

Rationale for Performing Visual Assessments with Hearing-Impaired Persons Prior to Conducting Speechreading Research and Training

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Articles dealing with research in speechreading and other complex visual tasks have dealt with such factors as viewing angle, lighting, and other environmental variables. However, these articles rarely include reports of the status of the visual systems of their subjects. This article emphasizes the importance of assessing the integrity of the visual system before conducting speechreading research and training. Also suggested are methodologies for evaluating the speechreading skill levels of deaf students/clients prior to and after therapeutic intervention. The need for programs performing cochlear research and implants to collaborate more closely so that they might more rapidly advance the "state of the art" in cochlear prostheses and implantation procedures is stressed.

Much previous research in lipreading may be of questionable validity since scores on lipreading tests may have been contaminated by differences in visual acuity among subjects. It would be reasonable to conclude that before subjects are chosen to participate in research projects they should receive complete optometric evaluations and that this information should receive consideration in the final choice of subjects. Before hearing-impaired individuals are enrolled for lipreading training they should be encouraged to obtain optometric evaluation and correction, if necessary, to insure optimal functioning of the visual modality in a difficult and complex learning situation. (Hardick, Oyer, & Irion, 1970, p. 99)

In their review of literature concerned with lipreading (speechreading) and vision, Hardick et al. (1970) found that there had been no prior systematic investigation of the effect of any of the relevant visual parameters on speech-

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reading performance and that *investigators typically do not report that subjects were given either tests of visual acuity or optometric examinations.*

In their research, Hardick et al. (1970) studied a variety of visual parameters, including: (a) visual acuity (the ability of the eye to resolve or differentiate detail of objects when viewed at close range or at a distance), (b) color vision (the ability to discriminate color differences), (c) binocular vision (the ability of the two eyes to work together to produce a single, clear image), (d) rate of eye blink (number of blinks per minute when the eyes are visually fixated), and (e) others. Results of this research showed that there is a relationship between *far* visual acuity and speechreading performance. The authors concluded that "people with relatively minor acuity problems will obtain significantly lower scores on a lipreading test than those with normal acuity." Preliminary data collected at NTID supports Hardick et al. in their statement that even a mild visual acuity impairment can adversely influence speechreading performance (Brannen, 1982). In addition, Hardick et al. demonstrated that sentence-type materials when used for speechreading assessments and instruction were more sensitive for persons with deficiencies in visual acuity than isolated word and story materials.

The main theme of the 1983 Summer Institute of the Academy of Rehabilitative Audiology (ARA) focused upon the "state of the art" in cochlear implants. Eight persons representing a number of ear, nose, and throat hospital clinics affiliated with cochlear implant groups presented papers dealing with this topic. Several of the speakers presented research results to demonstrate the benefits of cochlear implants, especially when used in conjunction with pre-implant orientation and pre- and post-implant auditory and speechreading training. Presenters discussed criteria utilized to select candidates appropriate for cochlear implants, including: (a) amount of residual hearing; (b) benefits, or lack thereof, afforded by the use of conventional amplification; (c) patient motivation; and (d) additional rehabilitative needs. Also, initial work-ups for potential adult implant recipients included such items as a comprehensive history, complete ear, nose, and throat examinations, routine and diagnostic audiometric evaluations, and electronystagmography. In no case, however, was there any mention of a precursory eye examination such as that suggested by Hardick et al. (1970).

The purpose of this paper, therefore, is two-fold: (a) to present a rationale for conducting visual examinations for all persons with hearing loss — especially those persons with severe to profound hearing losses, and (b) to suggest methodologies for assessing the speechreading performance of hearing-impaired adults as a precursor to speechreading research and/or training.

