	.000
Speech Intelligibility	.000	-.846	-.846	.000
IQ	.000	.000	.000	.825
Age	.000	.000	.000	-.765
Special Education Hours	.000	-.598	.000	-.407
TSA	.000	.775	.000	.000
TACL	.000	.796	.000	.000
WPTU	.308	.797	.000	.000
Major				

Propositions	.922	.000	.000	.000
Minor Propositions	.909	.300	.000	.000
Total Cohesions	.962	.000	.000	.000
Collocation Cohesions	.775	.423	.000	.000

Table 4. Eigenvalues and Proportion of Variance for the Four Factors

Factor	Eigenvalues	Cumulative Proportion of Total Variance
Semantics	4.36	.36
Syntax	2.25	.55
Hearing/Speech	1.59	.68
Cognitive Performance	1.06	.77

Table 5. Means and Standard Deviations (SD) of Normally Hearing and Deaf or Hard-of-Hearing Students Matched on Reading Ability and Age for Text Cohesions and Propositions

Language Variable	Normally Hearing Means (SD)	Deaf or Hard-of-Hearing Means (SD)
Number of Subordinate Clauses	4.6 (4.0)	4.3 (4.7)
NumberofT-Units	11.7 (6.2)	12.9 (7.9)
Number of Major Propositions	27.9 (16.7)	20.7(14.5)
Number of Minor Propositions	40.1 (30.8)	35.4(27.8)
Number of Reference Cohesions	28.3 (15.5)	26.1(19.8)
Number of Lexical Cohesions	8.7 (7.5)	10.3 (8.6)
Number of Collocation Cohesions	5.3 (3.5)	5.2 (4.5)
Number of Conjunction Cohesions	6.2 (3.5)	7.4 (4.5)
Total Words	118.0 (62.0)	132.0 (90.7)
Total Propositions	54.8 (36.3)	58.2 (40.7)
Total Cohesions	45.1 (23.6)	49.6 (36.3)
Major Propositions/ Total Propositions	39.6 (3.7)	39.1 (7.7)
Minor Propositions/ Total Propositions	50.4 (3.7)	47.9 (9.4)
Syntactic Cohesions/ Total Cohesions	55.9 (7.9)	56.6 (4.7)

Semantic Cohesions/ Total Cohesions	33.3 (7.5)	33.3 (4.5)

Table 6. Means and Standard Deviations (SD) for Normally Hearing and Deaf or Hard-of-Hearing Students Matched on Reading Ability and Age for Clause Development

Language Variable	Normally Hearing Means(SD)	Deaf or Hard-of-Hearing Means(SD)
Syntactic Density Score	29.4 (9.8)	29.8 (9.7)
Number of WPTU	10.4 (2.1)	10.4 (2.3)
Number of Words per Main Clause	8.3 (1.9)	8.5 (2.6)
Number of Words per Subordinate Clause	5.5 (1.2)	5.4 (2.9)
Number of Modals	1.0 (1.7)	1.4 (1.3)
Number of Be/Have Auxiliaries	4.6 (3.8)	4.3 (3.6)
Number of Prepositional Phrases	8.6 (3.8)	11.6 (9.2)
Number of Possessive Pronouns	3.4 (2.5)	3.7 (2.7)
Number of Adverbs of Time	3.9 (3.9)	2.0 (2.6)
Number of Gerunds/ Participles	2.7 (2.1)	4.2 (4.4)

Table 7. Means and Standard Deviations (SD) for Normally Hearing and Deaf or Hard-of-Hearing Students Matched on Reading Ability but Not Age for Text Cohesions and Propositions

Language Variable	Normally Hearing Means (SD)	Deaf or Hard-of-Hearing Means (SD)
Number of Subordinate Clauses	1.8 (1.6)	3.4 (4.3)
NumberofT-units	9.3 (4.3)	12.3 (7.5)
Number of Major Propositions	12.0 (8.4)	18.6 (11.9)
Number of Minor Propositions	23.3 (14.2)	35.3 (27.8)
Number of Reference Cohesions	15.6 (8.7)	26.0 (20.5)
Number of Lexical Cohesions	4.4 (3.7)	9.6 (8.4)
Number of Collocation		

