

# **Hearing and Functioning in Everyday Life Questionnaire (HFELQ): Development and Validation of an ICF-based Instrument**

Elin Karlsson<sup>1 2 3</sup>, Elina Mäki-Torkko<sup>1 4</sup>, Sarah Granberg<sup>1 2</sup>, Stephen Widén<sup>1 2</sup>, Vinaya  
Manchaiah<sup>5 6 7 8 9</sup>, Vinay<sup>10</sup>, M. Kathleen Pichora-Fuller<sup>11</sup>, Melissa Selb<sup>12</sup>, De Wet Swanepoel<sup>7</sup>  
<sup>8</sup>, Krishna Yerraguntla<sup>9</sup>, Johanna Gustafsson<sup>1 2</sup>

<sup>1</sup> Audiological Research Centre, Faculty of Medicine and Health, Örebro University, Örebro Sweden

<sup>2</sup> School of Health sciences, Faculty of Medicine and Health, Örebro University, Örebro Sweden

<sup>3</sup> Swedish Institute of Disability Research (SIDR), Örebro University, Örebro Sweden

<sup>4</sup> School of Medical Sciences, Faculty of Medicine and Health, Örebro University, Örebro Sweden

<sup>5</sup> Department of Otolaryngology-Head and Neck Surgery, University of Colorado School of Medicine,  
Aurora, Colorado, USA

<sup>6</sup> UCHealth Hearing and Balance, University of Colorado Hospital, Aurora, Colorado, USA

<sup>7</sup> Virtual Hearing Lab, Collaborative initiative between University of Colorado School of Medicine  
and University of Pretoria, Aurora, Colorado, USA

<sup>8</sup> Department of Speech-Language Pathology and Audiology, University of Pretoria, South Africa

<sup>9</sup> Department of Speech and Hearing, Manipal College of Health Professions, Manipal Academy of  
Higher Education, Manipal, India

<sup>10</sup> Audiology Group, Institute of Neuromedicine and Movement Sciences, Norwegian University of  
Science and Technology, Trondheim, Norway

<sup>11</sup> Department of Psychology, University of Toronto, Mississauga, Ontario, Canada

<sup>12</sup> ICF Research Branch and Swiss Paraplegic Research, Nottwil, Switzerland

Corresponding author: Elin Karlsson, elin.karlsson@oru.se, Address: Audiological Research Centre, Örebro University Hospital, A-house, floor 10, 70185 Örebro

**Conflict of interest:**

The authors report no conflicts of interest, and there are no external funding sources to report

**Abstract:**

**Objectives:** Self-assessment instruments are commonly used in audiological rehabilitation. However, several studies highlight the lack of multidimensionality in existing outcome measures, with the consequence that they only partially capture aspects of functioning in everyday life for people living with hearing loss. This study aimed to develop and investigate the content validity of a self-assessment instrument based on the validated Brief International Classification of Functioning, Disability, and Health (ICF) Core Set for Hearing Loss.

**Design:** The design was a two-part instrument development study. The first part focused on the item-generation process of the instrument, named the Hearing and Functioning in Everyday Life Questionnaire (HFEQ) during an experts' workshop. The second part focused on international content validation of the instrument using group interviews. Strategic sampling was used and 30 adults with hearing loss from India, South Africa, and the United States participated in the group interviews.

**Results:** The expert's workshop resulted in the first version of the HFEQ containing 30 items. The results from group interviews show that the content of the HFEQ was considered to be valid concerning its relevance, comprehensiveness and comprehensibility. A majority (73%) of the HFEQ items were perceived by the participants as relevant and easy to comprehend. For the remaining 27% of the items, the content was perceived to be relevant in all countries, but some terms and expressions were reported to require rewording or clearer examples.

These modifications will be made in the next step of the development process.

**Conclusion:** Content validation of the HFEQ demonstrates promising results, with participants perceiving the content as relevant and comprehensible. Further psychometric validation is required to investigate other psychometric properties, such as construct validity and reliability. The HFEQ has the potential to become a valuable new instrument for assessing everyday functioning in people with hearing loss in audiological rehabilitation and in research.

