

NTID RESEARCH BULLETIN

Center for Research, Teaching and Learning · National Technical Institute for the Deaf · Rochester Institute of Technology

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For those of you who have not had the opportunity to visit NTID, the cover of this issue of the BULLETIN offers a view of the College's new Learning Center, completed this past August in time to open for the new academic year.

Throughout this issue are other photos of the Learning Center.

Politically Correct Research?

We are sometimes told that research into differences between deaf and hearing people is inappropriate and potentially misleading. Maybe--but we have now seen enough such comparisons to know that some consistent, real differences do emerge. Do we ignore them because the research is not politically correct? No. Do we ignore them because the differences are meaningless? If they are meaningless, yes. But how do we know? For that, we would need to examine variation across a range of individuals--deaf and hearing-- and determine what underlies those differences. Then, we can know whether or not they have any significance. We have to keep in mind, however, that a "difference" does not necessarily imply "better" or "worse." Any such differences are unlikely to be "simply" a matter of hearing status, language preference, parental communication fluency, or the like. Life is not that simple!

Let's take a walk through a real mine field: Intelligence. We know that many early IQ tests were biased against anyone who lacked the socio-cultural experiences of hearing, white, middle-class suburbia. They were not culture-fair for minority children who came from urban, often disadvantaged early environments; they certainly were not at all fair for deaf children. Now we have new tests that are language-independent and culture-independent, at least within some clearly defined limits. Even so, when deaf and hearing children are shown to have equivalent IQs according to one of these (usually nonverbal) tests, the deaf children often lag behind in school-related academic performance. I am told (usually by hearing people) that such research is "inappropriate," "audist," and a reflection of the oppression of deaf people by the hearing majority. Nonsense! Such findings suggest that there are factors other than intelligence that influence academic achievement in deaf children, nothing more, nothing less.

The same controversy arises in discussions of the value of spoken English versus Signed English versus ASL as a first language for deaf children. (Now we're really getting hot!) Some investigators have argued that the use of English and Signed English should be "suppressed" [sic] in educating deaf children. Others have argued that learning ASL as a first language will impede deaf children's acquisition of spoken or written English. Sorry, but I don't see any valid research findings that support either position. As I see it, the concern here should be the influence of a child's first language on subsequent cognitive and social growth: deaf children must have available a broad array of educational opportunities. There is not a single correct decision.

What I make of all this is that each of us must be true to our own principles. For researchers, the primary bases for those principles must lie in data--not our personal experiences, not our personal preferences, but the facts. As a scientist, I need to set aside irrational criticism. Personally, my goal is to fully understand the cognitive, language, and social functioning of deaf students and to ensure that such information is used to optimize their academic, personal, and career potentials. If I need to ask some politically unpopular questions to accomplish this...so be it.



[Marc Marschark](#)

Director, CRTL



More than 160 hours of tutoring support were available in the Learning Center to students during fall quarter. Tutoring is provided by full-time and adjunct faculty, and by advanced students selected and mentored by faculty to provide tutorial support for more entry-level students. Two Tutoring Initiatives will help illuminate the teaching / learning dynamics associated with effective tutoring, and help stimulate community-wide dialogue and visibility regarding the "craft of tutoring."

Acoustic and Perceptual Features of Speech Produced During Simultaneous Communication

by Robert Whitehead



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A program of research has been undertaken at NTID to study the acoustic and perceptual characteristics of speech which is produced during simultaneous communication. This research is a collaborative effort which includes Brenda Whitehead from the Department of Speech/Language at NTID, and Nicholas Schiavetti and Dale Metz from the State University of New York, Geneseo.

Description of Simultaneous Communication

Simultaneous communication (SC) is a form of communication between deaf and hearing persons that combines speech and manually coded English (sign and fingerspelling) and necessitates the production of each word of an utterance using both spoken and manual modalities (Akamatsu & Stewart, 1989; Maxwell & Bernstein, 1985). Theoretically, there are at least two reasons for the use of SC with children who are deaf. The first is that SC is thought to enhance the development of English language skills by the simultaneous representation of English through both spoken and manual channels (Marmor & Petitto, 1979; Strong & Charlson, 1987). Secondly, it is believed that SC can expose deaf children to the segmental and suprasegmental features of speech, thereby enhancing the development of oral communication skills (Vernon & Andrews, 1990).