RATIONALE FOR PERFORMANCE OF VISUAL ASSESSMENTS

Research endeavors need to place greater emphasis on both the status and

functioning of the visual system among hearing-impaired persons. . . . The use of residual hearing and vision are *both* important to the general development and education of hearing-impaired persons. Further, as hearing loss becomes more severe, the role of vision in the total development of hearing-impaired individuals (personal/social skills, language/communication skills, and academic/career development) becomes more significant. (Johnson, Caccamise, Rothblum, Hamilton, & Howard, 1981, p. 350)

Studies have shown that there is a higher incidence of visual impairments among hearing-impaired people than the general population (Campbell, Polomeno, Elder, Murray, & Altosaar, 1981; Hicks & Pfau, 1979; Johnson et al., 1981). The National Society to Prevent Blindness (NSPB) states that about 25% of the general population of school age children are in need of professional attention because of suspected visual impairment (NSPB, 1972). While Campbell et al. (1981) reported that the incidence rates of visual impairments among a variety of hearing-impaired student populations ranged between 38% to 58%, figures from three years of research conducted at the National Technical Institute for the Deaf (NTID) from 1977 to 1979 place the percentage of visual impairments and pathologies among its hearing-impaired population at 65%. Many causes of hearing impairments may also result in concomitant visual impairments. Two of these pathologies are maternal rubella (German measles contracted by the mother especially during the first trimester of pregnancy), and retinitis pigmentosa (RP) together with inherited hearing loss — a condition referred to as Usher's Syndrome.

Of particular significance to this report is the high incidence of far visual acuity problems, since Hardick et al. (1970) stated that there is a relationship between far visual acuity and complex visual tasks such as speechreading. For example, of 620 students who entered NTID during the Summer Sessions of 1978 and 1979, 58.4% were identified as having a far visual acuity problem, a color deficiency problem, a binocular vision problem, or combinations thereof. Of this group, the greatest number, 302 (48.7%) had far visual acuity problems. In addition, data collected on this population revealed that although most of these students had been adequately corrected for their visual acuity problem, others had not. For instance, 20 (6.6%) did not own corrective lenses, and 7 (2.3%) were found to have inadequate correction.

These data point out why it is important that programs serving deaf adults not assume that their clients have received appropriate visual attention by the time they have reached adulthood. (Note: The average chronological age of entering NTID students is approximately 19.5 years.) Furthermore, it is not known whether, for those NTID students who were inadequately corrected, the problem was due to progression of the visual impairment since they received their last prescription or because they received inappropriate correction because of inadequate communication

during the visual examination. That this latter problem probably did occur in several cases can be demonstrated by the fact that several students had poorer vision with than without their corrective lenses. Thus, it is important to have interpreters present, as necessary, during visual examinations of deaf persons and to have persons with good manual/simultaneous communication skills conducting visual screening with deaf clients.

Table 1
Referrals for Ophthalmological Examinations As a Result of Visual Screening Conducted on 518 Students Entering NTID During the 1983 Summer Session

Reason for Referral	N	%
Far Visual Acuity Only	50	9.6
Color Only	16	3.1
History Only	30	5.8
Two Visual Problems	17	3.3
Three Visual Problems	2	.4
Totals	115	22.2

Table 1 further illustrates the need for visual screening and ophthalmological or optometric examinations prior to conducting research and/or communication-related instruction with deaf clients. As noted in Table 1, of 518 new students entering NTID during the 1983 Summer Session who received visual assessments, 22.2% ($n=115$) were referred for in-depth ophthalmological examinations. Again, the largest number of referrals (9.6%) were made for students suspected of having correctable or non-correctable far visual acuity problems although many other referrals were made on the basis of suspected color vision problems or pathologies in possible need of professional attention.

For programs considering conducting visual screening for hearing-impaired persons as a precursor to carrying out research and/or training in speechreading and other complex visual tasks, it is important that visual assessments be carried out in an appropriate manner. The Orthorater Vision Tester is used at NTID to screen students for far and near visual acuity. The results of research conducted to demonstrate the appropriateness of this equipment, the recommended referral criteria, and screening procedures utilized to prevent overreferrals (false-positive condition) and underreferrals (false-negative condition) for subsequent ophthalmological examinations are presented in Johnson et al. (1981). Since this equipment is relatively expensive, additional research has been carried out to demonstrate the efficacy of utilizing a less expensive *rear-illuminated Snellen chart* to screen for far visual acuity problems. The results of this research have

been published by Johnson and Caccamise (1983), and although a slightly higher false-positive rate can be expected, the use of procedures recommended by these authors can help keep overreferrals to a minimum.

