

Psychosocial Correlates of Hearing Aid Adjustment

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Abstract

Despite considerable evidence regarding the detrimental effects of untreated hearing loss, there continues to be an underutilization of hearing aids by adults. The Long Term Follow-Up of Patients in the National Institute on Deafness and Other Communication Disorders/Veterans Affairs (NIDCD/VA) Hearing Aid Clinical Trial (Cooperative Studies Program [CSP] 418-A) provided the opportunity to compare a number of potential psychosocial influences and outcomes for hearing aid users and nonusers from the original CSP 418 study. The Communication Profile for the Hearing Impaired (CPHI) results provide compelling evidence of hearing aid benefit. Mean Communication Performance (CP) scores for hearing aid users on the Social, Work, and Home scales improved significantly from the original CSP 418 administration. For nonusers, there were no significant CPHI changes from the previous administration. Although hearing aid users and nonusers did not differ in optimism, this parameter was correlated with personal adjustment, measured via the CPHI. Hearing aid use was associated with the perception of major life events, such as illness, retirement, and so forth.

Key Words: Communication performance, hearing aid benefit, psychosocial adjustment

Abbreviations: CI = Communication Importance; CLE = Checklist of Life Events; CP = Communication Performance; CPHI = Communication Profile for the Hearing Impaired; CSP = Cooperative Studies Program; CST = Connected Speech Test; GHABP = Glasgow Hearing Aid Benefit Profile; LOT = Life Orientation Test; NIDCD = National Institute on Deafness and Other Communication Disorders; PHAB = Profile of Hearing Aid Benefit; SADL = Satisfaction with Amplification in Daily Life; VA = Veterans Affairs

Sumario

A pesar de la evidencia considerable en relación con los efectos perjudiciales de una hipoacusia no tratada, continúa existiendo una sub-utilización de auxiliares auditivos (AA) en los adultos. El Seguimiento a Largo Plazo de Pacientes en el Estudio Clínico de Auxiliares Auditivos del Instituto Nacional de Sordera y Otros Trastornos Comunicativos/Asuntos de Veteranos (NIDCD/VA) (Programa de Estudios Cooperativos [CSP] 418-A) ofrece una oportunidad de comparar un número de influencias y resultados psico-sociales en usuarios y no usuarios de AA, del estudio CSP 418 original. Los resultados del Perfil de Comunicación para el Hipoacúsico (CPHI) aportaron una evidencia

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convinciente sobre el beneficio del AA. Los puntajes medios de Desempeño en la Comunicación (CP) para usuarios de AA en las escalas Social, Laboral y Hogareña, mejoraron significativamente con respecto a la administración original del CSP 418. Para los no usuarios, no existieron cambios significativos en el CPHI comparados con la previa administración de la prueba. Aunque el optimismo de los usuarios y de los no usuarios no difería, este parámetro se correlacionó con el ajuste personal, medido a través del CPHI. El uso de AA se asoció con la percepción de eventos principales en la vida del sujeto, tales como enfermedad, retiro, y otros.

Palabras Clave: Desempeño en la comunicación, beneficio del auxiliar auditivo, ajuste psico-social

Abreviaturas: CI = Importancia de la comunicación; CLE = Lista de Eventos en la Vida; CP = Desempeño en la comunicación; CPHI = Perfil de Comunicación en el Hipoacúsico; CSP = Programa de Estudios Cooperativos; CST = Prueba de Lenguaje Conectado; Glasgow = Perfil de Glasgow de Beneficio del Auxiliar Auditivo; LOT = Prueba de Orientación en la Vida; NIDCD = Instituto Nacional de Sordera y otros Trastornos Comunicativos; PHAB = Perfil de Beneficio del Auxiliar Auditivo; SADL = Satisfacción con la Amplificación en la Vida Diaria; VA = Asuntos de Veteranos

As the baby boomer generation ages, there is an increasing number of people with hearing impairment. Nonetheless, market penetration for hearing aid purchase is not increasing and remains at around 22% (Kochkin, 1999). Even when individuals purchase hearing aids, on average 16.2% of the hearing aids are never worn and are often returned for credit or relegated to a dresser drawer (Kochkin, 2000). Given the pronounced deleterious effects that untreated hearing loss may have on individuals (National Council on Aging, 1999), the underutilization of hearing aids by adults who potentially might benefit from them should be a major concern to audiologists. Two recent studies highlight the effects of hearing loss on the quality of life of older adults. Using participants in the Longitudinal Aging Study in Amsterdam, ranging in age from 55 to 85 years, Kramer et al (2002) found that hearing impairment was positively associated with depressive symptoms and loneliness, and negatively associated with feelings of self-mastery, scores on self-efficacy, and social network size. Similarly, Joore et al (2002) found that hearing loss in older adults compromised quality of life scores and, further, that after being fitted for hearing aids for the first time, overall quality of life and psychological well-being in elders with hearing loss were significantly improved.

Erdman et al (1994) have pointed out that this situation is similar for adherence to regimens for other health-related condi-

tions. There is a low rate of patient compliance in following through on regimens recommended by health professionals (Meichenbaum and Turk, 1987). The level of adherence varies depending on the type of treatment. Treatment for chronic conditions such as hearing loss and other disabilities must be sustained over long, often indefinite periods of time. Not surprisingly, the lowest rates of adherence occur for chronic disorders and disabilities. DiMatteo and DiNicola (1982) offer a number of explanations for noncompliance with treatment recommendations, including motivation, outcome expectations, health beliefs, denial, locus of control, patient resources, and the practitioner-patient relationship. DiMatteo and her coauthors (1993) point out that as many as 80% of all patients undergoing long-term treatments for chronic disease fail to carry out a specified management regimen to completion.

Sherbourne and her coauthors (1992) conducted a longitudinal evaluation of over 1000 patients with chronic medical diseases (hypertension, diabetes, and heart disease) to identify factors affecting adherence to treatment recommendations. Five possible antecedents of adherence were examined: health perceptions, individual characteristics, social circumstances, practitioner-patient relationship, and health knowledge. Lower levels of adherence were associated with a number of factors and/or life events such as worse physical health, younger age, and financial difficulties. Higher levels of

adherence were associated with satisfaction with medical care. Social support was linked to higher levels of adherence only for patients with diabetes. Among patients with heart disease, older individuals with higher education levels were more likely to adhere to treatment regimens. For patients with hypertension, greater adherence was evident for patients with heart disease, lower levels of health distress, and greater age. The results of this study highlight the fact that the life events and factors influencing compliance for one medical condition may be quite different from the factors that affect compliance for a different condition. The strongest predictor of adherence to treatment recommendations was whether the patient had adhered in the past. These authors also concluded that patients with chronic conditions are at particular risk for not adhering to professional advice.