Although research on SC has provided some information regarding its relative advantages and disadvantages, more research is needed to examine the quality of the speech model presented to deaf and hard-of-hearing children while using SC. Empirical information regarding segmental and suprasegmental features of speech produced during SC would provide useful information regarding synchronization of two modes of communication and the possible effects of speech production differences during SC on the acquisition of speech features by children who are deaf.

Prior to the initiation of our research, there had been limited data reported in the literature regarding speech produced in conjunction with sign language. For example, elongation of speech segment durations and slowing of speech rate have been reported by Bellugi and Fischer (1972) for speech combined with American Sign Language, Windsor and Fristoe (1991) for speech combined with Key Word Signing (where only the most meaningful words are signed, e.g., base nouns, base verbs, adjectives), and Huntington and Watton (1984), who described the speech of three teachers who used speech and signed English in a total communication classroom with deaf children.

Initial Research

The purpose of our initial investigation (Whitehead, Schiavetti, Whitehead, & Metz, 1995a) was twofold: to determine if there are changes in specific temporal characteristics of speech that occur during SC, and to determine if known temporal rules of spoken English are disrupted during SC. Ten hearing speakers skilled in SC uttered sentences consisting of the carrier sentence, "I can say . . . again," with embedded experimental CVC (consonant-vowel-consonant) words. The sentences were produced under conditions of speech, speech combined with signed English, and speech combined with signed English for every word except the CVC word, which was fingerspelled. The experimental CVC words consisted of: job/hop, god/hot, fib/rip, kid/hit. The temporal features investigated included sentence duration, experimental CVC word duration, vowel duration in experimental CVC words, interword intervals before and after experimental CVC words, and consonantal effects of vowel duration.

The results indicated that for all durational measures, the speech/sign/fingerspelling task was longest, followed by speech/sign task, with the speech task being shortest. It was also found that for all three speaking conditions, vowels were longer in duration when preceding voiced consonants than when vowels preceded their voiceless cognates, and that a low vowel was longer in duration than a high vowel. These findings indicate that although speakers consistently reduce their rate of speech when using SC, they do not violate the specific temporal rules of English regarding consonant effect on vowel duration or vowel height effect on vowel duration. Both of these rules are important for consonant and vowel perception.

Subsequent Research

In a following study (Schiavetti, Whitehead, Metz, Whitehead, & Mignerey, 1996) we investigated speaking rate and voice onset time (VOT) during SC by hearing speakers. VOT is the interval of time between the release of a voiced or voiceless stop-plosive consonant (e.g., b/p, t/d, k/g) and the onset of voicing of the following vowel. Stimulus words initiated with voiced and voiceless plosives were embedded in a sentence that was spoken and produced with SC. VOT measures were calculated from acoustic recordings; results indicated significant differences between speech-only and SC conditions, with speech produced during SC demonstrating both slower speaking rate and increased VOT of voiceless consonants. VOTs produced during both SC and speech-only conditions followed English voicing rules and varied appropriately with place of articulation. The enlarged voicing contrast during SC was consistent with previous findings regarding influence of rate changes on the temporal fine structure of speech (Miller, 1987) and was similar to the voicing contrast results reported by Picheny, Durlach, and Braida (1986) in their work on "speaking clearly for the hard of hearing."

Since signs vary in their amount of movement, e.g., complexity, we decided to investigate the effect of the signing task on temporal features of speech during SC (Whitehead, Schiavetti, Whitehead, & Metz, 1996). The effects of three independent variables:

- communication mode: speech only vs. SC,
- sign task demand: base vs. elaborated signs (e.g., father vs. grandfather), and
- type of sign movement: kinetic (where the handshape stays the same, e.g., father - grandfather) vs. morphokinetic (where the handshape changes, e.g., think - believe)

...were studied on five dependent variables:

- word duration,
- sentence duration,
- diphthong duration,
- interword-interval before signed experimental word, and
- interword-interval after signed experimental word.

