Enhanced Visual Speech Perception in Individuals With Early-Onset Hearing Impairment

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Purpose: L. E. Bernstein, M. E. Demorest, and P. E. Tucker (2000) demonstrated enhanced speechreading accuracy in participants with early-onset hearing loss compared with hearing participants. Here, the authors test the generalization of Bernstein et al.'s (2000) result by testing 2 new large samples of participants. The authors also investigated correlates of speechreading ability within the early-onset hearing loss group and gender differences in speechreading ability within both participant groups.

Method: One hundred twelve individuals with early-onset hearing loss and 220 individuals with normal hearing identified 30 prerecorded sentences presented 1 at a time from visible speech information alone.

Results: The speechreading accuracy of the participants with early-onset hearing loss (M = 43.55% words correct; SD = 17.48) significantly exceeded that of the participants with normal hearing (M = 18.57% words correct; SD = 13.18), $t(330) = 14.576$, $p < .01$. Within the early-onset hearing loss participants, speechreading ability was correlated with several subjective measures of spoken communication. Effects of gender were not reliably observed.

Conclusion: The present results are consistent with the results of Bernstein et al. (2000). The need to rely on visual speech throughout life, and particularly for the acquisition of spoken language by individuals with early-onset hearing loss, can lead to enhanced speechreading ability.

KEY WORDS: speechreading, lipreading, deafness

The ability to perceive speech solely by viewing the talker—that is, to *speechread (lipread)*—is known to vary over a wide range of accuracy in both the hearing and hearing-impaired populations (Andersson, Lyxell, Rönnberg, & Spens, 2001; Bernstein, Demorest, & Tucker, 2000; MacLeod & Summerfield, 1987; Mohammed et al., 2005). This variation presumably arises due to variations in one or more component perceptual and cognitive processes whose source is not presently understood in any detail (Hall, Fussell, & Summerfield, 2005). Recent evidence suggests that one important factor may be the perceiver's hearing history (Bernstein et al., 2000). Specifically, the perceptual and/or linguistic experience associated with early-onset severe-to-profound hearing impairments, henceforth referred to as *early-onset deafness,* appears to provide a context conducive to the development of enhanced speechreading ability (Andersson & Lidestam, 2005; Bernstein et al., 2000; Hay-McCutcheon, Pisoni, & Kirk, 2005; Mohammed et al., 2005). In the present article, we report on a new demonstration of enhanced speechreading ability in individuals with early-onset deafness compared with individuals with normal hearing. Additionally, we report on gender differences in speechreading ability (Johnson, Hicks, Goldberg, & Myslobodsky, 1988; Watson, Qiu, Chamberlain, & Li, 1996). Finally, we also investigated in the early-onset deafness participant group the relationship between individual speechreading ability and a variety of subjective and objective measures frequently collected in our testing.

A positive relationship between the degree of reliance on optical speech information for spoken communication associated with hearing impairment and speechreading ability might seem intuitively obvious. However, degree of hearing loss has been argued to be either unrelated to (Hall et al., 2005; Summerfield, 1991) or negatively correlated with (Mogford, 1987) speechreading ability. Summerfield argued that the necessity to rely on speechreading for spoken communication due to hearing loss does not result in enhanced speechreading ability (Hall et al., 2005; Summerfield, 1991). Summerfield (1991) stated that "the best totally deaf and hearing-impaired subjects often perform only as well as the best subjects with normal hearing" (p. 123). Similar levels of measured performance between deaf and hearing participants, combined with evidence that speechreading ability was difficult to train, were offered as the justification for Summerfield's earlier conclusion and recent restatement (Hall et al., 2005) that "good lipreaders are born and not made" (p. 123).

Other authors have argued for a negative relationship between hearing loss and speechreading ability (Mogford, 1987). Mogford reviewed studies of speechreading ability and training that compared the performance of children with prelingual-onset deafness and children with normal hearing. Mogford concluded that the hearing children could speechread as well as or better than deaf children. She reasoned that speech perception is normally a bimodal process (McGurk & MacDonald, 1976; Sumby & Pollack, 1954) such that the absence of auditory experience also harms speechreading. Children with hearing developed visual speech perception skills as a part of normal development, and the presence of an intelligible auditory signal facilitated this development. Furthermore, hearing children had a solid language basis to use for interpreting the underspecified visual speech signal.

