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Self-Reported Hearing Handicap and Audiometric Measures in Older Adults

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Abstract

As part of an epidemiologic study of hearing disorders in older adults, audiometric thresholds (250–20,000 Hz), word recognition performance (Northwestern University Auditory Test No. 6 word lists in quiet and in competing message), and Hearing Handicap Inventory for the Elderly-Screening (HHIE-S) scores were evaluated for 3178 adults ranging in age from 48 to 92 years. Overall, higher HHIE-S scores were more prevalent for older age groups and for greater degrees of hearing loss. After adjusting for the degree of hearing loss, the probability of reporting a hearing disability (handicap) decreased with age.

Key Words: Aging, hearing disability, Hearing Handicap Inventory for the Elderly-Screening, hearing impairment, presbyacusis

Abbreviations: ANSI = American National Standards Institute, HHIE = Hearing Handicap Inventory for the Elderly, HHIE-S = Hearing Handicap Inventory for the Elderly-Screening, NU-6 = Northwestern University Auditory Test No. 6, PTA = pure-tone average

Hearing loss is among the most prevalent conditions affecting older adults (Moscicki et al, 1985; Gates et al, 1990; Cruickshanks et al, 1998). The reported prevalence rate for hearing loss in older listeners varies somewhat, depending on the adopted definition of hearing loss, including the selection of test frequencies that are included in the algorithm used to define hearing loss. Regardless of the hearing loss definition, however, hearing impairment is a common problem for many older adults. In a most recent epidemiologic study of hearing loss in older adults, for example, Cruickshanks et al (1998) reported prevalence rates for hearing loss in adults ranging in age from 48 through 92 years. Across all ages, the prevalence of hearing loss approximated 46 percent; the prevalence of hearing loss increased with age and was greater for men than for women. Indeed, there is evidence suggesting that the prevalence of hearing loss in older adults (65 years of age and older) is on the rise (Ries, 1994).

Although we have considerable data, including recent findings from larger epidemiologic studies (Moscicki et al, 1985; Gates et al, 1990; Cruickshanks et al, 1998), documenting hearing loss or impairment across age and gender in older adults, there are considerably fewer data available regarding self-perceived hearing handicap or disability associated with the hearing loss in old age. This is an important issue because different measures are required for the evaluation of hearing impairment and hearing handicap or disability (Weinstein and Ventry, 1983; Weinstein et al, 1995; ASHA, 1997). Further, persons with hearing impairment may or may not report a significant self-perceived hearing handicap in their daily lives. The concept of hearing handicap or disability requires consideration of issues that extend beyond the audiogram used for classification of hearing impairment. As noted by Ventry and Weinstein (1983), "there is an imperfect relationship between hearing handicap (however measured) and hearing impairment."

A number of different instruments for self-assessment of hearing handicap have been developed over the past 30 years (Schow and

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Gatehouse, 1990; Schow, 1991). Only a limited number of these instruments, however, have been designed and standardized exclusively for use with an older adult population. Among the self-assessment instruments designed for adults, for example, only the Hearing Handicap Inventory for the Elderly (HHIE) and the screening version of the same instrument (HHIE-S) were designed exclusively for use in older adults (Ventry and Weinstein, 1983; Weinstein, 1984; Schow and Gatehouse, 1990). Although only a small percentage of practicing audiologists use self-assessment scales routinely (Schow et al, 1993; Martin et al, 1998), the HHIE is the instrument used by the largest number of audiologists (Schow et al, 1993). The HHIE-S is also one of the self-assessment measures recommended by the American Speech-Language-Hearing Association (ASHA, 1997) in screening for hearing disability in adults. The HHIE-S meets basic psychometric requirements (ASHA, 1997; Mencher et al, 1997, p. 248). Specifically, the HHIE-S has relatively good construct validity and internal consistency (Weinstein and Ventry, 1982; Weinstein, 1986), is a reliable test (Ventry and Weinstein, 1982; Weinstein and Ventry, 1982; Weinstein et al, 1986; Bess, 1995), and offers adequate test sensitivity and specificity (Lichtenstein et al, 1988; Schow et al, 1990; Bess, 1995).

