BMJ open

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Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004066
Article Type:	Research
Date Submitted by the Author:	19-Sep-2013
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Primary Subject Heading:	Ear, nose and throat/otolaryngology
Secondary Subject Heading:	Ear, nose and throat/otolaryngology
Keywords:	Adult otolaryngology < OTOLARYNGOLOGY, Audiology < OTOLARYNGOLOGY, PUBLIC HEALTH

Acceptance of hearing disability in adults noticing hearing difficulties

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Abstract

Objective: The aim of this study was to develop a Hearing Disability Acceptance Questionnaire (HDAQ), and to study its construct and concurrent validity. ***Design:*** Cross-sectional. ***Participants:*** A total of 90 participants who were noticing hearing difficulties were recruited in the UK. ***Main outcome measures:*** HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ). Participants' completed self-report measures on hearing disability acceptance, hearing disability, anxiety and depression and a measure of stages of change. ***Results:*** The results suggest that the HDAQ has a two- factor structure that explains 75.69% of the variance. The scale showed good internal consistency (Cronbach's alpha of 0.86). HDAQ was also found to have good concurrent validity in relation to self-reported hearing disability, self-reported anxiety and depression and readiness to change measures. ***Conclusions:*** It has been suggested that acceptance is an important aspect when facing chronic health conditions. To our knowledge there is no previously published validated scale to measure the acceptance of hearing disability and for this reason HDAQ could be useful in future research. However, the role of acceptance in adjusting to hearing disability needs to be further investigated.

Key Words

Hearing disability, hearing loss, acceptance, self-reported measure

Summary

Article Focus

- To develop a Hearing Disability Acceptance Questionnaire (HDAQ), and to study its construct and concurrent validity.

Key Message

- The results suggest that the HDAQ has a two- factor structure that explains 75.69% of the variance. The scale showed good internal consistency (Cronbach's alpha of 0.86).
- Results suggest moderately strong negative but statistically significant correlation between acceptance and hearing disability, moderate negative but statistically significant correlation between acceptance and anxiety and depression, weak negative but statistically significant correlation between acceptance and readiness to change.
- The role of acceptance in adjusting to hearing disability needs to be further investigated.

Strengths and Weakness

- Online recruitment method the study sample may not be representative of the general population and also the online format of questionnaire administration may have some differences to pen-and-paper format.
- Although there are measures that study coping indirectly, there is no well-established acceptance scale to study the concurrent validity of the HDAQ with the same construct (i.e., acceptance).

Introduction

In the process of help seeking, an individual with hearing loss may pass through several stages.[1] Edgett[2] highlighted that the process of making a decision to seek help can involve four main stages which included: (1) understanding hearing loss; (2) personal experiences; (3) interaction with society; and (4) taking action. In another study, Engelund[3] suggested that patients go through four main stages while making a decision to seek help which include: (1) attracting attention; (2) becoming suspicious; (3) sensing tribulation; and (4) jeopardising the fundamental self. In our previous studies related to 'patient journey' of person with hearing impairment (PHI) we took this further and studied the journey from initial onset of problems to successful rehabilitation and developed a patient journey model.[4 5] This model suggests that the PHI goes through seven main stages before, during and after their audiological rehabilitation, which includes: (1) pre-awareness; (2) awareness; (3) movement; (4) diagnostics; (5) rehabilitation; (6) self-evaluation; and (7) resolution. This is a long process as the PHI may on an average take up to 10 years or more to seek help after started to notice hearing difficulties,[6] and further research is necessary to better understand this process.[7] Nevertheless, these studies provide insights regarding stages of adjustment to hearing loss, which may be an indirect (or secondary) indicator of the process of acceptance. In addition, from the above studies it is clear that becoming aware and accepting a hearing disability plays an important role in progressing further in their journey when managing the condition.

There are a few studies in audiology literature which focus on self-assessment of hearing loss,[8] immediate reactions to diagnosis of hearing loss,[9 10] actions taken after failing a screening tests,[11] attitudes to hearing loss and the use of hearing aids,[12 13] and ways in which people with hearing loss cope with their condition.[14-16] These studies provide further insights into initial onset of the condition and how people with hearing disability may manage their

condition. A recent literature review suggested that acceptance of hearing loss prior to hearing aid fitting would positively influence both hearing aid uptake and subsequent hearing aid use.[17] However, there are still large numbers of people with hearing disability who aware that they have a problem, but are still not seeking help and/or not taking up intervention strategies. The previous literature can be confusing as the term 'acceptance' was used in those studies (i.e., acceptance is used synonymously with adherence to treatment/management options) rather than studying 'acceptance' using validated scales which captures different dimensions of the construct.

In psychological terms, 'acceptance' can be defined as '*a process of actively taking in thoughts, memories, feelings and bodily sensations in a specific situation without having to follow or change them*'.[18] Acceptance may have various dimensions including self- and social acceptance which may require both emotional and behavioural adaptations. For instance, the different views of what the term acceptance actually entails can be made visible by looking at studies of education and academic success, where the term peer acceptance is used in reference to what degree a pupil is seen as someone who is desirable to interact with.[19] In disability studies, acceptance has been proposed to be the key component of adjusting to a disabling condition.[20] Although it is suggested that acceptance of chronic conditions has often been studied from the perspective of grief and loss, it is also important to study the acceptance of chronic conditions in relation to perspectives of those living with a chronic condition with focus on adaptation to and acceptance of change in one's life.[21]

Experiential avoidance is similar to the concept of avoidance coping, and can be seen as the opposite reaction to acceptance, that is, the person attempts to ignore and minimize the problems caused by hearing impairment.[22] However, some researchers argue that coping and

experiential avoidance are unique but overlapping constructs.[23] For example, in a recent study on anxiety disorders, although acceptance (i.e., experiential avoidance) loaded on the same factors as emotional-focused and avoidant coping, acceptance did explain some additional variance when predicting psychological distress and well-being.[23] Both acceptance and experiential avoidance in relation to hearing impairment can be interpreted in the light of stigma theory,[24] which has previously been applied in research on hearing impairment.[25 26]

The term 'acceptance' in relation to hearing disability has not been well defined and often it is used and/or referred in relation to help-seeking and intervention adoption (e.g., hearing aids). In effect, differences exist in terms of psychological and audiological ways of defining the term 'acceptance' in relation to hearing disability. There are however various scales to study the acceptance of other disabilities and chronic conditions. [20 21 27-30] There are few studies in audiology that focuses on coping, although they generally measure coping indirectly using questions related to communication problems.[22] For example, the Communication Strategies Subscale (CSS) in the questionnaire Communication Profile for the Hearing Impaired (CPHI).[31] The CPHI-CSS focuses on maladaptive behaviours, verbal strategies and non-verbal strategies that give insight to poor adjustment to hearing impairment and poor social support.[32] However, to our knowledge there is no published validated scale to study the acceptance of hearing disability.

The current study was aimed at developing a self-report measure of hearing disability acceptance and to study its construct and concurrent validity. Our focus on acceptance in this study was on more on psychological terms (i.e., experiential avoidance which is the opposite of acceptance).

Method

Study Design and Participants

The study used cross-sectional data obtained during a clinical trial (i.e., pre-intervention data) of a pre-fitting counseling program.[33 34] Ethical approval was received from Research Ethics Committee, College of Human and Health Sciences, Swansea University. A study advertisement was made in the United Kingdom through various sources including national newspapers, hearing loss charity websites (i.e., Action on Hearing ~~Loss~~ and Hearing Link), and local GP practice notice boards requesting those who are noticing hearing difficulties but not using hearing aids and who had access to internet to participate in this study. Interested participants were encouraged to access the study website using the URL supplied. A total of 90 participants completed the informed consent form, provided demographic information and also completed few questionnaires via internet. The questionnaires used were: Hearing Disability Acceptance Questionnaire (HDAQ), Hearing Handicap Questionnaire (HHQ), Hospital Anxiety and Depression Scale (HADS), University of Rhode Island Change Assessment (URICA) Scale.

Development of the Hearing Disability Acceptance Questionnaire (HDAQ)

The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ) which was developed in Sweden for studying tinnitus acceptance.[30] The TAQ was influenced by the Acceptance and Action Questionnaire (AAQ) – 32[35] and the Chronic Pain Acceptance Questionnaire - Revised (CAQ-R)[28] and adding few additional questions. The 12-item TAQ has two factors which were named '*activity engagement*' and '*tinnitus suppression,*' and had good internal consistency with Chronbach's alpha α=0.89.[30] Resembling TAQ, HDAQ is a measure of experiential avoidance/acceptance. All the 12-items were taken from the TAQ by replacing the word 'tinnitus' with 'hearing problem'. However, the 12-items were further

reduced to 7-items (see the results section). Each item is rated on a 7-point Likert scale (1 = never true, 7 = always true). Total scores range from 7 to 49 with higher scores indicative of more acceptance of hearing disability (see Appendix 1).

Other Questionnaires

The HHQ is an instrument which provides a measure of personal and social effects - emotional distress and discomfort, social withdrawal, and general restriction of participation.[36] HHQ has 12 questions scored on a 5-point Likert scale (1 = never, 5 = almost always). Total scores range from 12 to 60 with higher scores indicative of greater disability. HHQ has a good Cronbach's alpha of.95 for the emotional and.93 for the social scale.

The HADS was used for screening for symptoms of anxiety and depression. The HADS consists of 14 items divided into two subscales (anxiety and depression).[37] Each item is scored from 0 to 3 (0 = not at all, 3 = most of the time) with a total score of 0 to 42 with higher scores indicative of more self-reported anxiety and depressive symptoms. In general, HADS has good reliability and acceptable sensitivity and specificity,[38] which includes internet administration.[39]

URICA is a measure of stages of change consisting of four sub-scales: pre-contemplation, contemplation, action and maintenance.[40 41] The original URICA scale consists of 32-items, however, in this study we use a modified version ('the problem' is replaced by 'the hearing problem') consisting of 24-item scale.[42] Each item is rated on a 5-point Likert scale (1 = strong disagreement, 5 = strong agreement) and each sub-scale measures specific aspects. Because most of the study participants were in early stages of help seeking and had not used intervention for their hearing disability, the eight URICA items relevant to the maintenance

were excluded, as they were considered irrelevant. Total scores in each subscale can range from 8 to 40. The sums of subscales of contemplation and action stages were added and then by subtracting the precontemplation stage scores (contemplation + action – pre-contemplation) a readiness to change composite can be obtained. This scale has been used in a recent study which investigated the usage of the URICA scale in adults with acquired hearing impairments seeking help for the first time, and showed good construct, concurrent and predictive validity of the scale.[42]

Data Analysis

Statistical analysis was performed using the software IBM - SPSS Version 19 for Windows. In the first stage descriptive statistics were used to examine demographic factors and the assumption of normality was tested where appropriate. Principal components analysis (PCA) was performed to reduce correlated variables to a smaller set of important composite variables and to study the factor structure,[43] and Cronbach's alpha was calculated to study the internal consistency of HDAQ.[44] Pearson's correlations were performed to study the association between factors: hearing disability acceptance, self-reported hearing disability, self-reported anxiety and depression and readiness to change.

Results

Table 1 shows the sample characteristics. Average age of participants and average duration of hearing disability were 63.41 and 11.67 years respectively. There was equal spread of males and females in the study sample. Also, nearly two-third of participants' had consulted hearing healthcare professionals previously at least once.

[Insert Table 1 near here]

HDAQ factor structure

PCA with Varimax rotation was performed to study the factor structure with limit for eigenvalues set at 1.0 and a limit for factor loadings at .40.[43] The scores for items with reverse scoring were reversed before analysis. The initial number of factors of interest was determined using Kaiser's rule of eigenvalues of >.[45] Subsequently, a scree plot was examined to decide on the number of factors to extract.[46]

In the first instance, the PCA resulted in 3 factor model for the 12-items. However, cross loadings were noted for a few items (i.e. item for which two or more factors loading at .40 eigenvalues or above). PCA was also performed using Direct Oblimin rotation to check if these cross loadings were because of the high correlation between items which also resulted in cross loading of items. The sampling adequacy was assessed with Kaiser-Meyer-Olkin (KMO) statistics, with a value of 0.86. The three factors explained 72.90 % of variance in the 12-items HDAQ. Factor 1 accounted for 49.65% of the variance (with eigenvalue of 3.40), factor 2 for 13.95% of the variance (with eigenvalue of 3.32) and factor 3 for 9.30% of the variance (with eigenvalue of 2.01). Cronbach's alpha was 0.54 for factor 1, 0.50 for factor 2, 0.72 for factor 3 and 0.79 for the overall 12-items. Internal consistency for overall scale was good even though it was not very high for factors 1 and 2.

In the next stage, items which resulted in cross loadings were removed from analysis until no cross loadings were found which resulted in removal of 5-items in the original 12-item scale (removed items are in Appendix 2). Item reduction is one of the key goals of PCA (i.e., reducing the set of variables to smaller number while still accounting for most of the variance). Also, removing the items with complex psychometric properties (i.e., cross

loading) is one of the ways to improve the construct validity of self-report measures.[47] Subsequently, the 7-item HDAQ resulted in a two-factor model with no cross loading and no outliers (See table 2). The sampling adequacy was assessed with KMO statistics, with a value of 0.82. The two factors explained 75.69 % of variance in the HDAQ. The factor 1 accounted for 42.94% of the variance (with an eigenvalue of 3.00) and the factor 2 for 32.75% (with an eigenvalue of 2.29). The factors were named: (1) *activity engagement* – defined as the pursuit of life activities regardless of hearing disability; and (2) *avoidance and suppression* – defined as the attempts to avoid difficult listening situations and attempts to control and suppress thoughts and feeling related to hearing disability. For the factor 'avoidance and suppression' a low score indicates more avoidance and suppression, as the items are reversed in the scoring. Cronbach's alpha was 0.90 for factor 1, 0.82 for factor 2 and 0.86 for the overall HDAQ, showing good internal consistency.[44] The correlation between two factors was $r(90) = .51$, $p < 0.001$, suggesting that while the two subscales were distinguishable they were also related.

[Insert Table 2 near here]

Further, we performed PCA in the split sample to study the generalizability (i.e., split sample validation). The sample of 90 was randomly divided into two groups of 45 each. PCA for the first group (sample of 45) with 12-items resulted in three factor model with cross loadings. However, the PCA with 7-items after removal of items with cross loadings resulted in two factor structure which explained 76.41% of variance with no cross loadings. PCA was also performed on the second group (sample of 45) which also resulted in two factor structure which explained 75.93% of variance with no cross loadings. The results from both split samples and the total sample were in close agreement (see Table 3), strongly supporting the two factor model.

[Insert Table 3 near here]

Correlation among HDAQ and Other Scales

Table 4 shows the Pearson's correlation coefficients between HDAQ and other scales. The two subscales of HDAQ were moderately associated with each other and strongly associated with the full scale. Results suggest a moderately strong negative but statistically significant correlation between acceptance and hearing disability, moderate negative but statistically significant correlation between acceptance and anxiety and depression, weak negative but statistically significant correlation between acceptance and readiness to change. This may suggest that for those with higher hearing disability acceptance had lower self-reported hearing disability, lower self-reported anxiety and depression, and lower readiness to change. Also, a weak positive but statistically significant correlation was observed between self-reported hearing disability and self-reported anxiety and depression, indicating that those with higher self-reported hearing disability are likely to have higher self-reported anxiety and depression. Although there are some differences, the relationship between individual subscales and other factors (i.e., hearing disability, anxiety and depression and readiness to change) did not differ much when compared to full HDAQ scale.

[Insert Table 4 near here]

Discussion

Research in recent years has pointed to the utility of psychological acceptance in reliving the impact of chronic health conditions.[29 48-50] This paper offers the first attempt, as known by the authors, of extending this concept to hearing disabilities. After the necessary psychometrical modifications were done a two-factor structure emerged, in line with the TAQ[30] and some of the similar self-report measures related to acceptance.[51] Internal consistency is equal to that

of the commonest general acceptance scale, the AAQ-I.[52] However, the updated version of this scale has rejected a two-factor structure in measuring acceptance and instead suggested a uni-dimensional measure for the AAQ-II.[53] Our study results did not show single factor structure for HDAQ. The first factor, *activity engagement*, is assumed to entail in what way the subject maintains a desired level of activates even though facing obstacles. For example, a low level of activity engagement can be described by a person who stops going with his or hers friends to visit restaurants as they might fear not being able to follow the conversation in that context. The other factor, avoidance, can be described as the unwillingness to experience events because of the related emotional harm that the event causes. This concept can be thought of as the opposite of acceptance.[54]

The items in the current acceptance scale (i.e., HDAQ) were taken from the scale used for studying acceptance in people with tinnitus, which originally come from general acceptance questionnaires (i.e., AAQ & CAQ-R). Although there are most likely differences in how people may cope with 'tinnitus' and 'hearing disability', there are similarities on how people cope with chronic conditions in general and acceptance is proposed to be key component of adjustment to a disabling condition.[20] For this reason, studying the construct 'acceptance' in various chronic conditions including 'hearing disability' with a general framework as defined and used in psychology would be valuable to both researchers and clinicians.