One further caution should be made with regards to the referral criteria recommended by Johnson et al. (1981). These authors recommend ophthalmological referral for far visual acuity when either or both eyes are 20/40 or poorer and for near visual acuity if either or both eyes are Jaeger 4 (analogous, but not comparable to 20/40) or poorer. However, Hardick et al. (1970, p. 99) have stated that "apparently minor deviations in far visual acuity affect lipreading performance." Their research demonstrates that lipreading scores were significantly poorer for subjects with 20/25 and 20/30 or greater in either or both eyes than those with bilaterally normal vision.

In conclusion, the following recommendations should help rectify some of the problems discussed in the above paragraphs:

1. A thorough eye examination should be performed for all persons upon discovery of a hearing loss.
2. All persons with severe to profound hearing losses should receive periodic hearing and visual examinations.
3. Interpreters skilled in signing and fingerspelling should be used, as appropriate, to ensure adequate communication during visual screening and eye examinations of hearing-impaired persons.¹
4. All persons working with hearing-impaired people — including teachers, therapists, and hearing-impaired persons' families — should receive training related to optimizing the use of vision by all hearing-impaired people.²
5. It is imperative that all hearing-impaired persons receive visual screening and corrective follow-up, if needed, prior to conducting speech-reading training and research in which an intact visual channel is essential.

METHODOLOGIES FOR ASSESSING SPEECHREADING PERFORMANCE

Communication assessments are undertaken for a variety of reasons: (1) rapid identification of clients in need of communication skill(s) development; (2) explaining an individual client's communication strengths/weaknesses not only to the client, but other professionals and family members (upon consent of the client); (3) use in developing a communication individualized education program (CIEP) for the client; (4) language and communication program management (defining personnel, equipment, and space needs); and (5) studying trends within client populations. (Johnson

¹Recommended visual screening procedures, referral criteria, and minimal ophthalmological procedures have been described by Johnson et al. (1981).

²Recommendations pertinent to helping hearing-impaired persons optimize the use of their vision may be found in Caccamise, Meath-Lang, and Johnson (1981).

& Crandall, 1982, pp. 235-236)

History of the NTID Communication Performance Profile

In 1971 NTID set out to develop a communication performance profile to study the receptive and expressive skills of its entering student populations. The Communication Performance Profile Committee was charged with the task of selection and/or development of a battery of screening instruments which would be appropriate for this task.³ It was determined by the committee that: (a) all profile components should meet the five criteria outlined in the opening quotation to this section, (b) whenever possible, assessment instruments should be selected from among already existing instruments to preclude the arduous and time-consuming task of test development and evaluation, (c) there should be multiple forms of each component within the assessment battery to allow for reassessment at periodic and aperiodic intervals to check for progress in skill development, and (d) each component within the assessment battery should take into consideration the English reading/vocabulary levels of the average adult deaf person within the general population, which is at the 4th grade level (Crandall, 1980).

The original assessment battery containing nine components (six receptive and three expressive) was completed and began to be utilized at NTID in 1972. The profile was first described at the Summer Institute of the Academy of Rehabilitative Audiology in 1974 (Johnson, 1975). It has since undergone aperiodic minor revisions, but remains essentially the same. These revisions, test administration, scoring procedures, test interpretation, the profile rating system, and its usefulness with secondary and post-secondary-level deaf students have been described in detail (Johnson, 1976; Johnson, 1978; Johnson & Caccamise, 1981; Johnson, Caccamise, & Kadunc, 1980; Johnson & Crandall, 1982; Johnson & Kadunc, 1980; Johnson, Walter, Crandall, McPherson, Subtelny, Levitt, Caccamise, & Davis, 1980; Sims, 1982).