**Keywords:** Audiological rehabilitation, Content validity, Cross-cultural validation, Cross-national, Hearing loss, International Classification of Functioning Disability and Health, Outcome measures, Survey instruments, Validation.

## **List of Abbreviations**

### **Audiological Rehabilitation (AR)**

#### *Consensus-based Standards for the Selection of Health Measurement Instruments*

#### *(COSMIN)*

Convention on the Rights of Persons with Disabilities (CRPD)

Decibel, Hearing Level (dB HL)

European Expert Group (HEAR)

Hearing and Functioning in Everyday Life Questionnaire (HFEQ)

International Classification of Functioning Disability and Health (ICF)

Patient Report Outcome Measures (PROMS)

United Nations (UN)

World Health Organization (WHO)

## **Introduction**

The functioning of an individual with a health condition is a complex concept that reflects the interactions between bodily functions, body structures, the execution of daily activities, participation in society and other major life areas, and the environment in an individual's everyday life. This concept was introduced in the International Classification of Functioning, Disability, and Health (ICF) (World Health Organization [WHO], 2001).

The ICF is a widely accepted framework that is used to describe functioning and disability in relation to health (WHO, 2001) and it is the foundation for the ICF Core Sets for Hearing Loss. The ICF Core Sets for Hearing Loss comprise a selection of ICF categories that are considered relevant for individuals with hearing loss. More specifically, the Comprehensive ICF Core Set for Hearing Loss is a selection ICF categories that are relevant for adults with hearing loss. The Brief ICF Core Set for Hearing Loss is a shorter version of the Comprehensive set (Danermark, 2013; ICF Research Branch, 2013). The ICF Core Sets for Hearing Loss (Comprehensive and Brief) can be used to study functioning in everyday life for people with hearing loss (Granberg, 2015; Karlsson et al., 2021) and have been validated in four studies supporting their content and construct validity (Alfakir, Holmes, & Noreen, 2015; Alfakir et al., 2019; Karlsson et al., 2021; van Leeuwen et al., 2017). The results of these validation studies support the inclusion of all parts of the ICF Core Sets for hearing loss when assessing everyday functioning, consistent with a multi-dimensional approach to audiological rehabilitation (AR) (Alfakir et al., 2015; Karlsson et al., 2021; van Leeuwen et al., 2017). Therefore, the Brief ICF Core Set is considered to be a robust foundation for development of a self-assessment instruments to measure functioning (Karlsson et al., 2021).

Self-assessment instruments are commonly used within AR (Montano, 2007). They can be used to assess individual needs and rehabilitation goals, or as outcome measures to assess the effects of AR. Many different self-report instruments, measuring different

consequences of hearing loss, have been developed and used in AR (Bentler & Kramer, 2000; Granberg et al., 2014a), including patient-reported outcome measures (PROMs) (Barker, MacKenzie, Elliott, & de Lusignan, 2015). However, the existing outcome measures demonstrate a lack of multi-dimensionality, with the consequence that they only partially capture aspects of functioning in everyday life for people living with hearing impairment (e.g., Manchaiah et al, 2019).

There is low consensus regarding which instruments should be used in AR for adults. Furthermore, many of the instruments that have been developed over several decades have not been adequately validated or updated (for reviews see Bentler & Kramer, 2000; Manchaiah et al., 2019; Viergever et al., 2021). The results of these reviews indicate that the psychometric testing of audiological instruments has been largely overlooked.

When developing new instruments, there are recommendations and general guidelines to follow, with the typical sequence of steps starting with item generation followed by testing of the psychometric properties of the instrument (Fayers & Machin, 2007). However, according to the COSMIN taxonomy (the Consensus-based Standards for the selection of health Measurement Instruments), content validation is one of the most important steps and should be performed early in the process of instrument development because it establishes whether a questionnaire measures what it aims to measure (Mokkink et al., 2018). According to COSMIN, content validity can be divided into (1) relevance, (2) comprehensiveness (meaning that no key aspects are missing) and (3), comprehensibility (Terwee et al., 2018).