The study results indicate that lower acceptance was associated with increased emotional distress. This relationship between the HDAQ and HADS is interesting when compared to similar studies that have pointed to the pivotal role of acceptance in relationship to suffering. For instance, McCracken[55] found that acceptance was a greater predictor of psychosocial disability in patients with chronic pain rather than the degree of experienced pain. Numerous

other studies have also found that greater acceptance is related to psychological well-being (for a summary see review paper by Ruiz[56]). In the present study, greater acceptance was correlated with a more modest rating of one's hearing problems and could thus possibly serve as an analogue to the above-mentioned finding regarding pain. Also, a recent systematic review showed that self-reported hearing disability as one of the robust predictor of hearing help-seeking, hearing aid uptake, hearing aid use and satisfaction with hearing rehabilitation,[17] which suggest self-reported hearing disability as an important factor in the process of accepting hearing loss and seeking appropriate intervention. Furthermore, problems with depression and anxiety were elevated in those who scored higher on the HHQ, which illustrates the far-reaching consequences a hearing loss might have. The relationship between HDAQ and readiness to change was both negative and significant, implying that those who were more accepting of their current status also were less prone to seek a change of their current situation. The association between HDAQ subscales and other factors did not differ much. This may be due to the fact that both subscales found to have strong association with the full scale and moderate association among each other.

It is interesting to note that, even though participants were not using hearing aids, two-thirds of the study sample had consulted hearing healthcare professional at least on one occasion. The reasons for their consultation are likely to be: (1) having accepted their condition (i.e., hearing disability); (2) in a dilemma of whether or not they have the condition and wanted to confirm this with clinicians; or (3) persuasion from their communication partners. Although the reasons for not using intervention (e.g., hearing aids) are not clear, it may be related to their perceived seriousness of their hearing problems. Previous research suggests that there is no linear relationship between hearing disability and its effects on activities and participation,[8 57] which may help explain why not all people with hearing disability, may

uptake interventions. For this reason, it is important to study the hearing disability acceptance more in line with psychological terms. Moreover, it is important to note that becoming suspicious or becoming aware of the hearing disability does not mean that they perceive their difficulties significant enough to affect their communication and quality of life. This is something clinicians must be aware of when they are planning and making recommendations about interventions, especially for patients who are coming to the hearing clinic for the first time. Also, much work is needed to understand how the 'hearing disability acceptance' may either facilitate or hinder the journey through this condition.

Limitations of the Study

While the current study focused on an important area where there is dearth of literature, it has some limitations. Firstly, acceptance in relation to hearing disability has not been well defined and this scale may only focus on some components of acceptance (i.e., more in line with psychological acceptance). This may to some degree explain why those with greater acceptance show less readiness to change. However, this is indeed an important component to understand as it may explain why many people who are aware of their hearing disability still refrain from seeking professional help and receive appropriate interventions. Secondly, due to the online recruitment method the study sample may not be representative of the general population and caution must be taken with generalising the results.[58 59] Thirdly, the online format of questionnaire administration may have some differences to pen-and-paper format even though web-based questionnaires have been found to be reliable and valid.[60 61] Fourthly, the study results are only related to the sample population who are noticing hearing difficulties rather than those who are typically seen in clinical situations, even though there may be some overlap as nearly two-thirds of the current study sample had previously consulted hearing healthcare professionals. Lastly, although there are measures that study

coping indirectly, there is no well-established acceptance scale to study the concurrent validity of the HDAQ with the same construct (i.e., acceptance). It would have also been interesting and useful to study the association between 'acceptance' and other constructs such as 'cognitive functions' and 'psychological well-being'. Further, the predictive validity of the scale needs to be further explored.

Conclusions

In summary, the study results indicate that further exploration of the possible role of acceptance in the impact and willingness to adjust to hearing problems could be a fruitful endeavour, particularly in understanding what role the acceptance might play in the patient journey of PHI. However, much work remains to be done. Primarily, a coherent theoretical framework is needed that accounts for what, if any, role-acceptance may play in the adjustment to hearing problems. One cannot simply take for granted that successful management of other conditions that entails the introduction of painful experiences (e.g., tinnitus, chronic pain, anxiety) is relevant to hearing disability that instead is characterized by the loss of (auditory) experiences. Also, the scientific legwork of examining the longitudinal stability of the concept, it's relevancy to objective measures of hearing disability, the utility of the current structure of the HDAQ as well as if can be successful in alleviating the suffering that is usually connected to hearing disability remains to be further explored.

Acknowledgements

We would like to thank Alexander Alasjö for his help in setting up the online questionnaires and Ariane Laplante-Lévesque for providing the revised version of URICA scale to be used

in this study. This study was a part of doctoral studies of main author and parts of the manuscripts have been presented in the doctoral thesis.

Contributors

VM - Contributed to most parts of the work including data collection, analysis and writing; PM - Contributed to writing up; JR - Contributed to study design and writing up; GA - Contributed to study design and writing up; TL - Contributed to study design and writing up.

Funding

This study was partly funded by the grants from Swedish Council for Working Life and Social Research 2009-0055 and Swedish Research Council 2007-8654.

Ethical Approval

Ethical approval was received from Research Ethics Committee, College of Human and Health Sciences, Swansea University.

Data Sharing

No additional data are available.

Conflict of interests

None.

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Tables

Table 1: Demographic characteristics of participants

Age (M ± SD in years)	63.41 ± 10.49
Gender (% male)	50
Duration of hearing difficulties (M ± SD in years)	11.67 ± 10.83
Consulted healthcare professional about hearing difficulties (%)	
▪ Yes	65.6
▪ No	34.4
Education (%)	
▪ Compulsory education	13.3
▪ Secondary education	48.9
▪ Tertiary education	37.8
Self-reported hearing disability acceptance (HDAQ) (M ± SD)	36.88 ± 7.85
▪ Activity engagement	22.72 ± 4.36
▪ Avoidance and suppression	14.16 ± 4.65
Self-reported hearing disability (HHQ) (M ± SD)	34.96 ± 9.95
▪ Emotional	20.61 ± 5.75
▪ Social	14.32 ± 4.85
Self-reported anxiety and depression (HADS) (M ± SD)	14.77 ± 7.50
▪ Anxiety	7.04 ± 4.43
▪ Depression	7.70 ± 3.81
Stages-of-change (URICA)	
Readiness to Change composite (Scores ± SD)	39.41 ± 8.63

Table 2: HDAQ principle components analysis (n=90)

Scale: 7-item HDAQ	Factor 1: Activity engagement	Factor 2: Avoidance and suppression
Item 1	0.854	
Item 2	0.891	
Item 3	0.857	
Item 4	0.763	
Item 5		0.885
Item 6		0.862
Item 7		0.734
Cronbach's alpha	0.90	0.82
Percentage of variance	42.94	32.75
Eigenvalue	3.0	2.29

Table 3: Split sample validation for 7-item HDAQ

	Full sample (n=90)	Split sample 1 (n=45)	Split sample 2 (n=45)
Percentage variance explained			
▪ Factor 1	42.94	43.48	44.13
▪ Factor 2	32.75	32.93	31.80
▪ Combined	75.69	76.41	75.93
Eigenvalue			
▪ Factor 1	3.0	3.0	3.0
▪ Factor 2	2.29	2.3	2.2
Cronbach's alpha			
▪ Factor 1	0.90	0.83	0.82
▪ Factor 2	0.82	0.89	0.90
▪ Combined	0.86	0.88	0.86

Table 4: Correlation among different scales (*: significant correlation with $\alpha < 0.01$)

	HDAQ	HDAQ - 1	HDAQ - 2	HHQ	HADS	URICA-R
Self-reported hearing disability acceptance (HDAQ)	1.00					
HDAQ Factor 1: Activity engagement	0.86*	1.00				
HDAQ Factor 2: Avoidance and suppression	0.88*	0.51*	1.00			
Self-reported hearing disability (HHQ)	-0.70*	-0.50*	-0.71*	1.00		
Self-reported anxiety and depression (HADS)	-0.58*	-0.62*	-0.39*	0.36*	1.00	
Readiness to change (URICA-R)	-0.27*	-0.19*	-0.29*	0.20	0.18	1.00

Appendices

Appendix 1: Hearing Disability Acceptance Questionnaire (HDAQ)

Direction

Below you will find a number of statements. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices:

1	2	3	4	5	6	7
Never true	Very rarely true	Seldom true	Sometimes true	Often true	Almost always true	Always true

For instance, if you believe a statement is "Often true", you would circle number 5 on the row following the statement.

Items

1. I am leading a full life, even though I have hearing problem...
2. My life is going well, even though I have hearing problem ….
3. Despite hearing problem, I can draw up and stick to a certain course in my life….
4. When my hearing problem increases I can still take care of my responsibilities…
5. My hearing problem leads me to avoid certain situations…
6. My hearing problem changes me as a person…
7. I spend a lot of time thinking about how things would be for me, without a hearing problem…

Scoring

Reverse score items: 5, 6 & 7.

Appendix 2: Removed items

- My hearing problem has led me to decrease my engagement in former activities…
- It is necessary for me to control my negative thoughts and feelings concerning my hearing problem….
- I will be in better control of my life if I can control my negative thoughts about my hearing problem….
- I have to struggle to get things done when I have a hearing problem …
- I strive to suppress aversive thoughts and feelings related to my hearing problem…

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2 & 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 – 6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7 – 9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7 - 9
Bias	9	Describe any efforts to address potential sources of bias	7, 15 & 16
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	9
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	9
		(*e*) Describe any sensitivity analyses	9
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9 & 24
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	9 - 12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9 - 12
		(*b*) Report category boundaries when continuous variables were categorized	9 - 12
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9 - 12
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9 - 12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12 - 15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15 & 16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15 & 16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15 & 16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ open

The acceptance of hearing disability among adults experiencing hearing difficulties

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004066.R1
Article Type:	Research
Date Submitted by the Author:	12-Nov-2013
Complete List of Authors:	C. Manchaiah, Vinaya K.; Anglia Ruskin University, Department of Vision and Hearing Sciences Molander, Peter; Linköping University, Department of Behavioural Sciences and Learning Ronnberg, Jerker; Linköping University, Linnaeus Centre HEAD, Swedish Institute for Disability Research, Department of Behavioral Science and Learning Andersson, Gerhard; Linkoping University, Lunner, Thomas; Linköping University, Department of Behavioural Sciences and Learning, Linnaeus Centre HEAD, Swedish Institute for Disability Research
Primary Subject Heading:	Ear, nose and throat/otolaryngology
Secondary Subject Heading:	Ear, nose and throat/otolaryngology
Keywords:	Adult otolaryngology < OTOLARYNGOLOGY, Audiology < OTOLARYNGOLOGY, PUBLIC HEALTH

The acceptance of hearing disability among adults experiencing hearing difficulties

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Abstract

Objective: This study developed the Hearing Disability Acceptance Questionnaire (HDAQ) and tested its construct and concurrent validities. ***Design:*** Cross-sectional. ***Participants:*** A total of 90 participants who were experiencing hearing difficulties were recruited in the UK. ***Outcome Measures:*** The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ). Participants completed self-report measures regarding hearing disability acceptance, hearing disability, symptoms of anxiety and depression, and a measure of stages of change. ***Results:*** The HDAQ has a two-factor structure that explains 75.69% of its variance. The factors identified were *activity engagement* and *avoidance and suppression*. The scale showed sufficient internal consistency (Cronbach's α=0.86). The HDAQ also had acceptable concurrent validity with regard to self-reported hearing disability, self-reported anxiety and depression, and readiness to change measures. ***Conclusions:*** Acceptance is likely an important aspect of coping with chronic health conditions. To our knowledge, no previously published and validated scale measures the acceptance of hearing disability; therefore, the HDAQ might be useful in future research. However, the role of acceptance in adjusting to hearing disability must be further investigated.

Keywords

Hearing disability, hearing loss, acceptance, self-reported measure

Summary

Article Focus

- To develop the Hearing Disability Acceptance Questionnaire (HDAQ) and study its construct and concurrent validities.

Key Message

- The results suggest that the HDAQ has a two-factor structure that explains 75.69% of its variance. The scale showed sufficient internal consistency (Cronbach's α=0.86).
- The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change.
- The role of acceptance in adjusting to hearing disability must be further investigated.

Strengths and Weaknesses

- Due to its online recruitment, the sample might not represent the general population. In addition, the online questionnaire might differ from a pen-and-paper format.
- Although there are measures that study coping indirectly, no well-established acceptance scale examines the concurrent validity of the HDAQ using the same construct (i.e., acceptance).

Introduction

An individual with hearing loss might pass through several stages when help-seeking.[1] Edgett[2] emphasised that the decision-making process to seek help involves four major stages: (1) understanding hearing loss; (2) personal experience; (3) interactions with society; and (4) taking action. In another study, Engelund[3] suggested that patients proceed through four major stages while making a decision to seek help: (1) attracting attention; (2) becoming suspicious; (3) sensing tribulation; and (4) jeopardising the fundamental self. In our previous studies of the "patient's journey" regarding people with hearing impairment (PHI), we took this idea further and studied this journey from the initial onset of problems through successful rehabilitation, thereby developing a patient journey model.[4-5] This model suggests that PHI experience seven major stages before, during, and after their audiological rehabilitation: (1) pre-awareness; (2) awareness; (3) movement; (4) diagnostics; (5) rehabilitation; (6) self-evaluation; and (7) resolution. On average, PHI can take 10 years or more to seek help after first noticing hearing difficulties; hence, this process might take many years.[6] Although additional research is necessary to better understand this process,[7] these previous studies nevertheless provide insight regarding the stages of adjusting to hearing loss, which might be an indirect (or secondary) indicator of the process of acceptance. In addition, it is clear from the aforementioned studies that becoming aware of and accepting a hearing disability play important roles in further progressing in their journey to manage their condition.

A few studies in the audiology literature have focused on the self-assessment of hearing loss,[8] immediate reactions to the diagnosis of hearing loss,[9-10] actions taken after failing screening tests,[11] attitudes toward hearing loss and the use of hearing aids,[12-13] and the ways in which PHI cope with their condition.[14-16] These studies provide further insights into the initial onset of the condition and how PHI manage their condition. A recent literature review suggested

that the acceptance of hearing loss prior to hearing aid fitting positively influences both hearing aid acquisition and subsequent hearing aid use.[17] However, numerous PHI who are aware that they have a problem but continue not to seeking help, use intervention strategies, or both remain. The literature can be confusing because the term "acceptance" is used synonymously with treatment/management option adherence, rather than studying this term using validated scales that capture different dimensions of this construct.

In psychological terms, acceptance is *a process of actively taking in thoughts, memories, feelings, and bodily sensations in a specific situation without having to follow or change them*.[18] Acceptance can have various dimensions including self- and social acceptance that require both emotional and behavioural adaptations. For instance, the different views of what acceptance actually involves is evident from examining studies of education and academic success, where the term *peer acceptance* refers to a pupil who is judged to be a desirable interaction partner.[19] Disability studies have proposed that acceptance is the key component to adjusting to a disabling condition.[20] Although the acceptance of chronic conditions has often been studied from the perspectives of grief and loss, studying the acceptance of chronic conditions with regard to the perspectives of those living with it, with a focus on adaptation to and accepting change in one's life, is also important.[21]

Experiential avoidance is similar to the concept of avoidance coping and can be defined as the opposite reaction to acceptance; that is, a person attempts to ignore and minimise the problems caused by hearing impairment.[22] However, some researchers have argued that coping and experiential avoidance are unique but overlapping constructs.[23] For example, although acceptance (i.e., experiential avoidance) loaded on to the same factors as emotion-focused and avoidant coping in a recent study of anxiety disorders, acceptance explained

additional variance when predicting psychological distress and well-being.[23] With regard to hearing impairment, both acceptance and experiential avoidance can be interpreted in light of stigma theory,[24] which has previously been applied in hearing impairment research.[25-26]

Acceptance, in relation to hearing disability, has not been well defined; often this term is used to refer to help-seeking behaviour and intervention (e.g., hearing aids) adoption. In effect, differences exist in terms of the psychological and audiological ways of defining acceptance with regard to hearing disability. However, various scales examine the acceptance of other disabilities and chronic conditions.[20-21, 27-30] Past audiology studies have focused on coping; however, coping is generally measured indirectly via questions related to communication problems[22] [e.g., the Communication Strategies Subscale (CSS) in the Communication Profile for the Hearing Impaired (CPHI) questionnaire].[31] The CPHI-CSS focuses on maladaptive behaviours as well as verbal strategies and non-verbal strategies, and it provides insight concerning poor adjustment to hearing impairment and poor social support.[32] To our knowledge, however, no published and validated scale examines the acceptance of hearing disability.

