# Longitudinal Changes in Personal Adjustment to Hearing Loss in Adult Cochlear Implant Users

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Changes were monitored in personal adjustment to hearing loss in a sample of 21 adult cochlear implant users. The Communication Profile for the Hearing Impaired (Demorest & Erdman, 1986) was administered pre-implant; and at 1-, 9-, and 18-months post-connection. Thirty selected items from the Personal Adjustment Scales were assigned to two subscales (Hearing and General Communication) to determine whether more immediate changes occur for feelings and attitudes toward hearing loss, than toward communication interactions, in general. The group analysis indicated significant improvement on both subscales after only 1 month of implant use. There were three patterns of change with nine subjects showing no significant change on either subscale, four showing significant change after only 1 month of implant use, and eight subjects showing a more gradual change on the subscales. The effects of an aural rehabilitation program and implant type were also explored.

Numerous research reports have presented data on the use of self-assessment inventories as indices of hearing aid benefit for mild to moderately hearing impaired persons (Birk-Nielsen & Ewertsen, 1974; Chermak & Miller, 1988; Cox & Gilmore, 1990; Demorest & Walden, 1984; Dempsey, 1986; Hutton, 1980; Malinoff & Weinstein, 1989a, 1989b; Newman & Weinstein, 1988; Tannahill, 1979; Walden, Demorest, & Hepler, 1984). With the promising speech perception results observed for cochlear implant users (Hopkinson et al., 1986) and improvements in other sensory devices, such as vibrotactile aids, there is an increasing need to evaluate benefit for various types of sensory aids in persons

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presenting severe to profound hearing impairment. The Performance Inventory for Profound and Severe Loss (PIPSL) (Owens & Raggio, 1988) was specifically designed for this population. Additionally, the Communication Profile for the Hearing Impaired (CPHI) (Demorest & Erdman, 1986), originally used with hard-of-hearing military personnel, has been administered to cochlear implant users to assess benefit from the implant device and target areas for rehabilitation (Lansing & Davis, 1988, 1990; Skinner, Binzer, Nettles, & Smith, 1989). Benefit has typically been defined as a reduction of self-reported hearing handicap or improvement in self-reported communication efficiency following the fitting of a hearing aid or a cochlear implant.

Although many of the earlier studies have focused on the improvement in self-reported speech understanding following the fitting of a sensory device, issues related to personal adjustment toward hearing loss have been given more attention in the recent literature. Self-reports such as the Hearing Handicap Inventory for the Elderly (Ventry & Weinstein, 1982), the Hearing Performance Inventory (Giolas, Owens, Lamb, & Schubert, 1979) and the Communication Profile for the Hearing Impaired (Demorest & Erdman, 1986), have incorporated scales to assess feelings and attitudes toward hearing loss.

Cochlear implant users might be expected to have more negative feelings and attitudes toward hearing loss than hard-of-hearing individuals due to a greater degree of hearing loss (Thomas & Gilhome-Herbst, 1980). However, data reported by Knutson and Lansing (1990) suggest a similar range of scores for cochlear implant candidates and hard-of-hearing individuals on the Personal Adjustment Scales of the CPHI. There are, however, limited data regarding improvement in personal adjustment for cochlear implant users. Skinner et al. (1989) reported gains on several CPHI Personal Adjustment Scales over time for three pre/peri-linguistically deafened adults using multichannel cochlear implants. Insight into a hearing impaired individual's adjustment to hearing loss may provide information important to the development of an aural rehabilitation program for that individual. One component of an aural rehabilitation program, counseling, consists of two basic areas: (a) "informational counseling" which serves to provide the client and family with an understanding of the hearing loss, its consequences, and the role of amplification; and (b) "affective" or "personal adjustment" counseling which includes the identification and discussion of attitudes and feelings toward hearing loss (McCarthy, Culpepper, & Lucks, 1986; Pollack, 1978; Sanders, 1975, 1988). This second area of counseling has been described and illustrated by Schum (1986) and Roberts and Bryant (1988).

