An exploratory study identifying a possible response shift phenomena of the *Glasgow hearing aid benefit profile*

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Abstract

A then-test technique was used to investigate the possibility of a response shift in the *Glasgow hearing aid benefit profile* (GHABP).

Following completion of part 1 of the GHABP, 16 adults were invited for hearing-aid follow up appointments. In accordance with then-test technique, participants were asked to think back to before they had their hearing-aids fitted and the GHABP part 1 was completed again to re-establish the disability and handicap scores. These scores were then compared with the initial GHABP part I scores. Paired T testing and Wilcoxon Rank tests were carried out to investigate the statistical significance of the response shift effect.

Statistically significant differences were seen between initial and retrospective GHABP (disability) scores using t test. No significant differences could be seen between the initial and retrospective handicap scores. Results suggest participants may have demonstrated a possible response shift phenomenon with the disability construct of the GHABP questionnaire, related to a possible re-calibration effect or a denial of disability effect.

This exploratory study suggests that the GHABP questionnaire may be subject to a response shift phenomena. We suggest that further more robust studies are completed to verify this and recommend that this could have psychological impact on participants when explaining the results of the outcome measure and may affect hearing aid use. There is also potential for this phenomenon to affect global GHABP scores specifically when demonstrating to stakeholders the overall success of an audiology service.

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Introduction

Hearing-aid (HA) outcome measures aim to quantify the success of the HA intervention and associated quality of life (QoL) in the context of hearing health benefit. As knowledge of HA outcomes increases across the globe it is important to understand any possible inaccuracies related to repeatability of outcome measures. It is also established however, that individuals can subconsciously change their perception of their conditions leading to response shift.[1] In a study using then-test technique[2] a response shift in QoL measurement in hearing impaired individuals was revealed. To the best of our knowledge no study has measured the possibility of response shift with the *Glasgow hearing aid benefit profile* (GHABP).[3] Therefore, the aim of this paper is to explore if there is a response shift in the GHABP, specifically the hearing disability and handicap constructs, and, if so, to further understand its relevance.

Undoubtedly the GHABP facilitated a breakthrough in understanding the individual benefit of a HA intervention. The GHABP may also be used as a holistic, service-wide measure of the quality of HA interventions.[3] Divided into two parts, the GHABP part I questionnaire produces a metric for person-reported hearing disability and handicap in four predefined conditions. This part is usually completed either before HA fitting or at initial contact when hearing assessment takes place. Further customised scenarios can add to the individuality of the

questionnaire. Following HA fitting, the same questions are repeated to measure the effect of HA use and its benefit (part II) and thereby establish quantitative estimates of HA use, satisfaction, benefit and residual hearing disability.

The questionnaire is able to estimate the self-reported degree of hearing difficulty experienced; the corresponding overall hearing disability and the ensuing effects on an individual's life, which will correspond to hearing handicap. However, it is worth noting that the GHABP does not appear to cover all listening options, for example, listening to the television in quiet environments or listening in situations where there is little sound. This is clearly a limitation unless this listening scenario is specified in the customised section of the questionnaire. Despite this, the GHABP questionnaire has validity and reliability as an outcome measure and has been used in several studies internationally. For example, in assessing the success of frequency compression hearing aids;[4] assessing the effectiveness of middle ear implantable hearing aids[5] and phoneme discrimination training for HA respondents.[6]

Response shift can be defined as a change in the subjective opinion or belief related to a clinical intervention over a time period during a sustained period of illness or chronic condition. This simple explanation can be further expanded to describe the detail of response shift. Researchers, including those in audiology, have described three plausible reasons for response shift: recalibration, for example changes in perception of hearing disability post HA fitting; re-prioritisation, for example changes in perceptual importance of health related quality of life (HR-Qol)[1] and reconceptualization, a redefinition of a target construct. For example a questionnaire examining mental health, might be understood later in time as a something measuring loneliness.

Interestingly, when reporting his original study Gatehouse[3] did not discuss response shift. However, he did refer to the repeatability of the questionnaire over a three-week period.[3] In the original questionnaire and its repeat administration a correlation of more than 0.89 was achieved. This is clearly very high and there was a suggestion that some participants may have recalled their initial responses. From a defining principle however, it is important to differentiate between response shift and repeatability; repeatability being the stability of the questionnaire over a specified period of time, in the absence of any changes in condition, psychology or psychosocial position.

