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Is Measured Hearing Aid Benefit Affected by Seeing Baseline Outcome Questionnaire Responses?

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Abstract

Purpose—To determine whether hearing aid outcome measured by the Hearing Handicap Inventory (HHI) for the Elderly/Adults (Newman, Weinstein, Jacobson, & Hug, 1990; Ventry & Weinstein, 1982) is differentially affected by informed vs. blind administration of the postfitting questionnaire.

Method—Participants completed the HHI at their hearing aid evaluation and again at their hearing aid follow-up visit. At follow-up, half received a clean HHI form (blind administration), whereas the remainder responded on their original form (informed administration) and could thus base their follow-up responses on those they gave at the hearing aid evaluation.

Results—The data show that for the population examined here, informed administration of the follow-up HHI did not yield a different outcome to blind administration of the follow-up HHI. This was not influenced by past hearing aid use, age of the participant, or the duration of time between baseline questionnaire completion and follow-up completion.

Conclusion—These data suggest that completion of follow-up questionnaires in either informed or blind format will have little impact on HHI responses, most likely because of the many other factors that combined to influence hearing aid outcome.

Keywords

outcomes; hearing aids; audiologic rehabilitation

Self-report questionnaire measurements have been used to assess the effectiveness of intervention or treatment. Usually one or more such measures are made at baseline, and then others are made after a period of time following an intervention. Baseline questionnaire responses may be used to determine the most appropriate intervention, to target counseling, and to ensure that problems encountered are addressed by the intervention provided. Assuming the questionnaire is responsive to a change and that the questionnaire is valid (i.e., it measures that which it is thought to measure; Guyatt, Townsend, Keller, & Singer, 1989), a comparison of the follow-up responses to the baseline responses reflects the impact of the intervention. Self-reported hearing aid outcome is often measured in this manner using questionnaires such as the Hearing Handicap Inventory for Adults (HHIA; Newman,

Weinstein, Jacobson, & Hug, 1990) or the Hearing Handicap Inventory for the Elderly (HHIE; Ventry & Weinstein, 1982), Abbreviated Profile of Hearing Aid Benefit (Cox & Alexander, 1995), or the International Outcome Inventory for Hearing Aids (Cox & Alexander, 2002).

When questionnaires are used to measure hearing aid outcome, participants/patients are often not shown their baseline responses when completing the questionnaire for the second time; that is, they are blind to their baseline responses. The rationale for this practice is that providing previous responses will introduce a bias such that participants may either repeat their previous answers even though a change may have occurred or exaggerate changes to please the experimenter or clinician (Guyatt et al., 1989). In reality, however, there is little empirical work to validate or dispute this assumption. Furthermore, it could be hypothesized that informing participants/patients of their baseline responses, that is, showing them their baseline questionnaire when they complete the follow-up questionnaire, might actually lead to a more consistent use of the questionnaire response scale. If, for example, a participant/patient responds 5 on a scale of 1–10 to the question “Does your own voice sound natural to you?” (Item Q12 from the Speech, Spatial and Qualities questionnaire of Gatehouse & Noble, 2004), and he or she can still recall how he or she came to rate the quality of speech as a 5, his or her follow-up response can be calibrated to that response on the scale. In this study, we examined whether hearing aid outcomes as measured with a questionnaire differ depending on whether the follow-up questionnaire is administered in a blind versus an informed manner.

The results of the few studies in which blind versus informed administration of questionnaires at follow-up were examined are somewhat mixed. Guyatt, Berman, Townsend, and Taylor (1985) administered a questionnaire to assess reported quality of life associated with stable and newly diagnosed respiratory disease. Forty-three participants with stable disease completed a questionnaire at baseline, and then again at two follow-up visits during which they completed first a blind questionnaire and, 30 min later, an informed questionnaire. A group of 13 newly referred patients completed a questionnaire at baseline, and then at follow-up 2–6 weeks later. At that time, they completed a blind questionnaire and, between 5 and 15 min later, an informed questionnaire. The informed questionnaires showed less between-visit variability among the stable patients, but informed and blind administrations showed the same degree of change for the newly referred treated patients. These findings suggest that informed administration has benefits over blind administration in terms of reliability of responses but that informed and blind methods are equally sensitive to change.