The CID Everyday Speech Sentences

The ten lists of CID Everyday Speech Sentences developed by a working group (Chairman, Dr. Grant Fairbanks) of the Armed Forces - National Research Council Committee on Hearing and Bio-Acoustics (CHABA) were selected to be used for measuring performance levels for five of the six receptive communication profile parameters included in the *NTID Communication Performance Profile*. These ten lists, each containing ten sentences, and the criteria adhered to in their development are included in Davis and Silverman (1970).

³The Communication Performance Profile Committee was made up of Dr. Kathryn Harris and Dr. Harry Levitt (City University of New York), Dr. William Castle, Dr. Joanne Subtelny, and Dr. Donald Johnson (NTID), and Dr. Diane Castle (Rochester School for the Deaf and NTID).

These criteria were: (a) the vocabulary is appropriate to adults with fourth grade English reading vocabulary levels (Johnson, 1978; Johnson & Crandall, 1982), (b) the words appear with high frequency in one or more of the well-known word counts of the English language, (c) proper names and proper nouns are not used, (d) common nonslang idioms and contractions are used freely, (e) phonetic loading and 'tongue-twisting' are avoided, (f) redundancy is high, (g) the level of abstraction is low, (g) grammatical structure varies freely, (h) each list has an average of approximately 70 words and sentence length varies from 2 to 12 words with the average sentence containing 5 words, and (i) the sentence forms include declaratives, imperatives, rising interrogatives, and falling interrogatives. A sample list of CID Everyday Speech Sentences is shown in Table 2.

Table 2
Sample List from 10 CID Everyday Speech Sentence Lists

Practice sentences for all lists:

1. This is a beautiful day.
2. Do you have a piece of paper?

List 1:

1. Walking's my favorite exercise.
 2. Here's a nice quiet place to rest.
 3. Our janitor sweeps the floors every night.
 4. It would be much easier if everyone would help.
 5. Good morning.
 6. Open your window before you go to bed!
 7. Do you think that she should stay out so late?
 8. How do you feel about changing the time when we begin work?
 9. Here we go.
 10. Move out of the way!
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Note. Underlined words are key words, and only these words are scored (50 key words per list \times 2% each = 100% maximum score). Word order is *not* considered in scoring. The English vocabulary level for List 1 is 4.68 grade level equivalent (GLE) (Barley & Merchon, 1976).

CID Everyday Speech Sentences and Speechreading Assessment

Summary of NTID Research. The five receptive parameters in the *NTID Communication Performance Profile* for which the CID Everyday Speech Sentences are used to assess communication skill levels are hearing (speech) discrimination, speechreading without and with sound, and manual (signs and fingerspelling only) and simultaneous (speech, signs, and fingerspelling) reception. Sims (1975) reported on the validity of the CID Everyday Speech Sentences and their usefulness in assessing speech discrimination

skills of severely hearing-impaired persons. Sims included interlist correlations for the ten sentence lists, a comparison of these lists with the W-22, PBK-50, and the Pickett Modified Rhyme Tests, and CID sentence split-half list correlations. Caccamise (1979) reported on the reliability of the CID sentence lists for performance assessment of receptive English simultaneous and manual receptive communication skills with NTID students.

Although they have been researched extensively at NTID, interlist correlations and other data concerning the use of the CID Everyday Speech Sentence Lists as tools to assess the speechreading skills of NTID students have not been made available for external dissemination. However, this information has been prepared for use as an "in-house" working paper.⁴ The results of this research on the speechreading versions of the ten lists of CID Everyday Speech Sentences has shown: (a) all lists to be highly correlated (.84 to .93 for the "no sound" versions and .89 to .98 when sound was used during speechreading assessment), (b) the mean score for all ten lists were similar for the "with sound" versions; *there were no significant differences between the means for lists 1, 3, 5, 6, 9, and 10 ($p < .05$)*, but there were small, but significant differences between the means of these six lists and lists 2, 4, 7, and 8, and (c) *that scores must improve on retest by 16% or more in order to be 95% confident that the improvement is not due to test error and/or other variables.*

All ten lists contain a sound track so that speechreading assessments may be administered either with or without sound. The procedure utilized at NTID is to administer two different lists (one with sound and one without sound) in order to study the contribution of sound to the speechreading performance of students.