Speakers were twelve hearing, experienced sign language users. There were 40 experimental words which were embedded in the carrier sentence, "I can say . . . again," and which were produced in speech only and in SC conditions.

Results indicated temporal disruptions of longer sentence durations for SC than speech only, and longer anticipatory durations of interword-interval-before and diphthong-before signed words, especially those involving signs with greater task demand or with movements including handshape changes. These results indicate finite effects of sign task demand and movement on pause and segment durations before production of the sign during SC.

In typical SC, the communicator uses signs most of the time and depends on fingerspelling, which is slower than signing, for words that do not have a sign. These fingerspelled words are usually either orthographically multisyllabic or contain a large number of letters, requiring more finger/hand articulations, thus increasing the difficulty of the manual task in SC.

Our next study (Whitehead, Schiavetti, Whitehead, & Metz, 1995b), investigated both acoustic and perceptual features of speech during SC which consisted of words that increased in fingerspelling complexity. Specifically, this study investigated the effect of fingerspelling task length on temporal characteristics and perceived naturalness of speech produced during SC. Stimulus words at four levels of fingerspelling task length (e.g., care, careless, carelessly, carelessness) were each embedded in a carrier sentence that was spoken and produced with SC. In the SC condition, the carrier sentence was signed

while the stimulus words were fingerspelled. Five temporal measures were calculated from acoustic recordings and perceived speech naturalness was rated by a panel of listeners using a 9-point scale.

Results indicated significant differences in temporal measures and naturalness ratings between the speech and SC conditions and among levels of fingerspelling task length (complexity). Speech produced during SC was rated less natural and demonstrated increased interword-interval, diphthong, word, and sentence durations. Regression analysis indicated significant correlations between temporal measures and perceived speech naturalness and analysis of variance showed significant increases in segmental and interword-interval durations and perceived speech unnaturalness as fingerspelling task length increased.

To further investigate the perceptual features of SC, we studied the perception of final consonant voicing in speech produced during SC (Metz, Schiavetti, Lessler, Laws, Whitehead, & Whitehead, 1996). This study investigated the potential influence of alterations in the temporal structure of speech produced during SC on the perception of final consonant voicing. Experienced signers recorded six pairs of experimental CVC English words, which were embedded in a sentence, under conditions of speech alone and SC. Each pair of CVCs differed only in the voicing characteristic of the final consonant (e.g., hit vs. hid, but vs. bud, etc.). The words were digitally edited to remove the final consonant and played to 20 listeners who, in a forced-choice paradigm, circled the word they thought they heard. Results indicated that even though the vowel durations were greater in the SC condition, the judges accurately identified the voicing characteristics of the final consonants. Thus it appears that although temporal disruptions occur during SC, these disruptions do not affect the perception of specific consonants.

Results and Conclusions

In general, the results of our research to this point in time indicate that there are temporal disruptions which occur in speech which is combined with sign language in SC. Some of the temporal elongations, however, continue to follow the temporal rules of spoken English such as consonant effect on vowel duration and vowel duration according to vowel height. Other temporal disruptions, particularly interword-intervals before and after the experimental words (e.g., words with varying fingerspelling or sign complexity), play a significant role in the overall elongation of speech during SC and its perceived naturalness. Our research, and the research on Key Word Signing by Windsor and Fristoe (1991) indicate that prolonged interword-intervals before certain signed or fingerspelled words indicates greater planning time to complete the more complex signed/fingerspelling task. Our data also indicate that prolonged interword-intervals after certain signed or fingerspelled words signify an attempt by the speaker in SC to equalize the time difference between the manual and speech tasks and thus maintain as high a degree of simultaneity as possible. Thus it appears that in SC the speaker is slowing the faster task of speech to approximate the rate of the slower task of signing.