Cohesions	3.0 (1.8)	5.1 (4.5)
Number of Conjunction Cohesions	5.9 (3.2)	7.8 (4.7)
Total Words	122.8 (86.8)	74.1 (32.2)
Total Propositions	53.9 (37.1)	37.8 (19.8)
Total Cohesions	48.6 (36.9)	28.9 (13.9)
Major Propositions/ Total Propositions	38.5 (4.7)	37.0 (4.6)
Minor Propositions/ Total Propositions	52.5 (4.7)	48.4 (9.0)
Syntactic Cohesions/ Total Cohesions	61.5 (6.6)	56.7 (5.1)
Semantic Cohesions/ Total Cohesions	28.5 (6.6)	33.9 (6.2)

Table 8. Means and Standard Deviations (SD) for Normally Hearing and Deaf or Hard-of-Hearing Students Matched on Reading Ability but Not Age for Clause Development

Language Variable	Normally Hearing Means (SD)	Deaf or Hard-of-Hearing Means (SD)
Syntactic Density Score	27.5 (4.9)	29.6 (9.8)
WPTU	7.6 (1.2)	10.2 (2.5)*
Number of Words per Main Clause	6.7 (0.9)	9.0 (2.4)*
Number of Words per Subordinate Clause	4.9 (2.8)	4.6 (3.5)
Number of Modals	0.4 (0.5)	1.6 (1.3)
Number of Be/Have Auxiliaries	2.1 (1.9)	4.1 (3.9)
Number of Prepositional Phrases	5.1 (2.9)	10.8 (9.3)
Number of Possessive Pronouns	1.9 (1.7)	3.1 (2.7)
Number of Adverbs of Time	3.5 (3.8)	1.9 (2.6)
Number of Gerunds/ Participles	2.3 (2.1)	3.4 (3.4)

[*]p<.05

Table 9, Means and Standard Deviations (SD) of Test Scores by Instructional Methodology for the WJPEB Paragraph Comprehension Subtest, the TACL, the TSA, and the Clarke Test

Instructional Method	WJPEB Paragraph Comprehension	TACL	TSA	The Clarke Test

	Subtest Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Total Communication	10.0 (3.4)	88.8 (9.8)	73.5 (22.7)	36.7 (28.6)
Oral-Aural	11.2 (4.6)	89.0 (7.1)	77.0 (25.2)	67.3 (31.3)

Table 10. Means and Standard Deviations (SD) of Age, IQ Scores[*] and Better Ear PTA by Instructional Methodology (Oral-Aural or Total Communication/ Simultaneous Communication)

Method of Instruction	Age Mean (SD)	IQ Mean (SD)	Better Ear PTA Mean (SD)
Total Communication	12.2 (1.5)	105 (12.0)	94.8 (11.6)
Oral-Aural	12.8 (1.3)	107 (16.4)	86.8 (13.6)

[*] IQ scores were reported in school records: 80% were from the WISC-R and 20% were from the Leiter International Performance Test or Hiskey Nebraska Test of Learning Abilities

Table 11. Means and Standard Deviations (SD) of Deaf or Hard-of-Hearing Students Instructed in Oral-Aural and Total Communication Methods

	Oral-Aural Means (SD) (N=26)	Total Communication Means (SD) (N=21)
WPTU	8.14 (2.29)	7.3 (1.9)
Total Propositions	47.0 (32.4)	46.4 (35.4)
Total Major Propositions	20.6 (12.9)	20.6 (14.0)
Total Minor Propositions	26.4 (21.4)	25.8 (22.4)
Total Collocations	3.9 (3.5)	3.3 (2.6)

References

American National Standards Institute. (1970). Specifications for audiometers (ANSI S3.6-1969). New York: American National Standards Institute.

Bereiter, C., & Scardamalia, M. (1987). The psychology of written composition. Hillsdale, NJ: Erlbaum.

Carrow-Woolfolk, E. (1973). Test of auditory comprehension of language. Boston: Teaching Resources.

Center for the Assessment of Demographic Studies. (1991). Stanford achievement test (8th ed.): Hearing-impaired norms booklet. Washington, DC: Gallaudet University, Gallaudet Research Institute, Center for the Assessment of Demographic Studies.

Conrad, R. (1979). The deaf school child. London, UK: Harper & Row.

Davis, J.M., Elfenbein, J., Schum, R., & Bentler, R.A. (1986). Effects of mild and moderate hearing impairments on language, educational, and psychosocial behavior of children. Journal of Speech and Hearing Disorders, 5I(1), 53-62.