In the various studies using self-report indices of hearing aid benefit, for example, the post-fitting measure has been administered at various intervals following the fitting, ranging from 1 week to 1 year (Malinoff & Weinstein, 1989a). Typically, the self-assessment inventory was administered to subjects only once prior to and once following the hearing aid fitting. Recently, repeated-measures data have been obtained on first-time hearing aid users (Malinoff & Weinstein, 1989a; Seyfried, 1990). Data from these investigators suggest that

the time of the post-fitting assessment can highly influence the amount of benefit measured.

Malinoff and Weinstein (1989a) administered the Hearing Handicap Index for the Elderly (HHIE) to 25 older adults (i.e., over the age of 55) once prior to the fitting of a hearing aid, and 3 weeks, 3 months, and 1 year post-fitting. They reported a significant change or improvement in the Emotional Scale score following 3 weeks of hearing aid use. Comparison of the 3 month and 1 year post-fitting scores to those obtained prior to the hearing aid fitting indicated a significant, long-term improvement in attitudes and feelings toward hearing loss. However, the long-term change in scores (i.e., improvement in adjustment) was not as great as that found at the 3 week post-fitting measure.

Seyfried (1990) presented selected items from the Personal Adjustment Scales (PA) of the Communication Profile for the Hearing Impaired (Demorest & Erdman, 1986) to seven, first-time hearing aid users. Items were administered at bimonthly intervals. Subjects were fit with a hearing aid (at 1 month) and given "personal adjustment counseling" (at 2 months). A long-term follow-up was conducted after 8 to 10 months of hearing aid use. For the bimonthly measures, random selection was used to establish shorter 10-item scales from the pool of 30 items described as Factor 1 on the Personal Adjustment Scales (Demorest & Erdman, 1986). The full set of 30 items was administered at the long-term follow-up. The group mean score on the PA scale showed a gradual change or improvement which began following the hearing aid fitting and continued during the month after the counseling session. This improvement stabilized at the end of the third month (i.e., when compared to the long-term measure). Malinoff and Weinstein (1989a, 1989b) found a fairly immediate and significant change or improvement in feelings toward hearing loss after a hearing aid fitting. However, the score noted by Seyfried on the PA Scale during the first month of hearing aid use was not significantly different or better than the pre-fitting score.

Obvious differences between the Malinoff and Weinstein (1989a) and Seyfried (1990) studies include the different response scales and items used. The items on the Emotional Scale of the HHIE tend to associate negative feelings directly with the hearing loss. For example, many items are worded using the following format: "Does a hearing problem cause you to feel . . . ?" In contrast, 17 of the 30 CPHI Personal Adjustment items used in the Seyfried (1990) study tend to reflect more general attitudes toward communication, such as: "I'm not very relaxed when conversing with others." Provision of a hearing aid may immediately lessen the negative consequences of the hearing loss on communication and subsequently result in a fairly immediate change in hearing-related feelings. In contrast, change on more general communication attitudes and feelings might occur more gradually over time.

Similarly, a fairly immediate change in hearing-related feelings may be associated with the provision of a cochlear implant. Many post-lingually deafened adults unable to understand speech with appropriately fitted amplification may

achieve high levels of sound-only word recognition and improved audiovisual speech perception scores with a multichannel cochlear implant (for a review, see Hopkinson et al., 1986). Little is known, however, about the possible effects of training and implant type on the self-assessment of communication performance and personal adjustment for cochlear implant users. Lansing and Davis (1990) reported initial repeated measures data on the CPHI for seven multichannel implant users. Subjects in their study used one of two multichannel implants (Ineraid or Nucleus) and received formal training at 1- or 9-months post stimulation. Preliminary perusal of the data suggested that the acquisition of an implant itself, and the first month of use, may have a greater impact on perceived communication performance than the additional experience with the implant device and formal training. The observed CPHI improvement scores were generally larger for the Personal Adjustment Scale than the other scales. However, standard deviations suggested much variability among the subjects for all of the CPHI scales. This factor, combined with the small sample size, did not permit the use of formal statistical tests to evaluate the possible effects of training and implant type. Additionally, due to the observed inter-subject variability in speech perception results for implant users in general, these investigators encouraged the utilization of both single-subject and group data analyses.