In a later study, Guyatt et al. (1989) conducted a double-blind randomized controlled trial of 32 participants comparing blind versus informed administration of a questionnaire similar to the quality of life associated with respiratory disease questionnaire used above, known as the Chronic Respiratory Disease Questionnaire (CRQ; Guyatt, Berman, Townsend, Pugsley, & Chambers, 1987). Physiological assessments of respiratory function were also assessed. No differences in CRQ scores between blind and informed methods of completion were noted at follow-up in any of the four intervention conditions. However, larger (but not statistically significant) effect sizes were seen for the informed method on the Emotional Function scale

of the CRQ than for the scales reporting fatigue, mastery (feeling of control over the disease), and dyspnea (breathing difficulty). In other words, the questionnaire was equally responsive with informed and blind administration. There were, however, significantly stronger correlations between CRQ responses and the physiological measures of function in the informed administration condition than in the blind administration condition. The authors suggest these correlations imply that informed administration gives results that are more valid because informed administration calibrates the participants to their previous response, and thus they responded more consistently from visit to visit.

In a more recent study, Schünemann, Guyatt, Griffith, Stubbing, and Goldstein (2002) examined 85 patients with chronic respiratory disease using the CRQ and the St. George's Respiratory Questionnaire (SGRQ; Jones, Quirk, Baveystock, & Littlejohns, 1992) to determine whether the seeming advantages of informed administration remain when the time between baseline and follow-up is long. Participants completed the CRQ and SGRQ before and after a 3-month respiratory rehabilitation program. Forty-two individuals completed the questionnaires at follow-up in the blind condition, and 43 completed them in the informed condition. No differences were found in responses for informed and blind administration. The authors concluded it was because participants no longer received the benefit of "recalibration" from the informed condition due to the long (3-month) intervention period. More specifically, they suggested that participants could no longer recall how they felt at baseline and thus could not use the information to map their current feelings onto the scale they used at baseline.

Finally, van der Velde et al. (2010) examined blind versus informed questionnaire administration of a Food Allergy Quality of Life scale. Eleven participants completed the questionnaire at baseline, 6 months later in the informed condition, and then 3 months after this in the blind condition. They found no differences in scores between informed and blind follow-up and no differences in correlations between baseline and informed or baseline and blind results. The authors concluded that both methods are appropriate and that due to the logistical burden, blind follow-up is likely preferable.

In the field of audiology, we are aware of only one study in which the issue of informed versus blind administration of hearing-related outcome questionnaires was addressed, albeit indirectly. The study was conducted by Munroe and Lutman (2004). In this study, 32 first-time hearing aid users completed the Glasgow Hearing Aid Benefit Profile (Gatehouse, 1999) on seven or nine occasions. Participants completed the questionnaire once at the time they received a hearing aid and then six or eight times after fitting over the following 24 weeks. Sixteen of the participants answered the postfitting questions relative to their first set of responses: "In this situation, how much more does your hearing aid help you/how much more satisfied are you compared to around the time you *first started* to use the hearing aid?" The remaining 16 answered the postfitting questions relative to the previous occasion on which they completed the questionnaire: "In this situation, how much more does your hearing aid help/ how much more satisfied are you compared to when you visited the lab *three weeks ago*?" Munroe and Lutman found that preintervention ratings were similar for both groups but that follow-up responses differed on the basis of whether the participants answered the questions relative to their baseline responses or relative to their responses on

the previous occasion on which they completed the questionnaire. When participants responded relative to the previous completion occasion, the reported outcome changed over time. However, when the baseline reference was used, no changes were seen over time. These data illustrate that the baseline from which judgments are made may affect questionnaire responses.