It should be noted that at least two other speaking conditions involve changes in temporal speech characteristics, similar to those found in SC, which might be perceived as unnatural, but may accomplish important communication tasks. These conditions are: persons speaking more clearly to communicate with hard-of-hearing listeners (Picheny, Durlach, & Braida, 1986) and mothers speaking to young children, e.g. "motherese" or "parentese" (Snow & Ferguson, 1977; Swanson, Leonard, & Gandour, 1992). Both of these conditions involve reduction of speech rate and increased vowel duration. With respect to young children, it is believed that these speech alterations are among a larger constellation of "parentese" behaviors that are thought to help facilitate speech and language development in children. Further, these same alterations have been described in speech that is consciously altered to be more intelligible to hearing impaired listeners (Picheny, Durlach, & Braida, 1986). It is our belief that comparisons between speech produced during SC, speech produced by mothers speaking to young children, and speech produced by persons speaking to listeners with hearing loss should be investigated in future research.

Our research is contributing to the data base on dual-task activities and demonstrates, on both an acoustic and perceptual level, the effect of attempting to combine the two distinct and different motor tasks of speech and sign language/fingerspelling. It is believed that the application of these data, and other data which we are presently collecting, could improve our ability to communicate effectively between hearing and deaf persons, as well as to provide an accurate speech model for the deaf child.

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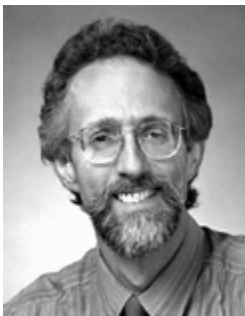
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The NTID Learning Center is open more than 75 hours per week during each quarter. Uses, primarily by students, include work related to academic courses and educational workshops, student clubs and organizations, and "personal business." More information is available on the Learning Center Web Page, <http://www.rit.edu/NTID/CSR/nlc/>

The Assessment of Writing and Access to College Degree Programs

by John Albertini, Joseph Bochner, and Fred Dowaliby



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At NTID, deaf and hard-of-hearing students' access to associate and baccalaureate degree programs is often delayed because of their English language and literacy skills. Most deaf students on our campus are placed in developmental English courses until they are eligible to enter the required Freshman composition course, which they must pass to enter most degree programs at NTID and RIT. For many, preparation for degree programs takes two years; for those unable to get into and out of this course, the options are limited.

Currently, students are placed in developmental English courses based on their performance on the Michigan Test of English Language Proficiency (English Language Institute, 1977) and the reading comprehension portion of the California Achievement Tests (Tiegs & Clark, 1957). A student who achieves a score of 80 or better on the language proficiency test and a grade equivalent score of 10.0 or above on the reading test is considered "proficient" and allowed to write an essay for placement into "the writing sequence," which consists of two preparatory writing courses and the Freshman composition course.

Reason for the Study

Placement of students in developmental writing courses based on language proficiency and reading scores has been problematic; and increasingly, students enter the university with the goals of obtaining associate, baccalaureate and graduate degrees. Thus, a direct measure of writing, The NTID Writing Test, was developed.

The present study was undertaken to estimate the concurrent and predictive validity of the NTID Writing Test. Scores on the NTID Writing Test were compared with those on the Test of Written English (Educational Testing Service, 1992), a direct measure of writing typically administered to hearing foreign students wishing to study at universities in the U.S. and Canada. Research by Traxler (1990) has indicated that the Test of Written English (TWE) can provide valid estimates of the writing abilities of deaf college students.

To estimate predictive validity, we chose as a performance criterion the number of quarters necessary to successfully complete the Freshman composition course, the gateway to the university's degree programs. If the test provides useful information about deaf students' writing skills upon entering college and about their probability of success in the writing sequence, this information may be used to help faculty plan curriculum and students plan their courses of study.