Despite an abundance of research implicating the importance of a multi-dimensional approach and a need to include aspects of everyday life in AR assessment (Alfakir et al., 2015; Humes, 2021; Karlsson et al., 2021; Montano, 2014; Stephens et al. 2001; van Leeuwen et al., 2017), only two instruments have embraced the bio-psycho-social perspective of the

ICF in measuring functioning (van Leeuwen et al., 2020; Alfakir & Holmes, 2017). The two instruments are an e-tool (developed by van Leeuwen et al., 2020) and an instrument developed and validated for a group of older adults with hearing loss (Alfakir & Holmes, 2017). However, there are no self-assessment instruments that measure everyday functioning multidimensionally for adults with hearing loss that can be used as a foundation in the initial part of AR and/or as an outcome measure to evaluate the AR.

The overall aim of the current study was to develop a self-assessment instrument with the purpose to assess the everyday functioning of adults with hearing loss for use in clinical AR settings as well as in research. The first aim of the current study was to develop a new (internationally applicable) AR self-assessment instrument, called the Hearing and Functioning in Everyday Life Questionnaire (HFEQ), based on, and operationalized from the validated Brief ICF Core Set for Hearing Loss and the validation by Karlsson et al. (2021). The second specific aim was to investigate the content validity of the new instrument, from the perspective of adults with hearing loss.

## **Materials and Method**

The overall development process involved an international collaboration and was based on the three steps; (a) preparation, (b) experts' workshop including item generation for the HFEQ and (c) pilot testing for content validation from the perspective of adults with hearing loss.

### **Preparation**

The preparation for the study entailed an overview of the relevant literature and the identification of issues that are important for everyday functioning from the perspective of various stakeholders, including adults with hearing loss, professionals, and researchers (Alfakir et al., 2015; Danermark et al., 2013; Granberg et al., 2014a-d; Granberg et al., 2015; van Leeuwen et al., 2017). Importantly, the results of the international validation of the Brief

ICF Core Set for Hearing Loss served as a foundation for the current study (Karlsson et al., 2021).

### **Experts' Workshop - Item Generation**

#### ***Design***

Eleven international experts in the field of audiology and/or in the ICF took part in a three-day workshop in September 2019 in Örebro, Sweden. The experts (the authors) represented the following seven countries: Canada, India, Norway, South Africa, Sweden, Switzerland, and the United States.

The aims of the workshop were: (a) to discuss how to design the new questionnaire based on the Brief ICF Core Set for Hearing Loss, (b) to decide which aspects of each ICF category should be included, (c) to develop items (in English).

#### ***Procedures***

The workshop followed the method of item generation described by Nassar-McMillan (2022) and was facilitated by a moderator (SG), assisted by two note takers (EK and JG), and all discussions were audio-recorded.

The session started with the moderator presenting the 27 categories of the Brief ICF Core Set for Hearing Loss and overviews of the previous studies conducted on the Core Sets (step 1). Altogether, the information about the development and validation of the Brief ICF Core Set for Hearing Loss provided deeper knowledge and a more comprehensive understanding of the ICF categories for the experts participating in the workshop. Based on this background, the group of experts then decided which ICF categories should be included in the HFEQ and what the content of the target items should cover.

Next, the experts were divided into two subgroups with similar representations of areas of expertise (ICF and/or audiology) and familiarity with the English language. The

groups were tasked with generating specific questionnaire items for the target content. After the items had been generated, instructions for respondents and the rating scale were developed. Following the rating system proposed in the ICF (ICF, 2001), a five-scale rating was chosen to distinguish between different levels of everyday functioning. Additionally, there was a rating option, *not applicable*. Finally, all generated items were discussed by all experts to arrive at a consensus on the first version of the HFEQ (see Supplemental Appendix 1). In all steps of the workshop, consensus concerning the items, response-options, and the instructions for respondents was achieved through discussions involving all experts.

### **Content Validation of the HFEQ**

The aim of the content validation (Step 3) was to explore whether the content of the HFEQ was relevant, comprehensive and comprehensible for English-speaking adults living with hearing loss in different countries. Following the methodology suggested by Drennan (2002), the content validation involved group interviews where the moderators used verbal protocols to understand how respondents perceived and interpreted the HFEQ.