### Purpose

The current investigation evaluated the change in attitudes and feelings toward hearing loss following the provision of a cochlear implant to a group of profoundly, postlingually deafened adults. It was hypothesized that change on hearing-related items (i.e., from the 30 PA items of the CPHI constituting Factor 1) would occur shortly after the provision of a cochlear implant, whereas change on the general communication items (from the pool of 30 items) would occur more gradually. Another factor explored in the study was the influence of aural rehabilitation procedures on personal adjustment toward hearing loss. These rehabilitation procedures were provided to 10 of the subjects at 1 month post-connection and to 11 of the subjects at 9 months post-connection. The effect of implant type (i.e., either Nucleus or Ineraid multichannel implants) on personal adjustment to hearing loss was also considered.

## METHOD

### Subjects

This study included a sample of 21 consecutively admitted participants in the University of Iowa Cochlear Implant Project. Prior to implantation, all had profound, bilateral, post-lingual hearing losses (pure tone average $\geq$ 95 dB HL). The group included 10 males and 11 females ranging from 27 to 71 years of age (mean age = 50.1; *SD* = 14.6). These consecutively implanted individuals were alternately assigned to either an "early" rehabilitation group ($n$ = 10) whose members received an aural rehabilitation program (Lansing & Davis,

1988) at 1 one month post-connection or to a "late" rehabilitation group ($n$ = 11) whose members received the program at 9 months post-connection. Additionally, subjects were alternately assigned to receive either an Ineraid ($n$ = 10) or a Nucleus ($n$ = 11) multichannel cochlear implant. Table 1 provides basic descriptive information on the 21 subjects who participated in the study.

**Table 1**

Subject Description for Individuals in the Rehabilitation Groups

| Subject | Age at Intake | Years of Profound Loss | Years of Hearing Aid Use |
|---|---|---|---|
| | Early Rehabilitation Group | | |
| Ineraid Subjects | | | |
| B2 | 67 | 8 | 5 |
| W3 | 65 | 7 | 22 |
| B4 | 32 | 1 | 15 |
| C5 | 58 | 2 | 4 |
| C15 | 62 | 18 | 36 |
| Nucleus Subjects | | | |
| T1 | 42 | 28 | 5 |
| K6 | 44 | 23 | 0 |
| B12 | 66 | 3 | 42 |
| H17 | 27 | 1 | 0 |
| C19 | 30 | 1 | 0 |
| *M* | 49.3 | 9.2 | 12.9 |
| *SD* | 16.1 | 16.1 | 15.5 |
| | Late Rehabilitation Group | | |
| Ineraid Subjects | | | |
| R8 | 71 | 1 | 0 |
| H10 | 50 | 5 | 25 |
| W13 | 65 | 44 | 0 |
| H14 | 64 | 7 | 32 |
| Z18 | 33 | 10 | 1 |
| R21 | 37 | 5 | 4 |
| Nucleus Subjects | | | |
| S7 | 61 | 1 | 0 |
| V9 | 52 | 5 | 4 |
| I11 | 28 | 19 | 20 |
| C16 | 51 | 22 | 16 |
| C20 | 46 | 15 | 21 |
| *M* | 50.7 | 12.2 | 11.2 |
| *SD* | 13.9 | 12.7 | 11.9 |

**Materials and Procedures**

All subjects were evaluated at the University of Iowa Hospitals and Clinics prior to implantation; and at 1-, 9-, and 18-months post-connection. During any of these visits, clients were free to initiate discussions with the rehabilitative audiologist (CRL) concerning feelings and attitudes toward hearing difficulties. Formal exercises that included the identification and discussion of feelings and attitudes toward hearing loss were restricted to the aural rehabilitation program. The formal aural rehabilitation consisted of an intensive 40-hour program that extended across a period of 10 days (Lansing & Davis, 1988). This program did not focus on personal adjustment to hearing loss per se, but on structured practice with audiovisual speech stimuli and problem-solving strategies for difficult communication situations. The exercises, which addressed adjustment to hearing loss, included the following: (a) role-playing of communication situations with subsequent discussion of related feelings and attitudes, (b) discussion of environmental variables in communication and attitudes toward taking an active role in changing the environment, (c) discussion of feelings and attitudes experienced about communication breakdowns, (d) discussion of attitudes related to exercises described in Kaplan, Bally, and Garretson (1987), (e) viewing videotaped communication interactions and discussing attitudes and feelings related to these interactions. At no time were the specific CPHI Personal Adjustment Scale items nor a subject's responses to any of those items discussed.