The current study developed a self-report measure of hearing disability acceptance and investigated its construct and concurrent validities. We focused on the psychological aspects of acceptance in this study (i.e., experiential avoidance, which is the opposite of acceptance).

Method

Study Design and Participants

The current study used cross-sectional data obtained during a clinical trial (i.e., pre-intervention data) of a pre-fitting counselling program.[33-34] Ethical approval was received

from the Research Ethics Committee, College of Human and Health Sciences, Swansea University. A study advertisement was offered in the UK through various sources including national newspapers, hearing loss charity websites (i.e., Action on Hearing ~~Loss~~ and Hearing Link), and local GP practice notice boards, inviting those who were experiencing hearing difficulties but not using hearing aids to those who had access to the Internet to participate in this study. Interested participants were encouraged to access the study website using the URL supplied. A total of 90 participants completed the informed consent form, provided demographic information, and completed four online questionnaires. These questionnaires included the Hearing Disability Acceptance Questionnaire (HDAQ), the Hearing Handicap Questionnaire (HHQ), the Hospital Anxiety and Depression Scale (HADS), and the University of Rhode Island Change Assessment (URICA) Scale.

Development of the HDAQ

The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ), which was developed in Sweden to study tinnitus acceptance.[30] The TAQ was based on the Acceptance and Action Questionnaire (AAQ),[35] and the Chronic Pain Acceptance Questionnaire-Revised (CPAQ-R);[28] some additional questions were included. The 12-item TAQ has two factors (*activity engagement* and *tinnitus suppression*), and it has sufficient internal consistency (Cronbach's α=0.89).[30] Like the TAQ, the HDAQ is a measure of experiential avoidance/acceptance. Its 12 items were taken from the TAQ, and the word "tinnitus" was replaced with "hearing problem". However, the 12 items were further reduced to 7 items (see the results section). Each item was rated on a 7-point Likert scale (1=never true, 7=always true). Total scores ranged from 7 to 49; higher scores indicate greater acceptance of hearing disability (see Appendix 1).

Other Questionnaires

The HHQ measures personal and social effects (i.e., emotional distress and discomfort, social withdrawal, and general participation restrictions).[36] The 12 questions of the HHQ are scored on a 5-point Likert scale (1=never, 5=almost always). Total scores range from 12 to 60, and higher scores indicate greater disability. The HHQ has acceptable internal consistency, with Cronbach's α of 0.95 and 0.93 for the emotional and social scales, respectively.

The HADS was used to screen for symptoms of anxiety and depression. The HADS consists of 14 items, divided into two subscales: anxiety and depression.[37] Each item is scored from 0 to 3 (0=not at all, 3=most of the time) with a total score ranging from 0 to 42; higher scores indicate more self-reported anxiety and depressive symptoms. In general, the HADS has acceptable reliability (r=.84), internal consistency (α=.83), and sensitivity and specificity (0.80),[38] including Internet administration.[39]

The URICA measures of stages of change across four subscales: pre-contemplation, contemplation, action, and maintenance.[40-41] The original URICA scale consists of 32 items; however, the current study used a modified version (*the problem* was replaced with *the hearing problem*) consisting of a 24-item scale.[42] Each item was rated on a 5-point Likert scale (1=strong disagreement, 5=strong agreement), and each subscale measured specific aspects. Most study participants were in the early help-seeking stages and had not received interventions for their hearing disabilities; therefore, the eight URICA items regarding maintenance were excluded because they were considered irrelevant for the sample. The total scores of each subscale ranged from 8 to 40. The subscale scores concerning the contemplation and action stages were added, from which the pre-contemplation stage scores were subtracted to obtain a readiness-to-change composite score (i.e., contemplation + action

– pre-contemplation). A recent study used this modified scale to investigate the use of the URICA scale among adults with acquired hearing impairments seeking help for the first time. This scale showed acceptable construct, concurrent, and predictive validities.[42]

Data Analyses

All data analyses were performed using IBM SPSS Version 19 for Windows. Descriptive statistics were applied to examine demographic factors, and the assumption of normality (i.e., Shapiro-Wilk test values of 0.05) was tested before conducting a principal components analysis (PCA). A PCA was performed to reduce the correlated variables to a smaller set of important composite variables and examine the factor structure.[43] Cronbach's αs was calculated to assess the internal consistency of the HDAQ.[44] Pearson's correlations were performed to examine the association among the following factors: hearing disability acceptance, self-reported hearing disability, self-reported anxiety and depression, and readiness to change.

Results

The data were normally distributed. Table 1 displays the sample characteristics. The average age of participants and the average duration of hearing disability were 63.41 and 11.67 years, respectively. The number of males and females in the sample was equal. In addition, nearly two-thirds of participants had consulted healthcare professionals specialised in hearing (e.g., audiologists, hearing aid dispensers, or ENT specialists) at least once.

[Insert Table 1 near here]

HDAQ factor structure

A PCA with Varimax rotation was performed to examine the factor structure. Eigenvalues were set at 1.0, and the limit for factor loadings was set at .40.[43] The relevant items were reverse scored before analysis. The initial number of factors of interest was determined using Kaiser's rule of eigenvalues greater than 1.0.[45] Subsequently, a scree plot was examined to determine the number of factors to extract.[46]

In the first instance, the PCA resulted in a three-factor model for the 12 items. However, cross loadings were noted for some items (i.e., items that loaded at .40 or above on two or more factors). A PCA was also performed using Direct Oblimin rotation to determine whether these cross loadings were due to the high correlations among items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.86, and Bartlett's Test of Sphericity was significant [$\chi^2(66)=370.89$, $p<.001$]. The three factors explained 72.90% of the variance in the 12-item HDAQ. Factor 1 accounted for 49.65% of the variance (with an eigenvalue of 3.40); Factor 2 accounted for 13.95% of the variance (with an eigenvalue of 3.32); and Factor 3 accounted for 9.30% of the variance (with an eigenvalue of 2.01). The Cronbach's αs were 0.54, 0.50, 0.72, and 0.79 for Factors 1, 2, 3, and the overall 12 items, respectively. The internal consistency of the overall scale was acceptable, although it was not high for Factors 1 and 2.

In the next stage, all items that resulted in cross loadings were removed from the analysis; thus, five items were removed from the original 12-item scale (see Appendix 2 for the removed items). Item reduction (i.e., minimising the set of variables while still accounting for most of the variance) is one of the key goals of PCA. Moreover, removing the items with complex psychometric properties (i.e., cross loadings) can improve the construct validity of self-report measures.[47] Subsequently, the seven-item HDAQ resulted in a two-factor model

with no cross loading or outliers (see Table 2). The KMO measure of sampling adequacy was 0.82, and Bartlett's test of sphericity was significant ($\chi^2[21]=363.93$, $p<.001$). These factors explained 75.69% of the variance in the HDAQ. Factor 1 accounted for 42.94% of the variance (with an eigenvalue of 3.00), and Factor 2 accounted for 32.75% (with an eigenvalue of 2.29). The factors were identified as: (1) *activity engagement* (i.e., the pursuit of life activities regardless of hearing disability) and (2) *avoidance and suppression* (i.e., attempts to avoid difficult listening situations as well as those to control and suppress the thoughts and feeling related to hearing disability). A low *avoidance and suppression* score indicates more avoidance and suppression because the items are reverse scored. Cronbach's αs were 0.90, 0.82, and 0.86 for Factors 1, 2, and the overall HDAQ, showing acceptable internal consistency.[44] The correlation between the factors was $r(90)=0.51$, $p<0.001$, which suggests that the two subscales were distinguishable but related.

[Insert Table 2 near here]

Furthermore, we performed a PCA on the split sample to test for generalisability (i.e., split-sample validation). The sample of 90 was randomly divided into two groups of 45. The PCA for the first split sample of 45 on 12 items resulted in a three-factor model with cross loadings. However, the PCA with 7 items (after the removal of the items with cross loadings) resulted in a two-factor structure that explained 76.41% of the variance without cross loadings. A PCA was also performed on the second split sample of 45 that also resulted in a two-factor structure that explained 75.93% of the variance without cross loadings. The results from both the split samples and the total sample were in close agreement (see Table 3), strongly supporting the two-factor model.

[Insert Table 3 near here]

Correlations Between the HDAQ and Other Scales

Table 4 shows the Pearson's correlation coefficients between the HDAQ and other scales. The two HDAQ subscales were moderately associated with each other and strongly associated with the full scale. The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change. These results suggest that those people higher hearing disability acceptance had less self-reported hearing disability, fewer self-reported symptoms of anxiety and depression, and lower readiness to change. In addition, a weak positive correlation was found between self-reported hearing disability and self-reported symptoms of anxiety and depression, which indicates that people with higher self-reported hearing disability are likely to have higher self-reported symptoms of anxiety and depression. Although differences were observed, the relationships between the individual subscales and other factors (i.e., hearing disability, symptoms of anxiety and depression, and readiness to change) did not differ much compared with the full HDAQ scale.

[Insert Table 4 near here]

Discussion

Recent research has indicated the utility of psychological acceptance with regard to reducing the impact of chronic health conditions.[29, 48-50] The current paper is the first known attempt to extend this concept to hearing disabilities. After the necessary psychometrical modifications, a two-factor structure emerged for the HDAQ that was in line with the TAQ[30] and similar self-report measures related to acceptance.[51] Its internal consistency was equal to that of the most commonly used general acceptance scale, the AAQ-I.[52] However, research on an

updated version of this scale rejected a two-factor structure with regard to measuring acceptance; rather, it suggested a unidimensional structure for the AAQ-II.[53] Our study did not reveal a single-factor structure for the HDAQ. The first factor, *activity engagement*, was assumed to reflect whether participants maintain a desired level of activity despite facing obstacles. For example, a low level of activity engagement might be observed in a person who stops dining with his or her friends at restaurants because they fear they might not be able to follow the conversation. The other factor, *avoidance and suppression*, is the unwillingness to experience events due to their related emotional distress. This concept is the opposite of acceptance.[54]

The HDAQ items were taken from the scale used to study acceptance in people with tinnitus, which, in turn, was based on the AAQ and CPAQ-R. Although differences most likely exist with regard to how people cope with tinnitus and hearing disability, similarities are found in terms of how people cope with general chronic conditions. Acceptance is likely a key component of adjusting to a disabling condition.[20] Thus, the study of acceptance in various chronic conditions including hearing disability using the general framework applied in 'contextual psychology' is valuable to both researchers and clinicians.

The study results indicate that less acceptance was associated with increased emotional distress. The relationship between the HDAQ and the HADS is interesting when compared with similar studies that have indicated the pivotal role of acceptance with regard to suffering. For instance, McCracken[55] found that acceptance was a stronger predictor of psychosocial disability among patients with chronic pain than the degree of pain they experienced. Numerous other studies have also found that greater acceptance is related to psychological well-being (for a summary, see the review by Ruiz[56]). In the present study,

greater acceptance was correlated with a more modest rating of hearing problems; therefore, it might be analogous to the aforementioned findings regarding pain. Moreover, a recent systematic review showed that self-reported hearing disability is a robust predictor of hearing help-seeking, hearing aid acquisition, hearing aid use, and satisfaction with hearing rehabilitation,[17] which suggests that self-reported hearing disability is an important factor in the processes of accepting hearing loss and seeking appropriate interventions. Furthermore, symptoms of depression and anxiety were elevated among those who scored higher on the HHQ, which illustrates the far-reaching consequences that hearing loss might have. The relationship between the HDAQ and readiness to change was negative and significant, which implies that those who were more accepting of their current status were less prone to seek a change in their current situation. The association between the HDAQ subscales and other factors did not differ much. This finding might be because both subscales were found to have strong associations with the full scale and moderate associations with each other.

Interestingly, although participants did not use hearing aids, two-thirds of the sample had consulted healthcare specialists on at least one occasion. The reasons for these consultations are likely to include: (1) acceptance of their condition (i.e., hearing disability); (2) a dilemma regarding whether they had the condition and a desire to confirm this supposition with clinicians; or (3) urging from their social partners. Although the reasons for not accepting intervention (e.g., hearing aids) are not clear, they might be related to the perceived seriousness of their hearing problems. Previous research suggests that a linear relationship does not exist between hearing disability and its effects on activities and participation,[8 57] which might help explain why not all people with hearing disabilities seek interventions. Thus, studying hearing disability acceptance in psychological terms is important. Importantly, becoming suspicious or aware of a hearing disability does not mean that PHI

perceive their difficulties as significant enough to affect their communication and quality of life. This gap between awareness and action is something that clinicians must be aware of when they plan and recommend interventions, especially for patients coming to the hearing clinic for the first time. In addition, much work is needed to understand how hearing disability acceptance either facilitates or hinders the journey through this condition.

Study Limitations

Although the current study focused on an important area of limited research, it nevertheless has certain limitations. Acceptance with regard to hearing disability is not well defined, and this scale might only focus on certain components of acceptance (i.e., psychological acceptance). This limitation might partially explain why people with greater acceptance show less readiness to change. However, this component is important to understand because it might explain why many people who are aware of their hearing disability continue to refrain from seeking professional help and appropriate interventions. Due to the online recruitment method, the sample might not represent the general population, and caution must be used in generalising the results.[58-59] Moreover, the relatively small sample size was surprising, given that the advertisement was published in a national newspaper. The smaller sample size might also be a limitation of this study. Validating this scale with a larger population is necessary, although the split-sample validation strongly supported the two-factor model. The online format of the questionnaire might differ from a pen-and-paper format, although web-based questionnaires have been found to be reliable and valid.[60-61] The study results are only relevant with regard to participants who experience hearing difficulties rather than typical participants in clinical situations, although there might be some overlap because nearly two-thirds of the current sample had previously consulted hearing specialists. Although indirect coping measures exist, no well-established acceptance scale examines the concurrent validity

of the HDAQ using acceptance. Studying the associations between *acceptance* and other factors such as *cognitive functions*, *personality*, *quality of life*, and *psychological well-being* would have been interesting and useful; however, these factors were not included in the current study. Furthermore, the predictive validity of the scale must be explored.

Conclusions

In summary, our results suggest that additional exploration of the potential role that acceptance plays in the process of adjusting to hearing problems would be a fruitful endeavour, particularly with regard to understanding the role that acceptance plays in the journey of PHI. However, much work remains to be done. Specifically, a coherent theoretical framework is needed to account for what role, if any, acceptance plays with regard to adjusting to hearing problems. One cannot take for granted the fact that the successful management of other conditions, which all entails painful experiences (e.g., tinnitus, chronic pain, and anxiety), are relevant to hearing disability, which instead is characterised by the loss of (auditory) experiences. In addition, future research must examine the longitudinal stability of acceptance and its relevance to objective measures of hearing disability as well as the utility of the current structure of the HDAQ and whether it can successfully alleviate the suffering usually associated with hearing disability.

Acknowledgements

We thank Alexander Alasjö for his help with applying the online questionnaires and Ariane Laplante-Lévesque for providing us with the revised version of the URICA scale used in this study. This study was a part of the doctoral study of the first author, and portions of this manuscript were presented as a doctoral thesis.

Contributors

VM contributed to most of the work including data collection, analysis, and writing; PM contributed to the writing; JR contributed to study design and writing; GA contributed to study design and writing; and TL contributed to study design and writing.

Funding

Grants from the Swedish Council for Working Life and Social Research 2009-0055 as well as the Swedish Research Council 2007-8654 partially funded this research.

Ethical Approval

Ethical approval was received from the Research Ethics Committee, College of Human and Health Sciences, Swansea University.

Data Sharing

No additional data are available.

Conflict of interests

None.