Over the past decade, increasing attention in audiological research has been given to the nonaudiological variables that may influence hearing aid outcomes and adjustment (Gatehouse, 1994; Garstecki and Erler, 1998, 1999; Kricos, 2000). In a review of the literature, Kricos (2000) identified a number of nonaudiological variables that potentially could influence audiological outcomes, including race/ethnicity, gender, age, personality, self-efficacy, and social support. In particular, personality factors such as extroversion, anxiety, depressive symptoms, and locus of control, as well as the availability of social support, influence hearing aid use.

One personality variable that has received scant attention from audiology researchers is dispositional optimism. Several studies cited by Iwanaga et al (2004) used the Life Orientation Test (LOT; Scheier and Carver, 1985), a measure of dispositional optimism, to show that optimists generally tend to deal with stressful events by using active coping strategies and problem-focused coping strategies, whereas pessimists tend to adopt denial and avoidance coping strategies. Dispositional optimism has also been found to play a role in influencing whether a person persists in goal-directed behaviors (Strack et al, 1987; Carver et al, 1989; Scheier et al, 1989; Aspinwall and Taylor, 1992). Strack et al (1987), for example, showed that optimists were more likely to complete an alcohol aftercare program. In development of the

LOT, Scheier and Carver (1985) demonstrated that LOT scores correlated positively with self-esteem and negatively with measures of hopelessness, depression, perceived stress, alienation, social anxiety, and symptoms of physical illness. Only a few audiology researchers have used the LOT to determine whether dispositional optimism influences the hearing aid users' abilities to cope with hearing loss. Scott et al (1994) and Andersson et al (1995) found modest correlations between hearing aid users' degree of dispositional optimism and the level of stress/annoyance they experienced when trying to cope with difficult listening situations. We are unaware of any research to date that has compared hearing aid users versus nonusers on this personality trait.

Brooks and Hallam (1998) further delineated the role of attitudes toward hearing difficulties and hearing aids on hearing aid outcomes. These authors studied over 100 hearing aid candidates and found that those who were most distressed by their hearing problems and who reported wanting or needing hearing aids used their hearing aids more frequently and rated them more highly in listening situations. Gatehouse (1994) and Andersson et al (1995) reported that affective states such as optimism and neuroticism also may have an effect on individuals' assessment of hearing problems and hearing aid benefits. Erdman and Demorest (1994) found that several scales (e.g., Self-Acceptance, Acceptance of Loss, Denial, Problem Awareness) of the Communication Profile for the Hearing Impaired (CPHI) were related to continued compliance with recommended hearing aid use. Similarly, Jerram and Purdy (2001) found that research participants with better personal adjustment to hearing loss as measured by the Acceptance of Loss scale of the CPHI reported using their hearing aids more often.

In a series of studies comparing those individuals who adhered to the audiologist's recommendation to use hearing aids (referred to as adherents) with those who did not (nonadherents), Garstecki and his associates identified several factors that may affect compliance with the recommendation to use hearing aids (Garstecki, 1996; Garstecki and Erler, 1996, 1998, 1999). These included gender, age, social

support, socioeconomic status, education, and attitudes toward hearing aid use. These results were consistent with those of Erdman and Demorest (1998b).

The Long Term Follow-Up of Patients in the National Institute on Deafness and Other Communication Disorders/Veterans Affairs (NIDCD/VA) Hearing Aid Clinical Trial (Cooperative Studies Program [CSP] 418-A) provided the opportunity to compare the psychosocial characteristics and hearing aid adjustment of hearing aid users and nonusers from the original CSP 418 NIDCD/VA Hearing Aid Clinical Trial study. The specific aims reported in this paper were to determine whether hearing aid users and nonusers differed in dispositional optimism, whether the occurrence of major life events affected hearing aid use, and whether there were significant differences in the psychosocial characteristics of hearing aid users and nonusers.

METHOD

Participants

The participants in the original NIDCD/VA Hearing Aid Clinical Trial (CSP 418) were selected to be representative of the age, race, gender, and degree of hearing loss typical of the adult hearing aid wearing public. Demographic and audiological data for participants in the present study are delineated in Bratt et al (in this issue). There were 197 members of the original CSP 418 cohort who completed either a clinic visit or an in-home visit for CSP 418-A, as described by Bratt et al (in this issue). One hundred sixty-four of the study participants were hearing aid users, defined as having used hearing aids within the past month. Thirty-three of the study participants were nonusers, defined in this study as individuals who at one time wore hearing aids, many for an extended period of time, but who were no longer using their hearing aids. Although some of the non-hearing aid users had malfunctioning hearing aids that they still had in their possession, it must be emphasized that these were individuals who expressed no intention of getting their hearing aids repaired so that they could resume their use. Thus, they were categorized as nonusers. The distribution of reported daily hearing aid use

can be found in Takahashi et al (in this issue). The majority of participants reported using their instruments more than eight hours per day. Nineteen percent of the participants reported using their hearing aids less than one hour per day or did not use them at all. The mean age of the cohort in the follow-up study was 73.2 years (range = 36–96), with 56.9% of the participants being male and 79.4% Caucasian. On average, the degree and configuration of hearing losses were similar for both groups (moderate-to-severe sloping losses), with the nonusers having slightly better air-conduction thresholds in the right and left ears at 2000 Hz ($p < .05$) and in the left ear at 4000 Hz ($p < .05$). All of the participants had sensorineural hearing losses. Similarly, unaided word recognition in quiet was significantly better ($p < .05$) for nonusers than users, with scores of 81.4% in the right ear and 78.9% in the left ear for nonusers, and 76.2% in the right ear and 72.5% in the left ear for hearing aid users.

Test Materials and Procedures

The LOT (Scheier and Carver, 1985) was used to assess participants' degree of dispositional optimism. The LOT is a questionnaire measure of generalized positive outcome expectancies, for which adequate internal consistency and retest reliability have been demonstrated (Scheier and Carver, 1985). The LOT consists of 12 statements, and participants were asked to read each statement and then circle the response that represented their level of agreement with each statement. Respondents rated their agreement on a five-point Likert scale ranging from 4 ("Strongly Agree") to 0 ("Strongly Disagree"). Four of the LOT items reflect optimism (e.g., "In uncertain times, I usually expect the best"); four items reflect pessimism (e.g., "I hardly ever expect things to go my way"); and four are filler statements designed to disguise the purpose of the test (e.g., "I enjoy my friends a lot"). Responses to the filler statements are not scored, and response categories for the negative-content questions were reversed for scoring. The maximum score obtainable on the LOT is 32 points. A higher score indicates greater optimism.