All subjects completed the entire Communication Profile for the Hearing Impaired at each assessment time (pre-implant, and 1 month, 9 months, and 18 months post-connection). Those subjects receiving *early* aural rehabilitation completed the CPHI prior to the 1 month post-connection aural rehabilitation program, and those receiving the *late* rehabilitation completed the CPHI prior to the 9 month post-connection rehabilitation program.

For the purposes of the current study, only 30 selected items from the Personal Adjustment Scales were analyzed. As previously mentioned, these items constitute a single common factor (Factor 1, as described by Demorest and Erdman, 1986). This set of selected items includes items from seven of the Personal Adjustment Scales of the CPHI (i.e., Self-Acceptance, Acceptance of Loss, Anger, Exaggeration of Responsibility, Discouragement, Stress, and Withdrawal). According to Demorest and Erdman, the 30 items constituting Factor 1 represent "feelings and emotions" toward hearing loss. The reason for selecting this particular set of items was that the items could easily be grouped into two subscales of items describing (a) hearing-related feelings and attitudes, and (b) general communication feelings and attitudes. Hearing-related items were defined as those items which included a statement associating hearing loss or communication difficulty with a specific feeling or emotion (e.g., "My hearing loss makes me mad"). General communication items included statements associating a feeling or emotion with: (1) communication breakdowns, (2) attempts at repair, or (3) communication interactions in general (e.g., items #74, #76, and #96 in the Appendix). The authors of this report reviewed each of the 30

items and independently assigned each to either the Hearing subscale (H) or the General Communication subscale (GC). The item assignments were in 100% agreement with one another. Thirteen of the items were assigned to the Hearing subscale and 17 items were assigned to the General Communication subscale. The items and subscale designations are presented in the Appendix. The average subscale scores were then determined for each subject at each measurement time.

## RESULTS

### Analysis of Group Data

A repeated-measures ANOVA was conducted to determine differences across time on both the Hearing and General Communication subscales for the entire sample of 21 subjects. The ANOVA utilized a three-factor mixed design (measurement time × implant type × time of aural rehabilitation). Implant type (Ineraid versus Nucleus) and time of aural rehabilitation (early/1-month versus late/9-month group) were the two between-subject factors. The measurement time (pre-implant, 1-, 9-, 18-months post-connection) was the within-subject factor. This design allowed for formal tests of all three main effects and interactions among the factors.

Significant differences were found across the measurement times for the H subscale (i.e., $df = 3$, $F = 12.51$, $p < .001$). The factor of time, however, interacted with the type of implant (i.e., $df = 3$, $F = 3.35$, $p < .03$). Mean scores for the two implant groups at each measurement time suggest that Nucleus (N) users improve quickly and level off while Ineraid (I) users slowly reach the same level as Nucleus users (mean scores pre-implant: I = 2.22, N = 1.94; mean scores 1-month: I = 2.33, N = 2.60; mean scores at 18-months: I = 2.76, N = 2.65).

Significant differences were found across the various measurement times for scores on the GC subscale (i.e., $df = 3$, $F = 10.99$, $p < .001$). This main effect did not interact with time of rehabilitation or implant type. A Tukey post-hoc analysis indicated that all the post-connection scores for the GC subscale were significantly different from the pre-implant scores. The post-implant scores were not, however, significantly different from one another.