Nevertheless, Bernstein et al. (2000) reported that the previous conclusions did not match with their own formal and informal testing of adults with congenital or early-onset deafness. Bernstein et al. conducted a study of speechreading ability in 96 college students with normal hearing and 72 students at Gallaudet University with 60 dB HL or greater bilateral hearing loss. The participants with early-onset deafness reported English as their native language and education in oral or mainstream environments for 8 or more years. Of the participants, 71% with early-onset deafness had bilateral profound hearing loss, and 62% reported the loss had occurred by 6 months of age. The authors tested speechreading ability across a variety of linguistic levels of stimuli, and the results provided an unambiguous demonstration of a difference between the two populations. Although both groups included some very poor performers, the majority of the participants with early-onset deafness speechread more accurately than the majority of the hearing participants. In addition, the best deaf speechreaders were those with a profound congenital loss. These results supported the conclusion that the need to rely on visual speech for the acquisition of spoken language can lead to enhanced speechreading ability.

Subsequently, Bernstein et al. (2000) noted that one difference between their previous results and contradictory ones in the literature was that their study included primarily individuals with early-onset severe-to-profound hearing loss, whereas previous studies included individuals with postlingual and less severe losses. This suggested that early onset of the hearing loss is an important factor in developing enhanced speechreading.

More recently, Mohammed et al. (2005) reported on a test comparing the speechreading ability of deaf and hearing British adults. Twenty-nine participants who reported severe-to-profound hearing loss prior to 5 years of age were compared with 29 adults with self-reported normal hearing. Speechreading ability was tested using the Test of Adult Speechreading (TAS; Ellis, MacSweeney, & Campbell, 2001), which requires the participant to view a speech segment at various levels of linguistic complexity ranging between isolated words and connected speech and match it to one image out of six. The test was constructed to be sensitive to perceptual abilities while minimizing the effects of response mode that may result due to different levels of fluency in written or spoken English. As in Bernstein et al. (2000), the participants with early-onset deafness, on average, were more accurate than the participants with hearing. These results provide a further demonstration that the need to rely on visual speech to acquire spoken language can lead to enhanced speechreading ability.

Here, we report on a new study of speechreading ability in two large samples, one of adults with early-onset deafness (N = 112), and the other of adults who reported no history of hearing loss (N = 220). The data were collected as part of routine preexperimental participant screenings for several projects investigating speechreading and reading in adults with normal hearing and hearing impairments. Speechreading ability was assessed with the identification of 30 isolated sentence-length stimuli presented without any acoustic signals and without any semantic context. We expected that, on average, the participants with early-onset deafness would be more accurate speechreaders than the hearing participants. Furthermore, similar to the results reported in Bernstein et al. (2000), both participant groups were expected to include individuals who were very inaccurate speechreaders, suggesting that hearing loss by itself is not a sufficient condition for enhanced speechreading ability. The participants in this study do not overlap with those reported in Bernstein et al. (2000).

Gender differences, with women having the advantage in speechreading ability, have been reported in studies of normal hearing participants (Johnson et al., 1988; Watson et al., 1996). Sources of women's speechreading advantage could be, perhaps, increased linguistic ability or increased attention to the face in female perceivers. Previous studies on early-onset deaf participants versus normal-hearing participants did not test for gender differences within or between participant groups (Bernstein et al., 2000; Ellis et al., 2001). We did so here. If the previously observed gender difference is due to an innate female superiority for language, then we would expect that the difference would be observed independent of hearing status. In contrast, if the difference is associated with experiential gender differences, then differences might be diminished or absent in a group of deaf perceivers who, regardless of gender, relied on vision for communication.

Finally, individual differences in speechreading ability within the deaf group raise the question: What factors are associated with speechreading ability? Bernstein, Demorest, and Tucker (1998) investigated individual differences in audiological variables, familial history, communication preferences, and measures of reading among the same participants reported in Bernstein et al. (2000). Regression analysis led to three factors with a multiple *R* value of .77 for scores on speechreading sentences, which were (a) self-ratings of success in understanding the speech of the general public, (b) use of speech for communication at home, and (c) English reading score. The first two factors suggest that the amount of experience one has had communicating successfully via speech is important. Although the direction of the association is not known, it suggests the possibility that, by virtue of their increased ability to speechread, some deaf individuals get more practice speechreading. Skill in reading may be important in that it provides a method for reliably expanding English vocabulary and grammatical knowledge. Here, we sought to test previously observed associations on a new sample of early-onset deaf participants.

