A Comparison of Two Measures of Hearing Aid Satisfaction in a Group of Elderly Hearing Aid Wearers

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Objective: The objective of this study was to compare the results of two measures of hearing aid satisfaction, an indirect measure (Satisfaction with Amplification in Daily Living, SADL; Cox & Alexander, 1999) and a direct measure (an expanded version of the MarkeTrak-IV survey; Kochkin, 1996), in a group of elderly hearing aid wearers.

Design: A total of 43 elderly hearing aid wearers completed both satisfaction measures (order counterbalanced across wearers) after 1 mo of wearing 2-channel wide dynamic range compression (WDRC) in-the-canal (ITC) hearing aids. A correlational research design was employed.

Results: The elderly hearing aid wearers in this study yielded results on each measure of hearing aid satisfaction that were generally consistent with those found previously in larger groups of similar samples. The correlation between each measure of satisfaction ($r = 0.75$) was positive, moderately strong, and significant ($p < 0.01$) for the global scores of the SADL and MarkeTrak-IV scales.

Conclusions: Although different approaches to the measurement of satisfaction were followed in the development of the SADL (indirect approach) and the MarkeTrak-IV (direct measurement) scales, similar results were obtained with each scale. The 15-item SADL instrument, however, is much shorter than the MarkeTrak-IV instrument and, as a result, is more efficient to administer clinically.

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Hearing aid outcome measures have been of increasing interest to audiologists, consumers, hearing aid manufacturers, third-party payers, and researchers alike, although not always for the same reasons (Humes, 1999, 2001; Weinstein, 1997). One of the dimensions of hearing aid outcome that has received more emphasis over the past decade has been the measurement of hearing aid satisfaction in the hearing aid wearer. Unquestionably, the most extensive efforts to measure hearing aid satisfaction have been those made by Kochkin since 1990. Kochkin has surveyed thousands of hearing aid purchasers regarding their hearing aid satisfaction using a series of custom-made satisfaction surveys referred to as MarkeTrak (Kochkin, 1990), MarkeTrak-II (Kochkin, 1991), MarkeTrak-III (Kochkin, 1992a, 1992b, 1993), MarkeTrak-IV (Kochkin, 1994a, 1994b, 1996, 1997, 1998), and, most recently, MarkeTrak-V (Kochkin, 1999, 2000a, 2000b). Although each iteration of the MarkTrak scales has differed slightly from its predecessors, the basic approach for the measurement of hearing aid satisfaction has remained the same. A direct rating of satisfaction, ranging from “very satisfied” to “very dissatisfied” on a five-point scale has been employed with survey items grouped into product features (comfort of physical fit, packaging, frequency of cleaning, visibility/size, etc.), performance in various listening environments (car, outdoors, telephone, small groups, etc.), and dispenser service (quality of service, dispenser knowledge, dispenser professionalism, etc.). The results from the MarkeTrak surveys have been presented in a number of ways, from displays of response histograms for individual items on the survey to an overall satisfaction score derived from the average of all survey items or from a single survey item regarding overall satisfaction. Although there have been some variations in the total number of items comprising various versions of the MarkeTrak instruments, the most recent versions contain about 40 items devoted to hearing aid satisfaction.

More recently, Cox and Alexander (1999) developed a shorter measure of hearing aid satisfaction referred to as the Satisfaction with Amplification in Daily Living (SADL) instrument. This test is much shorter than the various iterations of the MarkeTrak survey, being comprised of only 15 items. Although it has not been used with nearly as many hearing aid wearers as the MarkeTrak surveys, it has nonetheless undergone extensive evaluation with hundreds of hearing aid wearers in several different clinical settings (Cox & Alexander, 1999, 2001; Hosford-Dunn & Halpern, 2000, 2001). Unlike the MarkeTrak instruments, which directly query the hearing aid user regarding perceived satisfac-
tion, the SADL survey never specifically mentions “satisfaction.” Rather, a seven-point adjective or descriptive-word scale, ranging from a high of “tremendously” to a low of “not at all” is used as the response continuum for questions, such as, “Do you think your hearing aid is worth the trouble?” “Does wearing your hearing aid improve your self confidence?” and “How natural is the sound from your hearing aid?” As a result, the SADL would be considered an indirect measure of hearing aid “satisfaction.”