Although the HHIE and HHIE-S were developed as tools for the assessment of hearing handicap in persons aged 65 years and older, the original standardization group consisted of a small number of older adults. Specifically, the HHIE-S norms were based on a pool of 162 participants aged 65 years or older. The degree of hearing loss, defined by the pure-tone average (PTA) for 500, 1000, and 2000 Hz, ranged from 0 to >55 dB HL for the participants. Given the screening objective for the instrument, the factors of age and gender were not evaluated in the data analyses. Indeed, there are no data on the prevalence of hearing handicap in older adults based on the HHIE-S instrument and there are also no data available establishing the independent effects of age and gender on HHIE-S scores for older adults. Such data may be important in evaluating the extent of hearing impairment and hearing handicap in older adults. Further, the degree of hearing loss may constitute a separate and confounding factor in the analysis of primary aging effects. These effects served as the primary focuses for the present epidemiologic study.

The primary purpose of the present study, then, was to examine the relation between self-perception of hearing disability and age in older adults. Measures of self-perceived hearing handicap, auditory thresholds for traditional and ultra-high frequencies, and word recognition performance in quiet and in the presence of a competing message were analyzed for a large group of older adults. Both age and gender effects were evaluated in relation to the prevalence of self-reported hearing handicap. Specific analyses were directed at determining the relations between age (by gender) and self-perception of hearing handicap, and at those audiometric indices that impact on variations in self-assessment of hearing handicap with age.

METHOD

Participants

Data for the present study were collected for 3471 participants (1963 women, 1508 men) in the baseline examination of the population-based study of hearing loss in older adults, the Epidemiology of Hearing Loss Study (EHLS). Approximately 99 percent of the participants were non-Hispanic white. Further details regarding the study population, including the prevalence and degree of hearing loss for study participants, have been provided in earlier reports (Klein et al, 1992; Cruickshanks et al, 1998; Nondahl et al, 1998; Wiley et al, 1998). For selected analyses, participants were assigned to one of four groups according to age in years (48–59: 666 women, 570 men; 60–69: 561 women, 482 men; 70–79: 519 women, 351 men; 80–92: 217 women, 105 men).

Procedures

HHIE-S scores (Ventry and Weinstein, 1983), audiometric thresholds for tones of 250–20,000 Hz, word recognition scores (Northwestern University Auditory Test No. 6 [NU-6]) in quiet, and word recognition scores in competing message (S/N = +8) were taken for each participant in one test session on the same day. The NU-6 tests were the female talker versions available on the Veterans Administration compact disc (version 1.1, 1991). In an effort to partially control for differences in the degree of high-frequency hearing loss across participants and age groups, word recognition tests were performed at 36 dB re each participant's audiometric threshold at 2000 Hz in the better ear. Behavioral air-conduction thresholds for tones were obtained using a diagnostic audiometer (Virtual, 320). A conventional

bracketing procedure (ASHA, 1978) was used for all threshold measures. The same audiometer coupled with a compact disc player (Sony, CDP-497) was used for administration of word recognition tests. The audiometer was calibrated in accordance with appropriate American National Standards Institute standards (ANSI, 1989, 1996). All testing was performed in sound-treated rooms meeting ANSI standards for ambient background noise (ANSI, 1991).

RESULTS

Prevalence of Hearing Handicap

HHIE-S data are summarized in Table 1. Throughout the analyses, HHIE-S scores >8 were considered indicative of a self-reported hearing handicap (Bess et al, 1989; ASHA, 1997). The percentage of participants with HHIE-S scores > 8 differed significantly for age groups and for men and women; the prevalence of self-reported hearing handicap (HHIE-S > 8) was higher for older age groups and was higher for men than for women. The age group trend was significant for the entire participant sample and independently for women and for men (see Table 1). The prevalence of hearing handicap was 14.2 percent for women and 23.3 percent for men (chi-square = 47.15, $p < .0001$); these prevalence rates were unchanged after adjusting for age. Prevalence findings are illustrated in Figure 1.

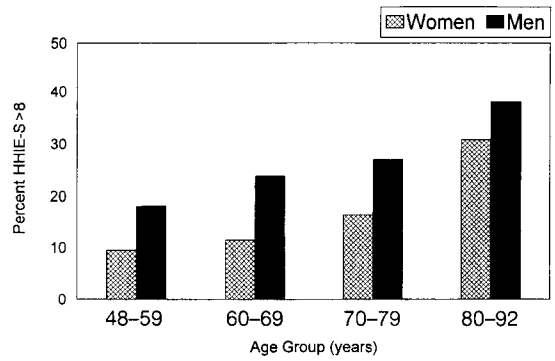

Figure 1 Prevalence of hearing handicap (HHIE-S > 8) by age and gender for all participants in the study.