Rationale for Sentence-Length Materials. Hardick et al. (1970, p. 99) postulated that, ". . . differences in visual acuity would be most dramatically illustrated by isolated word stimuli since they are short in length and perhaps not so dependent on higher mental processes as are the more complex stimuli, thus reducing the number of variables involved and maximizing the probability of finding a significant difference if a true difference exists." However, as previously stated, their research showed sentence materials to be more sensitive to differences in visual acuity than isolated word and story materials.

Sims (1982), with regard to the CID Everyday Speech Sentence Lists, discussed the benefits of sentence length assessment materials, stating that they have great appeal because they have high face validity — especially with regard to assessment of functional communication. Sims warned, however, that there are disadvantages with these types of materials, since

⁴For information concerning research conducted on the CID Everyday Speech Sentences relative to their use for assessing speechreading skills, contact Dr. Donald G. Sims, Research Associate, NTID Communication Program.

phonetic analysis of the responses are difficult and poor English language skills may influence test results. This latter statement is especially true with congenitally deaf persons who often do not achieve a good command of the grammar and syntax of English. This point was illustrated by Johnson and Crandall (1982) when they showed that the average student entering NTID in 1980 ($n = 299$) attained speechreading scores of approximately 40% when the speechreading versions of the CID Everyday Speech Sentences were administered without sound. In comparison, Jeffers and Barley (1971), using Forms A and B of the Barley speechreading versions of the CID Everyday Sentences Test, showed college students and hard-of-hearing adults achieved mean speechreading scores of approximately 60%. Moreover, this problem is evident even though students/clients receive two points for each of 50 key words correctly identified within a list of CID Everyday Speech Sentences regardless of the order in which they are written on the standard test form.

In their favor, Sims (1982) stated that CID Everyday Speech Sentence Tests distribute NTID students normally about a speechreading mean score of 50% correct which makes them useful for placement of students in speechreading classes. Sims, however, suggested that the Jacobs Tests (Sims & Jacobs, 1976) be utilized in lieu of the CID Sentence Tests to assess the results of speechreading training — especially with students having basic-level speechreading skills — since they are somewhat less difficult and appear to be more sensitive to gains made as a result of training.⁵

Current Use of the Speechreading Versions of the CID Everyday Speech Sentences. Since the use of the NTID speechreading assessment versions of the CID Everyday Speech Sentences was first reported (Johnson, 1975), several hundred letters requesting information concerning their use have been received and processed. The ten sentence lists are available through NTID in film, videocassette, videocartridge, and/or audiocassette format and have been made available to many programs.⁶ NTID continues to utilize the sentence lists to identify students in need of speechreading training and to demonstrate student progress. Rules for scoring along with examples are shown in Table 3. The percentage scores can be converted to a 5-point rating scale with easily understood matching functional descriptors as shown in Table 4. For example, a scale score rating of 5 means that the student understands, without difficulty, all of the information in the sentences; a rating of 3 means that, with difficulty, approximately half of the information is under-

⁵For more information concerning the Jacobs Speechreading Test, contact Marjorie Jacobs, Audiologist, or Dr. Donald Sims, Research Associate, NTID Communication Program.

⁶NTID plans to disseminate the speechreading versions of the CID Everyday Speech Sentences through an external agency. However, currently it is filling all requests, at cost, to potential users. For details relative to purchasing and other information concerning the speechreading and other receptive parameters of the NTID Communication Performance Profile, contact the first author of this paper.

stood; a rating of 1 means that no communication has taken place.