Both subscales showed change over time and may actually measure a common factor. Therefore, scores for each subscale collapsed across implant and rehabilitation group were correlated at each measurement time. Scores on each subscale were highly correlated at each measurement time, with Pearson correlation coefficients ranging from +.83 to +.91. Consequently, an additional repeated-measures ANOVA for the combination of the two subscales (GC + H/30) was conducted to determine if the use of the longer scale might be more sensitive to the different implants or timing of rehabilitation. Only the main effect, measurement time, was statistically significant for the total 30-item score (i.e., $df = 3$, $F = 13.13$, $p < .001$). Furthermore, measurement time did not interact with implant type or time of rehabilitation.

**Analysis of Individual Data**

Tests of statistical significance for group data may indicate small, but important trends in the data. Clinically, however, the change in individual scores may be equally, if not more, important. In the current study, the criterion for change in individual scores was based on data reported by Demorest and Erdman (1988). These investigators presented criterion for determining improvement at the .05 level on the Personal Adjustment Scales. The current study used items from seven of the PA Scales. Therefore, in order to establish a criterion for the current study, an average of the reported criterion for those seven PA scales was computed. The resulting criterion of $\geq .90$ was used to indicate improvement in the current study. It should be noted that the criterion for improvement used in this study is based upon data collected at similar time intervals from Demorest and Erdman's sample of hard-of-hearing individuals, and further study is needed to determine whether the criterion for change differs in profoundly hearing-impaired individuals.

The scores on the Hearing and General Communication subscales could potentially range from 1 to 5, with 1 representing the most negative feelings and attitudes toward hearing loss and communication and 5 representing the least negative. Table 2 presents the mean scores for each subject on the subscales across time. In the table, an asterisk indicates an improvement of .90 or greater compared to the pre-implant score.

Nine of the subjects (W3, B4, C15, B12, C19, W13, H14, R21, C20) showed no significant change on either subscale at any time interval. Five of these subjects (W3, B4, C19, W13, C20) had relatively high pre-implant subscale scores indicating fairly positive feelings and attitudes toward hearing loss (i.e., scores on both subscales for these subjects were beyond one standard deviation from the group means). Four of the nine (B4, W13, H14, R21) also had anecdotally reported only limited speech understanding benefits from use of the cochlear implant. Ten subjects (B2, C5, K6, S7, R8, V9, H10, Ill, C16, Z18) showed change or improvement on both subscales, and two subjects (T1, H17) showed significant change or improvement on only one subscale.

Perusal of the CPHI (GC and H subscales) scores indicated that no subjects showed a significant change from the 1- to the 9-month scores. One subject, C16, showed a significant change from the 9- to 18-month scores on the General Communication subscale. The significant change from the 9- to the 18-month measure is indicated by a plus sign. There was one instance of significant change in a negative direction on the subscales (i.e., for subject V9 from the 9- to 18-month measures).

**Instances of First Significant Change**

The hypothesis concerning the time course of change on the subscales was addressed by examining the instances of first change on the subscales for each of the subjects. Because there were no instances of change between the 1- and 9-month measures and only one between the 9- and 18-month measures (i.e.,

**Table 2**

Scores on the General Communication (GC) and Hearing (H) Subscales For All Subjects