To determine whether the occurrence of

major life events affected hearing aid use by the CSP 418-A cohort, the two senior authors devised a measure called the Checklist of Life Events (CLE). The CLE is designed to gather data on the occurrence of major life events, as well as the impact of those events on hearing aid use, that have taken place since the participants were involved in the original CSP 418 study. The checklist consists of 14 items, 12 of which list major life events such as "Death of Husband/Wife/Partner," as well as two open-ended items that allowed the participant to identify other major changes/events and/or other experiences that may have influenced hearing aid use (see Appendix). The questions were read aloud to the participant, who was asked to answer "Yes" or "No" as to whether she or he had experienced the event(s) since the first hearing aid study. If the response was "Yes," the participant was asked to indicate whether the event(s) had resulted in an increase, decrease, or no change in hearing aid use. For some of the event categories, the participant was asked to briefly list the specific events experienced.

To obtain information regarding psychosocial adjustment and communication, participants were also asked to complete the CPHI (Demorest and Erdman, 1987; Erdman and Demorest, 1998a) in a pencil-and-paper format. The questionnaire has 145 items grouped into 25 scales, which in turn cluster into five major sections: Communication Performance, Communication Importance, Communication Environment, Communication Strategies, and Personal Adjustment. Participants use a one- to five-point scale to denote their agreement with statements on the questionnaire regarding various communication situations and variables. If the participant wore hearing aids, she or he was instructed to respond to the items as if wearing hearing aids. Nonusers were asked to base their responses on current unaided experiences.

It should be noted that in the original CSP 418 study, approximately one-half (46.7%) of the participants had never used a hearing aid, 6% were previous hearing aid users, and 48.1% were current hearing aid users. As in the present study, the original CSP 418 hearing aid users were asked to base their CPHI responses on their aided

experiences.

CPHI scales are scored such that low scores suggest problem areas or potentially exacerbating variables and high scores indicate more favorable adjustment. The CPHI has undergone extensive standardization and has been found to be a useful and reliable clinical and research tool (Demorest and Erdman, 1989a, 1989b; Kricos and Holmes, 1996; Erdman and Demorest, 1998a, 1998b). Canonical and factor analyses indicate that the various scales of the CPHI draw on independent aspects of communication difficulties typically experienced by individuals who are hearing impaired (Demorest and Erdman, 1989a, 1989b).

Additional measures were administered as part of the CSP 418-A follow-up study, the results of which were pertinent to the data reported in this manuscript. These included aided and unaided responses to a recorded version of the Northwestern University Auditory Test No. 6 (NU-6) monosyllabic word-recognition test (Tillman and Carhart, 1966; Wilson, 1993; Shanks et al, in this issue); the Connected Speech Test (CST; Cox et al, 1987, 1988; Shanks et al, in this issue), a measure of the ability to comprehend everyday, connected discourse; the Satisfaction with Amplification in Daily Life (SADL; Cox and Alexander, 1999, 2001; Takahashi et al, in this issue), a measure of hearing aid satisfaction; the Glasgow Hearing Aid Benefit Profile (GHABP; Gatehouse, 1999; Takahashi et al, in this issue), a self-report of activity limitations and benefit from, use of, and satisfaction with hearing aids; and the Profile of Hearing Aid Benefit (PHAB; Cox and Rivera, 1992; Takahashi et al, in this issue), a subjective measure of the hearing aid user's perceptions of the benefit received from hearing aids. A more complete description of these test materials, as well as the outcomes with each measure, can be found in Takahashi et al (in this issue) and Shanks et al (in this issue).

RESULTS

Comparisons between the current hearing aid users and the non-current hearing aid users were conducted using two-

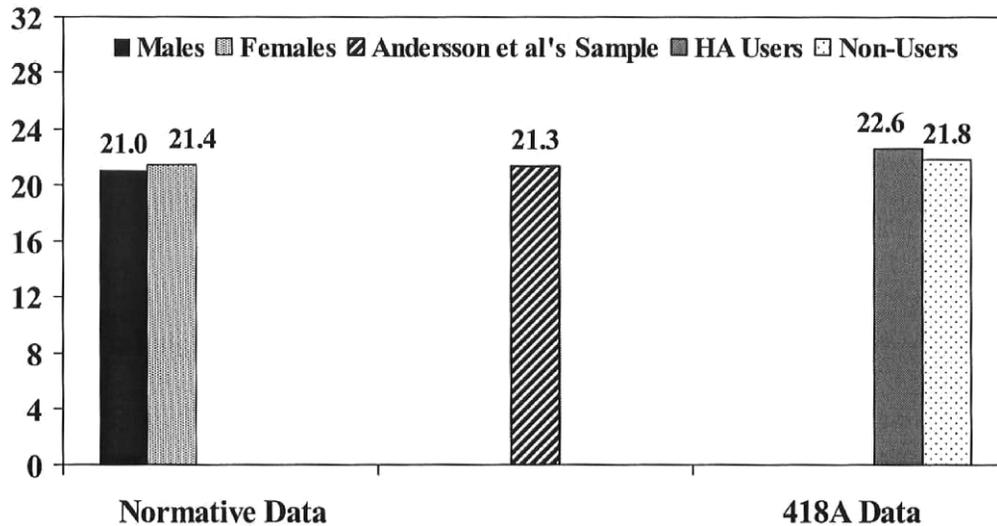


Figure 1. Mean Life Orientation Test (Scheier and Carver, 1985) scores for normative group (Scheier and Carver, 1985), for Andersson et al (1995) with older adults, and for the 418-A hearing aid users and nonusers.

sample t-tests for independent groups, as were the analyses of the CPHI scores by age. Analyses of the change data from the original trial to the current trial were accomplished using paired t-tests. All tests were two-sided and employed an alpha level of 0.05. Spearman correlation coefficients were calculated for many of the outcome measures. A correlation value of $r(tm) |.5|$ with $p < .05$ was selected a priori for determining significance.

Life Orientation Test

Figure 1 shows the mean LOT scores for the normative population of undergraduate male and female college students (Scheier and Carver, 1985), as well as the mean LOT scores for the 418-A participant hearing aid users and nonusers (classified as such if they reported not using hearing aids within the last month). A higher score indicates greater optimism, and scores can range from 0 to 32. Mean scores of 22.6 (range = 9–32) for current hearing aid users and

21.8 (range = 11–29) for nonusers were similar to those of the normative college student group and were not significantly different from each other. Thus, dispositional optimism, as assessed by the LOT, does not appear to influence hearing aid use.