Response shift can be measured in different ways. However, the then-test is one of the most common to be applied to a given outcome measure. Presently only one study describes response shift in hearing loss.[2] This study measured the response shift in HA respondents using EuroQol-5D, a frequently used HR-QoL questionnaire. It was suggested that response shift is a relatively important factor when assessing outcome measures related to the clinical effectiveness of medical interventions. Moreover, response shift could have an impact on health economic aspects of various interventions, if not fully understood.[2]

Further analysis of the possible change process can be determined with the then-test. Here individuals follow a pattern of conventional HA fitting. However, post HA intervention they are invited to re-consider what it was like without the HA, that is to answer the questionnaire retrospectively. The advantages and disadvantages of the then- test technique are well documented.[1] Advantages relate to understandable instructions and speed of administration. Moreover, statistical analysis is relatively straightforward. This is because, to demonstrate changes in T_1 and T_0 stages, either T testing, or a non-parametric equivalent, are recommended. However, researchers also recommend additional measures are taken to reduce the chance for error and enhance then-test accuracy. Examples include the use of a control group, ensuring T_1 is completed within a sensible time frame to permit greater accuracy of recall and the use of additional outcome measures.[1] Of course the then-test is not without limitation. For example some individuals may not recall their original health situation and this is classified as recall bias.[7]

Materials and Methods

Study design

This was an exploratory longitudinal survey, the aim of which was to investigate the possibility of a response shift of the GHABP questionnaire using then-test technique.

Ethics

Ethical approval was granted by the South Wales Research Ethics Committee on 24-1-13 (reference 13/WA/0001). The study was conducted in accordance with the 1964 Declaration of Helsinki and all participants gave written informed consent.

Participants

Sixteen adults attending an Audiology clinic in South Wales, UK were invited by letter to participate in this study. Inclusion criteria were: referred to the Audiology clinic for initial assessment, fitted with digital hearing aids (Resound IFIT71, IFIT81, ES71 or ES81) optimally programmed to NAL-NL1, invited for first follow up HA intervention appointment, able to give informed consent and proficient in the English language.

Outcome measures

The GHABP questionnaire measures self-reported auditory disability (degree of hearing problems), handicap (degree to which hearing problems impact on day to day life, listening situations) and HA use pre and post intervention. The pre HA fitting (part I) and post HA fitting (part II) questionnaires show the effectiveness of the HA intervention. The GHABP questionnaire examines responses in 4 pre-defined listening situations: 1) listening to television with other family or friends when volume is adjusted to suit other people; 2) having a conversation with one other person when there is no background noise; 3) carrying on a conversation in a busy street or shop; and 4) having a conversation with several people in a group. Individuals are initially asked to answer "yes" or "no" to having difficulty in hearing in each of these listening environments. If respondents answer "yes", they are asked to grade how much difficulty they have in that situation. There are five response categories along the lines of a Likert scale, namely: not applicable, not at all, only a little, a moderate amount, quite a lot and very much indeed.

Data collection

Data were collected in two stages as illuminated in Table 1. The first stage of data collection (T_0) took place at the initial hearing assessment. Here demographic information related to gender and age was collected together with information about the average hearing loss of individual ears and mean hearing loss. The second stage of data collection (T_1) took place 14 weeks later at the post HA follow up appointment. At this appointment participants were asked to complete the GHABP (part I) questionnaire again (T_1) and also GHABP (part II).

Data analysis

At each stage the GHABP questionnaire was administered through a specific audiology data base (auditbase). The GHABP outputs were subsequently calculated by the computer. The data set was then manually inputted into an excel database and imported into SPSS (v22). The data collected were, age, gender, mean hearing loss, GHABP (disability T_0), GHABP (disability T_1), GHABP (handicap T_0), GHABP (handicap T_1), GHABP (use), GHABP (satisfaction), GHABP (benefit), and GHABP (residual disability).

Descriptive statistics were used to provide details concerning the

characteristics of the sample. Data were checked for normality using Shapiro Wilks test. Continuous and normally distributed data were analysed using parametric T test and Wilcoxon Signed Ranks tests were performed. A P value of equal to or less than 0.05 was considered significant. Correlational (parametric and non-parametric) analyses and multiple linear regression analyses were performed.

Results

Sixteen adults, eleven women and five men between 46 and 78 years participated in the study. All variables were normally distributed except for GHABP (Handicap T_1), disability response shift and GHABP (benefit). This was tested using the Shapiro Wilks test.