Ethical approval was obtained in Canada in January 2020 (38598, data collection was planned for March 2020 but was cancelled due to the COVID-19 pandemic), India in January 2020 (57/2020; CRTI 2020/03/032441; HMSC 2020-9322), South Africa in January 2020 (HUM048/1119), and the United States in November 2019 (IRB-FY20-78).

### ***Study Sample***

The group interviews were coordinated from Sweden. Data were collected from English-speaking participants in India, South Africa, and the United States. Although English is an official language in all of these countries, it was expected that there could be variation in participants' dialects and their use of English as a native/dominant or second/non-dominant language. Purposive sampling was used and a researcher in each country contacted patients



from hearing health clinics. The inclusion criteria were adults ( $\geq 18$  years of age) with mild to profound hearing loss defined according to the European Expert Group HEAR (HEAR, 1996) who were able to take part in a group interview in English. Degree of hearing loss was determined based on the results of pure-tone audiograms recorded within the last year in existing patient files. The average of the pure-tone thresholds (PTA) at 500, 1000, 2000, and 4000 Hz in the better ear was calculated for each participant. In order to include as many perspectives as possible, the participants were heterogeneous in terms of age, gender, degree of hearing loss, and educational level. In total, 30 individuals (7 groups) participated with 3–6 individuals in each group. Participants' demographic data are presented in Table 1.

**Table 1.** Demographic information for the participants (n=30)

<b>Variable</b>	<b>Participants n (%)</b>
<b><i>Country</i></b>	
India	17 (56.7)
South Africa	3 (10.0)
The US	10 (33.3)
<b><i>Gender</i></b>	
Women	6 (20)
<b><i>Age (years)</i></b>	mean 63.6, SD 18.4; range 23–87
<b><i>Degree of hearing loss*</i></b>	
Mild (25 – 40 dB HL)	10 (33.3)
Moderate (41–70 dB HL)	14 (46.7)
Severe/profound ( $\geq 71$ dB HL)	6 (20)
<b><i>Hearing aid users</i></b>	24 (80)
<b><i>Education</i></b>	
High school	5 (16.7)
University	25 (83.3)
<b><i>Employed</i></b>	24 (80)

\* Based on the average of the pure-tone thresholds at 0.5, 1, 2, and 4 kHz in the ear with better hearing (HEAR, 1996).

### *Procedures*

The objective of the group interviews was to discuss the content of the items of the HFEQ with adults who live with hearing loss. The interviews were conducted in groups to stimulate discussions about the items among participants. A researcher in each country moderated the group interviews. All sessions were audio-recorded and documented by a note taker. Six interviews were held face-to face and one (in the United States) was conducted online because of the COVID-19 pandemic. The interviews started with information about the session and a review of the informed consent (which had been signed prior to the group session), including confirmation that the session would be audio-recorded. Next, participants completed the HFEQ in pen-paper format with the interviewer present. The participants were informed that the HFEQ was being developed for use in clinical and research settings. After completing the HFEQ, the participants were asked questions on the relevance, comprehensiveness and comprehensibility of the introduction and instruction part of the HFEQ. To explore the relevance and comprehensibility of the items in the HFEQ, the participants were then asked to comment on each item in the questionnaire and the response options. They were asked if they found each item and its wording, and the response options to be unclear or confusing. The participants were also asked to discuss what each item meant, and how they interpreted the content of each item, to ensure that the items were being read as intended.

To facilitate the hearing situation in the groups, the number of participants in each group was limited to a maximum of six. Quiet environments were chosen, and assistive listening technology was available as needed. The moderator was careful to repeat items or parts of the discussion to support understanding among all participants.

**Table 2.** Interview guide

<b>Topic</b>	
<b>Part 1</b>	
1	Introduction
2	Rating scale / response options
<b>Part 2</b> (For each item)	
3	What do you think about the content of the question?
4	How relevant is the question for you?
5	How understandable is the question?
<b>Part 3</b>	
6	How do you experience the time it took to fill out the questionnaire?
7	Is there anything you would like to add?