Checklist of Life Events

The purpose of the CLE was to determine whether major life events involving health, increased dependence on others, change in living arrangements, and so on have an impact on hearing aid use and, if so, whether participants perceive these life events as affecting their hearing aid use. Table 1 displays the mean number of life events reported and the number of those events that participants felt had impacted their hearing aid use (either positively or negatively). The mean number of events reported was 2.8 (range = 0–8). The mean number of events that impacted hearing aid use was 0.3 (range = 0–4). The nonusers reported a significantly greater number of

Table 1. Checklist of Life Events for Hearing Aid Users and Nonusers

	Current User		Current Nonuser		p
	Mean	Range	Mean	Range	
Number of Events	2.8	0–8	3.1	0–8	.447
Number Impacting Hearing Aid Use	0.3	0–4	0.8	0–5	<.05

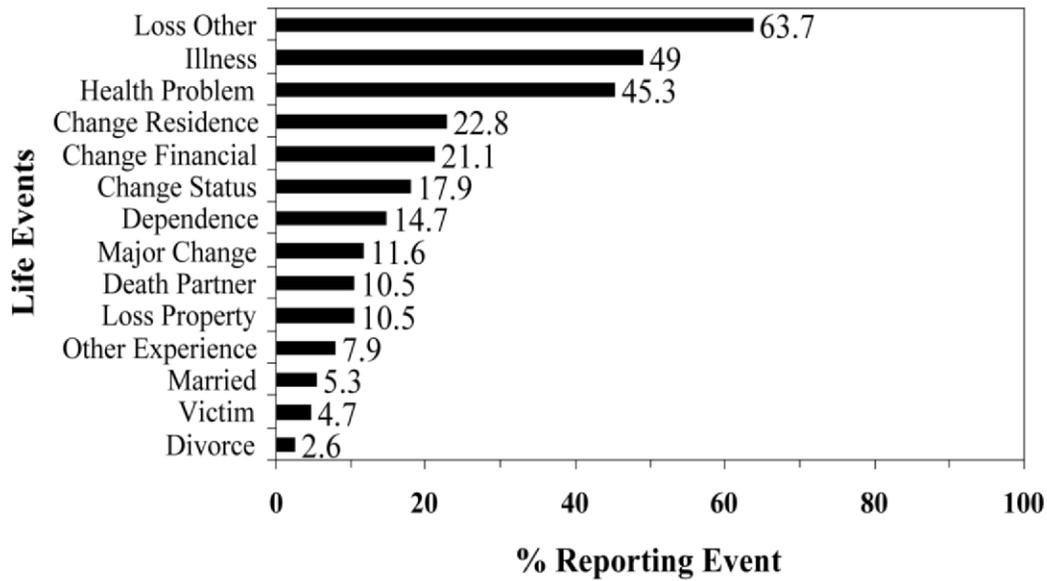


Figure 2. Percentage of participants reporting each life event.

events that impacted their use of hearing aids ($p < .05$). If we consider only events that participants felt *decreased* their hearing aid use, nonusers reported 0.55 events and users reported 0.18 events, a significant difference ($p < .05$).

As seen in Figure 2, the four most commonly reported life events were (1) loss of a close family member or friend (not including spouse); (2) serious illness/injury/accident/health problem; (3) major health problem of a family member or close friend (not including spouse); and (4) change in

residence or living arrangement, or move to a new place. Figures 3 and 4 show the percent of life events that were reported as either increasing or decreasing hearing aid use. The four events with the greatest percentage of positive impact on hearing aid use were (1) other experience; (2) marriage or living with new partner; (3) other major change or significant event; and (4) change in residence or living arrangement. Examples of responses from participants who reported “other experience” as increasing their hearing aid use included “wear

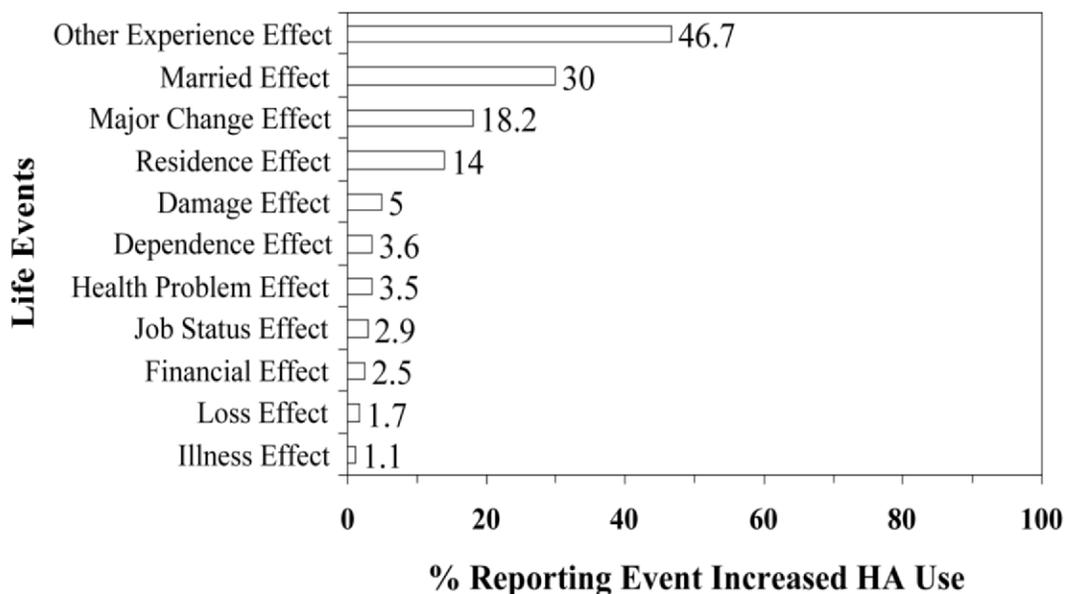


Figure 3. Percentage of life events reported as increasing hearing aid use.

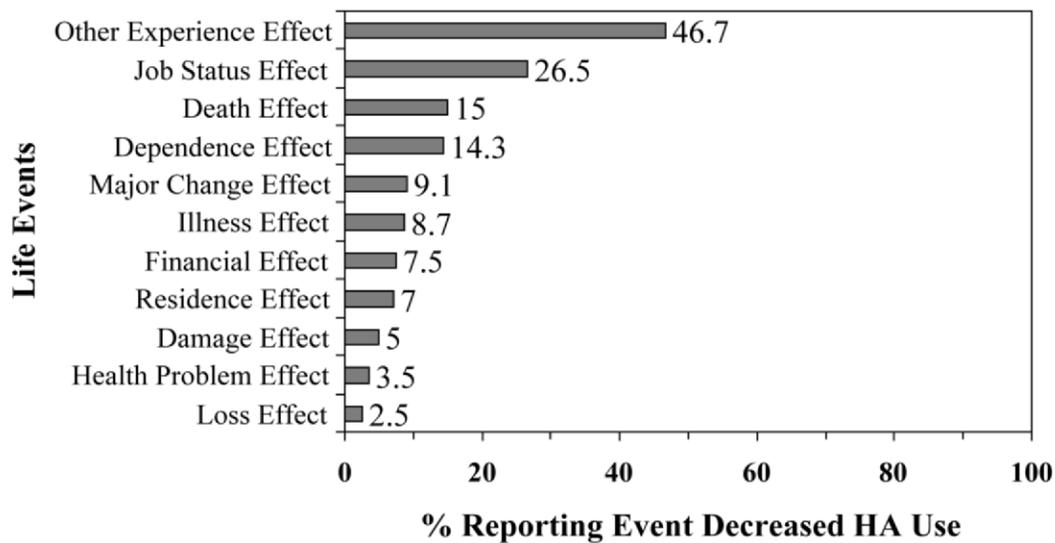


Figure 4. Percentage of life events reported as decreasing hearing aid use.