Effects of Hearing Loss

As a means of distinguishing the effects of age and degree of hearing loss on HHIE-S scores, data were stratified on the basis of degree of hearing loss. Hearing loss categories were based on mean tone thresholds for 500, 1000, 2000, and 4000 Hz (PTA) and arbitrarily were defined as no hearing loss, PTA ≤ 25 dB HL; mild hearing loss, PTA > 25 dB HL and ≤ 40 dB HL; moderate/marked hearing loss, PTA > 40 dB HL. These data are summarized in Table 2. The lower cutoff of 25 dB HL for degree of hearing loss is consistent with the screening criterion for hearing impairment in adults offered by ASHA (1997). In Table 2 and Figures 2, 3, and 4, the percentage of participants with HHIE-S > 8 is displayed by degree of hearing loss based on the PTA. Overall, the prevalence of hearing handicap was higher for participants with greater degrees of hearing loss. The prevalence rates for hearing handicap were 8 percent, 29.3 percent, and 64.6 percent for participants with no hearing loss, mild hearing loss, and moderate/marked hearing loss, respectively. Also included in Table 2 are statistical analyses of age group effects after stratifying data for all participants by degree of hearing loss. Based on the stratified data for the entire sample, there were significant age group trends for those with no hearing loss and for those with mild and moderate/marked degrees of hearing loss (see Table 2). Overall, within degree of hearing loss categories, the prevalence of hearing handicap was lower for older age groups (see Figs. 2–4). Within gender, there were exceptions to the general trend. Using a common alpha level ($p < .05$), there was no significant age group trend for women with mild

Table 1 Percentage of Participants with HHIE-S > 8

	Women		*Men*		*All*	
	n	*%*	*n*	*%*	*n*	*%*
All	1963	14.2	1508	23.3	3471	18.2
48–59 yrs	666	9.5	570	18.1	1236	13.4
60–69 yrs	561	11.4	482	23.7	1043	17.1
70–79 yrs	519	16.4	351	26.8	870	20.6
80–92 yrs	217	30.9	105	38.1	322	33.2
p value*	< .001		< .001		< .001	

*Mantel-Haenszel Chi-Square Test (Mantel and Haenszel, 1959) for overall age group trend.

Table 2 Percentage of Participants with HHIE-S > 8 Stratified by Degree of Hearing Loss

Degree of Hearing Loss	Women		Men		All	
	n	%	*n*	%	*n*	%
None	1483	6.3	891	10.7	2374	8.0
48–59 yrs	635	7.6	479	12.5	1114	9.7
60–69 yrs	469	6.8	278	9.4	747	7.8
70–79 yrs	322	4.0	125	6.4	447	4.7
80–92 yrs	57	1.8	9	11.1	66	3.0
p value*	.01		.04		< .001	
Mild	334	26.4	424	31.6	758	29.3
48–59 yrs	25	36.0	82	42.7	107	41.1
60–69 yrs	77	24.7	164	36.0	241	32.4
70–79 yrs	156	25.0	133	23.3	289	24.2
80–92 yrs	76	27.6	45	20.0	121	24.8
p value*	.71		< .001		.001	
Moderate/marked	146	66.4	193	63.2	339	64.6
48–59 yrs	6	100.0	9	88.9	15	93.3
60–69 yrs	15	86.7	40	72.5	55	76.4
70–79 yrs	41	80.5	93	59.1	134	65.7
80–92 yrs	84	53.6	51	58.8	135	55.6
p value*	< .001		.052		< .001	

Hearing loss categories were based on mean tone thresholds for 500, 1000, 2000, and 4000 Hz (PTA) and were defined as none, PTA ≤ 25 dB HL; mild, PTA > 25 dB HL and ≤ 40 dB HL; moderate/marked, PTA > 40 dB HL.

*Mantel-Haenszel Chi-Square Test (Mantel and Haenszel, 1959) for overall age group trend.

hearing loss and for men with moderate/marked hearing loss. The age group trend (specifically, decreased rate of hearing handicap for older age groups) was significant for all other gender-specific hearing loss groups.