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Tables

Table 1. Participants demographics

Age in years (M±SD)	63.41±10.49
Gender (% male)	50
Duration of hearing difficulties in years (M±SD)	11.67±10.83
Consulted a healthcare professional specialising in hearing regarding hearing difficulties (%)	
▪ Yes	65.6
▪ No	34.4
Education (%)	
▪ Compulsory education	13.3
▪ Secondary education	48.9
▪ Tertiary education	37.8
Self-reported hearing disability acceptance (HDAQ; M±SD)	36.88±7.85
▪ Activity engagement	22.72±4.36
▪ Avoidance and suppression	14.16±4.65
Self-reported hearing disability (HHQ; M±SD)	34.96±9.95
▪ Emotional	20.61±5.75
▪ Social	14.32±4.85
Self-reported anxiety and depression (HADS; M±SD)	14.77±7.50
▪ Anxiety	7.04±4.43
▪ Depression	7.70±3.81
Stages of change (URICA)	
Readiness-to-change composite (M±SD)	39.41±8.63

Table 2. HDAQ principle components analysis (n=90)

Scale: 7-item HDAQ	Factor 1: Activity engagement	Factor 2: Avoidance and suppression
1. I am leading a full life, even though I have a hearing problem	0.854	
2. My life is going well, even though I have a hearing problem	0.891	
3. Despite hearing problem, I can draw up and stick to a certain course in my life	0.857	
4. When my hearing problem increases, I can still take care of my responsibilities	0.763	
5. My hearing problem leads me to avoid certain situations		0.885
6. My hearing problem changes me as a person		0.862
7. I spend a lot of time thinking about how things would be for me without a hearing problem		0.734
Cronbach's α	0.90	0.82
Percentage of variance	42.94	32.75
Eigenvalue	3.0	2.29

Table 3. Split-sample validation for the seven-item HDAQ

	Full sample (n=90)	Split sample 1 (n=45)	Split sample 2 (n=45)
Percentage of variance explained			
▪ Factor 1: Activity engagement	42.94	43.48	44.13
▪ Factor 2: Avoidance and suppression	32.75	32.93	31.80
▪ Combined	75.69	76.41	75.93
Eigenvalue			
▪ Factor 1: Activity engagement	3.0	3.0	3.0
▪ Factor 2: Avoidance and suppression	2.29	2.3	2.2
Cronbach's α			
▪ Factor 1: Activity engagement	0.90	0.83	0.82
▪ Factor 2: Avoidance and suppression	0.82	0.89	0.90
▪ Combined	0.86	0.88	0.86

Table 4. Correlations between different scales (* = p<0.01)

	HDAQ	HDAQ - 1	HDAQ - 2	HHQ	HADS	URICA-R
Self-reported hearing disability acceptance (HDAQ)	1.00					
HDAQ Factor 1: Activity engagement	0.86*	1.00				
HDAQ Factor 2: Avoidance and suppression	0.88*	0.51*	1.00			
Self-reported hearing disability (HHQ)	-0.70*	-0.50*	-0.71*	1.00		
Self-reported anxiety and depression (HADS)	-0.58*	-0.62*	-0.39*	0.36*	1.00	
Readiness to change (URICA-R)	-0.27*	-0.26*	-0.29*	0.20	0.18	1.00

Appendices

Appendix 1. Hearing Disability Acceptance Questionnaire (HDAQ)

Directions

You will find numerous statements below. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices:

1	2	3	4	5	6	7
Never true	Very rarely true	Seldom true	Sometimes true	Often true	Almost always true	Always true

For instance, if you believe that a statement is "Often true", then you should circle "5" on the row following the statement.

Items

1. I am leading a full life, even though I have a hearing problem
2. My life is going well, even though I have a hearing problem
3. Despite hearing problem, I can draw up and stick to a certain course in my life
4. When my hearing problem increases, I can still take care of my responsibilities
5. My hearing problem leads me to avoid certain situations
6. My hearing problem changes me as a person
7. I spend a lot of time thinking about how things would be for me without a hearing problem

Scoring

Reverse score items 5, 6, and 7.

Appendix 2. Removed items

- My hearing problem has led me to decrease my engagement in former activities
- It is necessary for me to control my negative thoughts and feelings concerning my hearing problem
- I will be in better control of my life if I can control my negative thoughts about my hearing problem
- I have to struggle to get things done when I have a hearing problem
- I strive to suppress aversive thoughts and feelings related to my hearing problem

The acceptance of hearing disability among adults experiencing hearing difficulties

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Abstract

Objective: This study developed the Hearing Disability Acceptance Questionnaire (HDAQ) and tested its construct and concurrent validities. ***Design:*** Cross-sectional. ***Participants:*** A total of 90 participants who were experiencing hearing difficulties were recruited in the UK. ***Outcome Measures:*** The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ). Participants completed self-report measures regarding hearing disability acceptance, hearing disability, symptoms of anxiety and depression, and a measure of stages of change. ***Results:*** The HDAQ has a two-factor structure that explains 75.69% of its variance. The factors identified were *activity engagement* and *avoidance and suppression*. The scale showed sufficient internal consistency (Cronbach's α=0.86). The HDAQ also had acceptable concurrent validity with regard to self-reported hearing disability, self-reported anxiety and depression, and readiness to change measures. ***Conclusions:*** Acceptance is likely an important aspect of coping with chronic health conditions. To our knowledge, no previously published and validated scale measures the acceptance of hearing disability; therefore, the HDAQ might be useful in future research. However, the role of acceptance in adjusting to hearing disability must be further investigated.

Keywords

Hearing disability, hearing loss, acceptance, self-reported measure

Summary

Article Focus

- To develop the Hearing Disability Acceptance Questionnaire (HDAQ) and study its construct and concurrent validities.

Key Message

- The results suggest that the HDAQ has a two-factor structure that explains 75.69% of its variance. The scale showed sufficient internal consistency (Cronbach's α=0.86).
- The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change.
- The role of acceptance in adjusting to hearing disability must be further investigated.

Strengths and Weaknesses

- Due to its online recruitment, the sample might not represent the general population. In addition, the online questionnaire might differ from a pen-and-paper format.
- Although there are measures that study coping indirectly, no well-established acceptance scale examines the concurrent validity of the HDAQ using the same construct (i.e., acceptance).

Introduction

An individual with hearing loss might pass through several stages when help-seeking.[1] Edgett[2] emphasised that the decision-making process to seek help involves four major stages: (1) understanding hearing loss; (2) personal experience; (3) interactions with society; and (4) taking action. In another study, Engelund[3] suggested that patients proceed through four major stages while making a decision to seek help: (1) attracting attention; (2) becoming suspicious; (3) sensing tribulation; and (4) jeopardising the fundamental self. In our previous studies of the "patient's journey" regarding people with hearing impairment (PHI), we took this idea further and studied this journey from the initial onset of problems through successful rehabilitation, thereby developing a patient journey model.[4-5] This model suggests that PHI experience seven major stages before, during, and after their audiological rehabilitation: (1) pre-awareness; (2) awareness; (3) movement; (4) diagnostics; (5) rehabilitation; (6) self-evaluation; and (7) resolution. On average, PHI can take 10 years or more to seek help after first noticing hearing difficulties; hence, this process might take many years.[6] Although additional research is necessary to better understand this process,[7] these previous studies nevertheless provide insight regarding the stages of adjusting to hearing loss, which might be an indirect (or secondary) indicator of the process of acceptance. In addition, it is clear from the aforementioned studies that becoming aware of and accepting a hearing disability play important roles in further progressing in their journey to manage their condition.

A few studies in the audiology literature have focused on the self-assessment of hearing loss,[8] immediate reactions to the diagnosis of hearing loss,[9-10] actions taken after failing screening tests,[11] attitudes toward hearing loss and the use of hearing aids,[12-13] and the ways in which PHI cope with their condition.[14-16] These studies provide further insights into the initial onset of the condition and how PHI manage their condition. A recent literature review suggested

that the acceptance of hearing loss prior to hearing aid fitting positively influences both hearing aid acquisition and subsequent hearing aid use.[17] However, numerous PHI who are aware that they have a problem but continue not to seeking help, use intervention strategies, or both remain. The literature can be confusing because the term "acceptance" is used synonymously with treatment/management option adherence, rather than studying this term using validated scales that capture different dimensions of this construct.

In psychological terms, acceptance is *a process of actively taking in thoughts, memories, feelings, and bodily sensations in a specific situation without having to follow or change them*.[18] Acceptance can have various dimensions including self- and social acceptance that require both emotional and behavioural adaptations. For instance, the different views of what acceptance actually involves is evident from examining studies of education and academic success, where the term *peer acceptance* refers to a pupil who is judged to be a desirable interaction partner.[19] Disability studies have proposed that acceptance is the key component to adjusting to a disabling condition.[20] Although the acceptance of chronic conditions has often been studied from the perspectives of grief and loss, studying the acceptance of chronic conditions with regard to the perspectives of those living with it, with a focus on adaptation to and accepting change in one's life, is also important.[21]

Experiential avoidance is similar to the concept of avoidance coping and can be defined as the opposite reaction to acceptance; that is, a person attempts to ignore and minimise the problems caused by hearing impairment.[22] However, some researchers have argued that coping and experiential avoidance are unique but overlapping constructs.[23] For example, although acceptance (i.e., experiential avoidance) loaded on to the same factors as emotion-focused and avoidant coping in a recent study of anxiety disorders, acceptance explained

additional variance when predicting psychological distress and well-being.[23] With regard to hearing impairment, both acceptance and experiential avoidance can be interpreted in light of stigma theory,[24] which has previously been applied in hearing impairment research.[25-26]

Acceptance, in relation to hearing disability, has not been well defined; often this term is used to refer to help-seeking behaviour and intervention (e.g., hearing aids) adoption. In effect, differences exist in terms of the psychological and audiological ways of defining acceptance with regard to hearing disability. However, various scales examine the acceptance of other disabilities and chronic conditions.[20-21, 27-30] Past audiology studies have focused on coping; however, coping is generally measured indirectly via questions related to communication problems[22] [e.g., the Communication Strategies Subscale (CSS) in the Communication Profile for the Hearing Impaired (CPHI) questionnaire].[31] The CPHI-CSS focuses on maladaptive behaviours as well as verbal strategies and non-verbal strategies, and it provides insight concerning poor adjustment to hearing impairment and poor social support.[32] To our knowledge, however, no published and validated scale examines the acceptance of hearing disability.

The current study developed a self-report measure of hearing disability acceptance and investigated its construct and concurrent validities. We focused on the psychological aspects of acceptance in this study (i.e., experiential avoidance, which is the opposite of acceptance).

Method

Study Design and Participants

The current study used cross-sectional data obtained during a clinical trial (i.e., pre-intervention data) of a pre-fitting counselling program.[33-34] Ethical approval was received

from the Research Ethics Committee, College of Human and Health Sciences, Swansea University. A study advertisement was offered in the UK through various sources including national newspapers, hearing loss charity websites (i.e., Action on Hearing ~~Loss~~ and Hearing Link), and local GP practice notice boards, inviting those who were experiencing hearing difficulties but not using hearing aids to those who had access to the Internet to participate in this study. Interested participants were encouraged to access the study website using the URL supplied. A total of 90 participants completed the informed consent form, provided demographic information, and completed four online questionnaires. These questionnaires included the Hearing Disability Acceptance Questionnaire (HDAQ), the Hearing Handicap Questionnaire (HHQ), the Hospital Anxiety and Depression Scale (HADS), and the University of Rhode Island Change Assessment (URICA) Scale.

Development of the HDAQ

The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ), which was developed in Sweden to study tinnitus acceptance.[30] The TAQ was based on the Acceptance and Action Questionnaire (AAQ),[35] and the Chronic Pain Acceptance Questionnaire-Revised (CPAQ-R);[28] some additional questions were included. The 12-item TAQ has two factors (*activity engagement* and *tinnitus suppression*), and it has sufficient internal consistency (Cronbach's α=0.89).[30] Like the TAQ, the HDAQ is a measure of experiential avoidance/acceptance. Its 12 items were taken from the TAQ, and the word "tinnitus" was replaced with "hearing problem". However, the 12 items were further reduced to 7 items (see the results section). Each item was rated on a 7-point Likert scale (1=never true, 7=always true). Total scores ranged from 7 to 49; higher scores indicate greater acceptance of hearing disability (see Appendix 1).

Other Questionnaires

The HHQ measures personal and social effects (i.e., emotional distress and discomfort, social withdrawal, and general participation restrictions).[36] The 12 questions of the HHQ are scored on a 5-point Likert scale (1=never, 5=almost always). Total scores range from 12 to 60, and higher scores indicate greater disability. The HHQ has acceptable internal consistency, with Cronbach's α of 0.95 and 0.93 for the emotional and social scales, respectively.

The HADS was used to screen for symptoms of anxiety and depression. The HADS consists of 14 items, divided into two subscales: anxiety and depression.[37] Each item is scored from 0 to 3 (0=not at all, 3=most of the time) with a total score ranging from 0 to 42; higher scores indicate more self-reported anxiety and depressive symptoms. In general, the HADS has acceptable reliability (r=.84), internal consistency (α=.83), and sensitivity and specificity (0.80),[38] including Internet administration.[39]

The URICA measures of stages of change across four subscales: pre-contemplation, contemplation, action, and maintenance.[40-41] The original URICA scale consists of 32 items; however, the current study used a modified version (*the problem* was replaced with *the hearing problem*) consisting of a 24-item scale.[42] Each item was rated on a 5-point Likert scale (1=strong disagreement, 5=strong agreement), and each subscale measured specific aspects. Most study participants were in the early help-seeking stages and had not received interventions for their hearing disabilities; therefore, the eight URICA items regarding maintenance were excluded because they were considered irrelevant for the sample. The total scores of each subscale ranged from 8 to 40. The subscale scores concerning the contemplation and action stages were added, from which the pre-contemplation stage scores were subtracted to obtain a readiness-to-change composite score (i.e., contemplation + action

– pre-contemplation). A recent study used this modified scale to investigate the use of the URICA scale among adults with acquired hearing impairments seeking help for the first time. This scale showed acceptable construct, concurrent, and predictive validities.[42]

Data Analyses

All data analyses were performed using IBM SPSS Version 19 for Windows. Descriptive statistics were applied to examine demographic factors, and the assumption of normality (i.e., Shapiro-Wilk test values of 0.05) was tested before conducting a principal components analysis (PCA). A PCA was performed to reduce the correlated variables to a smaller set of important composite variables and examine the factor structure.[43] Cronbach's αs was calculated to assess the internal consistency of the HDAQ.[44] Pearson's correlations were performed to examine the association among the following factors: hearing disability acceptance, self-reported hearing disability, self-reported anxiety and depression, and readiness to change.

Results

The data were normally distributed. Table 1 displays the sample characteristics. The average age of participants and the average duration of hearing disability were 63.41 and 11.67 years, respectively. The number of males and females in the sample was equal. In addition, nearly two-thirds of participants had consulted healthcare professionals specialised in hearing (e.g., audiologists, hearing aid dispensers, or ENT specialists) at least once.

[Insert Table 1 near here]

HDAQ factor structure

A PCA with Varimax rotation was performed to examine the factor structure. Eigenvalues were set at 1.0, and the limit for factor loadings was set at .40.[43] The relevant items were reverse scored before analysis. The initial number of factors of interest was determined using Kaiser's rule of eigenvalues greater than 1.0.[45] Subsequently, a scree plot was examined to determine the number of factors to extract.[46]

In the first instance, the PCA resulted in a three-factor model for the 12 items. However, cross loadings were noted for some items (i.e., items that loaded at .40 or above on two or more factors). A PCA was also performed using Direct Oblimin rotation to determine whether these cross loadings were due to the high correlations among items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.86, and Bartlett's Test of Sphericity was significant [$\chi^2(66)=370.89$, $p<.001$]. The three factors explained 72.90% of the variance in the 12-item HDAQ. Factor 1 accounted for 49.65% of the variance (with an eigenvalue of 3.40); Factor 2 accounted for 13.95% of the variance (with an eigenvalue of 3.32); and Factor 3 accounted for 9.30% of the variance (with an eigenvalue of 2.01). The Cronbach's αs were 0.54, 0.50, 0.72, and 0.79 for Factors 1, 2, 3, and the overall 12 items, respectively. The internal consistency of the overall scale was acceptable, although it was not high for Factors 1 and 2.

In the next stage, all items that resulted in cross loadings were removed from the analysis; thus, five items were removed from the original 12-item scale (see Appendix 2 for the removed items). Item reduction (i.e., minimising the set of variables while still accounting for most of the variance) is one of the key goals of PCA. Moreover, removing the items with complex psychometric properties (i.e., cross loadings) can improve the construct validity of self-report measures.[47] Subsequently, the seven-item HDAQ resulted in a two-factor model

with no cross loading or outliers (see Table 2). The KMO measure of sampling adequacy was 0.82, and Bartlett's test of sphericity was significant ($\chi^2[21]=363.93$, $p<.001$). These factors explained 75.69% of the variance in the HDAQ. Factor 1 accounted for 42.94% of the variance (with an eigenvalue of 3.00), and Factor 2 accounted for 32.75% (with an eigenvalue of 2.29). The factors were identified as: (1) *activity engagement* (i.e., the pursuit of life activities regardless of hearing disability) and (2) *avoidance and suppression* (i.e., attempts to avoid difficult listening situations as well as those to control and suppress the thoughts and feeling related to hearing disability). A low *avoidance and suppression* score indicates more avoidance and suppression because the items are reverse scored. Cronbach's αs were 0.90, 0.82, and 0.86 for Factors 1, 2, and the overall HDAQ, showing acceptable internal consistency.[44] The correlation between the factors was $r(90)=0.51$, $p<0.001$, which suggests that the two subscales were distinguishable but related.