### **Data Analysis**

The group interviews were analyzed with a qualitative content analysis using the methodology recommended by Knafl et al. (2007). All interviews were transcribed verbatim. Each group interview was considered one case. For each of the cases, meaningful units were identified, condensed, and sorted into predefined categories (i.e., relevance, comprehensiveness, and comprehensibility). Thereafter, an inductive analysis of the content under each category was made to find patterns or contradictions in the participant's experiences, resulting in several sub-categories within each predefined category. The cases were analyzed with cross-case analysis, meaning that the findings were compared between the seven interview groups (Knafl et al., 2007) to find common sub-categories. After the analysis had been conducted, the experts' group discussed the results.

## **Results**

### **Experts' Workshop - Item Generation**

During the workshop, the experts decided which categories would become target content for item generation. Some items consisted of more than one ICF category, and some ICF categories were found in several items (see Supplemental Appendix 1). The ICF categories regarding the component body structures were disregarded. The ICF categories *d920 Recreation and leisure* and *b1301 Motivation* were included based on the results from the validation of the Core Set (Karlsson et al., 2021). Regarding some of the included ICF categories (*b230, d310, d350, b126, d360, e460*), it was decided to develop two items in order to capture relevant aspects of each category. For example, for the category *d350 Conversation*, the expert group decided to distinguish between conversation in quiet and in noisy environments. Moreover, based on the results of the validation of the Brief ICF Core Set for Hearing Loss, an effort was made to develop specific and “easy-to-comprehend” items based on ICF categories that had previously been experienced as hard to understand, in particular the categories *b126 Temperament and personality functions*, *b1301 Motivation*, and *d240 Handling stress and other psychological demands*.

The initial workshop resulted in the first version of the HFEQ. The first version of the HFEQ and the specific ICF categories that served as the foundation for each item are presented in Supplemental Appendix 1. The instrument consisted of an introduction with instructions and 30 items with the same 5-point rating scale used for all items.

### **Content Validation of the HFEQ**

The data collected in the group interviews yielded information on the participants' responses about the content validity of the HFEQ in terms of: (1) relevance, (2)

comprehensiveness and (3), comprehensibility (Terwee et al., 2018).

### ***Relevance***

Overall, the content of the HFEQ was perceived to be relevant by the participants. For 12 of the 30 items (items 2, 6, 7, 9, 11, 16, 17, 21, 25, 26, 27, and 28), there were no comments about irrelevant content. For the remaining 18 items, there were only minor comments such as comments indicating that some items were not applicable to some participants. Regarding three items that concerned the psychosocial issues of goal orientation, outlook on life, and ability to handle stress (items 14, 15, and 18), some participants indicated that the connection to hearing loss was vague or unclear and not relevant in their present form. For example, a participant expressed this matter as *“I wonder what the relevance is to my hearing”* (Item, 15 - Participant from India).

Two items, one concerning noticing soft sounds (item 1) and the other concerning understanding unfamiliar voices (item 8), were described as not being easy to respond to because participants felt that the response to these items would vary depending on the sound environment. A participant described this as *“I would say it would have been clearer if unfamiliar voices was more described that you know unfamiliar in which situations is it on the TV, is it on a speech or in the church or where you... when do you hear the unfamiliar voice”* (Participant from the United States).

As described below, the findings concerning relevance also demonstrated that some items were found to be not applicable by some participants who used the extra rating option or that participants reacted to content validity in terms of culturally specific interpretations.

### *Not applicable*

Out of the 30 items of the HFEQ, only two items were considered to be *not applicable* by some participants. Notably, these two items were considered not to be relevant for a specific participant, but the same participant recognized the items to be relevant for people with hearing loss in general. These two items concerned education and working life (items 22 and 23). Thus, these two items were considered to be relevant to include in the HFEQ, but it was noted that they might not be applicable to those who were not students or workers.

### *Culturally specific interpretations*

For three items of the HFEQ, culturally specific differences were noted in the responses of the participants. In India, most of the participants found the item concerning poor eyesight (item 5) to be irrelevant and making the connection between vision and hearing was considered to be hard. Nevertheless, participants in India with poor eyesight did find the content of this item to be relevant. Concerning accessibility in society (item 29), the participants from India described the content of the item as relevant, while those from South Africa and some from the United States did not consider the item to be relevant. In all countries, the item concerning assistive hearing devices (item 20) was reported to have low content validity. According to the participants in India and South Africa, technical systems, such as loop systems and closed captioning, are not used in public places and therefore the items were not possible to respond to. Nevertheless, most participants in India, South Africa and in the United States understood the meaning of the item, and one suggestion was to add “loop systems for television” as an example to make the content of the item more relevant. The item about participation in community life (item 24) was identified by the participants as not relevant because the term *community* is not used similarly in all countries. At the same time, all participants were familiar with the expression and either understood the term and could relate to it or choose the response option “not applicable”.