Covariate Analyses

Logistic regression analyses were used as a means of determining those covariates that impacted on variations in self-assessment of hearing handicap with age. Specifically, the odds/probability of having a hearing handicap (HHIE-S > 8) associated with each 5-year increase in age was determined after examining various combinations of possible effect modifiers. Consistent with the original purpose of the study, to determine the independent effects of age, the initial logistic regression analysis was focused on audiometric indices that might have accounted for variations in self-assessment of hearing handicap. The covariates used in these initial logistic regression models included gender, thresholds at specific audiometric frequencies from 250–14,000 Hz, various combinations of PTAs for frequencies 500–8000 Hz, the highest ultra-high frequency heard, word recognition scores in quiet, and word recognition scores in competing message. Covariates not independently associated with hearing handicap and not significant effect modifiers were eliminated from successive logistic regression models. The best-fit model, after eliminating nonsignificant covariates, is provided in Table 3 and indicates that the probability of having a self-reported hearing handicap decreased with age. Specifically, after adjusting for hearing thresholds at 500, 1000, 2000, 3000, and 6000 Hz and for the highest ultra-high frequency heard, the odds of having a self-reported hearing handicap decreased 24 percent for every 5-year increase in age. Gender differences were

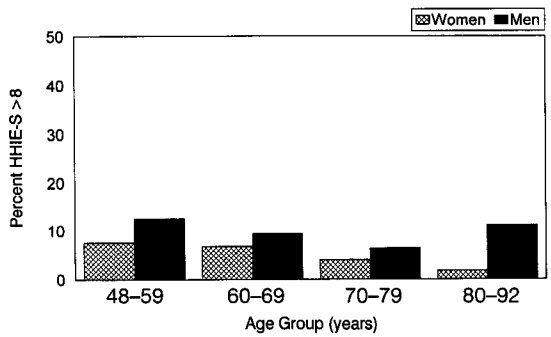

Figure 2 Prevalence of hearing handicap (HHIE-S > 8) by age and gender for participants with no hearing loss (PTA ≤ 25 dB HL).

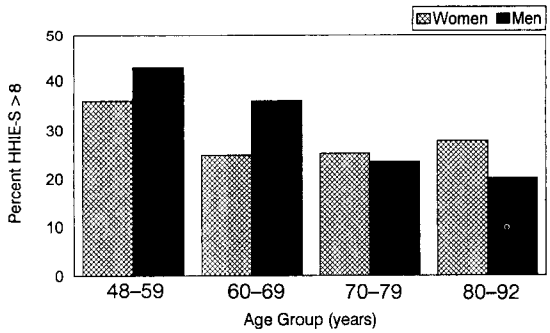

Figure 3 Prevalence of hearing handicap (HHIE-S > 8) by age and gender for participants with mild hearing loss (PTA > 25 dB HL and ≤ 40 dB HL).

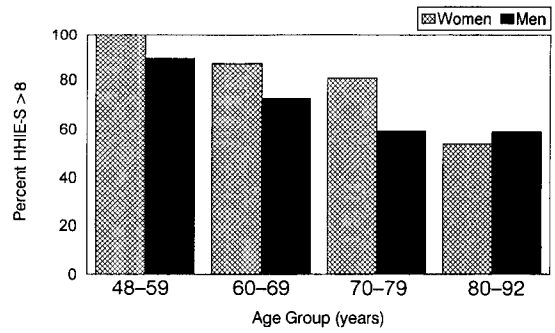

Figure 4 Prevalence of hearing handicap (HHIE-S > 8) by age and gender for participants with moderate/marked hearing loss (PTA > 40 dB HL).

not significant when other covariates were entered in the model.