Method

Participants

Participants were screened for the following characteristics: (a) between 18 and 45 years of age; (b) currently enrolled in, or graduated from, college; (c) no self-reported learning disabilities; (d) self-report of English as a native language; and (e) vision 20/30 or better in each eye, as determined with a standard Snellen chart. Additionally, deaf participants were screened to have (f) bilateral hearing impairments; (g) self-reported onset of loss prior to 4 years of age; (h) self-reported use of English as the primary language of the participant's family; and (i) education in mainstream and/or oral program for 8 or more years. Deaf participants were also asked to fill out an extensive questionnaire that concerned their and their families' hearing and education history, language experience, preferred modes of communication, and self-assessments of oral communication proficiency (see Bernstein et al., 1998). A majority (n = 83 out of 112) of the deaf participants were administered Form L of the Peabody Picture Vocabulary Test—Revised (PPVT–R; Dunn & Dunn, 1981), using words printed on index cards rather than the typical spoken presentation. All participants were paid for their participation.

Hearing participants. Speechreading data were obtained from 220 participants with normal hearing who had been recruited from among students on the campuses of California State University, Northridge (CSUN), University of Southern California, and University of California, Los Angeles as well as House Ear Institute employees. Sixty-three percent (n = 139) of the hearing participant group were women. The group mean age was 22 years (range = 18–45).

Participants with early-onset deafness. Speechreading data were obtained from 112 participants with early-onset deafness recruited from CSUN, of which 65% (n = 73) were women. The mean age across the group was 23 years (range = 18.0–39.5). The distribution of participant-reported age at onset of hearing impairment is shown in Table 1.

Fifteen participants reported that age of onset was prior to 4 years of age but did not provide an estimate of exactly when the loss occurred. Across participants, the mean better-ear pure-tone average was 96.74 dB HL (SD = 11.86). Eighty-four participants had 90 dB HL or greater better-ear pure-tone averages (profound hearing impairment). Audiometric testing was not performed as part of the data collection. A recent audiogram was provided by the participant or, with the participant's

Table 1. Distribution of age of onset of hearing impairment.

Age of onset (years)	*n*
Birth	64
0–1	12
1–2	15
2–3	4
3–4	2

Table 2. Distribution of reported cause of hearing impairment.

Cause	*n*
Unknown	66
Genetic/hereditary	15
Meningitis	10
Maternal rubella	8
Other	5
High fever	3
Drug reaction	3
Premature birth	2

permission, collected from the campus records. The distribution of reported causes of the hearing impairments is listed in Table 2.

Materials and Procedure

The speechreading screening test comprised 30 video-recorded sentences (Bernstein & Eberhardt, 1986) from the list of Central Institute for the Deaf Everyday Sentences (Davis & Silverman, 1970). Half of the sentences were spoken by a male talker (see Table 3). Participants were tested individually. Testing on the CSUN campus occurred in a quiet room, and testing at the House Ear Institute occurred in a sound-attenuated booth. The prerecorded sentence stimuli were played back from a video laserdisc under computer control and were displayed on a 14-in. (36-cm) color computer monitor approximately 0.5 m from the participant. No auditory signals were presented during the testing. After participants viewed each sentence, they typed at a computer terminal what they thought the talker had said. Participants were instructed not to worry about being absolutely certain before typing something and to type as much as they could remember.

Table 3. Sentence materials.

Talker	Sentence
F	Here we go.
F	It's raining.
F	Come here when I call you!
F	Should we let little children go to the movies by themselves?
F	Those windows are so dirty I can't see anything outside.
F	Don't let the dog out of the house!
F	Did you forget to shut off the water?
F	You can catch the bus across the street.
F	Put that cookie back in the box!
F	Music always cheers me up.
F	Where have you been all this time?
F	Stand there and don't move until I tell you!
F	The phone call's for you.
F	I don't know what's wrong with the car, but it won't start.
M	Here's a nice quiet place to rest.
M	Everybody should brush his teeth after meals.
M	People ought to see a doctor once a year.
M	It's a real dark night so watch your driving.
M	Call her on the phone and tell her the news.
M	There's not enough room in the kitchen for a new table.
M	Wait for me at the corner in front of the drugstore.
M	The morning paper didn't say anything about rain this afternoon or tonight.
M	She'll only be gone a few minutes.
M	If we don't get rain soon, we'll have no grass.
M	Where can I find a place to park?
M	Why don't they paint their walls some other color?
M	I'll take sugar and cream in my coffee.
M	I haven't read a newspaper since we bought a television set.
M	Call me a little later!