hearing aids more, realized grandkids talking less with me”; “more grandchildren to listen to”; “decreased hearing”; and “desire to understand people better.” Examples of responses from participants who reported “other major change or significant event” as increasing their hearing aid use included “improved quality of life due to increased income”; “trying to sell previous home”; “daughter was divorced and lived at home for one year”; and “entered the seminary.” The four events with the greatest percentage of negative impact on hearing aid use relative to participants reporting the event were (1) other experience; (2) change in job status, career, or duty; (3) death of husband, wife, or partner; and (4) increased dependence on others for personal care, activities of daily living, transportation. Examples of responses from participants who reported “other experience” as decreasing their hearing aid use included “both aids were run over/destroyed”; “aids repaired 2 yrs ago not worked well since”; “both HAs went through wash”; “one HA was broken and other lost.”

Communication Profile for the Hearing Impaired

Generally the 418-A results for the CPHI were very similar to the normative data established by Erdman and Demorest

(1998a). The nonusers had poorer (lower) scores in 15 of the 25 scales, compared to the hearing aid users (Table 2). The nonusers were significantly lower in five of the Communication Performance scales, Social ($p < .02$), Work ($p < .01$), Home ($p < .04$), Average Conditions ($p < .03$), Adverse Conditions ($p < .02$), indicating that they perceived poorer communication than the users socially, at work, and at home, in both average and adverse conditions.

The nonusers had significantly higher scores compared to the hearing aid users for the Physical Characteristics scale in the Communication Environment section, indicating that they were less likely to report negative effects of variables in their acoustic environments. Sample items for this scale include “I have to talk to others when there’s a lot of background noise” or “I have to communicate with others in a group situation.”

Correlation of CPHI Results with Other CSP 418-A Measures

A Spearman Rho correlation analysis was conducted among the various measures administered as part of the CSP 418-A research project. For correlation analyses, we chose a correlation value of $r \geq |.5|$ with $p \leq .05$ for determining significance. For the hearing aid users, seven CPHI scales were significantly correlated with the Negative

Table 2. Mean CPHI Scores for Hearing Aid Users (n = 130) and Nonusers (n = 23)

	Current User		Current Nonuser		<i>p</i>
	Mean	SD	Mean	SD	
CP: Social	3.3	0.8	2.8	0.7	<.05
CP: Work	3.3	0.8	2.9	0.8	<.05
CP: Home	3.5	0.7	3.1	0.7	<.05
CP: Average Conditions	3.7	0.8	3.3	0.9	<.05
CP: Adverse Conditions	3.0	0.8	2.6	0.8	<.05
CP: Problem Awareness	3.9	0.6	4.0	0.5	.26
CI: Social	2.9	0.7	3.1	0.8	.17
CI: Work	3.7	0.9	3.6	0.9	.71
CI: Home	3.2	0.7	3.4	0.9	.21
CE: Need	2.2	0.9	2.4	0.9	.47
CE: Physical Characteristics	3.2	0.6	3.5	0.7	<.05
CE: Attitudes of Others	3.7	0.8	3.7	0.6	.99
CE: Behavior of Others	3.8	0.7	3.6	0.6	.45
CS: Maladaptive Behaviors	4.1	0.7	4.0	0.6	.70
CS: Verbal Strategies	3.0	0.8	3.2	1.4	.53
CS: Nonverbal Strategies	3.7	0.9	3.7	0.8	.67
PA: Self-Acceptance	3.6	0.9	3.2	1.2	.06
PA: Acceptance of Loss	3.9	0.7	3.7	1.0	.25
PA: Anger	3.4	0.8	3.2	0.9	.48
PA: Displacement of Responsibility	3.0	0.8	3.0	0.7	.86
PA: Exaggeration of Responsibility	2.9	0.8	2.6	0.8	.18
PA: Discouragement	3.7	0.9	3.4	1.0	.16
PA: Stress	3.4	1.0	3.1	1.0	.11
PA: Withdrawal	3.5	0.9	3.1	0.8	.12
PA: Denial	3.2	0.9	3.6	0.8	.07

Note: CP = Communication Performance; CI = Communication Importance; CE = Communication Environment; CS = Communication Strategies; PA = Personal Adjustment.

Features scale of the SADL, including Maladaptive Behaviors ($r = .531, p < .0001$), Self-Acceptance ($r = .537, p < .0001$), Anger ($r = .560, p < .0001$), Discouragement ($r = .543, p < .0001$), Stress ($r = .525, p < .0001$), Withdrawal ($r = .533, p < .0001$), and Denial ($r = -.602, p < .0001$).

Besides the correlations between the SADL Negative Features scale and some of the CPHI Personal Adjustment scales, there were a number of significant correlations between some of the CPHI scales and other measures. Not surprisingly, for the hearing aid users, the Problem Awareness scale of the CPHI was significantly correlated with

the Residual Disability portion of the GHABP, which provides the opportunity for new hearing aid users to indicate the degree of any residual communication difficulties they may be experiencing despite using hearing aids ($r = .510, p < .0001$). For the nonusers, the Communication Needs scale of the CPHI was significantly correlated with the Proportion of Time Hearing Aids Used portion of the GHABP ($r = .685, p < .02$). Additionally for the nonusers, the Perceived Handicap portion of the GHABP was significantly correlated with a number of CPHI Personal Adjustment scales, including Self-Acceptance ($r = -.732, p < .0001$); Acceptance

of Loss ($r = -.497, p < .02$); Anger ($r = -.637, p < .01$); Discouragement ($r = -.629, p < .01$); Stress ($r = -.709, p < .001$); Withdrawal ($r = -.568, p < .005$); and Denial ($r = .597, p < .003$).