The current status of a patient's health also affects recall. For example, individuals feeling high levels of fatigue following chemotherapy recalled less fatigue than they had initially reported prior to treatment; however, those experiencing little fatigue following chemotherapy recalled more fatigue prior to treatment than currently reported (Sprangers et al., 1999). Similarly, among a group of patients who had undergone a radical prostatectomy 1–6 years previously, those who were now experiencing incontinence after the operation were more likely to recall preoperative urinary symptoms than those without current problems (Heathcote et al., 1998). In this respect, informed administration of a follow-up questionnaire has the advantage of reminding participants/patients about their preintervention status.

In terms of hearing aid outcome, Gagné, McDuff, and Getty (1999) point out that people's awareness of their difficulties changes over time, and, therefore, so do their perceptions of the problems they encounter and their reactions to those problems. Bentler, Neibuhr, Getta, and Anderson (1993a, 1993b) conducted a study in which they examined both perceived and measured hearing aid performance over time. Specifically, they investigated objective measures of speech understanding over time (i.e., percentage of correct speech recognition scores), subjective measures of speech understanding over time (i.e., responses from a self-report scale), and the relationship between the two. They found that speech understanding in quiet and in noise remained stable over the five occasions on which testing was conducted but that subjective speech understanding in quiet scores increased significantly over the three occasions on which the questionnaires were completed. In other words, over time, there was a perceived improvement in performance relative to actual performance. Although not explicitly stated, it is likely that the questionnaires were administered in a blind format. Thus, from these data, it is not possible to determine whether the participants' perceived ability to understand speech changed over time or whether the participants changed their interpretation of the questionnaire scale over time. In light of the fact that performance remained stable over time, the latter explanation—that the participants changed their interpretation of the questionnaire scale over time—seems probable.

Participants/patients change their outlook on hearing handicap through the treatment and counseling process such that “experience modifies one's expectations so that it matches actual performance. Changes in expectation over time may affect how expectation relates to satisfaction” (Wong, Hickson, & McPherson, 2003, p. 131). In the context of informed versus blind administration of follow-up questionnaires, one might expect a satisfied user to recall more problems prior to receiving a hearing aid, thus artificially inflating reported benefit. Conversely, a user who is dissatisfied might recall fewer problems prior to receiving a hearing aid, thus deflating reported benefit.

A common scenario that highlights the need to consider whether blind versus informed administration of follow-up questionnaires has an influence on hearing aid outcomes is when there is a discrepancy between reported and measured hearing aid benefit. Sometimes participants/patients report benefit from a hearing aid, and yet performance tests show no improvements over baseline. Conversely, sometimes there is a measurable performance benefit, and yet the patients report no benefit (Cox & Alexander, 1992; Preminger, Neuman, & Bakke, 2000; Saunders & Forsline, 2006). In both of these situations, it would be valuable to determine whether the discrepancy between performance and self-report is because the participant/patient has poor recall of his or her baseline experiences, he or she is not “calibrated” to the questionnaire response scale, one or other of the test measures is insensitive, or because there exists a true discrepancy between self-report and performance.

To this end, we used the HHIE or HHIA (as appropriate, depending on the participant’s age) to examine the impact of informed versus blind questionnaire administration on self-reported hearing aid outcome. In clinical practice and in research, changes in HHIE or HHIA (hereafter collectively referred to as the HHI) scores from pre- to posthearing aid fitting are often used as a metric of hearing aid benefit (Chisolm & Abrams, 2008; Newman, Sandridge, & Wodzis, 2008). Studies have examined the impact of time between hearing aid fitting and postfitting questionnaire completion on HHI benefit scores (Malinoff & Weinstein, 1989), the test–retest reliability of face-to-face versus paper-and-pencil administration (Newman & Weinstein, 1989; Weinstein, Spitzer, & Ventry, 1986), and the relationship between the HHI and audiometric data (Newman et al., 1990; Weinstein & Ventry, 1983). However, there do not appear to be any studies in which the impact of informed versus blind administration at follow-up on hearing aid outcome has been examined. Informal reports from audiologists suggest that there is little standardization regarding whether follow-up questionnaires are administered in an informed or a blind format, even though it is potentially important for interpreting the data. The purpose of the present study, then, was to determine whether blind versus informed completion of the HHI at follow-up affects overall outcome.