Note. F = female; M = male.

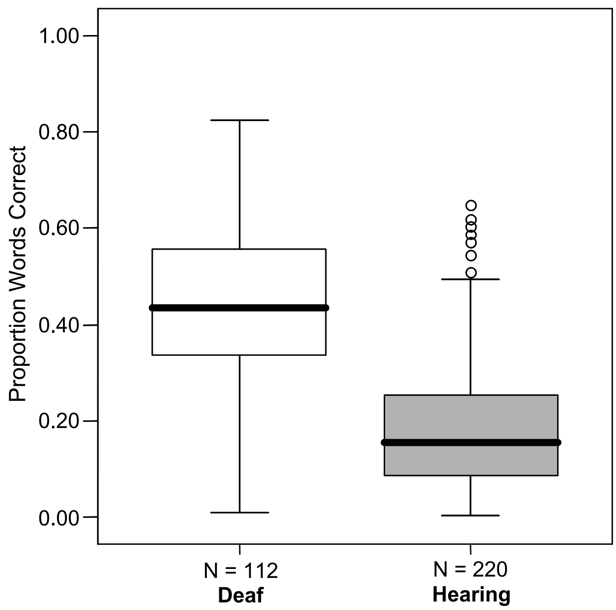
Results

After hand correction by an experimenter for misspellings or obvious typographical errors (e.g., *rign* for *ring*), scoring of words correct in speechread sentences was performed by custom software. Analyses were performed with both the raw percentage correct and, due to the generally low levels of accuracy for several participants, rationalized arcsine transform units (RAUs; Studebaker, 1985). The results were equivalent across both types of analyses, and the raw percentage correct scores are reported.

Group Differences

The performance of the participants with early-onset deafness (M = 43.55% words correct; SD = 17.48) significantly exceeded that of the participants with hearing (M = 18.57% words correct; SD = 13.18), $t(330)$ = 14.576, $p < .01$; $t_{RAU}(330)$ = 13.857, $p < .01$. Figure 1 shows a boxplot of the proportion of words correct in sentences for both participant groups. As expected, both groups included individuals who were extremely inaccurate. Thus, early-onset deafness is not a sufficient condition to guarantee even moderate speechreading accuracy. However, the upper quartile of those with early-onset deafness clearly scored above the upper quartile range of those with normal hearing. Furthermore, participants with early-onset deafness scoring above the lower quartile exceeded the upper quartile in the hearing-participant group. Only a few hearing participants scored in the upper quartile range of those with early-onset deafness. This evidence of enhanced speechreading ability in participants with early-onset deafness is consistent with observations reported in Bernstein et al. (2000) and Mohammed et al. (2005).

Figure 1. Boxplots of the proportion of words correct in sentences for participants with early-onset deafness and participants with hearing. The heavy horizontal line shows the median value, the boxes show the quartiles, the whiskers represent 1.5 times the interquartile range, and the circles depict outliers. *Outliers* are defined as cases with values between 1.5 and 3 times the interquartile range from the upper or lower edge of the box.



Gender Differences

Because the samples were collected across multiple experiments, groups did not comprise equivalent numbers of men and women. However, the proportion of women in both samples was comparable, with 63% in the hearing group and 65% in the deaf group. To investigate the possibility of gender differences and interactions with participant group, 2 × 2 analyses of variance (ANOVAs; untransformed and RAU-transformed) were conducted with two fixed factors, gender and hearing status. Neither the main effect of gender, $F(1, 328) = 2.644$, $p = .105$; $F_{RAU}(1, 328) = 3.297$, $p = .070$, nor the Gender × Hearing Status interaction reached the level of statistical significance, $F(1, 328) = 2.733$, $p = .10$; $F_{RAU}(1, 328) = 3.388$, $p = 067$ (normal-hearing participants: female M = 20.71% words correct, SD = 13.75; male M = 14.90% words correct, SD = 11.29; deaf participants: female M = 43.54% words correct, SD = 17.89; male M = 43.58% words correct, SD = 16.89). Thus, the present data set does not provide evidence for the existence of a gender difference in speechreading ability in either participant group.