Based on the outcome of the initial logistic regression analysis, additional factors were considered that might explain, at least in part, the decrease in reported hearing handicap for older age groups. A final logistic regression analysis was directed at an examination of effects for additional, nonaudiometric covariates potentially modifying the inverse age effect for hearing handicap. Information on these participant characteristics was obtained during the interview portion of the study (Cruickshanks et al, 1998) or was based on test data available from the ongoing eye study (Klein et al, 1992) in the same population. The additional participant characteristics evaluated were overall health, visual problems, impaired mobility, number of household members other than self (as a measure of social isolation), level of education, household income level, significant tinnitus, and employment status. (Definitions for the specific covariates are included at the bottom of Table 4.) These covariates were successively added to the original logistic regression model discussed earlier (see Table 3). Covariates that were not statistically significant and did not modify the age effect were eliminated from the final model. In the final model, a PTA (0.5, 1, 2, and 4 kHz) was used as a representation of hearing sensitivity because it resulted in better fitting models than those obtained using thresholds at individual test frequencies. The final, best-fit model (Hosmer and Lemeshow, 1989) is provided as Table 4 and indicates that the probability of reporting a hearing handicap decreased with age. After adjusting for hearing loss (PTA), fair/poor health, impaired mobility, less than a high school education, word recognition performance (in competing message), and significant tinnitus, the probability of having a self-reported hearing handicap decreased 27 percent for every 5-year increase in age. Gender differences were not significant.

DISCUSSION

Specific to the primary purpose of the present study, the unadjusted prevalence of self-reported hearing handicap (based on HHIE-S scores) was higher for older age groups and was higher for men than for women. The apparent increased self-perception of hearing handicap for older age groups, however, may be attributed to

Table 3 Initial Logistic Regression Model Results

Covariate	*Unit*	*Odds of Hearing Handicap Odds Ratio and 95% Confidence Interval*
Age	5 years	0.76 (0.71, 0.81)
500-Hz threshold	5 dB	1.17 (1.08, 1.26)
1000-Hz threshold	5 dB	1.16 (1.07, 1.26)
2000-Hz threshold	5 dB	1.09 (1.03, 1.15)
3000-Hz threshold	5 dB	1.17 (1.11, 1.23)
6000-Hz threshold	5 dB	1.07 (1.02, 1.11)
Highest ultra-high frequency tone heard	1000 Hz	1.06 (1.01, 1.11)

Hosmer and Lemeshow (1989) Goodness-of-Fit Test: chi-square (8) = 3.731, p = .88.

Table 4 Final Logistic Regression Model Results

Covariate	*Odds of Hearing Handicap Odds Ratio and 95% Confidence Interval*
Age (unit = 5 yrs)	0.73 (0.68, 0.79)
PTA (0.5, 1, 2, 4 kHz) (unit = 5 dB)	1.69 (1.58, 1.81)
Fair/poor health	1.38 (1.05, 1.82)
Impaired mobility	1.81 (1.40, 2.34)
<12 years education	0.64 (0.49, 0.84)
Word recognition score in competing message (unit = 5%)	0.95 (0.91, 0.98)
Significant tinnitus	3.60 (2.65, 4.89)

Nonaudiometric covariates used as a basis for the model were as follows: overall health (self-report as excellent, very good, good, fair, or poor); number of reported chronic health conditions (0–5, including cardiovascular disease, cancer, diabetes, emphysema, arthritis); hypertension (systolic ≥ 140 or diastolic ≥ 90 or on current medication for hypertension); impaired vision (visual contrast sensitivity < 1.55 in better eye, visual acuity 20/40 or worse in better eye); impaired mobility (including reported use of an aid for walking, or not able to walk six blocks, or not able to walk up/down a flight of stairs); reported balance problems; isolation (reported number of household members other than self); reported level of education (less than 12 years education); reported low income level (< $20,000 for household); reported number of daily cardiovascular and hypertension medications (0–7); significant tinnitus (described as moderate to severe, or inhibits sleep); and reported employment status (working or not working). Only significant covariates are included in the model.

Hosmer and Lemeshow (1989) Goodness-of-Fit Test: chi-square (8) = 5.50, p = .70.

the increased degree of hearing loss with age and the gender differences in degree of presenting hearing loss. Accordingly, as a means of distinguishing age effects independent of hearing loss, hearing handicap prevalence was evaluated for participants after stratifying measures on the basis of the degree of hearing loss. After accounting for the degree of hearing loss, the prevalence of self-reported hearing handicap generally was lower for older age groups than for younger age groups. Two exceptions to this general finding were observed. There was no significant age group trend for HHIE-S scores in women with mild hearing loss and in men with moderate/marked hearing loss. All other groupings by hearing loss and age revealed a significant age group trend. The two exceptions may be a result of the unique character of the particular population sample or a result of other factors, including the arbitrary categorical definitions of hearing loss. Even so, the general decline in self-reported hearing handicap in older age groups was apparent for the population sample. After accounting for the degree of hearing loss in men and women, self-reported hearing handicap was lower for older age groups. Based on logistic regression analyses, the probability of self-reported hearing handicap, after adjusting for the degree of hearing loss, declined 24 percent for every 5-year advancement in age for older adults in the present study (see Table 3).