[Insert Table 2 near here]

Furthermore, we performed a PCA on the split sample to test for generalisability (i.e., split-sample validation). The sample of 90 was randomly divided into two groups of 45. The PCA for the first split sample of 45 on 12 items resulted in a three-factor model with cross loadings. However, the PCA with 7 items (after the removal of the items with cross loadings) resulted in a two-factor structure that explained 76.41% of the variance without cross loadings. A PCA was also performed on the second split sample of 45 that also resulted in a two-factor structure that explained 75.93% of the variance without cross loadings. The results from both the split samples and the total sample were in close agreement (see Table 3), strongly supporting the two-factor model.

[Insert Table 3 near here]

Correlations Between the HDAQ and Other Scales

Table 4 shows the Pearson's correlation coefficients between the HDAQ and other scales. The two HDAQ subscales were moderately associated with each other and strongly associated with the full scale. The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change. These results suggest that those people higher hearing disability acceptance had less self-reported hearing disability, fewer self-reported symptoms of anxiety and depression, and lower readiness to change. In addition, a weak positive correlation was found between self-reported hearing disability and self-reported symptoms of anxiety and depression, which indicates that people with higher self-reported hearing disability are likely to have higher self-reported symptoms of anxiety and depression. Although differences were observed, the relationships between the individual subscales and other factors (i.e., hearing disability, symptoms of anxiety and depression, and readiness to change) did not differ much compared with the full HDAQ scale.

[Insert Table 4 near here]

Discussion

Recent research has indicated the utility of psychological acceptance with regard to reducing the impact of chronic health conditions.[29, 48-50] The current paper is the first known attempt to extend this concept to hearing disabilities. After the necessary psychometrical modifications, a two-factor structure emerged for the HDAQ that was in line with the TAQ[30] and similar self-report measures related to acceptance.[51] Its internal consistency was equal to that of the most commonly used general acceptance scale, the AAQ-I.[52] However, research on an

updated version of this scale rejected a two-factor structure with regard to measuring acceptance; rather, it suggested a unidimensional structure for the AAQ-II.[53] Our study did not reveal a single-factor structure for the HDAQ. The first factor, *activity engagement*, was assumed to reflect whether participants maintain a desired level of activity despite facing obstacles. For example, a low level of activity engagement might be observed in a person who stops dining with his or her friends at restaurants because they fear they might not be able to follow the conversation. The other factor, *avoidance and suppression*, is the unwillingness to experience events due to their related emotional distress. This concept is the opposite of acceptance.[54]

The HDAQ items were taken from the scale used to study acceptance in people with tinnitus, which, in turn, was based on the AAQ and CPAQ-R. Although differences most likely exist with regard to how people cope with tinnitus and hearing disability, similarities are found in terms of how people cope with general chronic conditions. Acceptance is likely a key component of adjusting to a disabling condition.[20] Thus, the study of acceptance in various chronic conditions including hearing disability using the general framework applied in 'contextual psychology' is valuable to both researchers and clinicians.

The study results indicate that less acceptance was associated with increased emotional distress. The relationship between the HDAQ and the HADS is interesting when compared with similar studies that have indicated the pivotal role of acceptance with regard to suffering. For instance, McCracken[55] found that acceptance was a stronger predictor of psychosocial disability among patients with chronic pain than the degree of pain they experienced. Numerous other studies have also found that greater acceptance is related to psychological well-being (for a summary, see the review by Ruiz[56]). In the present study,

greater acceptance was correlated with a more modest rating of hearing problems; therefore, it might be analogous to the aforementioned findings regarding pain. Moreover, a recent systematic review showed that self-reported hearing disability is a robust predictor of hearing help-seeking, hearing aid acquisition, hearing aid use, and satisfaction with hearing rehabilitation,[17] which suggests that self-reported hearing disability is an important factor in the processes of accepting hearing loss and seeking appropriate interventions. Furthermore, symptoms of depression and anxiety were elevated among those who scored higher on the HHQ, which illustrates the far-reaching consequences that hearing loss might have. The relationship between the HDAQ and readiness to change was negative and significant, which implies that those who were more accepting of their current status were less prone to seek a change in their current situation. The association between the HDAQ subscales and other factors did not differ much. This finding might be because both subscales were found to have strong associations with the full scale and moderate associations with each other.

Interestingly, although participants did not use hearing aids, two-thirds of the sample had consulted healthcare specialists on at least one occasion. The reasons for these consultations are likely to include: (1) acceptance of their condition (i.e., hearing disability); (2) a dilemma regarding whether they had the condition and a desire to confirm this supposition with clinicians; or (3) urging from their social partners. Although the reasons for not accepting intervention (e.g., hearing aids) are not clear, they might be related to the perceived seriousness of their hearing problems. Previous research suggests that a linear relationship does not exist between hearing disability and its effects on activities and participation,[8 57] which might help explain why not all people with hearing disabilities seek interventions. Thus, studying hearing disability acceptance in psychological terms is important. Importantly, becoming suspicious or aware of a hearing disability does not mean that PHI

perceive their difficulties as significant enough to affect their communication and quality of life. This gap between awareness and action is something that clinicians must be aware of when they plan and recommend interventions, especially for patients coming to the hearing clinic for the first time. In addition, much work is needed to understand how hearing disability acceptance either facilitates or hinders the journey through this condition.

Study Limitations

Although the current study focused on an important area of limited research, it nevertheless has certain limitations. Acceptance with regard to hearing disability is not well defined, and this scale might only focus on certain components of acceptance (i.e., psychological acceptance). This limitation might partially explain why people with greater acceptance show less readiness to change. However, this component is important to understand because it might explain why many people who are aware of their hearing disability continue to refrain from seeking professional help and appropriate interventions. Due to the online recruitment method, the sample might not represent the general population, and caution must be used in generalising the results.[58-59] Moreover, the relatively small sample size was surprising, given that the advertisement was published in a national newspaper. The smaller sample size might also be a limitation of this study. Validating this scale with a larger population is necessary, although the split-sample validation strongly supported the two-factor model. The online format of the questionnaire might differ from a pen-and-paper format, although web-based questionnaires have been found to be reliable and valid.[60-61] The study results are only relevant with regard to participants who experience hearing difficulties rather than typical participants in clinical situations, although there might be some overlap because nearly two-thirds of the current sample had previously consulted hearing specialists. Although indirect coping measures exist, no well-established acceptance scale examines the concurrent validity

of the HDAQ using acceptance. Studying the associations between *acceptance* and other factors such as *cognitive functions*, *personality*, *quality of life*, and *psychological well-being* would have been interesting and useful; however, these factors were not included in the current study. Furthermore, the predictive validity of the scale must be explored.

Conclusions

In summary, our results suggest that additional exploration of the potential role that acceptance plays in the process of adjusting to hearing problems would be a fruitful endeavour, particularly with regard to understanding the role that acceptance plays in the journey of PHI. However, much work remains to be done. Specifically, a coherent theoretical framework is needed to account for what role, if any, acceptance plays with regard to adjusting to hearing problems. One cannot take for granted the fact that the successful management of other conditions, which all entails painful experiences (e.g., tinnitus, chronic pain, and anxiety), are relevant to hearing disability, which instead is characterised by the loss of (auditory) experiences. In addition, future research must examine the longitudinal stability of acceptance and its relevance to objective measures of hearing disability as well as the utility of the current structure of the HDAQ and whether it can successfully alleviate the suffering usually associated with hearing disability.

Acknowledgements

We thank Alexander Alasjö for his help with applying the online questionnaires and Ariane Laplante-Lévesque for providing us with the revised version of the URICA scale used in this study. This study was a part of the doctoral study of the first author, and portions of this manuscript were presented as a doctoral thesis.

Contributors

VM contributed to most of the work including data collection, analysis, and writing; PM contributed to the writing; JR contributed to study design and writing; GA contributed to study design and writing; and TL contributed to study design and writing.

Funding

Grants from the Swedish Council for Working Life and Social Research 2009-0055 as well as the Swedish Research Council 2007-8654 partially funded this research.

Ethical Approval

Ethical approval was received from the Research Ethics Committee, College of Human and Health Sciences, Swansea University.

Data Sharing

No additional data are available.

Conflict of interests

None.

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Tables

Table 1. Participants demographics

Age in years (M±SD)	63.41±10.49
Gender (% male)	50
Duration of hearing difficulties in years (M±SD)	11.67±10.83
Consulted a healthcare professional specialising in hearing regarding hearing difficulties (%)	
▪ Yes	65.6
▪ No	34.4
Education (%)	
▪ Compulsory education	13.3
▪ Secondary education	48.9
▪ Tertiary education	37.8
Self-reported hearing disability acceptance (HDAQ; M±SD)	36.88±7.85
▪ Activity engagement	22.72±4.36
▪ Avoidance and suppression	14.16±4.65
Self-reported hearing disability (HHQ; M±SD)	34.96±9.95
▪ Emotional	20.61±5.75
▪ Social	14.32±4.85
Self-reported anxiety and depression (HADS; M±SD)	14.77±7.50
▪ Anxiety	7.04±4.43
▪ Depression	7.70±3.81
Stages of change (URICA)	
Readiness-to-change composite (M±SD)	39.41±8.63

Table 2. HDAQ principle components analysis (n=90)

Scale: 7-item HDAQ	Factor 1: Activity engagement	Factor 2: Avoidance and suppression
1. I am leading a full life, even though I have a hearing problem	0.854	
2. My life is going well, even though I have a hearing problem	0.891	
3. Despite hearing problem, I can draw up and stick to a certain course in my life	0.857	
4. When my hearing problem increases, I can still take care of my responsibilities	0.763	
5. My hearing problem leads me to avoid certain situations		0.885
6. My hearing problem changes me as a person		0.862
7. I spend a lot of time thinking about how things would be for me without a hearing problem		0.734
Cronbach's α	0.90	0.82
Percentage of variance	42.94	32.75
Eigenvalue	3.0	2.29

Table 3. Split-sample validation for the seven-item HDAQ

	Full sample (n=90)	Split sample 1 (n=45)	Split sample 2 (n=45)
Percentage of variance explained			
▪ Factor 1: Activity engagement	42.94	43.48	44.13
▪ Factor 2: Avoidance and suppression	32.75	32.93	31.80
▪ Combined	75.69	76.41	75.93
Eigenvalue			
▪ Factor 1: Activity engagement	3.0	3.0	3.0
▪ Factor 2: Avoidance and suppression	2.29	2.3	2.2
Cronbach's α			
▪ Factor 1: Activity engagement	0.90	0.83	0.82
▪ Factor 2: Avoidance and suppression	0.82	0.89	0.90
▪ Combined	0.86	0.88	0.86

Table 4. Correlations between different scales (* = p<0.01)

	HDAQ	HDAQ - 1	HDAQ - 2	HHQ	HADS	URICA-R
Self-reported hearing disability acceptance (HDAQ)	1.00					
HDAQ Factor 1: Activity engagement	0.86*	1.00				
HDAQ Factor 2: Avoidance and suppression	0.88*	0.51*	1.00			
Self-reported hearing disability (HHQ)	-0.70*	-0.50*	-0.71*	1.00		
Self-reported anxiety and depression (HADS)	-0.58*	-0.62*	-0.39*	0.36*	1.00	
Readiness to change (URICA-R)	-0.27*	-0.26*	-0.29*	0.20	0.18	1.00

Appendices

Appendix 1. Hearing Disability Acceptance Questionnaire (HDAQ)

Directions

You will find numerous statements below. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices:

1	2	3	4	5	6	7
Never true	Very rarely true	Seldom true	Sometimes true	Often true	Almost always true	Always true

For instance, if you believe that a statement is "Often true", then you should circle "5" on the row following the statement.

Items

1. I am leading a full life, even though I have a hearing problem
2. My life is going well, even though I have a hearing problem
3. Despite hearing problem, I can draw up and stick to a certain course in my life
4. When my hearing problem increases, I can still take care of my responsibilities
5. My hearing problem leads me to avoid certain situations
6. My hearing problem changes me as a person
7. I spend a lot of time thinking about how things would be for me without a hearing problem

Scoring

Reverse score items 5, 6, and 7.

Appendix 2. Removed items

- My hearing problem has led me to decrease my engagement in former activities
- It is necessary for me to control my negative thoughts and feelings concerning my hearing problem
- I will be in better control of my life if I can control my negative thoughts about my hearing problem
- I have to struggle to get things done when I have a hearing problem
- I strive to suppress aversive thoughts and feelings related to my hearing problem

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2 & 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 – 6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7 – 9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7 - 9
Bias	9	Describe any efforts to address potential sources of bias	7, 15 & 16
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	9
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	9
		(*e*) Describe any sensitivity analyses	9
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9 & 24
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	9 - 12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9 - 12
		(*b*) Report category boundaries when continuous variables were categorized	9 - 12
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9 - 12
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9 - 12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12 - 15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15 & 16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15 & 16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15 & 16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ open

The acceptance of hearing disability among adults experiencing hearing difficulties

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2013-004066.R2
Article Type:	Research
Date Submitted by the Author:	23-Nov-2013
Complete List of Authors:	C. Manchaiah, Vinaya K.; Anglia Ruskin University, Department of Vision and Hearing Sciences Molander, Peter; Linköping University, Department of Behavioural Sciences and Learning Ronnberg, Jerker; Linköping University, Linnaeus Centre HEAD, Swedish Institute for Disability Research, Department of Behavioral Science and Learning Andersson, Gerhard; Linkoping University, Lunner, Thomas; Linköping University, Department of Behavioural Sciences and Learning, Linnaeus Centre HEAD, Swedish Institute for Disability Research
Primary Subject Heading:	Ear, nose and throat/otolaryngology
Secondary Subject Heading:	Ear, nose and throat/otolaryngology
Keywords:	Adult otolaryngology < OTOLARYNGOLOGY, Audiology < OTOLARYNGOLOGY, PUBLIC HEALTH

The acceptance of hearing disability among adults experiencing hearing difficulties

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Keywords

Hearing disability, hearing loss, acceptance, self-reported measure

Abstract

Objective: This study developed the Hearing Disability Acceptance Questionnaire (HDAQ) and tested its construct and concurrent validities.

Design: Cross-sectional.

Participants: A total of 90 participants who were experiencing hearing difficulties were recruited in the UK.

Outcome Measures: The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ). Participants completed self-report measures regarding hearing disability acceptance, hearing disability, symptoms of anxiety and depression, and a measure of stages of change.

Results: The HDAQ has a two-factor structure that explains 75.69% of its variance. The factors identified were *activity engagement* and *avoidance and suppression*. The scale showed sufficient internal consistency (Cronbach's α=0.86). The HDAQ also had acceptable concurrent validity with regard to self-reported hearing disability, self-reported anxiety and depression, and readiness to change measures.

Conclusions: Acceptance is likely an important aspect of coping with chronic health conditions. To our knowledge, no previously published and validated scale measures the acceptance of hearing disability; therefore, the HDAQ might be useful in future research. However, the role of acceptance in adjusting to hearing disability must be further investigated.

Summary

Article Focus

- To develop the Hearing Disability Acceptance Questionnaire (HDAQ) and study its construct and concurrent validities.

Key Message

- The results suggest that the HDAQ has a two-factor structure that explains 75.69% of its variance. The scale showed sufficient internal consistency (Cronbach's α=0.86).
- The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change.
- The role of acceptance in adjusting to hearing disability must be further investigated.

Strengths and Weaknesses

- Due to its online recruitment, the sample might not represent the general population. In addition, the online questionnaire might differ from a pen-and-paper format in terms of data quality.
- Although there are measures that study coping indirectly, no well-established acceptance scale examines the concurrent validity of the HDAQ using the same construct (i.e., acceptance).

Introduction

An individual with hearing loss might pass through several stages when help-seeking.[1] Edgett[2] emphasised that the decision-making process to seek help involves four major stages: (1) understanding hearing loss; (2) personal experience; (3) interactions with society; and (4) taking action. In another study, Engelund[3] suggested that patients proceed through four major stages while making a decision to seek help: (1) attracting attention; (2) becoming suspicious; (3) sensing tribulation; and (4) jeopardising the fundamental self. In our previous studies of the "patient's journey" regarding people with hearing impairment (PHI), we took this idea further and studied this journey from the initial onset of problems through successful rehabilitation, thereby developing a patient journey model.[4-5] This model suggests that PHI experience seven major stages before, during, and after their audiological rehabilitation: (1) pre-awareness; (2) awareness; (3) movement; (4) diagnostics; (5) rehabilitation; (6) self-evaluation; and (7) resolution. On average, PHI can take 10 years or more to seek help after first noticing hearing difficulties; hence, this process might take many years.[6] Although additional research is necessary to better understand this process,[7] these previous studies nevertheless provide insight regarding the stages of adjusting to hearing loss, which might be an indirect (or secondary) indicator of the process of acceptance. In addition, it is clear from the aforementioned studies that becoming aware of and accepting a hearing disability play important roles in further progressing in their journey to manage their condition.