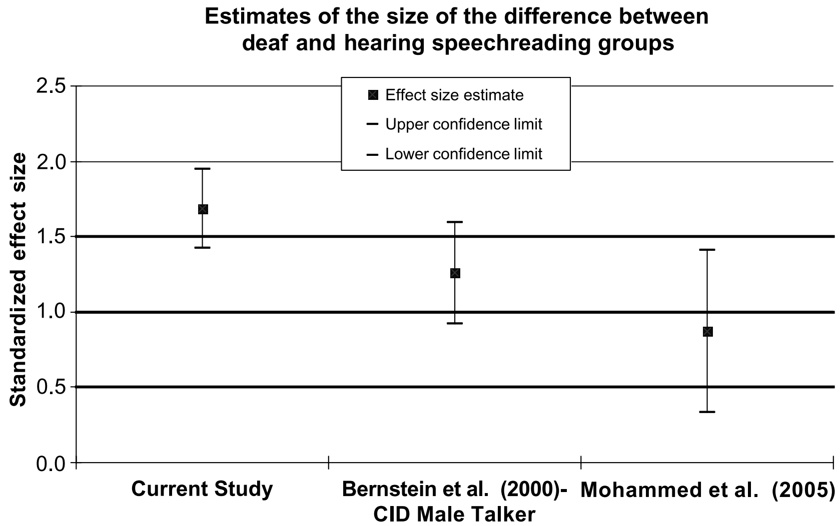
Individual Differences

To investigate individual differences within the deaf-participant group, correlation analyses were performed among audiometric data (left, right, and better-ear pure-tone averages), speechreading ability (number correct and RAU), printed English vocabulary knowledge (PPVT standard score equivalents), and self-assessed ability to communicate via spoken language with friends and the general public. These analyses were conducted on the subset of deaf participants (n = 83) for whom complete data were available. Results of Bernstein et al. (1998) were partially replicated. Consistent with Bernstein et al. (1998), audiologic measures did not correlate with speechreading measures. Also consistent with Bernstein's results, speechreading ability correlated with the self-assessments of ability to communicate via spoken language with friends and with the general public. Specifically, the speechreading measure correlated with self-assessment of ability to understand friends' speech ($r = -.330$; $r_{RAU} = -.351$), ability to understand the speech of the general public ($r = -.303$; $r_{RAU} = -.323$), ability of friends to understand your own speech ($r = -.390$; $r_{RAU} = -.397$), and ability of the general public to understand your own speech ($r = -.412$; $r_{RAU} = -.415$). In contrast to Bernstein's results, English scores were not correlated with speechreading ability. However, here, the test of printed English was limited to vocabulary knowledge, whereas measures in Bernstein et al. (1998) included a more comprehensive test of English proficiency. The present correlation results also are consistent with the hypothesis that extent of experience engaging in successful communication via speech is important.

General Discussion

The present study demonstrates enhanced speechreading ability within the population of individuals with early-onset deafness. These results are consistent with the results of two other recent studies (Bernstein et al., 2000; Ellis et al., 2001). Figure 2 shows the effect size (Cohen's d; Cohen, 1988) and 95% confidence interval for the difference in the speechreading ability of deaf and hearing participants observed here and in Bernstein et al. (2000) and Mohammed et al. (2005). In the present study, the effect size was 1.69, suggesting that the average prelingually deaf speechreader would score above 95% of the hearing participants. On the basis of Cohen's rule of thumb, all three studies support the conclusion that prelingual deafness has a large effect on speechreading ability. Taken together, the evidence supports the conclusion that conditions associated with early-onset deafness are conducive to developing enhanced speechreading abilities. This conclusion contradicts previous characterizations in the literature that individuals with normal hearing have similar (Summerfield, 1991) or better (Mogford, 1987) speechreading ability than those with hearing loss. Several possible reasons can be suggested for the apparent discrepancy between the