Davis, J.M., Shepard, N.T., Stelmachowicz, EG., & Gorga, M.E (1981). Characteristics of hearing-impaired children in the public schools: Part II psychoeducational data. Journal of Speech and Hearing Disorders, 46(2), 130-137.

de Villiers, P. (1991). English literacy development in deaf children: Directions for research and intervention. In J. Miller (Ed.), Research on child language disorders: A decade of progress (pp. 349-378). Austin, TX:PRO-ED.

Dixon, W.J., & Brown, M.B. (Eds.). (1979). BMDP biomedical computer programs P-series. Los Angeles: University of California Press.

Doll, E. (1965). Vineland social maturity scale: Manual of directions. Circle Pines, MN: American Guidance Service.

Gaines, R, Mandler, J., & Bryant, P. (1981). Immediate and delayed story recall by hearing and deaf children. Journal of Speech and Hearing Research, 24, 463-469.

Geers, A. (1985). Assessment of hearing-impaired children: Determining typical and optimal levels of performance. In Powell, E, Finitzo-Heiber, T., FrielPatti, S., & Henderson, D. (Eds.), Education of the hearing-impaired child (pp. 57-82). San Diego, CA: College Hill Press.

Geers, A., & Moog, J. (1987). Factors predictive of reading and writing skills in the congenitally deaf: Report of the oral sample (NIH-NINCDS Report No. 83-19). Bethesda, MD: National Institutes of Health.

Geers, A., & Moog, J. (1989). Factors predictive of the development of literacy in profoundly hearing-impaired adolescents. The Volta Review, 91, 69-86.

Geers, A.E., & Moog, J.S. (1992). Speech perception and production skills of students with impaired hearing from oral and total communication education settings. Journal of Speech and Hearing Research, 35, 1384-1393.

Glenn, C., & Stein, N. (1980). Syntactic structures and real world themes in stories generated by children (Tech. Rep.). Urbana, IL: University of Illinois, Center for the Study of Reading.

Golgar, D., & Osberger, M.J. (1986). Factors related to academic achievement. In M.J. Osberger (Ed.), Language and learning skills of deaf or hard-ofhearing students, ASHA Monograph, 23, 87-98.

Gormley, K.A., & McGill-Franzen, A. (1978). Why can't the deaf read?: Comments on asking the wrong question. American Annals of the Deaf, 123, 542-547.

Halliday, M.A.K., & Hasan, R. (1976). The cohesion of English. London, UK: Longman.

Hiskey, M.S. (1966). Manual for the Hiskey-Nebraska Test of Learning Aptitude. Lincoln, NE: Union

College Press.

Hunt, K.W. (1965). Grammatical structures written at three grade levels (National Council of Teachers of English Research Rep. No. 3). Champaign, IL: National Council of Teachers of English.

Jensema, C.J., & Trybus, R.J. (1978). Communication patterns and educational achievement of hearing impaired students (Series T, No. 2). Washington, DC: Office of Demographic Studies.

Kamphe, C.M., & Turecheck, A.G. (1987). Reading achievement of prelingually deaf students and its relationship to parental method of communication: A review of the literature. American Annals of the Deaf, 132, 11-15.

Karchmer, M. (1991,February). Educational outcomes and achievement levels. Presentation at Joint National Association of State Directors of Special Education-Conference of Executives of Schools for the Deaf on the Status of Education of the Deaf in the United States, Las Vegas, NV.

Kintsch, W. (1974). The representation of meaning in memory. Hillsdale, NJ: Erlbaum.

Kintsch, W. (1977). Reading comprehension as a function of text structure. In A.S. Reber & D.L. Scarborough (Eds.), Toward a psychology of reading (pp. 227-256). Hillsdale, NJ: Erlbaum.

Kintsch, E. (1991). Macroprocesses and microprocesses in the development of summarization skill. Cognition and Instruction, 7(3), 161-195.

Kintsch, W., & Vipond, D. (1979). Reading comprehension and readability in educational practice. In L.G. Nilsson (Ed.), Perspectives on memory research (pp. 329-365). Hillsdale, NJ: Erlbaum.

Kluwin, T.N. (1979). The effects of selected errors on the written discourse of deaf adolescents. Directions, 1(2), 46-53.

Kretschmer, R.R., & Krestchmer, L.W. (1978). Language development and intervention with the hearing impaired. Baltimore: University Park Press. Kretschmer, R.R., & Kretschmer, L W (1988). Communication assessment of deaf or hard-of-hearing children: From conversation to classroom. The Journal of the Academy of Rehabilitative Audiology Monograph Supplement, 21,5--17.