For nonusers, several of the unaided speech perception measures were significantly correlated with certain of the CPHI scales, particularly the Communication Performance (CP) scales. The unaided NU-6 scores of the nonusers were positively correlated with five of the six CP scales and with two of the Communication Importance (CI) scales: CP: Social ($r = .503, p < .05$); CP: Work ($r = .557, p < .01$); CP: Home ($r = .615, p < .01$); CP: Average Conditions ($r = .540, p < .05$); CP: Adverse Conditions ($r = .505, p < .05$); CI: Social ($r = .558, p < .01$); and CI: Home ($r = .551, p < .05$). The unaided CST scores (Q, 74 dB SPL) for the nonusers were positively correlated with several of the CPHI Communication Performance scales, as well as with the Attitude of Others scale and the Behavior of Others scale: CP: Social ($r = .540, p < .05$); CP: Work ($r = .558, p < .01$); CP: Home ($r = .599, p < .01$); Attitude of Others ($r = .664, p < .001$); and Behavior of Others ($r = .574, p < .01$).

Changes in CPHI Scores from the CSP 418 to the CSP 418-A Testing

In contrast to the current hearing aid nonusers, who showed no significant changes in any of the CPHI scales from the first to the second testing, the current hearing aid users reported significant changes from the original 418 study to the present follow-up study for approximately half of the CPHI scales (Table 3). CPHI scores for the current hearing aid users were significantly increased for CP: Social ($p < .001$), CP: Work ($p < .05$), CP: Home ($p < .001$), CP: Average Conditions ($p < .01$), CP: Adverse Conditions ($p < .05$), Stress ($p < .001$), and Withdrawal ($p < .05$). Comparing original CPHI data with data obtained in the present study, significantly decreased scores were evident for the hearing aid users for Problem Awareness ($p < .0001$), CI: Social ($p < .0001$), CI: Home ($p < .0001$), Displacement of Responsibility ($p < .05$), and Denial ($p < .05$).

CPHI Scores as a Function of Age

We also compared the mean scores on

the CPHI scales for respondents 80 years and older ($n = 50$) to those younger than 80 years ($n = 103$). The mean scores for the two age groups for CI: Social indicated that younger respondents put more emphasis on the importance of social communication ($p < .05$). Respondents 80 years and older had significantly higher scores ($p < .0001$) on the Communication Needs scale and the Physical Characteristics scale than younger respondents, both results suggesting that the communication demands on the older respondents were less than those of the younger respondents. These findings are in agreement with those of Garstecki and Erler (1996) and Erdman and Demorest (1998b).

DISCUSSION

Is Adjustment to Hearing Loss and Hearing Aid Use Affected by the Participant's Level of Optimism?

In view of the findings of previous research showing that dispositional optimism influences persistence in goal-directed behaviors (Strack et al, 1987; Carver et al, 1989; Scheier et al, 1989; Aspinwall and Taylor, 1992), we had anticipated that the hearing aid users in the CSP 418-A cohort would have significantly higher levels of optimism than the nonusers, but this was not the case. The mean LOT scores for our participants were similar to those of Andersson et al (1994), whose elderly participants (mean age = 69.6 years) yielded levels of dispositional optimism similar to the normative data for the LOT. Unlike the present study, all of the older adults in the Andersson et al (1994) study were hearing aid users, and a significant correlation was found between their LOT scores and their scores on a measure designed to evaluate their abilities to cope with hearing loss ($r = -0.43; p < 0.001$). In the present study, none of the CPHI scales yielded significant correlations for the nonusers, whereas for the hearing aid users, results were more similar to the Andersson et al (1994) findings, in that there were a number of weak correlations between the LOT results and the following CPHI scales: Self-Acceptance ($r = 0.361; p < .0001$); Acceptance of Loss ($r = 0.299; p < .0005$); Anger ($r = 0.317; p < .0002$); Discouragement ($r = 0.391; p < .0001$); Stress ($r = 0.420; p < .0001$);

Table 3. Change in Mean CPHI Scores for Hearing Aid Users (n = 130) and Nonusers (n = 23) from Original CSP 418 Study to the Present CSP 418-A Study (negative means denote decreased mean scores)

	Current User			Current Nonuser		
	Mean	SD	<i>p</i>	Mean	SD	<i>p</i>
CP: Social	0.3	0.9	<.001	-0.2	0.9	.24
CP: Work	0.2	1.0	<.05	-0.4	1.0	.08
CP: Home	0.3	0.9	<.001	-0.3	0.7	.07
CP: Average Conditions	0.3	1.0	<.002	-0.3	0.8	.11
CP: Adverse Conditions	0.2	0.9	<.05	-0.3	1.0	.15
CP: Problem Awareness	-0.2	0.5	<.001	-0.0	0.5	.85
CI: Social	-0.3	0.8	<.001	-0.1	0.8	.43
CI: Work	-0.1	1.0	.16	-0.2	1.0	.43
CI: Home	-0.3	0.8	<.001	-0.2	1.0	.39
CE: Need	0.1	0.8	.20	-0.1	0.7	.65
CE: Physical Characteristics	-0.0	0.8	.96	-0.1	0.9	.56
CE: Attitudes of Others	-0.0	0.6	.68	-0.1	0.8	.42
CE: Behavior of Others	-0.0	0.5	.37	-0.3	0.7	.11
CS: Maladaptive Strategies	-0.0	0.5	.95	-0.1	0.6	.51
CS: Verbal Strategies	-0.0	0.7	.95	0.3	1.4	.28
CS: Nonverbal Strategies	0.0	0.8	.68	0.1	0.6	.62
PA: Self-Acceptance	0.0	0.7	.67	-0.1	0.9	.66
PA: Acceptance of Loss	0.1	0.5	.16	0.2	0.8	.22
PA: Anger	0.0	0.7	.95	0.1	0.6	.28
PA: Displacement of Responsibility	-0.1	0.6	<.05	-0.1	0.9	.67
PA: Exaggeration of Responsibility	0.0	0.7	.82	0.1	0.7	.42
PA: Discouragement	0.0	0.7	.51	-0.1	0.8	.66
PA: Stress	0.2	0.8	<.0001	0.0	0.8	.89
PA: Withdrawal	0.1	0.7	<.05	-0.2	0.7	.31
PA: Denial	-0.1	0.7	<.05	0.0	0.6	.97

Note: CP = Communication Performance; CI = Communication Importance; CE = Communication Environment; CS = Communication Strategies; PA = Personal Adjustment.

Withdrawal ($r = 0.379$; $p < .0001$); and Denial ($r = -0.306$; $p < .0004$). These findings are similar to those of Scott et al (1994), who, for a group of adult hearing aid users, found a significant correlation between the LOT and coping skills ($r = 0.41$, $p < .01$), tension ($r = 0.35$, $p < .05$), and security ($r = 0.39$, $p < .05$).

Based on these results, we conclude that, whereas hearing aid use in our sample of participants was not related to degree of optimism, the hearing aid users' adjustment to hearing loss in areas such as self-acceptance

and psychosocial reactions (e.g., discouragement, withdrawal, stress) was weakly correlated to dispositional optimism.

Is Hearing Aid Use Affected by Life Events?