Figure 2. Standardized effect size (Cohen's *d*) with 95% confidence intervals of the difference in average speechreading scores in deaf and hearing participants are plotted for the present study, one stimulus set for Bernstein et al. (2000), and one for Mohammed et al. (2005). CID = Central Institute for the Deaf.



present results and previous characterizations of deaf and hearing speechreaders. First, previous generalizations were based on comparisons between postlingually deafened or hard-of-hearing versus normal-hearing individuals. If, as appears to be the case, early and lifelong reliance on visual information is critical for enhanced speechreading ability, then studies of postlingually deafened or hard-of-hearing participants cannot be expected to show differences between those with normal versus impaired hearing. Second, previous generalizations obtained with prelingually deaf individuals were based on studies of children. Such children frequently have delayed language acquisition, and differences between the deaf and hearing participants may have been a reflection of differences in language ability. Finally, and more important, many previous studies are based on relatively small sample sizes. However, given the exceptionally wide range of individual differences in speechreading ability in the prelingually deaf group, small samples are unlikely to be highly reliable. Thus, the present study, with a relatively large sample size and consistent with two previous studies of relatively large sample size, is more reliable than those previous studies that suggested no speechreading enhancement associated with deafness.

Gender Differences

The results of the ANOVA above did not support the conclusion that there are gender differences in speechreading ability. Certainly within the deaf-participant group, the average performance of the male and female participant groups was equivalent. However, had we only tested hearing participants, as was done previously, our conclusion might have been different. Our statistical test would not have included an estimate of the variance due to hearing status or to its interaction with gender. To explore this alternate possibility, we examined the data in Watson et al. (1996), which are most comparable to ours. They used an open-set sentence speechreading task that was identical to the one in the present study, including using stimuli from the same prerecorded set. They reported two studies with sample sizes of 40 (30 women) and 50 (18 women) participants, respectively. Their gender difference was reliable at $p = .013$ in Study I and $p = .007$ in Study II. The computed effect sizes for these studies (Cohen's $d = 1.09$ in Study I and $d = 0.78$ in Study II) suggest that gender has a large effect for participants with normal hearing. To analyze our data comparably, we carried out a t test restricted to the hearing participants in our study. Consistent with previous studies (Johnson et al., 1988; Watson et al., 1996), this test showed that women performed more accurately than did men, $t(218) = 3.224$, $p < .01$; $t_{RAU}(218) = 3.395$, $p < .01$. The result is consistent with a medium effect size (Cohen's $d = 0.45$). Given the significantly larger sample in the present study, the smaller estimated effect size here is likely more reliable. This interpretation is also supported by the inconsistent reliability of gender differences in speechreading ability across studies (cf. Irwin, Whalen, & Fowler, 2006; see also Johnson et al., 1988; Watson et al., 1996). The evidence taken across studies suggests that there is possibly a true, although modest, gender effect in speechreading ability within normal-hearing participants. This possibility further suggests that, in the future, studies of speechreading with hearing participants should control for effects of gender in the formation of participant groups.

Group and Individual Differences

The observed difference between the deaf- and hearing-participant groups raises the question of what factors are responsible for the enhanced speechreading ability. A simple explanation of this group difference could be that perceiving speech in the absence of any auditory signals is a very novel task for the hearing participants, whereas it is a common task for the participants with early-onset deafness. Thus, the difference between the groups is merely a result of differential task familiarity that could be nullified or reduced with additional speechreading experience by the hearing participants. To investigate this possibility, Bernstein, Auer, and Tucker (2001) tested the effect of short-term (six sessions) training with feedback on the speechread identification of isolated sentences in deaf and hearing participants. The results demonstrated that small gains in speechreading accuracy can be achieved but that the difference between the hearing and deaf participants remained stable over the course of the study. Those results led to the expectation that the group differences observed in the present study, as well as in Bernstein et al. (2000) and Mohammed et al. (2005), are stable and not simply the result of task familiarity per se. In addition, those results are consistent with our interpretation that early and lifelong reliance on visual information is critical for enhanced speechreading ability.