| | | Measurement Time | | | |
|---|---|---|---|---|---|
| | | **Pre Implant** | **One Month** | **Nine Months** | **Eighteen Months** |
| Early Rehabilitation Group | | | | | |
| Ineraid Subjects | | | | | |
| | Subscale | | | | |
| B2 | GC | 2.41 | 3.00 | 3.18 | 3.53* |
| | H | 2.38 | 2.62 | 3.08 | 3.46* |
| W3 | GC | 2.88 | 3.00 | 2.76 | 2.82 |
| | H | 3.31 | 3.23 | 3.31 | 3.23 |
| B4 | GC | 3.00 | 3.29 | 2.88 | 3.18 |
| | H | 3.46 | 3.69 | 3.00 | 3.23 |
| C5 | GC | 1.35 | 2.06 | 2.59* | 2.35* |
| | H | 1.15 | 1.62 | 2.08* | 2.23* |
| C15 | GC | 1.65 | 1.59 | 2.06 | 2.24 |
| | H | 2.15 | 2.08 | 2.54 | 2.69 |
| Nucleus Subjects | | | | | |
| | Subscale | | | | |
| T1 | GC | 1.70 | 2.35 | 2.65* | 2.53 |
| | H | 2.31 | 3.00 | 2.77 | 2.62 |
| K6 | GC | 1.60 | 2.18 | 2.53* | 2.53* |
| | H | 1.23 | 1.69 | 2.46* | 2.00 |
| B12 | GC | 1.12 | 1.65 | 1.41 | 1.59 |
| | H | 1.00 | 1.62 | 1.23 | 1.77 |
| H17 | GC | 2.29 | 2.76 | 2.82 | 2.59 |
| | H | 1.62 | 2.85* | 2.77* | 2.46 |
| C19 | GC | 3.29 | 3.00 | 3.35 | 2.94 |
| | H | 3.31 | 3.23 | 3.77 | 3.23 |
| Late Rehabilitation Group | | | | | |
| Ineraid Subjects | | | | | |
| | Subscale | | | | |
| R8 | GC | .94 | 1.47 | 2.00* | 1.65 |
| | H | 1.15 | 1.62 | 2.15 | 2.69* |
| H10 | GC | 1.47 | 2.00 | 2.35 | 2.94* |
| | H | 1.39 | 1.62 | 1.92 | 2.62* |
| W13 | GC | 3.47 | 3.18 | 3.00 | 3.35 |
| | H | 3.69 | 2.92 | 3.15 | 3.54 |
| H14 | GC | 2.35 | 2.06 | 2.41 | 2.00 |
| | H | 2.38 | 1.85 | 1.92 | 1.62 |

*Continued on next page*

**Table 2** *Continued*

| | | Measurement Time | | | |
|---|---|---|---|---|---|
| | | **Pre Implant** | **One Month** | **Nine Months** | **Eighteen Months** |
| Z18 | GC | 1.88 | 2.82* | 3.00* | 3.06* |
| | H | 2.62 | 3.15 | 3.08 | 3.54 |
| R21 | GC | 1.59 | 1.94 | 1.88 | 1.94 |
| | H | .77 | 1.23 | 1.08 | 1.54 |
| Nucleus Subjects | | | | | |
| Subscale | | | | | |
| S7 | GC | 1.82 | 1.70 | 2.12 | 2.76* |
| | H | .85 | 1.69 | 2.31* | 2.54* |
| V9 | GC | .88 | 2.47* | 3.06* | 1.76 |
| | H | 1.00 | 2.15* | 2.38* | 1.31 |
| I11 | GC | 2.12 | 3.41* | 2.88 | 2.88 |
| | H | 2.54 | 3.85* | 3.77* | 3.62* |
| C16 | GC | 2.24 | 1.82 | 2.41 | 3.35*+ |
| | H | 1.85 | 1.92 | 2.54 | 2.92* |
| C20 | GC | 3.47 | 3.82 | 3.94 | 3.82 |
| | H | 3.69 | 4.00 | 4.00 | 4.00 |

*Note.* * change ≥ .90 referenced to the pre-implant score. + change ≥ .90 referenced to the nine month score.

subject C16), only the change scores referenced to the pre-implant measure were examined. There was no obvious trend for the first significant change to occur more often on the General Communication Subscale versus on the Hearing Subscale.

### Effect of Aural Rehabilitation

It should be emphasized that all subjects receiving aural rehabilitation had used their implant for one or nine months prior to the aural rehabilitation program. Thus, in looking for possible effects of rehabilitation, it is necessary to acknowledge that implant use itself might alter or obscure any apparent effects of the aural rehabilitation program. If the aural rehabilitation program used resulted in a fairly immediate improvement in personal adjustment, then one might expect a significant change for the early rehabilitation group members to occur between the one and nine month measures (i.e., the program was provided following the one month measure) and to occur between the nine and eighteen month measures for those in the late rehabilitation group. There were no instances of significant change on the subscales between the one and nine month measures. One of the 11 subjects in the late rehabilitation group, subject C16, showed a significant change on the General Communication subscale from the 9- to the 18-month measure.