Method

Synopsis

Study participants were military Veterans attending a hearing aid evaluation at the Portland VA Medical Center (VAMC) Audiology Service. All participants completed the HHI on two occasions. The first occasion was at their hearing aid evaluation (HAE) appointment. The second was at their hearing aid follow-up visit. On the second occasion, some of the participants completed the questionnaire on a new HHI form (blind administration), and the remaining participants responded on the same form that they had used at their HAE (informed administration).

Participants

Participants were Veterans eligible to receive hearing aids through the VA who attended a routine HAE during the data collection period. The mean age of the participants was 66.0 years ($SD = 10.2$ years). All were capable of completing the HHI in pencil-and-paper format

unassisted. For logistical reasons, it was preferable to have the study receive institutional review board (IRB) exemption from the Portland VAMC. This exemption was granted with the understanding that we were not permitted to collect individually identifiable health information; thus, only the participants' year of birth and hearing aid user status were recorded. Data regarding gender, cognitive status, audiologic status, daily hearing aid use, and the like were not collected.

We knew a priori that we would not be able to obtain postfit questionnaires from all individuals who had completed a questionnaire at their HAE for two reasons. First, the Portland VAMC Audiology clinic conducts follow-up with most experienced hearing aid users by telephone rather than through a clinic appointment. Second, a large number of clinic patients choose not to participate in any form of follow-up, even though it is offered. Therefore, data were collected until sufficient pairs of questionnaires had been obtained. In total, 242 questionnaires were completed at HAE and 77 at a follow-up visit. Of the 77 pairs of questionnaires, 12 questionnaires had missing responses, resulting in 65 pairs of complete prefit and postfit questionnaires. Of these 65 pairs of questionnaires, 36 of the follow-up questionnaires were completed in the informed condition and 29 in the blind condition. Nine participants in the informed administration group and 14 in the blind administration group were experienced hearing aid users; 27 participants in the informed administration group and 15 in the blind administration group were new hearing aid users. The reason there were more new hearing aid users than experienced hearing aid users is likely associated with clinic procedures of conducting follow-up by telephone with experienced hearing aid users. In addition, more experienced hearing aid users than new users likely chose not to attend scheduled follow-up appointments. The average time between HAE and follow-up visit was 9.5 weeks (range = 3.3–22.1 weeks).

Test Measures

The 25-item HHI assesses the consequences of hearing loss on two scales: The Emotional scale (13 items) assesses the emotional consequences of hearing loss, and the Social scale (12 items) assesses the social consequences of hearing loss. Scores on each scale can be combined to make a total score that ranges from 0 (*no handicap*) to 100 (*maximum handicap*). There are two versions of the questionnaire: the HHIE for individuals age 65 years and over (Ventry & Weinstein, 1982) and the HHIA for individuals younger than 65 years (Newman et al., 1990). They differ in the wording of just three items.

Procedure

Prior to commencing the study, exemption was granted by the Portland VAMC IRB committee. All participants completed the HHI on two occasions: first at a routine HAE and second at their first follow-up visit. Participants age 65 years and over at the start of the study completed the HHIE on both occasions; participants under age 65 years completed the HHIA on both occasions. On the second occasion, half the participants were given a clean HHI form to complete (blind administration), and half were given back their original form on which to provide their second set of responses (informed administration). A cover page was generated for the forms on which the audiologist entered the participants' year of birth,

their hearing aid user status (new vs. experienced), and the date on which the questionnaire was completed.

Each morning before Portland VAMC Audiology clinics began, a member of the research team attached HHI forms to the clinic files of individuals scheduled to attend an HAE that day. Participants were counterbalanced to informed versus blind administration on an alternating sequence (i.e., Participants 1, 3, 5, 7, etc., were placed in the informed administration group; Participants 2, 4, 6, 8, and so on were placed in the blind administration group). On the morning of a patient's follow-up visit, a member of the research team returned to the clinic to attach to the patient's file either a clean HHI form if the participant was in the blind administration group or his or her already completed form if the participant was in the informed administration group.