Thus, we interpret the enhancement in speechreading ability for early deaf perceivers as related to an effect of experiential differences between the two participant groups. We suggest that individual variation in speechreading ability is likely a complex interaction between innately determined perceptual and cognitive abilities and the experiential environment in which an individual develops those abilities to a greater or lesser extent. Both participant groups have wide variance in skills that support speechreading, which is consistent with the wide ranges of speechreading ability in both groups observed here and elsewhere. If we assume that these perceptual and cognitive skills need early and focused experience to reach their full potential, then we would predict a general increase and expanded range of speechreading ability in individuals with early and more experience. Furthermore, at a cortical level of explanation, experiential differences may be accentuated by compensatory plasticity in cortex that can occur when input to one modality is altered or reduced early in life (Bavelier et al., 2001; Bavelier & Neville, 2002). This is consistent with results obtained with the early-onset deaf participants here and elsewhere.

Speechreading of sentences deploys higher level psycholinguistic processes, such as syntax and semantics, as well as perceptual processes, such as phonetic perception and word recognition. Experiential effects could arise across levels, but we have argued that the bottom-up processes afford entry to the higher level ones, and we have demonstrated a high level of similarity between the processes responsible for auditory and visual spoken word recognition (Auer, 2002; Auer & Bernstein, 1997; Auer, Bernstein, & Tucker, 2000; Mattys, Bernstein, & Auer, 2002). Auer and Bernstein (1997), in a computational investigation of speechreading and the lexicon, predicted that small gains in visual segmental intelligibility (phonetic perception) should result in large gains in word intelligibility. Consistent with this prediction, Bernstein et al.'s (2000) results demonstrated that small differences between the deaf and hearing populations existed at the level of nonsense syllable identification. Likewise, differences in transmitted features favored deaf adults and were associated with greater accuracy in identifying isolated words. Thus, some of the observed enhancement is likely occurring in the processes involved in identifying speech stimuli at the segmental and lexical levels. This suggests that enhancements to perceptual processes are responsible for extracting phonetic information and recognizing words on the basis of the optical speech stimulus (see Bernstein et al., 2000, for a more detailed discussion).

Consistent with the hypothesized enhancements in perceptual processing associated with early-onset deafness are the results of a recent case study of an expert speechreader (Andersson & Lidestam, 2005). This individual (AA), who was tested with a battery of tests designed to assess several of the component perceptual and cognitive processes involved in speechreading, provided evidence counter to the hypothesis that enhanced speechreading ability depended primarily on higher order cognitive abilities such as working memory. Instead, AA's results support the conclusion that his extremely high level of speechreading accuracy is based on highly efficient bottom-up perceptual processing (Rönnberg, Samuelsson, & Lyxell, 1998). AA did not exhibit a superior ability in working memory or verbal inference. However, AA was skilled in phonological processing, word and phoneme identification, and semantic and phonological tests of verbal fluency, suggesting AA was skilled at the retrieval of lexical entries. This way of achieving high levels of speechreading skill contrasts with the reliance on higher order cognitive processes previously observed in skilled speechreaders with postlingual loss (Andersson & Lidestam, 2005). Anderson and Lidestam suggested that enhancement of low-level processes was a result of his early-onset loss.

Conclusion

The present demonstration of enhanced speechreading ability in participants with early-onset deafness is consistent with those observed in a different sample of talkers of American English (Bernstein et al., 2000) and of British English (Mohammed et al., 2005). The present weight of evidence supports rejecting characterizations in the literature stating that individuals with normal hearing are similar to (Hall et al., 2005; Summerfield, 1991) or better (Mogford, 1987) speechreaders than individuals with hearing loss. The previous assertions were generalizations to the entire deaf population on the basis of results of studies with postlingually deafened adults or deaf children as participants. Here, we demonstrated that early-onset hearing loss is associated with an expanded range and increased level of speechreading ability, which is likely, at least in part, an outcome of the need to rely on visual speech for the acquisition of spoken language followed by lifelong reliance on visual speech.

Acknowledgment

This study was funded by Grant DC04856 from the National Institutes of Health (NIH) National Institute on Deafness and Other Communication Disorders. The data collection was supported by Grants DC04856, DC02107, DC00695, DC03633 from NIH National Institute on Deafness and Other Communication Disorders and Grant KDI 9996088 from the National Science Foundation.

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Received January 31, 2006

Accepted January 4, 2007

DOI: 10.1044/1092-4388(2007/080)

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