Given the existence of two well-developed measures of hearing aid satisfaction, one direct (MarkeTrak) and one indirect (SADL), it is only logical to wonder whether both instruments do, in fact, measure the same thing. To address this issue, both instruments were administered to a group of elderly hearing aid wearers who had been using identical hearing aids for approximately 1 mo at the time the surveys were completed. Additional procedural details are provided in the next section.

**METHOD**

**Participants**

The participants in this study were part of a larger group recruited for a large-scale, longitudinal study on hearing aid outcome measures via newspaper ads, flyers posted in the community, printed announcements in church/synagogue bulletins and word of mouth. All participants enrolled in the study met the following selection criteria: 1) age between 60 and 89 yr; 2) hearing loss that was flat or gently sloping (from 250 to 4000 Hz, no inter-octave change in hearing thresholds of more than 20 dB); 3) hearing loss that was of sensorineural origin (normal tympanometry and air-bone gaps no greater than 10 dB at three or more frequencies); 4) hearing loss that was bilaterally symmetrical (interaural difference within 30 dB at all octave and half-octave intervals from 250 to 4000 Hz); 5) pure-tone thresholds within the following ranges at frequencies of 250, 500, 1000, 1500, 2000, 3000, 4000, and 6000 Hz, respectively: 5 to 85, 5 to 85, 10 to 90, 20 to 95, 25 to 95, 30 to 120, 30 to 120, and 30 to 120 dB HL (ANSI, 1989); 6) no known medical or surgically treatable ear-related condition; 7) no known fluctuating or rapidly progressing hearing loss; 8) no cognitive, medical, or language-based conditions that may have limited the participant’s ability to complete the procedures used in the longitudinal study of outcome measures; 9) no use of medications that could affect hearing or cognition; and 10) completion of a signed medical clearance form, or waiver of such by the participant, and a signed informed consent form.

The present study reports on a group of 43 individuals who met the above selection criteria and completed both measures of hearing aid satisfaction. The 43 participants, of whom 27 were male and 16 were female, had a mean age of 75.3 yr (SD = 7.0 yr).

The mean air-conduction hearing thresholds (circles) and loudness discomfort levels (LDLs, inverted triangles) for each ear of the 43 participants are plotted in Figure 1. The dotted lines in each panel depict the range of hearing thresholds observed at each frequency. Mean speech-recognition thresholds (SRT) for spondaic words and word-recognition scores (WRS) for monosyllables in quiet are also presented in each panel.
Walden, Montgomery, and Prosek (1987) and an ascending approach with 5-dB step size. Corresponding mean speech-recognition thresholds (SRTs) and word-recognition scores in quiet, obtained with the Auditec recordings of the NU-6 materials (Tillman & Carhart, 1966) at 40 dB SL (re: SRT), are also depicted in Figure 1. All audiologic measurements were obtained using ER-3A insert earphones. Regarding prior hearing aid use, 69.8% of the participants had not previously worn hearing aids.

**Procedures**

After audiologic testing, participants returned for an extensive battery of cognitive, psychologic and auditory tests administered before hearing aid delivery and over a series of five 90- to 120-minute sessions. These prefit measures were included as potential predictors of performance on various hearing aid outcome measures and will not be considered further in this comparison of two satisfaction measures. Once this prefit testing was completed, the participants returned for the initial fit and delivery of their hearing aids. Based on the previously obtained audiologic information and using the “Unifit” fitting software made available by the hearing aid manufacturer, DSL-i/o targets (Cornelisse, Seewald, & Jamieson, 1995) for input levels of 50, 70 and 90 dB SPL were generated, the corresponding circuit parameters specified (see below), and the aids ordered. The Unifit software returned coupler-gain targets for subsequent verification on delivery.