Table 3
Rules for Scoring NTID Speechreading Versions of the CID
Everyday Speech Sentences With and Without Sound

Rule	Examples	
	Stimulus (S) ^a /Response (R)	Rationales and Scores
1. Misspelling is not an error if by context the correct word has been identified	Stimulus: <u>If you don't want these old magazines, throw them out.</u>	Rationale: No error — magazine counted as misspelling because by context it is correct (i.e., "these" and "them" contextually correct).
	Response: <u>If you don't want these old magazine throw them out.</u>	Score: 8 key words correct × 2 points = 16%.
2. If the word has been written rather than the contraction used by the speaker, no error is counted, but the two words are counted as one correct word as produced by the speaker.	Stimulus: <u>Walking's my favorite exercise.</u>	Rationale: "Walking is" is contextually correct.
	Response: <u>Walking is my favorite exercise.</u>	Score: 4 key words correct × 2 points = 8%.
	Response: <u>What is your favorite exercise?</u>	Rationale: The verb "is" is incorrect because the noun was incorrectly identified.
	Score: 2 key words correct × 2 points = 4%.	
3. Extra words are not counted as errors when predictable.	Stimulus: <u>Time's up.</u>	Rationale: "Time is" is contextually correct.
	Response: <u>Time is up.</u>	Score: 2 key words correct × 2 points = 4%.
	Stimulus: <u>How do you feel about changing the time when we begin work?</u>	Rationale: The word "to" does not detract from the content of the sentence.
	Response: <u>How do you feel about changing the time when we begin to work?</u>	Score: No error; 9 key words correct × 2 points = 18%.

4. Number of correct words including compound words are scored according to stimulus.	<p>Stimulus: It <u>would</u> be <u>much easier</u> if <u>everyone</u> would <u>help</u>.</p> <p>Response: It <u>would</u> be <u>much easier</u> if <u>every one</u> would <u>help</u>.</p> <p>Stimulus: <u>There's</u> a <u>good ballgame</u> this <u>afternoon</u>.</p> <p>Response: <u>There is</u> a <u>good ball game</u> this <u>afternoon</u>.</p>	<p>Rationale: Some compound words can correctly be written as two words.</p> <p>Score: No error; 5 key words correct × 2 points = 10%.</p> <p>Rationale: Same as example immediately above.</p> <p>Score: No error; 4 key words correct × 2 points = 8%.</p>
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*The stimulus examples are taken directly from the CID Everyday Speech Sentence Lists, and the underlined words are key words. Each key word receives two (2) points if correct in the response according to the above rules.

Table 4
Profile Ratings, Percentage Ranges and Functional Descriptors for Assessment of Speechreading Ability of NTID Students With and Without Sound

Profile Rating	Percentage Range ^a	Functional Descriptor
5	75-100%	Student understands the complete message
4	54-74	Student understands most of the content of the message
3	33-53	Student understands, with difficulty, about half of the message (understanding may improve with increased exposure)
2	11-32	Student understands little of the content of the message, but does understand a few isolated words or phrases
1	0-10	Student cannot understand the message

^aThe percentage ranges listed in Table 4 were arbitrarily selected and are presently undergoing research to study their appropriateness. Preliminary data indicate that additional refinement will take place.

Other programs currently utilizing the NTID speechreading versions of the CID Everyday Speech Sentences include: (a) the American School for the Deaf in West Hartford, Connecticut with students at the secondary level; (b) Gallaudet College in Washington, D.C., with its postsecondary-level deaf population; (c) the program for deaf postsecondary students at Seattle Community College in Seattle, Washington; (d) the House Ear Institute in Los Angeles, California, and some of its affiliated clinics in relation to cochlear implant research; (e) the Cochlear Implant Programs at the Univer-

sity of California Medical Center in San Francisco;⁷ and (f) most recently, the Surgical Products Division/3M in St. Paul, Minnesota, has requested master tapes to use for dubbing copies for the affiliates of their new cochlear implant program.