### *Comprehensiveness*

The majority of participants found the range of topics covered by the items of the HFEQ to be appropriate, although some found the range to be too broad. Interestingly, the same participants who reported that the HFEQ covered too broad a range of topics also stated that answering the HFEQ questions gave them an opportunity to gain new insights and knowledge about their hearing loss. No participant reported any relevant topic to be missing or that new topics should be added to the HFEQ.

### *Comprehensibility*

#### *Introduction section and the rating scale*

In general, the participants had favorable reports regarding the administration of the HFEQ. The questionnaire was perceived by them to be easy to complete. They did not express any difficulty comprehending the instructions. When the participants discussed the introduction of the HFEQ, there were comments about the recall period of two weeks. The recall period was considered by some participants to be too short a time frame but by others it was considered to be reasonable. The participants also found the completion time to be reasonable, neither too long nor too short. There were no unfavorable comments or suggestions concerning the response options for the rating scale and all participants found it easy to understand and use.

#### *Items*

Regarding 19 of the items of the HFEQ, participants reported the items to be clear, and they did not express any problems comprehending the items. For 11 items, problems in comprehensibility were mentioned, and for some items, the participants suggested clarifications (Table 3). For three items, the examples provided for the item were considered to be unclear and for 8 items some words were reported to be unfamiliar.

**Table 3.** Problems experienced understanding the HFEQ

Item	Question	Problem	Suggestion from the participants
1	To what extent do you have difficulties noticing soft sounds (such as whispering, insects, or birds)?	The examples make one think of <u>hearing</u> , not <u>noticing</u>  Some participants compare the examples and rate the same item differently depending on the example.	Use the word <u>hearing</u> instead.  Add “or” between the examples.
3	To what extent do you have difficulties listening to everyday sounds such as music, traffic sounds, or children playing?	The example “ <u>music</u> ” is hard because it depends on if there are lyrics or not.	Change to <u>instrumental music</u> ?
4	To what extent does ringing or buzzing in your ears cause problems in your everyday life?	The Indian participants find it hard to understand what <u>ringing</u> and <u>buzzing</u> mean.	Add <u>tinnitus</u> within brackets.
10	To what extent do you have difficulties conversing in a group?	The definition of a <u>group</u> is unclear for some participants.	
12	To what extent are you able to maintain concentration in challenging listening situations?	The term “ <u>challenging</u> ” is hard to abstract for some participants in India.	
13	To what extent does noise hinder you in everyday life as a person with hearing problems?	The term “ <u>hinder</u> ” is unclear.	
19	To what extent do you have difficulties communicating using telecommunication technology such as telephone, smartphones or computers?	To ease the rating, some participants want more specific examples.	
23	To what extent do you have difficulties participating in activities at paid work (including full-time or part-time) due to your hearing problems?		Clear but a suggestion from one participant is to change “ <u>participating</u> ” to “ <u>functioning</u> ” in work
24	To what extent do you have difficulties participating in community life (including volunteer work) due to your hearing problems?	The term “community life” is a cultural expression and not used in all countries	
29	To what extent is your community accessible to you as a person with hearing problems?		Suggestion change “ <u>community</u> ” to “ <u>society</u> ”.
30	To what extent do the hearing health services you have received help you in your everyday life?	“ <u>Hearing health services</u> ” is not an obvious expression in India.	



## **Discussion**

This study focused on the development and initial content validation of the ICF-based HFEQ questionnaire. The development part of the study resulted in the 30-item HFEQ. In the validation part of the study, the content of the HFEQ overall was found to be relevant and easy to comprehend by the participants. The findings suggest that the items of the HFEQ are relevant to the everyday functioning of adults with hearing loss. Some minor issues concerning relevance and comprehensibility were reported. These responses, including rewording and specific changes in examples suggested by participants for some items will inform further refinements of the HFEQ in the next phase of its development. Key lessons learned from the current study concern the importance of ensuring that items are robust to differences in the lived experience of people with hearing loss across cultures and changes in hearing healthcare that may occur over time. Differences across place and changes over time include the ongoing evolution of hearing healthcare as it becomes more responsive to psychosocial issues in person-centred care.