All hearing aids made use of 2-channel, wide dynamic range compression (WDRC) circuits with a variety of parameters available for specification. The compression threshold, or knee point, the crossover frequency separating the two channels, and the maximum output were all preset at the factory based on the prescribed values from the Unifit software. Two additional circuit parameters, the low-frequency gain and the high-frequency gain, were also preset by the factory, but could be adjusted by the clinician on site to obtain a better match to coupler targets, if necessary. All instruments were in-the-canal (ITC) devices and, with the exception of a few individuals who had a telecoil added to one instrument (determined by the wearer’s preference), were identical. Adjustable select-a-vent venting, and filtered wax guards were included on all devices. All hearing aids were equipped with volume-control wheels that were marked by the manufacturer with a small white dot at the perimeter to provide a visual reference for its position and adjustment by the clinician.

Although all adjustments to DSL-i/o targets were made with a 2-cm³ coupler in a testbox, real-ear insertion gain was still measured for input levels of 50, 70 and 90 dB SPL using a swept pure-tone signal and either Frye 6500 or Audioscan real-ear measurement equipment. No fine-tuning on the basis of the real-ear measurements, however, was performed because the focus of the full study was on individual differences in the performance of the hearing aid wearers when fit with identical hearing aids using uniform fitting practices. Regardless, because the current study made use of a within-subject research design to compare the two measures of satisfaction, poor fits that might result from the lack of fine tuning would be expected to affect both satisfaction measures similarly.

After the delivery of the hearing aids and their initial fitting by the clinician, a hearing aid orientation was conducted in which the following general topics were reviewed with each participant: 1) matters pertaining to the hearing aid purchase (user manual, warranty, 30-day trial period); 2) location and function of hearing aid components (microphone, volume control, battery door, telecoil switch, wax guard, etc.); 3) hearing aid battery (size, type, insertion and removal, etc.); 4) demonstration and practice in hearing aid insertion and removal; 5) demonstration and practice in care of hearing aids; and 6) counseling regarding benefits and limitations of amplification, and communication strategies to optimize benefit. Participants were instructed to use their hearing aids at least 4 hr per day and to begin use in easier listening conditions (quiet, one-on-one conversation, etc.) when possible. All participants paid for their hearing aids at delivery and were paid $150 for each follow-up session that was completed.

Each participant returned 2 wk later for a follow-up session. At the beginning of this session, gain measurements were again made in the coupler to evaluate the instruments and the aids were removed, inspected, and subsequently adjusted as needed to restore their function to that recorded in the initial session. The participant was also instructed to increase their minimum daily hearing aid usage to at least 6 hr.

Approximately 2 wk later, the participant returned for the 1-mo follow-up visit. The hearing aids were again examined, evaluated in the testbox and adjusted as needed to return their function to the target levels from the initial fitting session. After completion of some aided speech-recognition measures, each participant completed six sets of surveys, questionnaires or scales to provide subjective measures of benefit, satisfaction, usage and sound quality. Only the two measures of hearing aid satisfaction are considered here. Using a pencil-and-paper response format for each participant, a
slightly modified version of the MarkeTrak-IV survey (including two additional items regarding hearing aid size and eight additional items regarding the quality of the dispenser’s service) and SADL hearing aid satisfaction surveys were completed. The order of administration of these two satisfaction measures was reversed for every other hearing aid wearer.

RESULTS AND DISCUSSION

Figure 2 provides the means and standard deviations (error bars represent one standard deviation above the mean) for the satisfaction ratings from SADL questionnaire, including global and subscale scores (Positive Effect, Service & Cost, Negative Features, and Personal Image). Results from the current study (black bars) are compared with “norms” from two prior studies (gray bars).