Although there was no significant difference between nonusers and users in the total number of life events reported, nonusers reported a significantly greater number of events that impacted their hearing aid use ($p < .05$). Nonusers reported a

mean of 0.55 events that *decreased* use, and users reported a mean of 0.18 events that *decreased* use ($p < .05$). Although the majority of participants reported the loss of a close family member other than a husband/wife/partner, and close to half of the total participant sample reported a serious illness/injury/accident/health problem and/or a major health problem in a family member or close friend, more than 90% reported that these life events had no effect on their hearing aid use. As with the findings of Sherbourne et al (1992) in their investigation of antecedents of adherence to treatment regimens for a number of chronic medical diseases, our findings suggest that a number of factors and/or life events may affect adherence. Sherbourne et al (1992) emphasized that the life events and factors affecting compliance for one chronic condition may be different from the factors affecting compliance for a different condition. Based on results in the present study, it appears that life event categories (e.g., retirement or loss of employment, increased dependence on others, death of spouse or partner, damaged hearing aids) have the most negative impact on hearing aid use rather than health-related life events.

Thus, we conclude that life events are related to continued hearing aid use. Hearing aid users reported significantly fewer events that impacted their hearing aid use ($p < .05$). In particular, participants who discontinued use of hearing aids were more likely to report major changes in life events such as retirement, increased dependence on others, and death of a spouse or partner. Major health-related events, however, did not appear to exert as great a negative impact on hearing aid use as lifestyle changes.

As noted earlier, one of the most frequently cited life events affecting hearing aid use was in the category "Other Experience." Close to half of the respondents indicated an "Other Experience" as increasing their hearing aid use, while a similar proportion of respondents indicated an "Other Experience" as decreasing their hearing aid use. Examples of experiences cited as increasing hearing aid use included "wear hearing aids more, realized grandkids talking less with me"; "more grandchildren to listen to"; "decreased hearing"; and "desire to understand people

better." These experiences suggest that motivation to hear better is likely to be a major factor in hearing aid use. On the other hand, examples of responses from participants who reported "Other Experience" as decreasing their hearing aid use included "both aids were run over/destroyed"; "aids repaired 2 yrs ago not worked well since"; "both HAs went through wash"; "one HA was broken and other lost." These experiences suggest that malfunctioning hearing aids may have discouraged continued use of hearing aids, thus highlighting the importance of providing regular postfitting audiological follow-up care, even for individuals who have worn hearing aids for a number of years.

Do Hearing Aid Users and Nonusers Differ in Adjustment to Hearing Loss?

The most prominent differences between hearing aid users and nonusers occurred on the Communication Performance scales of the CPHI, which ask respondents how often they can communicate effectively in various settings and under different conditions. The nonusers reported significantly poorer performance than hearing aid users in social, work, and home settings, in both average and adverse conditions. These results provide compelling evidence of the efficacy of hearing aids for improving communication performance.

Our overall CPHI results differ from those of Humes et al (2003), who compared CPHI results for three groups of older adults: nonadherents who declined trying amplification; adherents who purchased but then returned their hearing aids (hearing aid rejecters); adherents who continued to wear their hearing aids for at least six months following the fitting (hearing aid accepters). Humes et al found that the nonadherents differed from the other two groups by having significantly lower scores on the Problem Awareness scale (Communication Performance category) and significantly higher scores on the Self-Acceptance scale (Personal Adjustment category), whereas the two groups that tried hearing aids (similar to the users and nonusers in the present study) did not differ from each other. The difference in results may be due to the fact that the Humes et al study followed the hearing aid accepters

and rejecters for a period of six months, whereas our study covered a period of four or five years. Perhaps this extended period of observation accounts for the significant differences on the CPHI between our hearing aid adherents (both accepters and rejecters) and those of Humes et al.

As indicated earlier, the Physical Characteristics scale of the CPHI queries the respondent about characteristics of the environment that make communication more difficult, such as presence of background noise. The nonusers' significantly higher mean score on the Physical Characteristics scale, compared to the hearing aid users, suggests that they view themselves as generally being in favorable communication environments, which may account for why they do not use hearing aids. On the other hand, the better mean score for Physical Characteristics for the nonusers may result from their not being as aware as the hearing aid users of aversive conditions such as noisy rooms. Takahashi et al (in this issue) reported that the Aversiveness scale of the Profile of Hearing Aid Benefit (PHAB; Cox and Rivera, 1992) was the only one of the seven PHAB scales for which the PHAB score was negative for the CSP 418-A hearing aid users. The Aversiveness scale is designed to determine whether the hearing aid user is bothered by uncomfortable background sounds. Aided hearing, of course, increases the likelihood that a listener will be aware of and troubled by background noise, and conversely, unaided hearing reduces the intensity, and thus annoyance of, background noise. The hearing aid users in this study may have reported being in unfavorable situations on the PC scale of the CPHI because of their perceived discomfort from aversive sounds when wearing their hearing aids. Although the CPHI PC scale and the PHAB Aversiveness scale do not measure exactly the same entities, the results obtained with them may be tangentially related in that use of hearing aids may make the listener more aware of background noises. This may explain, at least in part, why the nonusers were less likely than the users to report the effects of background noise.

The correlation of several of the Personal Adjustment scales of the CPHI with the Negative Features subscale of the SADL

results suggests a generalized negative effect. That is, the more likely that participants are bothered by the negative features of the hearing aids (such as background noise and feedback), the more likely they are to show evidence of maladaptive behaviors, poorer self-acceptance, increased anger, discouragement, stress, and withdrawal.

The negative correlation between the Denial scale and the Negative Features scale of the SADL may indicate that those who are not as troubled by the negative features of hearing aids are better adjusted to their hearing problems and do not experience negative emotional reactions to some of the annoyances of wearing hearing aids. Conversely, those who readily acknowledge the emotional reactions they are experiencing are more likely to perceive and acknowledge the negative aspects of hearing aid use.

Recall that in this study, we defined nonusers as individuals who had not used their hearing aids in the past month. For the nonusers, it is apparent from the significant correlations between some of the CPHI scales and other measures that the greater the perceived need to communicate effectively, the higher the proportion of time that nonusers, as defined in this study, reported using their hearing aids. It is also evident that the more favorable the respondents' views as expressed on many of the Personal Adjustment scales of the CPHI, the less likely the nonusers, as defined in this study, are to report feeling handicapped in the specified situations of the GHABP. Further, for the nonusers, the greater the NU-6 scores or the unaided CST results (Q, 74 dB SPL), the more favorable the CPHI results for Communication Performance, as well as the nonuser's perspective regarding the Attitude and Behavior of Others.