Kroese, J., Lotz, W., Puffer, C., & Osberger, M.J. (1986). Academic skills. ASHA Monograph, 23, 66-76.

LaSasso, C., & Davey, B. (1987). The relationship between lexical knowledge and reading comprehension for prelingually, profoundly hearing-impaired students. The Volta Review, 89, 211-220.

Leiter, R.G. (1959). Leiter international performance scale. Chicago: Stoelting.

Madden, R., Gardner, E.E, Rudman, H.C., Karlsen, B., & Merwin, J. (1972). Stanford achievement test. New York: Psychological Corporation/Harcourt Brace Jovanovich.

Mandler, J.M. (1978). Acode in the node: The use of story schema in retrieval. Discourse Processes, 1, 14-35.

Mandler, J., & Johnson, R. (1977). Remembrance of things parsed: Story structure and recall. Cognitive Psychology, 9, 111-151.

Manger, R.E. (1972). A speech intelligibility test for deaf children. Northampton, MA: Clarke School for the Deal

Meadow, K.E (1978). The natural history of a research project: An illustration of methodological issues in research with deaf children. In L.S. Liben (Ed.), Deaf children: Developmental perspectives (pp. 21-40). New York: Academic Press.

Moeller, M.P., & Johnson, D.L. (1989). Language skills of deaf students using manually coded English. Symposium conducted at the American Speech-LanguageHearing Association Convention, St. Louis, MO, and Second Annual Symposium for Educators of the Hearing Impaired, Denver, CO.

Moores, D. (1987). Factors predictive of literacy in deaf adolescents. (NIH-NINCDS Rep. No. 83-19). Bethesda, MD: National Institutes of Health.

Myklebust, H.R. (1965a). Development and disorders of written language. New York: Grune & Stratton.

Myklebust, H. (1965b). Picture story language test. New York: Grune & Stratton.

Osberger, M.J. (Ed.). (1986). Language and learning skills of hearing impaired students. ASHA Monograph, 23.

Peabody Language Development Kit. (1977). Circle Pines, MN: American Guidance Service.

Quigley, S., Steinkamp, M., Power, D., & Jones, B. (1978). Test of syntactic abilities. Beaverton, OR: Dormac.

Scardamalia, M., & Bereiter, C. (1984). Development of strategies in text processing. In H. Mandl, N.L. Stein, & T. Trabasso (Eds.), Learning and comprehension of text (pp. 379-406). Hillsdale, NJ: Erlbaum.

Stein, N., & Glenn, C. (1979). An analysis of story comprehension in elementary school children. In R. Freedie (Ed.), New directions in discourse processing (pp. 53-120). Norwood, NJ: Ablex.

Thorndyke, E (1977). Cognitive structures in the comprehension and memory of narrative discourse. Cognitive Psychology, 9, 77-110.

Turner, A., & Greene, E. (1978). The construction and use of a propositional text base. (Ms. No. 1713) JSAS Catalogue of Selected Documents in Psychology. Washington, DC: American Psychological Association.

Wechsler, D. (1974). Wechsler Intelligence Scale for Children-Revised. San Antonio, TX: Psychological Corporation.

Woodcock, S., & Johnson, M. (1979). Psychoeducational battery. Circle Pines, MN: American Guidance Service.

Yoshinaga, C. (1983). Syntactic and semantic characteristics in the writtenlanguage of hearing impaired and normally hearing school-aged children. Unpublished doctoral dissertation, Northwestern University, Evanston,IL.

Yoshinaga-Itano, C., & Downey; D. (1992). When a story is not a story: A process analysis of the written language of hearing-impaired children. The Volta Review, 94, 131-158. Yoshinaga-Itano, C., Downey, D., & Snyder, L. (1990). An approach to analyzing narratives in a hearing-impaired population. Presentation conducted at the American Speech-Language-Hearing Association Convention, Seattle, WA.

Yoshinaga-Itano, C., & Pollack, D. (1987,November). A retrospective study of children in the acoupedic method. Denver, CO: Listen Foundation.

~~~~~~~~

By Christine Yoshinaga-Itano, Lynn S. Snyder, and Rachel Mayberry

Dr. Yoshinaga-Itano is an assistant professor in the communication disorders speech sciences department at the University of Colorado, Boulder, CO

Dr. Snyder is a professor in the department of communicative disorders at California State University, Long Beach, CA

Dr. Mayberry is an assistant professor in the school of human communication disorders at McGill University, Montreal Quebec, Canada
~~~~~~~~