Figure 3 provides an item-by-item comparison of the results on the MarkeTrak-IV satisfaction survey from the current study (black bars) to those obtained with the identical instrument in a very similar study of 173 hearing aid wearers (gray bars; Humes et al., 2001), as well as the MarkeTrak-IV norms (circles) for about 260 hearing aid purchasers who had worn their hearing aids less than 1 yr (Kochkin, Reference Note 1). The data from Humes et al. (2001) are perhaps the most appropriate to use as “normative” data because the current study was very similar regarding selection criteria and procedures. In addition, the MarkeTrak-IV norms obtained by Kochkin (Reference Note 1) have not been published in detail and were obtained from the wearers after a longer period of hearing aid use (after a period of less than or equal to 1 yr of use). In recent longitudinal studies of hearing aid satisfaction conducted at Indiana University (IU) by the authors, declines in satisfaction have been observed during the first year of hearing aid use with the modified MarkeTrak-IV instrument.

The two sets of data displayed by horizontal bars in Figure 3, although obtained after 1 mo of hearing aid use, were obtained from wearers of different hearing aid circuits and types. The data from Humes et al. (2001) were obtained from wearers of full-shell ITE instruments having linear circuits with output-limiting compression whereas the participants in the current study used ITC hearing aids with 2-channel WDRC circuits. In general, the mean satisfaction ratings for both groups of hearing aid wearers tested at IU are nearly identical. The primary differences, moreover, are entirely consistent with the use of different types of hearing aids in each study. For example, in the left-hand portion of Figure 3, it is apparent that the wearers of smaller ITC instruments in the current study were more satisfied with the size, appearance, and visibility of their hearing aids than were the wearers of full-shell ITE in the prior study, but were also less satisfied with the ease of adjusting the volume control. In general, however, the data on the MarkeTrak-IV instrument in the current study are consistent with prior results from larger samples of hearing aid wearers, including those of Kochkin (Reference Note 1).

The presentation of results from the MarkeTrak-IV satisfaction survey generally has not made use of subscale scores. Rather, results have typically been presented on an item-by-item basis, as displayed previously in Figure 3. An overall satisfaction score, calculated as the mean or median rating for all 42 items of the instrument, is referred to as either the overall or global satisfaction rating. The mean satisfaction rating from the ITC wearers in
the current study after 1 mo of hearing aid usage was 4.15, which essentially indicates that the group, on average, was “satisfied” with their hearing aids’ features and performance, as well as with the manner in which they were dispensed.

The Pearson-r correlation between the global MarkeTrak-IV score and the global SADL score for the 43 participants in this study was 0.75. This moderately strong, positive, and statistically significant ($p < 0.01$) correlation coefficient suggests that the global versions of both measures of hearing aid satisfaction yielded comparable ratings across hearing aid wearers. That is, those individuals who had high indirect measures of satisfaction on the SADL tended to also have high direct measures of satisfaction with the MarkeTrak-IV instrument. This is illustrated in Figure 4, which provides a scatterplot of the global MarkeTrak-IV score against the global SADL score, along with the best-fitting linear regression equation for these data. Although the correlations of the global MarkeTrak-IV score with individual SADL subscale scores were generally lower ($r$ values from 0.42 to 0.62) than those for the global SADL score ($r = 0.75$), all four were positive, statistically significant ($p < 0.01$), and at least of moderate strength.

In conclusion, it appears that the global scores from the SADL and MarkeTrak-IV hearing aid satisfaction surveys yield comparable results in the same hearing aid wearers. This is true, moreover, despite the use of an indirect approach to the measurement of satisfaction with the SADL and a direct scaling of satisfaction in the MarkeTrak-IV instrument. The 15-item SADL instrument, however, is much shorter than the MarkeTrak-IV instrument.

Figure 3. Mean satisfaction ratings on the MarkeTrak-IV satisfaction survey for each item of the survey. Data from the present study (black bars) appear with data from a larger group tested under identical conditions, but with a different hearing aid circuit and type (gray bars), and with the original data for this instrument (circles, Kochkin Reference Note 1) obtained from individuals who had purchased their hearing aids up to a year before completion of the MarkeTrak-IV survey.
and, as a result, is more efficient to administer clinically.

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REFERENCES


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