Conclusions

The speechreading versions of the CID Everyday Speech Sentences have been utilized successfully since 1972. Since information concerning their use was first published by NTID (Johnson, 1975), they have become more broadly accepted as a means of rapidly assessing speechreading performance of severely hearing-impaired students at the secondary and postsecondary levels and in three major cochlear implant programs and their affiliated clinics around the country. Some important considerations concerning the use of these sentence lists to assess speechreading skills are:

1. They are meant to be used as screening devices to obtain approximations of speechreading skill levels and not to obtain diagnostic information to be used to develop speechreading training programs.
2. NTID research has demonstrated that six of the lists (1, 3, 5, 6, 9, & 10) are not significantly different in difficulty, and therefore, these six lists may be used for test/retest to demonstrate progress, or lack thereof, after therapeutic intervention.
3. When using the lists to assess progress in speechreading skill development, scores on the retest must be 16% or better than the initial test score in order to be 95% confident that the improvement is not due to test error and/or other variables.
4. The lists may be used with severely hearing-impaired students/clients providing they have achieved a minimum of fourth grade English reading/vocabulary levels.

SUMMARY

In 1970, Hardick et al. demonstrated that assessing the integrity of the visual system is essential prior to conducting speechreading research and training. They recommended a complete optometric examination for each

⁷The cochlear implant program at the University of California Medical Center in San Francisco has recently received permission from NTID to edit the NTID speechreading versions of the CID Everyday Speech Sentences. Since their clients are often postlingually deaf adults and have intelligible speech, they give their responses via speech, rather than the standard written mode utilized by NTID and other programs. (See the Appendix for the written response form sheet used at NTID for students to record responses to the CID Everyday Speech Sentence Stimuli.) Their modifications include: (a) changing the pretest instructions to delete information pertinent to written responses, and (b) shortening the time between each sentence to five (5) seconds to prevent boredom. These changes considerably shorten test administration time. They will soon be available at NTID for other programs desiring the shortened versions. Contact the first author of this paper and ask for the Owens Modified Versions of the CID Everyday Speech Sentences for Speechreading Assessment.

individual, and stated that speechreading performance may be affected by even minor deviations from normal (20/20) in far visual acuity. Research conducted with NTID students and other hearing-impaired populations around the country has shown that there is a higher incidence of visual impairments among hearing-impaired persons than in the general population. This is especially true for far visual acuity problems.

As a result of their research conducted at NTID, the authors of this paper have concluded that: (a) all students/clients should have a thorough eye examination upon discovery of a hearing loss, (b) periodic hearing and visual examinations should be conducted on all persons with severe to profound hearing losses, (c) interpreters should be utilized, as appropriate, to facilitate communication during visual screening and eye examinations, (d) families and persons working with hearing-impaired persons should receive training in optimizing the use of vision, and (e) all hearing-impaired persons should be screened, and corrected if necessary, prior to participation in speechreading research and training.

In addition, the use of the CID Everyday Speech Sentences to assess speechreading skill levels prior and subsequent to therapeutic intervention with hearing-impaired clients was discussed and recommended. It was suggested that: (a) these sentence lists be used for screening to identify persons in need of speechreading training and for pre- and post-therapeutic evaluations; (b) six of the ten lists were more appropriate for test/retest purposes since there were no significant differences between their mean score values, and (c) minimally, an increase of 16% or more on retest is necessary to demonstrate progress as a result of therapeutic intervention.

One final, but important recommendation, is that implant programs, especially those affiliated with a specific group, organize their research efforts so that research is conducted in a similar manner. Collaborative research among these programs would help to more rapidly advance the "state of the art" relative to achievement of better cochlear prostheses and implantation procedures for the benefit of both postlingually and prelingually deaf clients.

REFERENCES

- Barley, S., & Merchon, S. *L.E.M.A. readability program: Description, applications, user documentation (a computerized form of the Dale-Chall (1948) readability formula)*. Working Paper, Rochester, New York: NTID, 1976.
- Brannen, S. *Communication skills for the deaf visually impaired student*. NTID paper presented at the American Speech-Language-Hearing Association Convention, Toronto, Canada, 1982.
- Caccamise, F. Reliability of CID Sentence Lists for performance assessment of receptive English simultaneous and manual communication skills. *American Annals of the Deaf*, 1979, 124 (3), 726-730.
- Caccamise, F., Meath-Lang, B., & Johnson, D. Assessment and use of vision: Critical needs of hearing-impaired students. *American Annals of the Deaf*, 1981, 126 (3), 361-369.