A few studies in the audiology literature have focused on the self-assessment of hearing loss,[8] immediate reactions to the diagnosis of hearing loss,[9-10] actions taken after failing screening tests,[11] attitudes toward hearing loss and the use of hearing aids,[12-13] and the ways in which PHI cope with their condition.[14-16] These studies provide further insights into the initial onset of the condition and how PHI manage their condition. A recent literature review suggested

that the acceptance of hearing loss prior to hearing aid fitting positively influences both hearing aid acquisition and subsequent hearing aid use.[17] However, numerous PHI who are aware that they have a problem but continue not to seeking help, use intervention strategies, or both remain. The literature can be confusing because the term "acceptance" is used synonymously with treatment/management option adherence, rather than studying this term using validated scales that capture different dimensions of this construct.

In psychological terms, acceptance is *a process of actively taking in thoughts, memories, feelings, and bodily sensations in a specific situation without having to follow or change them*.[18] Acceptance can have various dimensions including self- and social acceptance that require both emotional and behavioural adaptations. For instance, the different views of what acceptance actually involves is evident from examining studies of education and academic success, where the term *peer acceptance* refers to a pupil who is judged to be a desirable interaction partner.[19] Disability studies have proposed that acceptance is the key component to adjusting to a disabling condition.[20] Although the acceptance of chronic conditions has often been studied from the perspectives of grief and loss, studying the acceptance of chronic conditions with regard to the perspectives of those living with it, with a focus on adaptation to and accepting change in one's life, is also important.[21]

Experiential avoidance is similar to the concept of avoidance coping and can be defined as the opposite reaction to acceptance; that is, a person attempts to ignore and minimise the problems caused by hearing impairment.[22] However, some researchers have argued that coping and experiential avoidance are unique but overlapping constructs.[23] For example, although acceptance (i.e., experiential avoidance) loaded on to the same factors as emotion-focused and avoidant coping in a recent study of anxiety disorders, acceptance explained

additional variance when predicting psychological distress and well-being.[23] With regard to hearing impairment, both acceptance and experiential avoidance can be interpreted in light of stigma theory,[24] which has previously been applied in hearing impairment research.[25-26]

Acceptance, in relation to hearing disability, has not been well defined; often this term is used to refer to help-seeking behaviour and intervention (e.g., hearing aids) adoption. In effect, differences exist in terms of the psychological and audiological ways of defining acceptance with regard to hearing disability. However, various scales examine the acceptance of other disabilities and chronic conditions.[20-21, 27-30] Past audiology studies have focused on coping; however, coping is generally measured indirectly via questions related to communication problems[22] [e.g., the Communication Strategies Subscale (CSS) in the Communication Profile for the Hearing Impaired (CPHI) questionnaire].[31] The CPHI-CSS focuses on maladaptive behaviours as well as verbal strategies and non-verbal strategies, and it provides insight concerning poor adjustment to hearing impairment and poor social support.[32] To our knowledge, however, no published and validated scale examines the acceptance of hearing disability.

The current study developed a self-report measure of hearing disability acceptance and investigated its construct and concurrent validities. We focused on the psychological aspects of acceptance in this study (i.e., experiential avoidance, which is the opposite of acceptance).

Method

Study Design and Participants

The current study used cross-sectional data obtained during a clinical trial (i.e., pre-intervention data) of a pre-fitting counselling program.[33-34] Ethical approval was received

from the Research Ethics Committee, College of Human and Health Sciences, Swansea University. A study advertisement was offered in the UK through various sources including national newspapers, hearing loss charity websites (i.e., Action on Hearing ~~Loss~~ and Hearing Link), and local GP practice notice boards, inviting those who were experiencing hearing difficulties but not using hearing aids to those who had access to the Internet to participate in this study. Interested participants were encouraged to access the study website using the URL supplied. A total of 90 participants completed the informed consent form, provided demographic information, and completed four online questionnaires. These questionnaires included the Hearing Disability Acceptance Questionnaire (HDAQ), the Hearing Handicap Questionnaire (HHQ), the Hospital Anxiety and Depression Scale (HADS), and the University of Rhode Island Change Assessment (URICA) Scale.

Development of the HDAQ

The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ), which was developed in Sweden to study tinnitus acceptance.[30] The TAQ was based on the Acceptance and Action Questionnaire (AAQ),[35] and the Chronic Pain Acceptance Questionnaire-Revised (CPAQ-R);[28] some additional questions were included. The 12-item TAQ has two factors (*activity engagement* and *tinnitus suppression*), and it has sufficient internal consistency (Cronbach's α=0.89).[30] Like the TAQ, the HDAQ is a measure of experiential avoidance/acceptance. Its 12 items were taken from the TAQ, and the word "tinnitus" was replaced with "hearing problem". However, the 12 items were further reduced to 7 items (see the results section). Each item was rated on a 7-point Likert scale (1=never true, 7=always true). Total scores ranged from 7 to 49; higher scores indicate greater acceptance of hearing disability (see Appendix 1).

Other Questionnaires

The HHQ measures personal and social effects (i.e., emotional distress and discomfort, social withdrawal, and general participation restrictions).[36] The 12 questions of the HHQ are scored on a 5-point Likert scale (1=never, 5=almost always). Total scores range from 12 to 60, and higher scores indicate greater disability. The HHQ has acceptable internal consistency, with Cronbach's α of 0.95 and 0.93 for the emotional and social scales, respectively.

The HADS was used to screen for symptoms of anxiety and depression. The HADS consists of 14 items, divided into two subscales: anxiety and depression.[37] Each item is scored from 0 to 3 (0=not at all, 3=most of the time) with a total score ranging from 0 to 42; higher scores indicate more self-reported anxiety and depressive symptoms. The HADS has acceptable reliability (r=.84) and internal consistency (α=.83),[38] including Internet administration.[39] In addition, the HADS also has acceptable sensitivity and specificity (AUC=0.80) as indicated in the receiver operator characteristic (ROC) curves.

The URICA measures of stages of change across four subscales: pre-contemplation, contemplation, action, and maintenance.[40-41] The original URICA scale consists of 32 items; however, the current study used a modified version (*the problem* was replaced with *the hearing problem*) consisting of a 24-item scale.[42] Each item was rated on a 5-point Likert scale (1=strong disagreement, 5=strong agreement), and each subscale measured specific aspects. Most study participants were in the early help-seeking stages and had not received interventions for their hearing disabilities; therefore, the eight URICA items regarding maintenance were excluded because they were considered irrelevant for the sample. The total scores of each subscale ranged from 8 to 40. The subscale scores concerning the

contemplation and action stages were added, from which the pre-contemplation stage scores were subtracted to obtain a readiness-to-change composite score (i.e., contemplation + action – pre-contemplation). A recent study used this modified scale to investigate the use of the URICA scale among adults with acquired hearing impairments seeking help for the first time. This scale showed acceptable construct, concurrent, and predictive validities.[42]

Data Analyses

All data analyses were performed using IBM SPSS Version 19 for Windows. Descriptive statistics were applied to examine demographic factors, and the assumption of normality (i.e., Shapiro-Wilk test values of 0.05) was tested before conducting a principal components analysis (PCA). A PCA was performed to reduce the correlated variables to a smaller set of important composite variables and examine the factor structure.[43] Cronbach's αs was calculated to assess the internal consistency of the HDAQ.[44] Pearson's correlations were performed to examine the association among the following factors: hearing disability acceptance, self-reported hearing disability, self-reported anxiety and depression, and readiness to change.

Results

The data was normally distributed. Table 1 displays the sample characteristics. The average age of participants and the average duration of hearing disability were 63.41 and 11.67 years, respectively. The number of males and females in the sample was equal. In addition, nearly two-thirds of participants had consulted healthcare professionals specialised in hearing (e.g., audiologists, hearing aid dispensers, or ENT specialists) at least once.

[Insert Table 1 near here]

HDAQ factor structure

A PCA with Varimax rotation was performed to examine the factor structure. Eigenvalues were set at 1.0, and the limit for factor loadings was set at .40.[43] The relevant items were reverse scored before analysis. The initial number of factors of interest was determined using Kaiser's rule of eigenvalues greater than 1.0.[45] Subsequently, a scree plot was examined to determine the number of factors to extract.[46]

In the first instance, the PCA resulted in a three-factor model for the 12 items. However, cross loadings were noted for some items (i.e., items that loaded at .40 or above on two or more factors). A PCA was also performed using Direct Oblimin rotation to determine whether these cross loadings were due to the high correlations among items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.86 with a reference value of 0 to 1.0, and Bartlett's Test of Sphericity was significant [$\chi^2(66)=370.89$, $p<.001$]. The three factors explained 72.90% of the variance in the 12-item HDAQ. Factor 1 accounted for 49.65% of the variance (with an eigenvalue of 3.40); Factor 2 accounted for 13.95% of the variance (with an eigenvalue of 3.32); and Factor 3 accounted for 9.30% of the variance (with an eigenvalue of 2.01). The Cronbach's αs were 0.54, 0.50, 0.72, and 0.79 for Factors 1, 2, 3, and the overall 12 items, respectively. The internal consistency of the overall scale was acceptable, although it was not high for Factors 1 and 2.

In the next stage, all items that resulted in cross loadings were removed from the analysis; thus, five items were removed from the original 12-item scale (see Appendix 2 for the removed items). Item reduction (i.e., minimising the set of variables while still accounting for most of the variance) is one of the key goals of PCA. Moreover, removing the items with

complex psychometric properties (i.e., cross loadings) can improve the construct validity of self-report measures.[47] Subsequently, the seven-item HDAQ resulted in a two-factor model with no cross loading or outliers (see Table 2). The KMO measure of sampling adequacy was 0.82, and Bartlett's Test of Sphericity was significant [$\chi^2(21)=363.93$, $p<.001$]. These factors explained 75.69% of the variance in the HDAQ. Factor 1 accounted for 42.94% of the variance (with an eigenvalue of 3.00), and Factor 2 accounted for 32.75% (with an eigenvalue of 2.29). The factors were identified as: (1) *activity engagement* (i.e., the pursuit of life activities regardless of hearing disability) and (2) *avoidance and suppression* (i.e., attempts to avoid difficult listening situations as well as those to control and suppress the thoughts and feeling related to hearing disability). A low *avoidance and suppression* score indicates more avoidance and suppression because the items are reverse scored. Cronbach's αs were 0.90, 0.82, and 0.86 for Factors 1, 2, and the overall HDAQ, showing acceptable internal consistency.[44] The correlation between the factors was $r(90)=0.51$, $p<0.001$, which suggests that the two subscales were distinguishable but related.

[Insert Table 2 near here]

Furthermore, we performed a PCA on the split sample to test for generalisability (i.e., split-sample validation). The sample of 90 was randomly divided into two groups of 45. The PCA for the first split sample of 45 on 12 items resulted in a three-factor model with cross loadings. However, the PCA with 7 items (after the removal of the items with cross loadings) resulted in a two-factor structure that explained 76.41% of the variance without cross loadings. A PCA was also performed on the second split sample of 45 that also resulted in a two-factor structure that explained 75.93% of the variance without cross loadings. The results from both the split samples and the total sample were in close agreement (see Table 3), strongly supporting the two-factor model.

[Insert Table 3 near here]

Correlations Between the HDAQ and Other Scales

Table 4 shows the Pearson's correlation coefficients between the HDAQ and other scales. The two HDAQ subscales were moderately associated with each other and strongly associated with the full scale. The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change. These results suggest that those people higher hearing disability acceptance had less self-reported hearing disability, fewer self-reported symptoms of anxiety and depression, and lower readiness to change. In addition, a weak positive correlation was found between self-reported hearing disability and self-reported symptoms of anxiety and depression, which indicates that people with higher self-reported hearing disability are likely to have higher self-reported symptoms of anxiety and depression. Although differences were observed, the relationships between the individual subscales and other factors (i.e., hearing disability, symptoms of anxiety and depression, and readiness to change) did not differ much compared with the full HDAQ scale.

[Insert Table 4 near here]

Discussion

Recent research has indicated the utility of psychological acceptance with regard to reducing the impact of chronic health conditions.[29, 48-50] The current paper is the first known attempt to extend this concept to hearing disabilities. After the necessary psychometrical modifications, a two-factor structure emerged for the HDAQ that was in line with the TAQ[30] and similar

self-report measures related to acceptance.[51] Its internal consistency was equal to that of the most commonly used general acceptance scale, the AAQ-I.[52] However, research on an updated version of this scale rejected a two-factor structure with regard to measuring acceptance; rather, it suggested a unidimensional structure for the AAQ-II.[53] Our study did not reveal a single-factor structure for the HDAQ. The first factor, *activity engagement*, was assumed to reflect whether participants maintain a desired level of activity despite facing obstacles. For example, a low level of activity engagement might be observed in a person who stops dining with his or her friends at restaurants because they fear they might not be able to follow the conversation. The other factor, *avoidance and suppression*, is the unwillingness to experience events due to their related emotional distress. This concept is the opposite of acceptance.[54]

The HDAQ items were taken from the scale used to study acceptance in people with tinnitus, which, in turn, was based on the AAQ and CPAQ-R. Although differences most likely exist with regard to how people cope with tinnitus and hearing disability, similarities are found in terms of how people cope with general chronic conditions. Acceptance is likely a key component of adjusting to a disabling condition.[20] Thus, the study of acceptance in various chronic conditions including hearing disability using the general framework applied in 'contextual psychology' is valuable to both researchers and clinicians.

The study results indicate that less acceptance was associated with increased emotional distress. The relationship between the HDAQ and the HADS is interesting when compared with similar studies that have indicated the pivotal role of acceptance with regard to suffering. For instance, McCracken[55] found that acceptance was a stronger predictor of psychosocial disability among patients with chronic pain than the degree of pain they

experienced. Numerous other studies have also found that greater acceptance is related to psychological well-being (for a summary, see the review by Ruiz[56]). In the present study, greater acceptance was correlated with a more modest rating of hearing problems; therefore, it might be analogous to the aforementioned findings regarding pain. Moreover, a recent systematic review showed that self-reported hearing disability is a robust predictor of hearing help-seeking, hearing aid acquisition, hearing aid use, and satisfaction with hearing rehabilitation,[17] which suggests that self-reported hearing disability is an important factor in the processes of accepting hearing loss and seeking appropriate interventions. Furthermore, symptoms of depression and anxiety were elevated among those who scored higher on the HHQ, which illustrates the far-reaching consequences that hearing loss might have. The relationship between the HDAQ and readiness to change was negative and significant, which implies that those who were more accepting of their current status were less prone to seek a change in their current situation. The association between the HDAQ subscales and other factors did not differ much. This finding might be because both subscales were found to have strong associations with the full scale and moderate associations with each other.

Interestingly, although participants did not use hearing aids, two-thirds of the sample had consulted hearing specialists on at least one occasion. The reasons for these consultations are likely to include: (1) acceptance of their condition (i.e., hearing disability); (2) a dilemma regarding whether they had the condition and a desire to confirm this supposition with clinicians; or (3) urging from their social partners. Although the reasons for not accepting intervention (e.g., hearing aids) are not clear, they might be related to the perceived seriousness of their hearing problems. Previous research suggests that a linear relationship does not exist between hearing disability and its effects on activities and participation,[8 57] which might help explain why not all people with hearing disabilities seek interventions.

Thus, studying hearing disability acceptance in psychological terms is important. Importantly, becoming suspicious or aware of a hearing disability does not mean that PHI perceive their difficulties as significant enough to affect their communication and quality of life. This gap between awareness and action is something that clinicians must be aware of when they plan and recommend interventions, especially for patients coming to the hearing clinic for the first time. In addition, much work is needed to understand how hearing disability acceptance either facilitates or hinders the journey through this condition.

