

Age Effects on Measures of Hearing Disability

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This study investigated the effects of age on self-perceived hearing disability among young and elderly people with comparable hearing sensitivity. Subjects were young (18–40 yr) and elderly (65–75 yr) listeners with either normal hearing sensitivity or mild-to-moderate sloping sensorineural hearing loss. The Hearing Handicap Inventory for the Elderly was presented to the older subjects and the Hearing Handicap Inventory for Adults was presented to the younger subjects. Statistical analyses revealed an interaction between age and hearing loss, in which younger subjects with hearing loss reported more handicapping effects of sensitivity loss than the elderly subjects with hearing loss. This age effect was not attributed to differences in hearing sensitivity between the young and elderly subjects with hearing impairment.

(*Ear & Hearing* 1994;15:262–265)

Elderly listeners with hearing loss exhibit poorer speech recognition performance than younger listeners with comparable hearing sensitivity particularly in degraded acoustic environments such as noise (Dubno, Dirks, & Morgan, 1984) or reverberation (Gordon-Salant & Fitzgibbons, 1993). One might predict, therefore, that the impact of a hearing loss on communication function is greater in elderly listeners than in younger listeners. This issue has not been assessed previously by direct comparisons of self-perceived hearing disability in younger and older listeners.

A popular method for evaluating the impact of a hearing loss on communication function is with a scale of hearing disability. Numerous scales have been developed to assess hearing disability, although most have been developed for specific populations. For example, the Communication Profile for the Hearing Impaired (CPHI) (Demorest & Erdman, 1987) was standardized on young adults with noise-induced hearing loss, whereas the Hearing Handicap Inventory for the Elderly (HHIE) (Ventry & Weinstein, 1982) was developed for an elderly population.

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None of the scales has been developed for and standardized on a routine clinical population that includes both young and elderly individuals with hearing loss.

Recently, a modified version of the HHIE was developed for evaluation of younger adults by revising three of the original items. This modified version is the Hearing Handicap Inventory for Adults (HHIA) and has characteristics that are comparable to the HHIE in terms of length, structure, high internal consistency reliability (Newman, Weinstein, Jacobson, & Hug, 1990), and high test-retest reliability (Newman, Weinstein, Jacobson, & Hug, 1991).

To our knowledge, performances of young and elderly listeners on a scale of hearing disability have not been compared previously, perhaps because most scales have been developed for a limited age group. The availability of two highly similar versions of the Hearing Handicap Inventory—HHIE and HHIA—provides the opportunity to compare directly the disabling effects of hearing loss in young and elderly listeners. The purpose of this study, then, was to assess the effects of age on perceived hearing disability, using the age-appropriate version of the Hearing Handicap Inventory (HHI). Based on previous findings that elderly people experience excessive speech recognition difficulty in degraded listening environments, we predicted that elderly people would also experience more disabling effects of the hearing loss than younger people.

METHOD

Subjects

Four subject groups with 10 subjects each participated. The composition of each group was as follows: Group 1—young listeners (18–40 yr) with normal hearing sensitivity from 250–4000 Hz (≤ 15 dB HL, re: ANSI, 1989); Group 2—elderly listeners (65–75 yr) with normal hearing sensitivity; Group 3—young listeners with mild-to-moderate sloping sensorineural hearing loss; Group 4—elderly listeners with mild-to-moderate sloping sensorineural hearing loss. The hearing losses of subjects in Group

3 were matched as closely as possible to those of subjects in Group 4 on an individual basis. Hearing-impaired subjects were identified through the Hearing Clinic files at the University of Maryland. Table 1 presents the mean pure-tone thresholds of the four subject groups. Each subject had normal tympanograms and acoustic reflex thresholds present at 100 dB HL or better at 500–2000 Hz. Speech recognition scores on Northwestern University Test No. 6 (Tillman & Carhart, 1966) presented in quiet exceeded 88%.

Stimuli

The stimuli used in the present experiment were the two versions of the HHI (for the Elderly and for Adults). Each version of the HHI includes 25 items: 12 items sample the respondent's perceived impact of the hearing loss on social situations and 13 items sample the respondent's emotional reaction to the hearing loss. The respondent indicates "yes" or "no" to each of the 25 questions. The HHIE was presented to the two groups of elderly listeners and the HHIA was presented to the two groups of younger listeners.

Procedures

The tests presented in this experiment were part of a larger experimental protocol, which has been described elsewhere (Gordon-Salant & Fitzgibbons, 1993). During the initial visit, pure-tone thresholds, speech recognition scores, and acoustic immittance measures were obtained. This was followed by administration of the HHIE or HHIA, using a paper-and-pencil format. The HHI results were scored according to the standard scoring scheme (Ventry & Weinstein, 1982).

TABLE 1. Mean pure-tone thresholds and standard deviations (in parentheses) in dB HL for the four subject groups (YNH = young normal hearing; YHI = young hearing impaired; ENH = elderly normal hearing; EHI = elderly hearing impaired).