The Test and the Students

Students are given thirty minutes to write an essay on an assigned topic. Each essay is read by three raters, English teachers trained in the scoring protocol. Training consists of scoring a selected sample of 25 papers and discussion of the ratings. All raters periodically participate in calibration sessions to maintain consistency. Raters may assign a maximum of 25 points to each of four categories: content, organization, language, and vocabulary, with the total possible score being 100. The reported score represents an average of the three raters' scores.

A representative sample of 65 students from NTID volunteered to participate in the concurrent validity study, which meant taking two tests, the Test of Written English, and the NTID Writing Test. The order of the tests was counterbalanced, and actual testing time was one-half hour for each test. The TWE papers were scored by the Educational Testing Service according to their procedures. Scores on the TWE may range from one to six points in increments of 0.5 points. The NTID Writing Test papers were scored by NTID faculty members trained in the scoring protocol. Scores on this test may range from 0 to 100 points.

For the predictive validity study, the course histories of 1,198 deaf and hard-of-hearing students entering the university from Fall, 1988, through Fall, 1992, were examined to determine whether entry writing test scores would predict the number of quarters needed to complete the required Freshman composition course. Based on results of a placement essay administered to eligible students, 582 students from this group were placed into "the writing sequence" (the two preparatory courses and the Freshman composition course). Of this number, 180 students did not complete the Freshman composition course, and 375 successfully completed the course with a grade of "D" or better. Results for 27 students were missing. In this study, entry scores on the NTID Writing Test, the reading comprehension subtest of the

California Achievement Tests, the Michigan Test of English Language Proficiency, and course histories for the successful students were analyzed.

Results and Conclusions

For the sixty-five students who participated in the concurrent validity study, the correlation between scores on the NTID Writing Test (mean=53.26) and those on the TWE (mean=3.31) was .83. For the 375 students participating in the predictive validity study, the correlation between scores on the NTID Writing Test (mean=59.19) and the reading comprehension subtest of the California Achievement Tests (mean=9.74) was .77. The mean number of academic quarters needed to successfully complete the Freshman composition course upon entry to the writing sequence was 2.33. Correlations involving students' performance on these variables are displayed in Table 1. All correlations exceed the .01 level of significance (two-tailed), and probably represent conservative estimates of true, underlying relationships due to a reduction in variances resulting when students who did not successfully complete the Freshman composition course were eliminated from the analysis.

Table 1. Correlations* among writing, English language proficiency (ELP), reading, and success in the Freshman composition course (N=375).

	Writing	ELP	Reading
ELP	.76		
Reading	.55	.71	
Quarters	-.48	-.49	-.40

*All ps <.01 (two-tailed).

As shown in Table 1, the correlation between the NTID Writing Test and number of quarters was -.48, meaning that students scoring low on the Writing Test required more quarters to successfully complete the Freshman composition course. Conversely, those scoring high on the Writing Test required fewer quarters. This relationship is statistically significant, although modest in magnitude, and indicates that approximately 23% of the variance in successful completion of the sequence is accounted for by performance on the NTID Writing Test.

The results of these studies provide evidence for both the concurrent and predictive validity of the NTID Writing Test, and they suggest directions for future testing and curriculum planning and for the assessment of college students' writing in general. For deaf and hard-of-hearing students, scores on the NTID Writing Test and the English language proficiency test may be used as rough, early predictors of readiness for degree programs.

Further research is necessary to determine whether more than one writing test sample or samples of other kinds of writing (such as samples from a writing portfolio) will improve the accuracy of such predictions. Research on the actual placement and performance of students in writing courses is also necessary. More accurate determination of writing skills would allow more accurate placement of students. More homogeneous classes, that is, classes where students had more comparable writing skills, would allow instructors to focus on skill areas of benefit to the class as a whole. More focus in turn should lead to more efficient and effective instruction.

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The Smart Classroom in the NTID Learning Center contains a sophisticated computer and electronic media projection system within a 16-station networked computer lab. It is currently used for six to eight regularly scheduled classes in English, Audiology, and Applied Technology computer courses, as well as for teacher and student workshops.

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