At the HAE, participants completed the HHI while they were having ear impressions made (i.e., after the audiologist had decided to fit them with a hearing aid). Participants were informed that their responses were for research use only and that responses would not be used to determine hearing aid candidacy, type/style of amplification, or the hearing aid settings. The audiologist did not specify whether experienced hearing aid users should complete the questionnaire in relation to unaided or aided listening. At the follow-up visit, participants completed the HHI at the start of their visit. The audiologists ensured that participants in the informed administration group used different color pens both times they completed the questionnaire.

Seven audiologists fitted hearing aids in the Portland VAMC Audiology clinic during the study. These individuals followed their routine hearing aid-fitting protocols; they did not adjust their protocol for purposes of the study, nor did they use HHI responses to make fitting decisions.

Power analysis using the data of Weinstein et al. (1986) was conducted. For an effect size of 19 points, the 95% confidence interval on the HHIE showed that 30 participants per group would result in 90% power to detect group differences at $p < .05$ for a one-way analysis of variance (ANOVA) comparing two groups. This is a conservative estimate given that the 95% confidence interval for the HHIA is only 12 points (Newman, Weinstein, Jacobson, & Hug, 1991).

Results

Analyses

We scored the HHI using the conventional protocol of totaling the points obtained to questions in each subscale such that a response of *yes* = 4 points, *sometimes* = 2 points, and *no* = 0 points. We computed hearing aid benefit by subtracting the HHI score at follow-up from the score at the HAE for the Social and Emotional scales separately. We conducted statistical analyses using Statistical Package for the Social Sciences (SPSS) Version 17.0.

Group equivalence—To evaluate equivalence of participants in the informed blind administration groups, we conducted ANOVAs comparing age, baseline HHI scores, and

time between baseline testing and follow-up. The group means and results of ANOVAs for each study group are shown in Table 1, along with follow-up HHI scores for each group. There were no differences between the participants in the two groups in terms of age or baseline and follow-up HHI scores. The number of weeks elapsed between baseline testing and follow-up for participants in the informed administration group was, on average, greater than for participants in the blind administration group, but this difference was not significant.

Hearing aid benefit—To confirm that the HHI was sensitive to hearing aid intervention, we examined degree of HHI hearing aid benefit. *Hearing aid benefit* was defined as HHI score at prefit minus the HHI score at postfit. To this end, the distribution of total HHI benefit scores of participants were plotted (see Figure 1). Ninety-four percent of participants reported at least some hearing aid benefit (benefit > 0), with 66% of participants reporting benefit equal to or greater than the 95% critical difference (benefit score of 12 for the HHIA and 36 for the HHIE; Newman et al., 1991; Weinstein et al., 1986). In other words, the HHI appeared to be sensitive to hearing aid intervention. A univariate ANOVA showed no significant difference in the benefit reported by new and experienced hearing aid users, $F(1, 63) = 3.5, p = .066, \eta^2 = 0.53$, although new users reported, on average, benefit of 33.3 points ($SD = 21.9$), and experienced users reported benefit of 22.7 points ($SD = 21.3$). This difference is not explained by a difference in the baseline HHI scores of the two groups: new users = 54.0 ($SD = 19.1$), experienced users = 56.3 ($SD = 26.3$), $F(1, 63) = 0.161, p = .690, \eta^2 = 0.003$.

Informed versus blind administration—We conducted univariate ANOVAs comparing HHI benefit reported by each study group for each scale separately to determine whether informed versus blind administration affected reported HHI benefit. HHI benefit did not differ between the groups on either scale: Emotional, $F(1, 63) = 0.420, p = .519, \eta^2 = 0.007$; Social, $F(1, 63) = 0.001, p = .983, \eta^2 = 0.001$. In other words, for the groups as a whole, form of administration did not affect hearing aid benefit. However, individual variables such as age, past hearing aid use, and time between HAE and follow-up could each have interacted with form of administration to affect HHI benefit. To examine the potential impact of these variables more closely, we conducted further analyses.