Group	Frequency (Hz)				
	250	500	1000	2000	4000
YNH	4.0 (3.7)	0.5 (2.7)	2.0 (4.0)	2.0 (3.3)	3.0 (5.6)
YHI	17.5 (16.8)	22.0 (20.0)	28.5 (17.0)	44.5 (15.4)	51.5 (10.7)
ENH	7.5 (4.6)	7.5 (5.6)	7.0 (7.1)	7.0 (4.6)	13.5 (3.2)
EHI	24.0 (9.7)	26.5 (8.0)	29.5 (13.5)	38.0 (8.4)	56.0 (13.9)

RESULTS AND DISCUSSION

The mean performance scores and standard deviations on the HHI (social items, emotional items, and total items) for the four subject groups are shown in Figure 1. Analyses of Variance (ANOVA) were conducted separately on the raw social scores, emotional scores, and total scores. The results revealed a significant main effect of hearing status ($F > 34$, $p < 0.01$) for each analysis, a significant main effect of age for the emotional and total scores ($F > 4.2$, $p < 0.05$), and a significant interaction between age and hearing status ($F > 7$, $p < 0.01$) for each of the three analyses. The source of each interaction was a significant age effect for hearing-impaired subjects but not for normal-hearing subjects. As expected, hearing-impaired subjects showed more hearing disability than normal-hearing subjects. An unexpected finding, however, was that young subjects with hearing loss exhibited more disabling effects of the hearing loss than elderly subjects with hearing loss.

One possible explanation for this age effect might have been poorer hearing sensitivity in the younger subjects than in the elderly subjects. To test this hypothesis, we compared the pure-tone thresholds of the two hearing-impaired groups at each audiometric frequency using t -tests. The results revealed no significant differences in pure-tone thresholds at any frequency ($t < 1.00$, $p > 0.28$, across frequency).

Given that the younger subjects reported more disabling effects of the hearing loss, we sought to determine if there were age-related differences in the sensitivity and specificity of the HHI for identifying individuals with mild-to-moderate hearing loss. Weinstein (1986) reported that a screening version of the HHIE could be used to identify people with significant hearing problems which require audiologic/otologic follow-up. Because the overall accuracies of the HHIE and HHIE-S are comparable for identifying hearing loss (Mulrow, Tuley, & Aguilar, 1990), it seemed appropriate to compare the accuracy of the HHIE and HHIA for identification of hearing loss among young and elderly listeners, respectively. The criterion for significant hearing disability was a cutpoint of 18% or greater on the HHI, as established by Ventry and Weinstein (1982). The calculated specificity rate for both young and elderly subjects was 100%, whereas the sensitivity rates were 90% and 50% for young and elderly subjects, respectively. Thus, it appears that the HHI is more sensitive for identifying mild-to-moderate hearing loss in younger subjects than in elderly subjects, at least for this small sample of subjects. Ventry and Weinstein (1982) noted that there was wide vari-

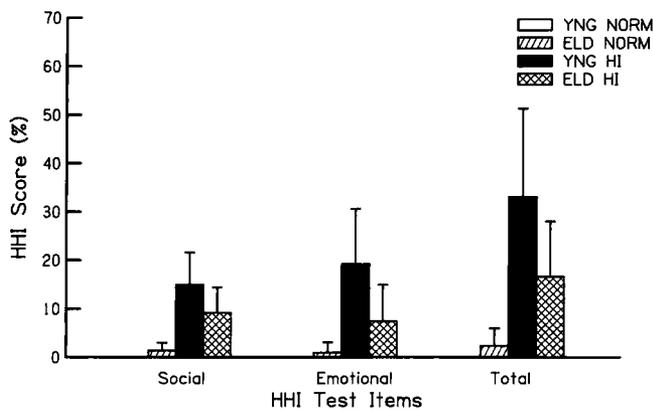


Figure 1. Mean Hearing Handicap Inventory scores for the four subject groups on the social items, emotional items, and total test items. Mean performance from young listeners with normal hearing was 0%.

ability in HHIE scores among elderly hearing-impaired subjects, which may explain the relatively low sensitivity rate observed.

The principle finding of this study is that younger subjects report more disability resulting from a mild-to-moderate hearing loss than elderly subjects. This finding may be attributable to several factors, including fewer demands on communication abilities in older people in retirement or a gradual progression of the hearing loss in older people that may produce subtle (and unnoticed) changes in communication function. Recent research on response criteria differences between young and elderly listeners supports the latter hypothesis. Gordon-Salant (1986) showed that elderly listeners have a higher degree of confidence in their own responses on speech recognition tasks than younger subjects, despite equivalent performance scores. Thus, elderly listeners may misunderstand the spoken message but respond with confidence that they are correct. Taken together with the current findings, these results indicate that elderly listeners may be less sensitive to the effect of a hearing loss on communication efficiency.

There are two practical implications of the current findings. The first is that age-related differences in perceived hearing disability may be associated with age-related trends in seeking audiological assistance. Dodds and Harford (1982) found that a large proportion of older adults in a community-based hearing conservation program failed to pursue recommendations for audiological evaluation and remediation. It appears that identification programs for hearing loss may need to include an aggressive counseling component for elderly people to realize the impact of a hearing loss on communica-

tion function. The second implication is that reduced perceived hearing handicap in older people may be a factor contributing to relatively low hearing aid acceptance by this group. Surveys indicate that approximately 20% of elderly hearing impaired individuals own hearing aids (Ries, 1982), and that between 53% and 72% of these elderly hearing aid owners use their hearing aids consistently (Salomon, Vesterager, & Jagd, 1988; Upfold & Wilson, 1983). Improving the older person's awareness of the impact of the hearing loss on communication also may be essential for reversing this trend. This goal could be accomplished by supplementing aggressive counseling with active demonstration of enhanced audibility afforded by assistive listening technology and wearable amplification. Through such efforts, older individuals with hearing loss may come to perceive what they have been missing.

ACKNOWLEDGMENTS:

This research was supported by a grant from the National Institute on Aging (R01 AG09191) awarded to the first author.

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Received August 18, 1993; accepted October 26, 1993

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