Table 2 shows the mean and SD values for age, mean hearing loss, disability and handicap response shift. As can be seen, the disability response shift variable demonstrates more variability compared with the handicap response shift. Parametric and non-parametric correlations can be seen in Appendices 1 and 2 for reference.

Multiple linear regression showed no significant predictions of the response shift variable (for GHABP disability and handicap) with mean hearing loss, GHABP (disability T0), GHABP (disability T_1), GHABP (handicap T_0), GHABP (handicap T_1), GHABP (use), GHABP (benefit), GHABP (satisfaction) and GHABP (residual disability).

Figure 1 shows the GHABP (disability) scores in percentages showing the change observed in T_0 and T_1. As can be seen, every T_1 value shows an increase compared with the original T_0 value.

Figure 2 above shows T_0 and T_1 values for GHABP (handicap). As both sets of scores for disability data were normally distributed a paired T test was appropriate and indicated that the GHABP disability (T_1) group score was statistically significantly higher than the GHABP disability group score at T_0 ($t=5.95$, $P=0.000027$). The handicap (T_1) group score was not normally distributed so the non-parametric Wilcoxon Signed Ranks test was used and showed no significant difference between [GHABP (handicap) T_1] and [GHABP (handicap) T_0] ($Z=67$, $P=0.132$).

Table 1. Data collection process including the then-test.

Variable name	Definition
GHABP (T_0) (part I)	1st contact with subject *prior* to HA fitting
GHABP (part II)	Completed *after* HA fitting at HA follow up
GHABP (T_1) part I	Completed *after* HA fitting at hearing aid follow up.
	Participants were asked to think back to what their listening was like without the hearing aid (then test)

GHABP, *Glasgow hearing aid benefit profile*; HA, hearing-aid.

Table 2. Descriptive data for age, mean hearing loss, disability response shift and handicap response shift.

		Age (years)	Mean hearing loss* (dBHL)	Disability response shift (%)	Handicap response shift (%)
Male	Mean	64.00	36.30	15.60	9.60
	Maximum	67.00	53.00	30.00	42.00
	Minimum	59.00	12.00	2.00	-17.00
	SD	3.39	16.03	11.15	23.03
Female	Mean	65.73	38.77	15.64	7.91
	Maximum	78.00	84.50	32.00	33.00
	Minimum	46.00	14.50	6.00	-25.00
	SD	10.62	18.97	10.76	17.27

*Right and Left ear mean. SD, standard deviation.

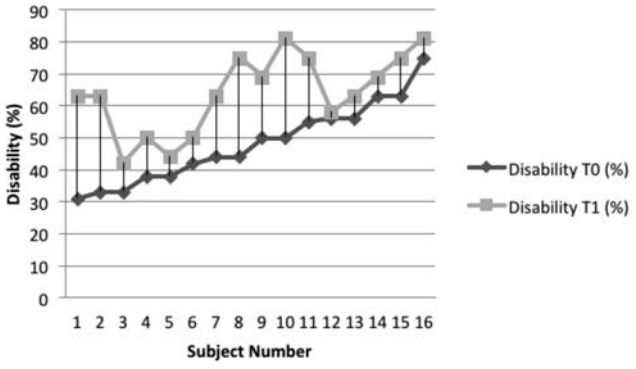

Figure 1. T_0 and T_1 disability scores for each subject.

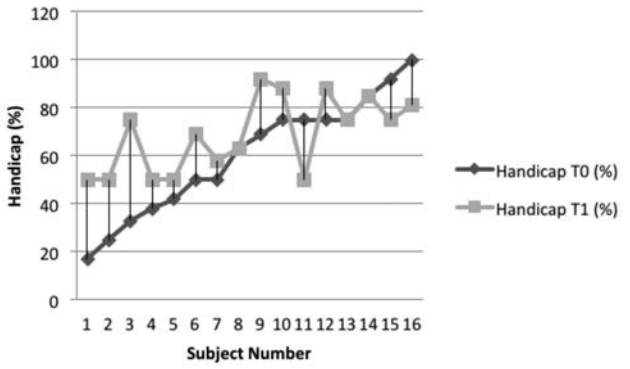

Figure 2. T_0 and T_1 handicap scores for each subject.