Hearing aid experience—HHI benefit scores of new and experienced hearing aid users in the informed and blind administration groups for the HHI Emotional and Social scales separately are displayed in Figure 2. We conducted a multivariate ANOVA, using the HHI scales as dependent variables and hearing aid user experience and form of administration as fixed factors. There was no significant main effect of hearing aid experience, nor was there a significant interaction between hearing aid experience and form of administration; thus, form of administration did not appear to differentially affect hearing aid outcome for new or experienced hearing aid users. These findings along with benefit scores on each scale for each subgroup analyzed are shown in Table 2.

Age—We examined the relationship between age and HHI benefit using Pearson correlation analyses. Scatter plots of these data along with regression lines and Pearson r

values are shown in Figure 3. The relationships between age and benefit on the HHI scales for participants in the informed and blind forms of administration groups are shown separately. Age did not correlate significantly with HHI benefit for either scale, nor was there a difference in this relationship between the two forms of administration.

Time between baseline measurement and follow-up—On the basis of the responses to two respiratory questionnaires, Schünemann et al. (2002) postulated that if time between baseline and follow-up was less than 12 weeks, then blind administration of follow-up questionnaires would lead to different outcomes than informed administration. However, according to the investigators, once the time exceeded 12 weeks, the difference in outcome between forms of administration would cease to exist. We therefore compared whether the HHI benefit of participants in the informed versus blind administration groups differed for participants whose follow-up period was less than 12 weeks (short-term follow up) from those whose follow-up period was more than 12 weeks (long-term follow up). The results obtained are displayed in Figure 4. It appears from the graph that follow-up time did not differentially affect outcome of the blind versus informed participants. This was confirmed by a multivariate ANOVA, in which there was no main effect of follow-up time on emotional benefit, $F(1, 61) = 0.229$, $p = .634$, $\eta^2 = 0.004$, or social benefit, $F(1, 61) = 0.548$, $p = .462$, $\eta^2 = 0.009$, nor was there a significant interaction between follow-up time and form of administration on either HHI scale: Emotional, $F(1, 61) = 0.145$, $p = .705$, $\eta^2 = 0.002$; Social, $F(1, 61) = 0.137$, $p = .712$, $\eta^2 = 0.002$. In other words, in this study, form of administration did not affect outcome, regardless of time elapsed between baseline and follow-up. It should be noted, however, that the number of participants with long-term follow-up was extremely small.

Discussion

The purpose of the present study was to determine whether the form in which follow-up questionnaires are administered (blind vs. informed) affects reported hearing aid outcome. Specifically, we wanted to determine whether providing an individual with baseline HHI responses at follow-up results in a different follow-up outcome compared with when the individual is not provided those baseline responses at follow-up HHI. Clinically, this is important because reported hearing aid outcomes are used to determine the success of a hearing aid fitting, to make adjustments to hearing aids, and as a metric by which clinics demonstrate efficacy to consumers and third-party payers. At this time, there appears to be little or no standardization regarding whether follow-up questionnaires are administered in an informed or a blind format. Procedurally, however, it would seem that informed administration of follow-up questionnaires might have advantages over blind administration. When conducting research, informed administration is likely to decrease individual differences in recall of baseline responses, leading to better within-group consistency. When in the clinic and conducting research, informed administration may lead to a more consistent use of the questionnaire response scale because the participant/patient can “recalibrate” his or her responses to his or her baseline responses. This will ultimately lead to a more consistent use of the questionnaire from visit to visit, and thus will improve the validity of questionnaire responses (Guyatt et al., 1989). Of course, these advantages only apply when a

questionnaire is being used to assess outcome. If the questionnaire is being used to assess residual difficulties, then baseline responses are less important for interpretation of the data.

Data from this study show that informed administration of follow-up HHIs did not yield different HHI benefit scores from those obtained using blind administration of the follow-up HHI. This finding was not affected by past hearing aid use, age of the participant, or long-versus short-term follow-up. Note, however, that there were only a few participants in the long-term follow-up group, and thus this finding should be confirmed by further study.