Study Limitations

Although the current study focused on an important area of limited research, it nevertheless has certain limitations. Acceptance with regard to hearing disability is not well defined, and this scale might only focus on certain components of acceptance (i.e., psychological acceptance). This limitation might partially explain why people with greater acceptance show less readiness to change. However, this component is important to understand because it might explain why many people who are aware of their hearing disability continue to refrain from seeking professional help and appropriate interventions. Due to the online recruitment method, the sample might not represent the general population, and caution must be used in generalising the results.[58-59] Moreover, the relatively small sample size was surprising, given that the advertisement was published in a national newspaper. The smaller sample size might also be a limitation of this study. Validating this scale with a larger population is necessary, although the split-sample validation strongly supported the two-factor model. The online format of the questionnaire might differ from a pen-and-paper format, although web-based questionnaires have been found to be reliable and valid.[60-61] The study results are only relevant with regard to participants who experience hearing difficulties rather than typical participants in clinical situations, although there might be some overlap because nearly two-

thirds of the current sample had previously consulted hearing specialists. Although indirect coping measures exist, no well-established acceptance scale examines the concurrent validity of the HDAQ using acceptance. Studying the associations between *acceptance* and other factors such as *cognitive functions*, *personality*, *quality of life*, and *psychological well-being* would have been interesting and useful; however, these factors were not included in the current study. Furthermore, the predictive validity of the scale must be explored.

Conclusions

In summary, our results suggest that additional exploration of the potential role that acceptance plays in the process of adjusting to hearing problems would be a fruitful endeavour, particularly with regard to understanding the role that acceptance plays in the journey of PHI. However, much work remains to be done. Specifically, a coherent theoretical framework is needed to account for what role, if any, acceptance plays with regard to adjusting to hearing problems. One cannot take for granted the fact that the successful management of other conditions, which all entails painful experiences (e.g., tinnitus, chronic pain, and anxiety), are relevant to hearing disability, which instead is characterised by the loss of (auditory) experiences. In addition, future research must examine the longitudinal stability of acceptance and its relevance to objective measures of hearing disability as well as the utility of the current structure of the HDAQ and whether it can successfully alleviate the suffering usually associated with hearing disability.

Acknowledgements

We thank Alexander Alasjö for his help with applying the online questionnaires and Ariane Laplante-Lévesque for providing us with the revised version of the URICA scale used in this study. This study was a part of the doctoral study of the first author, and portions of this manuscript were presented as a doctoral thesis.

Contributors

VM contributed to most of the work including data collection, analysis, and writing; PM contributed to the writing; JR contributed to study design and writing; GA contributed to study design and writing; and TL contributed to study design and writing.

Funding

Grants from the Swedish Council for Working Life and Social Research 2009-0055 as well as the Swedish Research Council 2007-8654 partially funded this research.

Ethical Approval

Ethical approval was received from the Research Ethics Committee, College of Human and Health Sciences, Swansea University.

Data Sharing

No additional data are available.

Conflict of interests

None.

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Tables

Table 1. Participants demographics

Age in years (M±SD)	63.41±10.49
Gender (% male)	50
Duration of hearing difficulties in years (M±SD)	11.67±10.83
Consulted a healthcare professional specialising in hearing regarding hearing difficulties (%)	
▪ Yes	65.6
▪ No	34.4
Education (%)	
▪ Compulsory education	13.3
▪ Secondary education	48.9
▪ Tertiary education	37.8
Self-reported hearing disability acceptance (HDAQ; M±SD)	36.88±7.85
▪ Activity engagement	22.72±4.36
▪ Avoidance and suppression	14.16±4.65
Self-reported hearing disability (HHQ; M±SD)	34.96±9.95
▪ Emotional	20.61±5.75
▪ Social	14.32±4.85
Self-reported anxiety and depression (HADS; M±SD)	14.77±7.50
▪ Anxiety	7.04±4.43
▪ Depression	7.70±3.81
Stages of change (URICA)	
Readiness-to-change composite (M±SD)	39.41±8.63

Table 2. HDAQ principle components analysis (n=90)

Scale: 7-item HDAQ	Factor 1: Activity engagement	Factor 2: Avoidance and suppression
1. I am leading a full life, even though I have a hearing problem	0.854	
2. My life is going well, even though I have a hearing problem	0.891	
3. Despite hearing problem, I can draw up and stick to a certain course in my life	0.857	
4. When my hearing problem increases, I can still take care of my responsibilities	0.763	
5. My hearing problem leads me to avoid certain situations		0.885
6. My hearing problem changes me as a person		0.862
7. I spend a lot of time thinking about how things would be for me without a hearing problem		0.734
Cronbach's α	0.90	0.82
Percentage of variance	42.94	32.75
Eigenvalue	3.0	2.29

Table 3. Split-sample validation for the seven-item HDAQ

	Full sample (n=90)	Split sample 1 (n=45)	Split sample 2 (n=45)
Percentage of variance explained			
▪ Factor 1: Activity engagement	42.94	43.48	44.13
▪ Factor 2: Avoidance and suppression	32.75	32.93	31.80
▪ Combined	75.69	76.41	75.93
Eigenvalue			
▪ Factor 1: Activity engagement	3.0	3.0	3.0
▪ Factor 2: Avoidance and suppression	2.29	2.3	2.2
Cronbach's α			
▪ Factor 1: Activity engagement	0.90	0.83	0.82
▪ Factor 2: Avoidance and suppression	0.82	0.89	0.90
▪ Combined	0.86	0.88	0.86

Table 4. Correlations between different scales (* = p<0.01)

	HDAQ	HDAQ - 1	HDAQ - 2	HHQ	HADS	URICA-R
Self-reported hearing disability acceptance (HDAQ)	1.00					
HDAQ Factor 1: Activity engagement	0.86*	1.00				
HDAQ Factor 2: Avoidance and suppression	0.88*	0.51*	1.00			
Self-reported hearing disability (HHQ)	-0.70*	-0.50*	-0.71*	1.00		
Self-reported anxiety and depression (HADS)	-0.58*	-0.62*	-0.39*	0.36*	1.00	
Readiness to change (URICA-R)	-0.27*	-0.26*	-0.29*	0.20	0.18	1.00

The acceptance of hearing disability among adults experiencing hearing difficulties

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Abstract

Objective: This study developed the Hearing Disability Acceptance Questionnaire (HDAQ) and tested its construct and concurrent validities. ***Design:*** Cross-sectional. ***Participants:*** A total of 90 participants who were experiencing hearing difficulties were recruited in the UK. ***Outcome Measures:*** The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ). Participants completed self-report measures regarding hearing disability acceptance, hearing disability, symptoms of anxiety and depression, and a measure of stages of change. ***Results:*** The HDAQ has a two-factor structure that explains 75.69% of its variance. The factors identified were *activity engagement* and *avoidance and suppression*. The scale showed sufficient internal consistency (Cronbach's α=0.86). The HDAQ also had acceptable concurrent validity with regard to self-reported hearing disability, self-reported anxiety and depression, and readiness to change measures. ***Conclusions:*** Acceptance is likely an important aspect of coping with chronic health conditions. To our knowledge, no previously published and validated scale measures the acceptance of hearing disability; therefore, the HDAQ might be useful in future research. However, the role of acceptance in adjusting to hearing disability must be further investigated.

Keywords

Hearing disability, hearing loss, acceptance, self-reported measure

Summary

Article Focus

- To develop the Hearing Disability Acceptance Questionnaire (HDAQ) and study its construct and concurrent validities.

Key Message

- The results suggest that the HDAQ has a two-factor structure that explains 75.69% of its variance. The scale showed sufficient internal consistency (Cronbach's α=0.86).
- The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change.
- The role of acceptance in adjusting to hearing disability must be further investigated.

Strengths and Weaknesses

- Due to its online recruitment, the sample might not represent the general population. In addition, the online questionnaire might differ from a pen-and-paper format in terms of data quality.
- Although there are measures that study coping indirectly, no well-established acceptance scale examines the concurrent validity of the HDAQ using the same construct (i.e., acceptance).

Introduction

An individual with hearing loss might pass through several stages when help-seeking.[1] Edgett[2] emphasised that the decision-making process to seek help involves four major stages: (1) understanding hearing loss; (2) personal experience; (3) interactions with society; and (4) taking action. In another study, Engelund[3] suggested that patients proceed through four major stages while making a decision to seek help: (1) attracting attention; (2) becoming suspicious; (3) sensing tribulation; and (4) jeopardising the fundamental self. In our previous studies of the "patient's journey" regarding people with hearing impairment (PHI), we took this idea further and studied this journey from the initial onset of problems through successful rehabilitation, thereby developing a patient journey model.[4-5] This model suggests that PHI experience seven major stages before, during, and after their audiological rehabilitation: (1) pre-awareness; (2) awareness; (3) movement; (4) diagnostics; (5) rehabilitation; (6) self-evaluation; and (7) resolution. On average, PHI can take 10 years or more to seek help after first noticing hearing difficulties; hence, this process might take many years.[6] Although additional research is necessary to better understand this process,[7] these previous studies nevertheless provide insight regarding the stages of adjusting to hearing loss, which might be an indirect (or secondary) indicator of the process of acceptance. In addition, it is clear from the aforementioned studies that becoming aware of and accepting a hearing disability play important roles in further progressing in their journey to manage their condition.

A few studies in the audiology literature have focused on the self-assessment of hearing loss,[8] immediate reactions to the diagnosis of hearing loss,[9-10] actions taken after failing screening tests,[11] attitudes toward hearing loss and the use of hearing aids,[12-13] and the ways in which PHI cope with their condition.[14-16] These studies provide further insights into the initial onset of the condition and how PHI manage their condition. A recent literature review suggested

that the acceptance of hearing loss prior to hearing aid fitting positively influences both hearing aid acquisition and subsequent hearing aid use.[17] However, numerous PHI who are aware that they have a problem but continue not to seeking help, use intervention strategies, or both remain. The literature can be confusing because the term "acceptance" is used synonymously with treatment/management option adherence, rather than studying this term using validated scales that capture different dimensions of this construct.

In psychological terms, acceptance is *a process of actively taking in thoughts, memories, feelings, and bodily sensations in a specific situation without having to follow or change them*.[18] Acceptance can have various dimensions including self- and social acceptance that require both emotional and behavioural adaptations. For instance, the different views of what acceptance actually involves is evident from examining studies of education and academic success, where the term *peer acceptance* refers to a pupil who is judged to be a desirable interaction partner.[19] Disability studies have proposed that acceptance is the key component to adjusting to a disabling condition.[20] Although the acceptance of chronic conditions has often been studied from the perspectives of grief and loss, studying the acceptance of chronic conditions with regard to the perspectives of those living with it, with a focus on adaptation to and accepting change in one's life, is also important.[21]

Experiential avoidance is similar to the concept of avoidance coping and can be defined as the opposite reaction to acceptance; that is, a person attempts to ignore and minimise the problems caused by hearing impairment.[22] However, some researchers have argued that coping and experiential avoidance are unique but overlapping constructs.[23] For example, although acceptance (i.e., experiential avoidance) loaded on to the same factors as emotion-focused and avoidant coping in a recent study of anxiety disorders, acceptance explained

additional variance when predicting psychological distress and well-being.[23] With regard to hearing impairment, both acceptance and experiential avoidance can be interpreted in light of stigma theory,[24] which has previously been applied in hearing impairment research.[25-26]

Acceptance, in relation to hearing disability, has not been well defined; often this term is used to refer to help-seeking behaviour and intervention (e.g., hearing aids) adoption. In effect, differences exist in terms of the psychological and audiological ways of defining acceptance with regard to hearing disability. However, various scales examine the acceptance of other disabilities and chronic conditions.[20-21, 27-30] Past audiology studies have focused on coping; however, coping is generally measured indirectly via questions related to communication problems[22] [e.g., the Communication Strategies Subscale (CSS) in the Communication Profile for the Hearing Impaired (CPHI) questionnaire].[31] The CPHI-CSS focuses on maladaptive behaviours as well as verbal strategies and non-verbal strategies, and it provides insight concerning poor adjustment to hearing impairment and poor social support.[32] To our knowledge, however, no published and validated scale examines the acceptance of hearing disability.

The current study developed a self-report measure of hearing disability acceptance and investigated its construct and concurrent validities. We focused on the psychological aspects of acceptance in this study (i.e., experiential avoidance, which is the opposite of acceptance).

Method

Study Design and Participants

The current study used cross-sectional data obtained during a clinical trial (i.e., pre-intervention data) of a pre-fitting counselling program.[33-34] Ethical approval was received

from the Research Ethics Committee, College of Human and Health Sciences, Swansea University. A study advertisement was offered in the UK through various sources including national newspapers, hearing loss charity websites (i.e., Action on Hearing ~~Loss~~ and Hearing Link), and local GP practice notice boards, inviting those who were experiencing hearing difficulties but not using hearing aids to those who had access to the Internet to participate in this study. Interested participants were encouraged to access the study website using the URL supplied. A total of 90 participants completed the informed consent form, provided demographic information, and completed four online questionnaires. These questionnaires included the Hearing Disability Acceptance Questionnaire (HDAQ), the Hearing Handicap Questionnaire (HHQ), the Hospital Anxiety and Depression Scale (HADS), and the University of Rhode Island Change Assessment (URICA) Scale.

Development of the HDAQ

The HDAQ was developed based on the Tinnitus Acceptance Questionnaire (TAQ), which was developed in Sweden to study tinnitus acceptance.[30] The TAQ was based on the Acceptance and Action Questionnaire (AAQ),[35] and the Chronic Pain Acceptance Questionnaire-Revised (CPAQ-R);[28] some additional questions were included. The 12-item TAQ has two factors (*activity engagement* and *tinnitus suppression*), and it has sufficient internal consistency (Cronbach's α=0.89).[30] Like the TAQ, the HDAQ is a measure of experiential avoidance/acceptance. Its 12 items were taken from the TAQ, and the word "tinnitus" was replaced with "hearing problem". However, the 12 items were further reduced to 7 items (see the results section). Each item was rated on a 7-point Likert scale (1=never true, 7=always true). Total scores ranged from 7 to 49; higher scores indicate greater acceptance of hearing disability (see Appendix 1).

Other Questionnaires

The HHQ measures personal and social effects (i.e., emotional distress and discomfort, social withdrawal, and general participation restrictions).[36] The 12 questions of the HHQ are scored on a 5-point Likert scale (1=never, 5=almost always). Total scores range from 12 to 60, and higher scores indicate greater disability. The HHQ has acceptable internal consistency, with Cronbach's α of 0.95 and 0.93 for the emotional and social scales, respectively.

The HADS was used to screen for symptoms of anxiety and depression. The HADS consists of 14 items, divided into two subscales: anxiety and depression.[37] Each item is scored from 0 to 3 (0=not at all, 3=most of the time) with a total score ranging from 0 to 42; higher scores indicate more self-reported anxiety and depressive symptoms. The HADS has acceptable reliability (r=.84) and internal consistency (α=.83),[38] including Internet administration.[39] In addition, the HADS also has acceptable sensitivity and specificity (AUC=0.80) as indicated in the receiver operator characteristic (ROC) curves.

The URICA measures of stages of change across four subscales: pre-contemplation, contemplation, action, and maintenance.[40-41] The original URICA scale consists of 32 items; however, the current study used a modified version (*the problem* was replaced with *the hearing problem*) consisting of a 24-item scale.[42] Each item was rated on a 5-point Likert scale (1=strong disagreement, 5=strong agreement), and each subscale measured specific aspects. Most study participants were in the early help-seeking stages and had not received interventions for their hearing disabilities; therefore, the eight URICA items regarding maintenance were excluded because they were considered irrelevant for the sample. The total scores of each subscale ranged from 8 to 40. The subscale scores concerning the

contemplation and action stages were added, from which the pre-contemplation stage scores were subtracted to obtain a readiness-to-change composite score (i.e., contemplation + action – pre-contemplation). A recent study used this modified scale to investigate the use of the URICA scale among adults with acquired hearing impairments seeking help for the first time. This scale showed acceptable construct, concurrent, and predictive validities.[42]

Data Analyses

All data analyses were performed using IBM SPSS Version 19 for Windows. Descriptive statistics were applied to examine demographic factors, and the assumption of normality (i.e., Shapiro-Wilk test values of 0.05) was tested before conducting a principal components analysis (PCA). A PCA was performed to reduce the correlated variables to a smaller set of important composite variables and examine the factor structure.[43] Cronbach's αs was calculated to assess the internal consistency of the HDAQ.[44] Pearson's correlations were performed to examine the association among the following factors: hearing disability acceptance, self-reported hearing disability, self-reported anxiety and depression, and readiness to change.

Results

The data was normally distributed. Table 1 displays the sample characteristics. The average age of participants and the average duration of hearing disability were 63.41 and 11.67 years, respectively. The number of males and females in the sample was equal. In addition, nearly two-thirds of participants had consulted healthcare professionals specialised in hearing (e.g., audiologists, hearing aid dispensers, or ENT specialists) at least once.