- Campbell, C., Polomeno, R., Elder, J., Murray, J., & Altsaar, A. Importance of an eye examination in identifying the cause of congenital hearing impairment. *Journal of Speech and Hearing Disorders*, 1981, 46 (3), 258-261.
- Crandall, K. English proficiency and progress made by NTID students. *American Annals of the Deaf*, 1980, 125 (3), 417-426.
- Davis, H., & Silverman, R. Central Institute for the Deaf everyday sentences. *Hearing and deafness Ed. 3* (Appendix). New York: Holt, Rinehart and Winston, 1970.
- Hardick, E., Oyer, H., & Irion, P. Lipreading performance as related to measurements of vision. *Journal of Speech and Hearing Research*, 1970, 13 (1), 92-100.
- Hicks, W., & Pfau, G. Deaf-visually impaired persons: Incidence and services. *American Annals of the Deaf*, 1979, 124 (3), 76-92.
- Jeffers, J., & Barley, M. *Speechreading (Lipreading)*. Springfield, Illinois: Charles C. Thomas, Publisher, 1971.
- Johnson, D. Communication characteristics of NTID students. *Journal of the Academy of Rehabilitative Audiology*, 1975, VIII (1 & 2), 17-32.
- Johnson, D. Communication characteristics of a young deaf adult population: Techniques for evaluating their communication skills. *American Annals of the Deaf*, 1976, 121 (4), 409-424.
- Johnson, D. The adult deaf client and rehabilitation. In J. Alpiner (Ed.), *Handbook of adult rehabilitative audiology*. Baltimore: Williams and Wilkins Co., 1978, 172-221.
- Johnson, D., & Caccamise, F. Rationale and strategies for planning communication individualized education programs (CIEP) for deaf students. *American Annals of the Deaf*, 1981, 126 (3), 370-383.
- Johnson, D., & Caccamise, F. Hearing-impaired students: Options for far visual acuity screening. *American Annals of the Deaf*, 1983, 128 (3), 402-406.
- Johnson, D., Caccamise, F., & Kadunc, N. Development of communication individualized education programs (CIEP) for deaf secondary-level students. *Journal of the Academy of Rehabilitative Audiology*, 1980, XIII, 32-50.
- Johnson, D., Caccamise, F., Rothblum, A., Hamilton, L., & Howard, M. Identification and follow-up of visual impairments in hearing-impaired populations. *American Annals of the Deaf*, 1981, 126 (3), 321-360.
- Johnson, D., & Crandall, K. The adult deaf client and rehabilitation. In J. Alpiner (Ed.), *Handbook of adult rehabilitative audiology*. Baltimore: Williams and Wilkins Co., 1982, 209-287.
- Johnson, D., & Kadunc, N. Usefulness of the NTID communication profile for evaluating deaf secondary-level students. *American Annals of the Deaf*, 1980, 125 (3), 337-349.
- Johnson, D., Walter, G., Crandall, K., McPherson, D., Subtelny, J., Levitt, H., Caccamise, F., & Davis, M. (Eds.) *Communication performance evaluation with deaf students: A review* (PB80-101082). Springfield, Virginia: National Technical Information Service (NTIS), 1980.
- National Society to Prevent Blindness (NSPB). *Teaching about vision (P-619)*. New York: NSPB, 1972, 1-71.
- Sims, D. The validation of the CID Everyday Sentence Test for use with the severely hearing impaired. *Journal of the Academy of Rehabilitative Audiology*, 1975, VIII (1 & 2), 70-79.
- Sims, D. Hearing and speechreading evaluation for the deaf adult. In D. Sims, G. Walter, & R. Whitehead (Eds.), *Deafness and communication*. Baltimore, Maryland: Williams and Wilkins, 1982.
- Sims, D., & Jacobs, M. *Speechreading evaluation and the National Technical Institute for the Deaf*. Paper presented at the Convention of the A.G. Bell Association for the Deaf, Boston, 1976.