Nonetheless, our data are in accordance with the findings of the majority of previous studies in which the impact of blind versus informed administration of outcomes questionnaires have been examined (Guyatt et al., 1985, 1989; Schünemann et al., 2002; van der Velde et al., 2010). The one exception was the study by Guyatt et al. (1985), in which informed administration showed less between-visit variability for participants who did not receive an intervention but identical sensitivity to change for those participants who received an intervention. In the present study, all participants received an intervention (hearing aids); thus, our design does not permit us to examine between-visit variability. Schünemann et al. (2002) postulated that informed administration would show benefits for participants whose follow-up questionnaire was administered relatively soon (less than 12 weeks) after baseline but not for those whose follow-up questionnaire was completed later. Our data did not show this, and in fact, nor did Schünemann et al. (2002); they simply showed no effect of informed versus blind administration for follow-up at 3 months and concluded their null results were due to the long-term follow-up period.

Our findings are in agreement with other studies in that there appeared to be no effect of the form of follow-up questionnaire administration on hearing aid benefit as measured by HHI. Nevertheless, this study was not without its limitations, which could have masked the effect of form of administration on HHI outcome. First, there were considerably more new hearing aid users than experienced users in the informed administration group. This was an unfortunate consequence of the fact that the Portland VAMC Audiology clinic conducts follow-up appointments with experienced hearing aid users over the telephone.

Second, there was considerable variation in the time interval between HAE and follow-up, ranging from 3 weeks to 22 weeks. This was unavoidable, due to the design of the study. As shown by much past research (Cox, Alexander, Taylor, & Gray, 1995; Horwitz & Turner, 1997; Malinoff & Weinstein, 1989; Saunders & Jutai, 2004) but by no means all (e.g., Humes, Wilson, Barlow, & Garner, 2002; Mulrow, Tuley, & Aguilar, 1992), hearing aid outcome changes over the initial weeks of hearing aid use. The participants in this study were likely at different points in terms of whether their hearing aid outcome had stabilized. This added variability might have masked any impact that form of administration might have had on HHI outcome.

Third, the power analysis for the study was conducted for the primary comparison of HHI responses of participants in the blind versus informed groups. It was not powered for the secondary analyses associated with hearing aid experience, participant age, or time elapsed before follow-up.

Finally, because the study was IRB exempt, we were limited in the data we could collect about each participant. Data such as number of years of past hearing aid use, participants' expectations about their newly fitted hearing aids, hearing aid satisfaction, and the counseling provided at the hearing aid evaluation and fitting appointments were variables that might have interacted with informed versus blind questionnaire administration. Specifically, as discussed in the introduction, current state of mind affects recall of past experiences (Heathcote et al., 1998; Sprangers et al., 1999) and thus could influence informed administration to a lesser extent than blind administration. Expectations about hearing aids change independently of actual performance (Bentler et al., 1993a, 1993b) and thus, once again, might affect blind administration more than informed administration of follow-up questionnaires. Hearing aid counseling that addresses psychosocial issues and potential benefit based on degree of hearing loss could each strongly affect outcome and HHI responses. Again, it would seem that informed versus blind administration might differentially affect responses of individuals who based their follow-up responses on this type of counseling information. Informal conversation with Portland VAMC clinic audiologists led us to understand that the majority of their hearing aid counseling focused on hearing aid orientation; thus, the impact of counseling is probably minimal. However, because there was not a significant relationship between user experience and outcome, nor was there a difference between the baseline scores of new and experienced hearing aid users, this is unlikely to explain our findings. The finding that new and experienced hearing aid users had equivalent baseline HHI scores is further reassuring because it suggests both groups used a similar baseline for their HHI responses at HAE, even though audiologists did not provide specific instructions about this. It is noteworthy that, on the whole, new users reported more HHI benefit at follow-up than the experienced users, despite the groups having equivalent baseline HHI scores; that is, the new users had lower HHI scores at post-fitting than the experienced hearing aid users. There are a number of longitudinal studies in which a substantial reduction in reported handicap is measured immediately after fitting that is followed by a gradual increase in handicap over the next few months of hearing aid use (Malinoff & Weinstein, 1989; Taylor, 1993). That is, there is a "halo" or "honeymoon" effect perceived when hearing aids are first worn that gradually diminishes over time. This halo effect may explain the (nonsignificant) difference in HHI benefit between the new and experienced hearing aid users.