Discussion

For the first time this study revealed a potential response shift with the GHABP questionnaire using then-test technique. This became apparent when analysing T_0 and T_1 GHABP (disability) scores and by carrying out T testing (t=5.95, P=0.000027). When examining Table 2 it is evident that mean data for hearing disability and handicap in each T_1 stage is higher than the initial T_0 data. Arguably this suggests an overall shift in response between first contact prior to HA fitting (T_0) and at HA follow up (T_1) when participants were asked to think back to what their listening was like without the HA (then-test).

The t test indicated that the difference in these scores was statistically significant. As the handicap value (T_1) was not normally distributed Wilcoxon rank testing showed that there was no statistical difference between the T_1 and the T_0 handicap scores. These results are of obvious interest and connect with previous researchers' findings.[2] The results suggest participants might be demonstrating a level of recalibration of their own perception of hearing disability. This could mean participants initially underestimated their hearing difficulties.

However, having been fitted and lived with a HA for several weeks, when completing the same questionnaire for T_1 participants' responses were different. Arguably it could be that at T_1 participants' answers represented their reality prior to HA fitting with greater accuracy. This suggests that at T_0 participants underplayed the extent of their hearing loss. Drawing on the work of Luterman[8] and Schum[9], this may relate to the possibility that at T_0 participants were in denial of their hearing disability: disability denial.[8,9] Denial is a protective coping strategy which, in this study may signal not only felt but anticipated and feared enacted stigma.

A pejorative concept, stigma is most frequently connected with the seminal work of Goffman.[10] Goffman advocated that stigma was associated with a discrediting or undesirable attribute, in this context hearing loss and use of a HA. Goffman argued that such attributes set individuals apart from others and spoil their identities. Stigma may be felt or enacted. Felt stigma has been described as the internal perception of shame associated with a visible, potentially discrediting condition and fear of others' reactions.[11] By way of contrast, enacted stigma relates to the interpersonal experience of prejudicial behaviour on the basis of an individual's perceived unacceptability.[12] The possibility of felt stigma associated with hearing loss and HA use connects with findings from earlier investigations.[13,14] Arguably participants in our study initially underplayed the degree of disability experienced as a consequence of their hearing loss in order to reduce the likelihood of the HA intervention and the perceived associated risk of enacted stigma.

A further discussion point relates to the variable nature of the response shift when analysing the T_0 and T_1 handicap [Handicap T_0 (GHABP part I) and Handicap T_1 (GHABP part I)]. With regard to the handicap dimension of the response shift it can be seen from the mean scores at T_0 and T_1 that although there is a response shift this difference is not statistically significant. It is possible that this relates simply to the small sample size. Indeed, with a larger study sample it is possible that this response shift would reach statistical significance. Given the sample size in the present study it is very difficult to produce any other accurate inference.

The findings reported here have implications for clinical practice not least because they suggest that patients underplay the extent of their hearing loss. This may relate to a re-calibration effect[1] or a denial of disability effect.[7] This may suggest that the hearing aid intervention has a larger reduction in disability when taking the response shift into account. If response shift is not considered there is potential to fail to demonstrate to patients that the HA intervention has improved their situation. This could have negative perceptual consequences to HA users and manifest as a possible adverse psychological effect in that patients may perceive that the HA intervention is not providing them with sufficient benefit. This in turn may lead to reduced HA use. It is possible that this may be connected to the ways in which the Audiologist explains the GHABP scores and signals the need for attention in terms of communication of information between the Audiologist and the patient.

Finally and importantly in this age of austerity, some consideration must be given to the health economic aspects of HA interventions. This is because the response shift effect may have implications in terms of demonstrating the effectiveness of the overall success of a service to key stakeholders, namely service and strategic managers, fund holders and governments.[3]

This study is not without limitations. Whilst the sample is small it is in accord with exploratory nature of the study and its aims. Moreover, significant results were seen with the disability scores of the GHABP. Future studies should aim to employ a much larger sample size to further investigate and ratify the assumed response shift effect, taking full consideration of work completed by earlier researchers.[1] While it was very difficult to plan to incorporate the recommendations made by previous researchers, such as to include the use of a control group, ensuring T_1 is completed within a sensible time frame to permit greater accuracy of recall and the use of additional outcome measures[1], we believe we have mitigated these potential effects in some ways for the time taken from HA fitting to follow up was no more that fourteen weeks. Furthermore the inclusion criteria required that all participants had mental capacity.

Conclusions

This study aimed to determine whether the GHABP questionnaire exhibited response shift in a small cohort of participants. Findings revealed statistically significant changes in self-perceived disability over time. This suggests that the GHABP questionnaire can be prone to a response shift.

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