Gender differences were not significant after other covariates were entered into the logistic regression model. This suggests that men and women fare about the same on the HHIE-S if comparisons are made for participants with comparable degrees of hearing loss. This also suggests that the HHIE-S is less influenced by gender than by the amount of hearing loss for a given participant. The lack of gender differences for the HHIE-S would tend to support its use in clinical screening applications.

Another set of logistic regression analyses was performed to examine additional, nonaudiometric factors that may have accounted for the observed decrease in reported hearing handicap (adjusted for hearing loss) with advancing age. These factors included health-related variables, visual problems, impaired mobility, social isolation (living alone), level of education, significant tinnitus, and employment status. Based on this final logistic regression model (see Table 4), after adjusting for the degree of hearing loss, the probability of self-reported hearing handicap declined 27 percent for every 5-year advancement in age for older adults in the present study. After accounting for the other covariates, there were no significant gender differences.

Given the increased prevalence of hearing loss with advancing age and the greater degree of hearing loss for older age groups (Cruickshanks et al, 1998), the decrease in self-reported hearing handicap with advancing age, even after accounting for degree of hearing loss, is a somewhat unexpected finding. Still, the attitudes that underlie the lower prevalence of self-reported hearing handicap in older adults also may be fundamental to the low prevalence of hearing aid use in this same population (Popelka et al, 1998). In the present study, 40.2 percent of participants with any measured hearing loss reported having a hearing handicap (HHIE >8). Popelka et al

(1998) found that the prevalence of current hearing aid use in the same study population was only 14.6 percent among participants with measured hearing loss. Clearly, many older adults with significant measured hearing loss do not report having a hearing handicap and are not using a hearing aid. This may reflect, in part, dissatisfaction with hearing aids that are available commercially or that were available at the time an individual completed a trial with the hearing aid. However, many older adults have never tried a hearing aid. Popelka et al (1998) reported that only 20.7 percent of older adults with any degree of hearing loss had ever used a hearing aid. Another explanatory factor, consistent with the findings of the present study, may be the tendency for older adults to feel that their hearing impairment is not severe enough to warrant use of a hearing aid. The low percentage of participants reporting a hearing handicap is certainly consistent with the low prevalence of hearing aid use in the same population. A simplistic conclusion is that if a person does not feel he/she has a problem, he/she does not try to fix it (e.g., with a hearing aid).

The observed decrease in self-reported hearing handicap with age, after accounting for the degree of hearing loss, in the present study is consistent with the age effects observed in other studies of self-report for older adults. A number of studies have shown that, relative to younger counterparts, older adults consistently report having less of a problem as the result of an identified disability or health disorder (Idler, 1993; Aldwin et al, 1996; Dening et al, 1998; Mercier et al, 1998). Similarly, cross-sectional age studies in adults with different chronic diseases indicate that symptoms of distress are less common in older patients (Callileth et al, 1984; Leventhal, 1984; Deeg et al, 1996). As Idler (1993) summarized the issue, "A substantial number of empirical studies find evidence for a tendency on the part of elderly people to minimize or even ignore their prevalent health problems" (p. S289). Results of the present study mirror these findings in other health-related areas. Only 18 percent of the entire study population in the present study reported having a hearing handicap. Among all participants with mild and moderate/marked hearing loss, 71 percent and 35 percent, respectively, did not report having a hearing handicap.

Several arguments have been advanced to explain the basis for the general finding that relative to younger adults with similar impairments, older adults express having less of a problem as a result of the impairment. Some of these arguments may be relevant to the observed age trends for self-reported hearing handicap in the present study. Older adults may simply be less bothered by a given disability and/or may cope more successfully in the face of the disability. It has been posited that because chronic illnesses and disorders are more common in older adults, the impact of these problems is less disruptive in older people relative to younger adults (Callileth et al, 1984; Deeg et al, 1996). It has also been suggested that, relative to younger adults, older adults may have developed better coping skills for the management of their disabilities (Callileth et al, 1984; Aldwin et al, 1996; Deeg et al, 1996). Both of these issues may partially explain the decreased prevalence of self-reported hearing handicap with advancing age (adjusted for degree of hearing loss) observed in the present study and also would be consistent with the decreased use of hearing aids noted by Popelka et al (1998). Relative to their younger counterparts, older adults may view their hearing impairment as less of a handicap and/or have found better ways to cope in the face of the hearing impairment.