In summary, based on our data and on past studies, it seems plausible that completion of follow-up questionnaires in either informed or blind format will have little impact on questionnaire responses. As pointed out by Saunders, Chisolm, and Abrams (2005), measurement of hearing aid outcome is complex because of the interplay of many factors (i.e., expectations, attitudes toward amplification, acclimatization, personality, past experiences, etc.), and form of administration is perhaps just a small and noninfluential part of the puzzle. However, before drawing definitive conclusions, further studies using additional outcome measures and more participants and broadening the participant pool to include non-Veterans are warranted.

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Figure 1.
Histogram of total Hearing Handicap Inventory (HHI) benefit obtained by participants.

Figure 2.

Mean HHI benefit of new and experienced hearing aid users by form of administration for each HHI scale shown separately. Error bars represent standard errors. The dark bars show group mean scores of participants in the informed administration group; light gray bars are group mean scores of participants in the blind administration group. Number of participants in each group is shown in each bar.

Figure 3. Scatter plots showing the relationship between participant age and HHI benefit on the Emotional and Social scales for informed and blind administration groups separately. Open rectangles depict benefit on the Emotional scale; $\times$ s depict benefit on the Social scale.

Figure 4.

Mean HHI benefit of participants with short-term and long-term follow-up periods by form of administration for each HHI scale shown separately. Error bars represent standard errors. The dark bars show group mean scores of participants in the informed administration group; light gray bars are group mean scores of participants in the blind administration group.

Table 1

Means, standard deviations, results of univariate analyses of variance (ANOVAs,) and eta squared (η^2) values comparing age, number of weeks between HAE and follow-up, and HHI scores for informed versus blind administration.

Variable	Informed administration	Blind administration	ANOVA		
			<i>F</i> (1, 63)	<i>p</i>	η^2
Age					
<i>M</i>	66.2	65.9	0.02	.902	0.001
<i>SD</i>	10.2	10.4			
Weeks between HAE and follow-up					
<i>M</i>	10.5	8.7	3.91	.053	0.058
<i>SD</i>	4.3	13.4			
Baseline Emotional HHI score					
<i>M</i>	27.3	26.9	0.014	.906	0.001
<i>SD</i>	13.5	11.5			
Baseline Social HHI score					
<i>M</i>	29.0	26.6	0.760	.387	0.012
<i>SD</i>	10.3	11.0			
Follow-up Emotional HHI score					
<i>M</i>	14.1	11.8	0.733	.395	0.011
<i>SD</i>	12.0	10.0			
Follow-up Social HHI score					
<i>M</i>	13.7	11.4	0.836	.364	0.013
<i>SD</i>	10.6	9.4			

Note. HAE = hearing aid evaluation; HHI = Hearing Handicap Inventory.

Table 2

Means, standard deviations, and results of ANOVAs with η^2 values comparing HHI benefit for informed versus blind administration and hearing aid experience.

HHI scale	Form of administration	New user	Experienced user	Main effect: Hearing aid experience	Interaction: Hearing Aid Experience $\times$ Form of Administration
Emotional	Informed				
	<i>M</i>	15.6	11.6	$F(1, 61) = 2.657$	$F(1, 61) = 0.006$
	<i>SD</i>	12.5	10.1	$p = .108$	$p = .940$
	Blind			$\eta^2 = 0.042$	$\eta^2 = 0.001$
	<i>M</i>	16.5	11.0		
	<i>SD</i>	12.6	12.8		
Social	Informed				
	<i>M</i>	18.0	12.4	$F(1, 61) = 3.316$	$F(1, 61) = 0.003$
	<i>SD</i>	10.7	11.1	$p = .073$	$p = .953$
	Blind			$\eta^2 = 0.052$	$\eta^2 = 0.001$
	<i>M</i>	16.6	11.3		
	<i>SD</i>	11.0	11.9		