### Effect of Implant Type

Visual inspection of Table 2 indicates that seven of the twelve subjects showing significant change on one or both subscales at any time interval were using the Nucleus implant. Of the nine subjects showing no significant change on either subscale, six were Ineraid subjects. However, the number of subjects in each implant group was very small. A chi-square test revealed no significant difference between the number of subjects improving for the two implant systems ($\chi^2(1) = 1.29$). The data do not support an effect of implant type.

## DISCUSSION

Data from the current study do not support a different time course of change on hearing-related vs. general communication attitudes and feelings in this sample of 21 adult, cochlear implant users. Although the group analysis indicated a significant change in attitudes and feelings toward hearing loss after only one month of implant use, only four of the subjects exhibited this pattern of change on one or both of the subscales (i.e., re the +.90 criterion). Nine of the subjects showed a more gradual change with significant change observed first at nine or eighteen months (i.e., re the pre-implant score). The significant change from the ANOVA may reflect the occurrence of small, positive changes for the majority of subjects; whereas the criterion of improvement approach reflects the presence or absence of significant change for each individual.

### Patterns of Change

Three patterns of change across time were detected. As previously mentioned, nine of the subjects showed no significant change on either subscale across time. Four of the implant subjects showed a significant change or improvement in attitudes and feelings toward hearing loss after only one month of implant use. And finally, eight of the subjects showed a more gradual change on one or both subscales (T1, B2, C5, K6, S7, R8, H10, C16). The finding of different patterns of change in attitudes and feelings is reminiscent of Dempsey's (1986) report of apparently marked individual differences in change on the Personal Section of the Revised Form of the Hearing Performance Inventory from the pre-hearing aid fitting scores to the 6-week post-fitting scores (i.e., changes ranged between +1.33 to −1.33). Given the presence of individual differences, the consideration of individual data is essential. The different findings of Malinoff and Weinstein (1989) and Seyfried (1990) may not be due to the different types of items on the self-assessments used, but rather to the different samples of individuals (i.e., a different distribution of change patterns for adjustment to hearing loss).

Various factors may contribute to the different patterns of change observed in this sample of 21 implant users. As might be expected, the "no change" pattern was commonly associated with (a) individuals who initially exhibited relatively positive feelings and attitudes (i.e., compared to the group of subjects as a whole) and/or (b) those who anecdotally reported minimal speech understand-

ing benefits from implant use. The finding of significant change at the 1-month measure for four subjects (i.e., immediately prior to the aural rehabilitation program for those in the early rehabilitation group) would suggest that implant use itself may produce a fairly immediate reduction of negative attitudes and feelings toward hearing loss. For these individuals, the auditory cues provided by the implant may contribute to a substantial change in communication abilities and ease of communication. This improvement in communication may result in a reduction of negative feelings and attitudes toward the hearing handicap. The gradual change in attitudes and feelings toward hearing loss exhibited by nine of the subjects may be the result of (a) increased benefit from the implant over time and/or (b) aural rehabilitation procedures.

**Consideration of Denial Scale Scores**

None of the Denial Scale items from the CPHI were included in the pool of 30 items used in this study. Clinicians using the Personal Adjustment Scales of the CPHI should, however, be aware of the information provided by the Denial Scale. Denial scores may, for example, indicate that an individual is unwilling to admit to difficulties in adjusting to hearing loss (Demorest & Erdman, 1987). Furthermore, denial may influence a subject's responses on the other Personal Adjustment Scales. Of the 21 subjects in this study, four (B2, C5, R21, C20) had denial scores at one or more measurement times (pre-implant, and/or at 1-month, 9-months, or 18-months post-connection) which indicated an unusually high amount of denial (i.e., scores beyond two standard deviations of the mean reported on this scale for hard-of-hearing individuals by Demorest and Erdman, 1987). Subscale scores for subjects B2 and C5 indicated significant change according to the prior mentioned statistical criterion. However, due to the apparent denial exhibited by these subjects, this apparent change is suspect. Their apparent improvement in personal adjustment may be related to the operational demands of the study (i.e., reporting improvement which is expected by the researcher or subject). Unwillingness to admit difficulties in adjusting to hearing loss may influence any rehabilitative effort, therefore, denial of problems should be addressed through counseling.