[Insert Table 1 near here]

HDAQ factor structure

A PCA with Varimax rotation was performed to examine the factor structure. Eigenvalues were set at 1.0, and the limit for factor loadings was set at .40.[43] The relevant items were reverse scored before analysis. The initial number of factors of interest was determined using Kaiser's rule of eigenvalues greater than 1.0.[45] Subsequently, a scree plot was examined to determine the number of factors to extract.[46]

In the first instance, the PCA resulted in a three-factor model for the 12 items. However, cross loadings were noted for some items (i.e., items that loaded at .40 or above on two or more factors). A PCA was also performed using Direct Oblimin rotation to determine whether these cross loadings were due to the high correlations among items. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy was 0.86 with a reference value of 0 to 1.0, and Bartlett's Test of Sphericity was significant [$\chi^2(66)=370.89$, $p<.001$]. The three factors explained 72.90% of the variance in the 12-item HDAQ. Factor 1 accounted for 49.65% of the variance (with an eigenvalue of 3.40); Factor 2 accounted for 13.95% of the variance (with an eigenvalue of 3.32); and Factor 3 accounted for 9.30% of the variance (with an eigenvalue of 2.01). The Cronbach's αs were 0.54, 0.50, 0.72, and 0.79 for Factors 1, 2, 3, and the overall 12 items, respectively. The internal consistency of the overall scale was acceptable, although it was not high for Factors 1 and 2.

In the next stage, all items that resulted in cross loadings were removed from the analysis; thus, five items were removed from the original 12-item scale (see Appendix 2 for the removed items). Item reduction (i.e., minimising the set of variables while still accounting for most of the variance) is one of the key goals of PCA. Moreover, removing the items with

complex psychometric properties (i.e., cross loadings) can improve the construct validity of self-report measures.[47] Subsequently, the seven-item HDAQ resulted in a two-factor model with no cross loading or outliers (see Table 2). The KMO measure of sampling adequacy was 0.82, and Bartlett's Test of Sphericity was significant [$\chi^2(21)=363.93$, $p<.001$]. These factors explained 75.69% of the variance in the HDAQ. Factor 1 accounted for 42.94% of the variance (with an eigenvalue of 3.00), and Factor 2 accounted for 32.75% (with an eigenvalue of 2.29). The factors were identified as: (1) *activity engagement* (i.e., the pursuit of life activities regardless of hearing disability) and (2) *avoidance and suppression* (i.e., attempts to avoid difficult listening situations as well as those to control and suppress the thoughts and feeling related to hearing disability). A low *avoidance and suppression* score indicates more avoidance and suppression because the items are reverse scored. Cronbach's αs were 0.90, 0.82, and 0.86 for Factors 1, 2, and the overall HDAQ, showing acceptable internal consistency.[44] The correlation between the factors was $r(90)=0.51$, $p<0.001$, which suggests that the two subscales were distinguishable but related.

[Insert Table 2 near here]

Furthermore, we performed a PCA on the split sample to test for generalisability (i.e., split-sample validation). The sample of 90 was randomly divided into two groups of 45. The PCA for the first split sample of 45 on 12 items resulted in a three-factor model with cross loadings. However, the PCA with 7 items (after the removal of the items with cross loadings) resulted in a two-factor structure that explained 76.41% of the variance without cross loadings. A PCA was also performed on the second split sample of 45 that also resulted in a two-factor structure that explained 75.93% of the variance without cross loadings. The results from both the split samples and the total sample were in close agreement (see Table 3), strongly supporting the two-factor model.

[Insert Table 3 near here]

Correlations Between the HDAQ and Other Scales

Table 4 shows the Pearson's correlation coefficients between the HDAQ and other scales. The two HDAQ subscales were moderately associated with each other and strongly associated with the full scale. The results revealed the following significant correlations: a moderately strong negative correlation between acceptance and hearing disability; a moderately negative correlation between acceptance and symptoms of anxiety and depression; and a weak negative correlation between acceptance and readiness to change. These results suggest that those people higher hearing disability acceptance had less self-reported hearing disability, fewer self-reported symptoms of anxiety and depression, and lower readiness to change. In addition, a weak positive correlation was found between self-reported hearing disability and self-reported symptoms of anxiety and depression, which indicates that people with higher self-reported hearing disability are likely to have higher self-reported symptoms of anxiety and depression. Although differences were observed, the relationships between the individual subscales and other factors (i.e., hearing disability, symptoms of anxiety and depression, and readiness to change) did not differ much compared with the full HDAQ scale.

[Insert Table 4 near here]

Discussion

Recent research has indicated the utility of psychological acceptance with regard to reducing the impact of chronic health conditions.[29, 48-50] The current paper is the first known attempt to extend this concept to hearing disabilities. After the necessary psychometrical modifications, a two-factor structure emerged for the HDAQ that was in line with the TAQ[30] and similar

self-report measures related to acceptance.[51] Its internal consistency was equal to that of the most commonly used general acceptance scale, the AAQ-I.[52] However, research on an updated version of this scale rejected a two-factor structure with regard to measuring acceptance; rather, it suggested a unidimensional structure for the AAQ-II.[53] Our study did not reveal a single-factor structure for the HDAQ. The first factor, *activity engagement*, was assumed to reflect whether participants maintain a desired level of activity despite facing obstacles. For example, a low level of activity engagement might be observed in a person who stops dining with his or her friends at restaurants because they fear they might not be able to follow the conversation. The other factor, *avoidance and suppression*, is the unwillingness to experience events due to their related emotional distress. This concept is the opposite of acceptance.[54]

The HDAQ items were taken from the scale used to study acceptance in people with tinnitus, which, in turn, was based on the AAQ and CPAQ-R. Although differences most likely exist with regard to how people cope with tinnitus and hearing disability, similarities are found in terms of how people cope with general chronic conditions. Acceptance is likely a key component of adjusting to a disabling condition.[20] Thus, the study of acceptance in various chronic conditions including hearing disability using the general framework applied in 'contextual psychology' is valuable to both researchers and clinicians.

The study results indicate that less acceptance was associated with increased emotional distress. The relationship between the HDAQ and the HADS is interesting when compared with similar studies that have indicated the pivotal role of acceptance with regard to suffering. For instance, McCracken[55] found that acceptance was a stronger predictor of psychosocial disability among patients with chronic pain than the degree of pain they

experienced. Numerous other studies have also found that greater acceptance is related to psychological well-being (for a summary, see the review by Ruiz[56]). In the present study, greater acceptance was correlated with a more modest rating of hearing problems; therefore, it might be analogous to the aforementioned findings regarding pain. Moreover, a recent systematic review showed that self-reported hearing disability is a robust predictor of hearing help-seeking, hearing aid acquisition, hearing aid use, and satisfaction with hearing rehabilitation,[17] which suggests that self-reported hearing disability is an important factor in the processes of accepting hearing loss and seeking appropriate interventions. Furthermore, symptoms of depression and anxiety were elevated among those who scored higher on the HHQ, which illustrates the far-reaching consequences that hearing loss might have. The relationship between the HDAQ and readiness to change was negative and significant, which implies that those who were more accepting of their current status were less prone to seek a change in their current situation. The association between the HDAQ subscales and other factors did not differ much. This finding might be because both subscales were found to have strong associations with the full scale and moderate associations with each other.

Interestingly, although participants did not use hearing aids, two-thirds of the sample had consulted hearing specialists on at least one occasion. The reasons for these consultations are likely to include: (1) acceptance of their condition (i.e., hearing disability); (2) a dilemma regarding whether they had the condition and a desire to confirm this supposition with clinicians; or (3) urging from their social partners. Although the reasons for not accepting intervention (e.g., hearing aids) are not clear, they might be related to the perceived seriousness of their hearing problems. Previous research suggests that a linear relationship does not exist between hearing disability and its effects on activities and participation,[8 57] which might help explain why not all people with hearing disabilities seek interventions.

Thus, studying hearing disability acceptance in psychological terms is important. Importantly, becoming suspicious or aware of a hearing disability does not mean that PHI perceive their difficulties as significant enough to affect their communication and quality of life. This gap between awareness and action is something that clinicians must be aware of when they plan and recommend interventions, especially for patients coming to the hearing clinic for the first time. In addition, much work is needed to understand how hearing disability acceptance either facilitates or hinders the journey through this condition.

Study Limitations

Although the current study focused on an important area of limited research, it nevertheless has certain limitations. Acceptance with regard to hearing disability is not well defined, and this scale might only focus on certain components of acceptance (i.e., psychological acceptance). This limitation might partially explain why people with greater acceptance show less readiness to change. However, this component is important to understand because it might explain why many people who are aware of their hearing disability continue to refrain from seeking professional help and appropriate interventions. Due to the online recruitment method, the sample might not represent the general population, and caution must be used in generalising the results.[58-59] Moreover, the relatively small sample size was surprising, given that the advertisement was published in a national newspaper. The smaller sample size might also be a limitation of this study. Validating this scale with a larger population is necessary, although the split-sample validation strongly supported the two-factor model. The online format of the questionnaire might differ from a pen-and-paper format, although web-based questionnaires have been found to be reliable and valid.[60-61] The study results are only relevant with regard to participants who experience hearing difficulties rather than typical participants in clinical situations, although there might be some overlap because nearly two-

thirds of the current sample had previously consulted hearing specialists. Although indirect coping measures exist, no well-established acceptance scale examines the concurrent validity of the HDAQ using acceptance. Studying the associations between *acceptance* and other factors such as *cognitive functions*, *personality*, *quality of life*, and *psychological well-being* would have been interesting and useful; however, these factors were not included in the current study. Furthermore, the predictive validity of the scale must be explored.

Conclusions

In summary, our results suggest that additional exploration of the potential role that acceptance plays in the process of adjusting to hearing problems would be a fruitful endeavour, particularly with regard to understanding the role that acceptance plays in the journey of PHI. However, much work remains to be done. Specifically, a coherent theoretical framework is needed to account for what role, if any, acceptance plays with regard to adjusting to hearing problems. One cannot take for granted the fact that the successful management of other conditions, which all entails painful experiences (e.g., tinnitus, chronic pain, and anxiety), are relevant to hearing disability, which instead is characterised by the loss of (auditory) experiences. In addition, future research must examine the longitudinal stability of acceptance and its relevance to objective measures of hearing disability as well as the utility of the current structure of the HDAQ and whether it can successfully alleviate the suffering usually associated with hearing disability.

Acknowledgements

We thank Alexander Alasjö for his help with applying the online questionnaires and Ariane Laplante-Lévesque for providing us with the revised version of the URICA scale used in this

study. This study was a part of the doctoral study of the first author, and portions of this manuscript were presented as a doctoral thesis.

Contributors

VM contributed to most of the work including data collection, analysis, and writing; PM contributed to the writing; JR contributed to study design and writing; GA contributed to study design and writing; and TL contributed to study design and writing.

Funding

Grants from the Swedish Council for Working Life and Social Research 2009-0055 as well as the Swedish Research Council 2007-8654 partially funded this research.

Ethical Approval

Ethical approval was received from the Research Ethics Committee, College of Human and Health Sciences, Swansea University.

Data Sharing

No additional data are available.

Conflict of interests

None.

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Tables

Table 1. Participants demographics

Age in years (M±SD)	63.41±10.49
Gender (% male)	50
Duration of hearing difficulties in years (M±SD)	11.67±10.83
Consulted a healthcare professional specialising in hearing regarding hearing difficulties (%)	
▪ Yes	65.6
▪ No	34.4
Education (%)	
▪ Compulsory education	13.3
▪ Secondary education	48.9
▪ Tertiary education	37.8
Self-reported hearing disability acceptance (HDAQ; M±SD)	36.88±7.85
▪ Activity engagement	22.72±4.36
▪ Avoidance and suppression	14.16±4.65
Self-reported hearing disability (HHQ; M±SD)	34.96±9.95
▪ Emotional	20.61±5.75
▪ Social	14.32±4.85
Self-reported anxiety and depression (HADS; M±SD)	14.77±7.50
▪ Anxiety	7.04±4.43
▪ Depression	7.70±3.81
Stages of change (URICA)	
Readiness-to-change composite (M±SD)	39.41±8.63

Table 2. HDAQ principle components analysis (n=90)

Scale: 7-item HDAQ	Factor 1: Activity engagement	Factor 2: Avoidance and suppression
1. I am leading a full life, even though I have a hearing problem	0.854	
2. My life is going well, even though I have a hearing problem	0.891	
3. Despite hearing problem, I can draw up and stick to a certain course in my life	0.857	
4. When my hearing problem increases, I can still take care of my responsibilities	0.763	
5. My hearing problem leads me to avoid certain situations		0.885
6. My hearing problem changes me as a person		0.862
7. I spend a lot of time thinking about how things would be for me without a hearing problem		0.734
Cronbach's α	0.90	0.82
Percentage of variance	42.94	32.75
Eigenvalue	3.0	2.29

Table 3. Split-sample validation for the seven-item HDAQ

	Full sample (n=90)	Split sample 1 (n=45)	Split sample 2 (n=45)
Percentage of variance explained			
▪ Factor 1: Activity engagement	42.94	43.48	44.13
▪ Factor 2: Avoidance and suppression	32.75	32.93	31.80
▪ Combined	75.69	76.41	75.93
Eigenvalue			
▪ Factor 1: Activity engagement	3.0	3.0	3.0
▪ Factor 2: Avoidance and suppression	2.29	2.3	2.2
Cronbach's α			
▪ Factor 1: Activity engagement	0.90	0.83	0.82
▪ Factor 2: Avoidance and suppression	0.82	0.89	0.90
▪ Combined	0.86	0.88	0.86

Table 4. Correlations between different scales (* = p<0.01)

	HDAQ	HDAQ - 1	HDAQ - 2	HHQ	HADS	URICA-R
Self-reported hearing disability acceptance (HDAQ)	1.00					
HDAQ Factor 1: Activity engagement	0.86*	1.00				
HDAQ Factor 2: Avoidance and suppression	0.88*	0.51*	1.00			
Self-reported hearing disability (HHQ)	-0.70*	-0.50*	-0.71*	1.00		
Self-reported anxiety and depression (HADS)	-0.58*	-0.62*	-0.39*	0.36*	1.00	
Readiness to change (URICA-R)	-0.27*	-0.26*	-0.29*	0.20	0.18	1.00

Appendices

Appendix 1. Hearing Disability Acceptance Questionnaire (HDAQ)

Directions

You will find numerous statements below. Please rate the truth of each statement as it applies to you. Use the following rating scale to make your choices:

1	2	3	4	5	6	7
Never true	Very rarely true	Seldom true	Sometimes true	Often true	Almost always true	Always true

For instance, if you believe that a statement is "Often true", then you should circle "5" on the row following the statement.

Items

1. I am leading a full life, even though I have a hearing problem
2. My life is going well, even though I have a hearing problem
3. Despite hearing problem, I can draw up and stick to a certain course in my life
4. When my hearing problem increases, I can still take care of my responsibilities
5. My hearing problem leads me to avoid certain situations
6. My hearing problem changes me as a person
7. I spend a lot of time thinking about how things would be for me without a hearing problem

Scoring

Reverse score items 5, 6, and 7.

Appendix 2. Removed items

- My hearing problem has led me to decrease my engagement in former activities
- It is necessary for me to control my negative thoughts and feelings concerning my hearing problem
- I will be in better control of my life if I can control my negative thoughts about my hearing problem
- I have to struggle to get things done when I have a hearing problem
- I strive to suppress aversive thoughts and feelings related to my hearing problem

STROBE 2007 (v4) Statement—Checklist of items that should be included in reports of *cross-sectional studies*

Section/Topic	Item #	Recommendation	Reported on page #
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2 & 3
Introduction			
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4 – 6
Objectives	3	State specific objectives, including any prespecified hypotheses	6
Methods			
Study design	4	Present key elements of study design early in the paper	7
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	7
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	7
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	7 – 9
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	7 - 9
Bias	9	Describe any efforts to address potential sources of bias	7, 15 & 16
Study size	10	Explain how the study size was arrived at	7
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	9
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	9
		(*b*) Describe any methods used to examine subgroups and interactions	9
		(*c*) Explain how missing data were addressed	NA
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	9
		(*e*) Describe any sensitivity analyses	9
Results			

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	9
		(b) Give reasons for non-participation at each stage	NA
		(c) Consider use of a flow diagram	NA
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	9 & 24
		(b) Indicate number of participants with missing data for each variable of interest	NA
Outcome data	15*	Report numbers of outcome events or summary measures	9 - 12
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9 - 12
		(*b*) Report category boundaries when continuous variables were categorized	9 - 12
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	9 - 12
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9 - 12
Discussion			
Key results	18	Summarise key results with reference to study objectives	12 - 15
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	15 & 16
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	15 & 16
Generalisability	21	Discuss the generalisability (external validity) of the study results	15 & 16
Other information			
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	17

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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