Significantly higher scores from the original 418 study were evident for the hearing aid users for five of the CPHI CP scales (Social, Work, Home, Average Conditions, and Adverse Conditions). These results suggest that the hearing aid users, on average, felt they were performing significantly better in a number of communication situations, including those occurring in adverse conditions. Further, the increased scores for the hearing aid users in the present study, compared to the original 418 study results, for the CPHI Stress and Withdrawal

scales suggest a significant reduction of strain and apprehension associated with communication situations, as well as reduction in the tendency to withdraw from social interaction.

The significantly decreased mean scores, from the original study to the present one, for Problem Awareness (one of the six Communication Performance scales) and for Denial for the hearing aid users are suggestive of perceived increased communication effectiveness. Similarly, their decreased mean Denial score may be due to their experiencing less frequent affective/emotional reactions as a result of wearing hearing aids. The decrease in mean importance for social and home communication may indicate that hearing aid users rate communicating effectively as less important to them since they started wearing their hearing aids. The significantly decreased mean score of the hearing aid users on the Displacement of Responsibility scale is worthy of note and could indicate that respondents who wear hearing aids increasingly blame their residual hearing problems on their communication partners.

It must be emphasized that the comparison of hearing aid users' and nonusers' CPHI scores from the original CPHI administration to the current administration, as described in the above paragraphs, is not simply a comparison of unaided communication performance to aided performance. Recall that close to half of the original CSP 418 participants were already hearing aid users at the time of their recruitment to the study and had been instructed to respond to CPHI items based on their aided experiences. Our results suggest that individuals who continued use of their hearing aids, regardless of whether they were hearing aid users or nonusers during the original study, generally reported significantly improved communication compared to those who discontinued hearing aid use.

Based on these results, it is apparent that hearing aid users evidenced substantially better adjustment to hearing loss than the nonusers. Hearing aid users reported significantly greater communication performance and use of positive adaptive strategies than hearing aid nonusers, an important finding that documents the efficacy of hearing aid use in adults.

Is Adjustment to Hearing Loss Affected by Age?

Our comparison of CPHI scores as a function of age showed that adults ages 80 years and older place less importance on social communication and perceive fewer communication demands than adults younger than 80 years. These findings are in agreement with those of Garstecki and Erler (1996) and Erdman and Demorest (1998b).

CONCLUSION

The CSP 418-A follow-up study provided the opportunity to compare a number of potential psychosocial influences and outcomes for hearing aid users and nonusers from the original CSP 418 NIDCD/VA Hearing Aid Clinical Trial study. Although there was no significant difference in outlook on life (optimism vs. pessimism) between hearing aid users and nonusers, the parameter of optimism/pessimism was mildly correlated with seven out of nine of the personal adjustment scales of the CPHI. Thus, for individuals who persevere with hearing aid use, there may be a tendency for more optimistic users to report better adjustment to hearing loss, results that are in line with the findings of Andersson et al (1995) and Scott et al (1994). It must be acknowledged, of course, that the directionality of the relationship between optimism and hearing aid adjustment is not definite; that is, the present research establishes a relationship between dispositional optimism and adjustment to hearing aids, but nevertheless, it is unclear as to whether optimism is the antecedent or the consequent of adjustment to hearing aids. However, test-retest data provided by Scheier and Carver (1985) indicate that the LOT possesses reasonable stability across time. Thus, because dispositional optimism can be considered a stable trait, it is likely that optimism impacts better adjustment to hearing loss and hearing aids, rather than the reverse.

Although there was no significant difference between hearing aid users and nonusers in the total number of life events reported, the nonusers reported a significantly greater number of events that they felt negatively impacted their hearing aid use. The older adult population is confronted

with many challenging life events such as retirement, loss of family and friends, change in financial situation, to name but a few. Thus, our results suggest that there should be further examination of the effects of these challenges and changes of lifestyle on the use of hearing aids by older adults, who constitute the majority of the population of hearing aid users.

The CPHI results of this study provide convincing evidence of the benefits of hearing aid use in adults with hearing loss. The mean Communication Performance scores for nonusers were significantly poorer than those for hearing aid users for all but one of the scales, the exception being for Problem Awareness. The nonusers showed *no* significant changes in any of the CPHI scales from the first to the second testing. For users, there were significant changes for approximately half of the CPHI scales, particularly for the Communication Performance scales.

Results from the NIDCD/VA hearing aid follow-up study (418-A) reveal exceptionally high rates of continued hearing aid use, benefit, and satisfaction among individuals who participated in the original 418 study. The results are encouraging and provide a comprehensive view of the perceptions of those who have successfully worn hearing aids in the intervening four to five years. We acknowledge that findings are probably not typical of outcomes in most audiology practices. Several factors may have played a role, including the ongoing monitoring and supervision that participants were afforded in the original CSP 418 study so as to ensure (1) their continued enrollment in the study and (2) valid data. The participants received expert audiological management from the study's research audiologists and were able to bring questions and/or problems to their audiologist's attention. The participants received intensive instructions in hearing aid use, were afforded the opportunity to evaluate different hearing aid fittings, and were able to select their preferred fitting after the extended periods of trial use. The participants were actively engaged in the hearing aid evaluation and selection process, a key ingredient in rehabilitative intervention that facilitates adherence to treatment and enhances long-term outcome (Anderson, 1977; Falvo, 1985; Meichenbaum and Turk,

1987; Dunbar-Jacob, 1993; Erdman et al, 1994; Noble, 1996). In short, the participants benefited from extensive rehabilitative supervision and were well on their way to becoming successful hearing aid users by the time the original study was completed. Future research is needed to answer the question that ultimately emerged from the current study: "What effects does audiologic/aural rehabilitation (AR) have on successful adjustment to hearing aids?"

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Appendix A. Checklist of Life Events

Please answer "YES" or "NO" to indicate whether you have experienced any of these life events since your participation in the first hearing aid study. You will be asked to briefly list some of these events, and you will also be asked whether these events have affected your use of hearing aids.

- | | | |
|--|-----|----|
| 1. Death of husband, wife, or partner?
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 2. Divorced or separated from wife, husband, or partner?
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 3. Loss of other close family member or friend?
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 4. Married or began living with new partner?
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 5. Serious illness, injury, accident, or health problem?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 6. Increased dependence on others for personal care, activities of daily living, transportation?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 7. Major health problem in family or close friend?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 8. Change in job status, career (e.g., fired, retired, change of job status)?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 9. Change in residence, living arrangements, or move to new place?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 10. Change in financial status?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |
| 11. Loss or damage to personal property or home?
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change | YES | NO |

12. Victim of crime, natural disaster, or physical abuse? YES NO
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change
13. Have you experienced any other major changes or significant events in your life since you started the study several years ago? YES NO
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change
14. Is there any other experience you can recall that influenced the extent to which you have used your hearing aids? YES NO
If yes, briefly list:
If yes, how did this change affect your use of hearing aids?
Increase Decrease No Change