**Effects of Aural Rehabilitation Program**

The lack of a direct relationship between the time of aural rehabilitation and change on the Personal Adjustment subscales may reflect the fact that the aural rehabilitation program focused on auditory-visual recognition of speech stimuli and problem-solving rather than directly on attitudes and feelings toward hearing loss. Perhaps, use of personal adjustment counseling strategies, such as those presented by Schum (1986) and Roberts and Bryant (1988), might produce changes in attitudes and feelings toward hearing loss. It is also possible that implant use itself obscured any possible effects from the aural rehabilitation program. While positive changes in attitudes toward hearing loss may be desireable, personal adjustment counseling or activities related to personal adjustment

(e.g., those mentioned in the Methods section) may serve more importantly in allowing individuals to identify feelings and attitudes toward hearing loss and their possible influence on communication behaviors.

### Effects of Implant Type

Implant type does not appear to be related to the occurrence of change, and the time at which change was detected on the Hearing and General Communication subscales. It may be of greater clinical importance to consider the number of individuals who maintained change or improvement in personal adjustment out to the 18-month measure. Five of the nine subjects showing change at the pre-to-one and/or pre-to-nine month intervals on at least one subscale maintained that change at the 18-month measure (C5, K6, Z18, S7, I11). Six subjects (T1, K6, H17, R8, V9, I11) did not maintain that significant change on one or both subscales at the 18-month measure.

### Future Research

Relatively little is known about changes in attitudes and feelings toward hearing loss following aural rehabilitation procedures, and further study is needed. It would be interesting, for example, to provide personal adjustment counseling and activities related to personal adjustment prior to a hearing aid fitting or cochlear implant connection to determine whether positive changes in attitudes and feelings toward hearing loss result. Because of the inherent variability of the hearing-impaired population, use of repeated-measures within-subject designs and consideration of individual data are highly advised. Longitudinal data should also provide indications of whether changes in personal adjustment are maintained.

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## APPENDIX

### THIRTY CPHI PERSONAL ADJUSTMENT ITEMS

| Item # | Subscale (GC or H) | Content |
|---|---|---|
| 39 | GC | Get upset when can't follow conversation |
| 57 | GC | Feel stupid when ask for repeat |
| 70 | GC | Feel foolish when misunderstand |
| 74 | GC | Get mad at self when can't understand |
| 76 | GC | Feel embarrassed when ask for repeat |
| 78 | H | Feel threatened by communication situations due to difficulty hearing |
| 80 | GC | Feel left out of conversations |
| 82 | H | My hearing loss makes me mad |
| 83 | H | Ashamed of hearing problems |
| 85 | GC | Not relaxed when conversing with others |
| 89 | GC | Feel guilty about asking people to repeat |
| 96 | GC | Not comfortable in most communication situations |
| 99 | H | Hearing loss makes me feel incompetent |
| 101 | H | Get tense because of my hearing loss |
| 103 | GC | Get aggravated when others don't speak up |
| 105 | H | Sensitive about hearing loss |
| 106 | H | When I have trouble hearing, I become nervous |
| 107 | H | Feel depressed as a result of hearing loss |
| 112 | H | Get discouraged because of hearing loss |
| 113 | GC | Worry about looking stupid when I can't understand |
| 114 | H | Straining to hear upsets me |
| 116 | H | Feel bad about inconvenience to others caused by my hearing loss |
| 117 | GC | Get impatient with those who won't repeat |
| 118 | H | Because of hearing loss, feel inadequate |
| 121 | GC | Problems communicating get me down |
| 131 | GC | Sometimes miss so much I feel left out |
| 132 | H | I let my hearing problems get me down |
| 139 | GC | When I can't understand, feel tense and anxious |
| 142 | GC | Not understanding is very discouraging |
| 143 | GC | Get angry when can't understand someone |