It might be argued that older adults express having less handicap as a result of hearing loss because their lifestyles place less demand on hearing. Due to reduced social contacts, fewer work demands, and a more restricted set of environmental activities that often are associated with everyday life for older adults, it might be argued that hearing does not play as large a role as that for younger adults who may lead a more active, varied lifestyle that places greater demands on hearing and communication abilities. In the present study, factors of job status, decreased mobility, social isolation, and other nonaudiometric factors contributed somewhat to the prevalence of hearing handicap, but these factors did not alter the relationship of reduced prevalence of self-reported hearing handicap with age, after accounting for the degree of hearing loss. The odds ratio for self-reported hearing handicap with age remained about the same with or without inclusion of the additional covariates. The stereotype of inactive senior citizens may not be an accurate profile for many older adults in this and other studies of aging. In the present study, for example, 14 percent of participants ≥ 65 years of age reported full- or part-time employment. Further, it might be argued that hearing abilities would be equally or more important for retired older adults given the potential increased dependence on others for

care as well as the potential for increased communication contacts that may accompany the additional free time that comes with retirement from the work force.

Another possible basis for the age effects observed in the present study is related to the generation of people represented by the group under study. Specifically, the outcomes may be a primary reflection of characteristics particular to the cohort studied. Several investigators have suggested that the generation of individuals comprising older age groups in contemporary aging studies likely experienced greater hardships in life relative to younger adults. These hardships may have led to the development of lower expectations in life, stronger coping and survival skills, and greater tolerance for health problems and disabilities that accompany growing old (Callileth et al, 1984; Idler, 1993; Deeg et al, 1996). An issue related to a possible cohort effect is that of selective survivorship (Idler, 1993). Those individuals that comprise older age groups have typically already experienced greater hardships, including a greater risk of health problems throughout their lifespan, lower socioeconomic conditions, and lower health care conditions. Sheer survival through these hardships inherently may have shaped a more optimistic group of individuals. Further, those that did not survive may, as a group, have been those with greater health problems and disabilities. The selective process of survival, then, may have produced a more robust, healthier older cohort representing a greater number of health optimists shaped by their life experiences. Given the cross-sectional nature of the present study, as well as a number of the previous studies in aging, it is not possible to parse aging effects independent of such a cohort effect. The longitudinal studies of Idler (1993) suggest that the issues of aging, cohort, and survivorship "...all appear to play a role..." and "It appears likely that interactions are present between two or even three of the hypotheses." This interaction between aging and cohort effects also is supported by the work of Dening et al (1998) on self-assessment of overall health.

Findings from the present study are consistent with the preponderance of similar age findings for self-assessment of other health problems and disabilities (see Idler, 1993, for a review of these studies). Regardless of the question asked, the answer appears to be the same: older respondents express having less handicap for a given problem or disability. This finding may, on the surface, appear to be inconsistent with expectations for older adults because of the apparent discrepancy between objective measures of health problems and the level of self-reported handicap or dissatisfaction associated with the problems. The outcome of decreased self-reported handicap with increased age, however, is compelling across a number of health areas and the breadth of consistency in the finding suggests that it is not likely the result of universally flawed measuring instruments. The problem, then, may be more a problem of an unexpected and not fully explainable outcome based on preexisting models. An alternative conclusion is that the outcome is as simple as it seems to be. Older adults, as aware of their limitations as their younger counterparts, are simply more satisfied with their lot.

CONCLUSIONS

The primary findings from the present study were that (1) the prevalence of hearing handicap, like the prevalence of hearing loss, increased with advancing age; (2) after stratifying measures on the basis of participants' hearing loss (PTA), the prevalence of reporting a hearing handicap decreased with age; and (3) the reduced probability of self-reported hearing handicap in older age groups, after adjusting for the degree of hearing loss, was not altered by including other health and nonaudiologic characteristics of the population in the model. The observed decrease in self-reported hearing handicap with advancing age will need to be accounted for in applications of self-assessment inventories of hearing impairment and in counseling older adults with hearing impairment.

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