### **Psychosocial issues within AR**

Some participants commented that a few items in the HFEQ probed psychosocial topics (i.e., goal orientation, outlook on life, and ability to handle stress) related to hearing loss that they had not thought about previously, and that the connections between these topics and hearing loss were vague or unclear to them. Their prior experiences of AR may have shaped their views about the relevance of these questions to hearing health and may reflect a lack of shift from a medical model to a psycho-social-environmental model in hearing healthcare (Gagné, Jennings & Southall, 2014). Within hearing health care, it has been common to focus on hearing aids as the main treatment, with relatively little attention to psychological or social aspects of adjustment to living with hearing loss (Montano, 2007). Thus, it may not be surprising that all participants did not immediately make the connection between hearing loss

and the HFEQ items concerning personal and psychosocial factors. Nevertheless, previous studies have determined that psychological factors, such as an individual's personality, are important for both help-seeking and rehabilitation outcomes (Bennet et al., 2021a; Manchaiah et al., 2015). Furthermore, mental state and emotions are part of the psychological (mental) functions in the ICF (WHO, 2001) (e.g., b152 Emotional functions), even though they may not be understood as such by the participants given current models of hearing healthcare.

The bio-psycho-social model, the Core Sets for Hearing Loss, and the HFEQ (based on the core set) deliberately broaden the view of hearing loss as a health condition to encompass everyday functioning, including the biological, psychological, and social aspects of health (WHO, 2001). Although audiologists may use different approaches to meet the psychological needs of their patients in AR, they are often not aware of, or familiar with, how to use standardized methods to assess or evaluate these needs (Bennett et al., 2021a; 2021b). In a previous validation study of the Brief ICF Core Set for Hearing Loss, some of the psychological categories (*b126 Temperament and personality functions, b1301 Motivation, and d240 Handling stress and other psychological demands*) were reported to be difficult to assess due to the broad and unspecific nature of the categories (Karlsson et al., 2021). Despite efforts to clarify these topics in the HFEQ, the results of the study indicate that further rephrasing of the items (item 14, 15, 18) is necessary to reduce uncertainty about the connection between personal and psychosocial factors and hearing. As the HFEQ aims to include a multi-dimensional perspective on everyday functioning, items about these issues are an important part of an instrument to measure biopsychosocial aspects of functioning in adults living with hearing loss.

### **Culturally specific interpretations**

The HFEQ was developed in an international context and the validation included participants from three different countries. A strength of the HFEQ is that its development started in an international context, and it will continue to be adapted and validated in several different cultures. The results of the present study revealed some culturally specific interpretations in relation to the HFEQ items. These differences may concern both how an item was understood by the participants and the item's connection to hearing loss in the specific culture. Although the risk of culturally biased expressions was considered during item generation for the HFEQ, the findings underscore how potentially important culturally specific differences must be evaluated in content validation studies (de Vet et al., 2011), including studies of instruments based on the ICF Core Sets. English is an official language in all of the included countries, but it is not necessarily the native or dominant language of all people in these countries. The results of the present study may reflect differences in English dialects, fluency in English and/or the extent to which participants use English as an everyday language. Ultimately, such differences are likely to be even greater among those whose AR needs could be assessed using the HFEQ in clinical practice. These potential differences should be considered in future validation studies of the HFEQ in various countries and in other languages (Fayers & Machin, 2007). Even if the present study shows good international content validity, further psychometric testing of the HFEQ is warranted, including future studies of translations of the HFEQ into languages other than English (Hall et al., 2018).

### **Eyesight**

The item related to vision (item 5) was found to be relevant for participants in all countries except India, where participants with good eyesight (but not those with vision impairment) found it difficult to comprehend the connection between vision and hearing loss. Importantly, however, the number of older adults in the global population is increasing (WHO, 2018), and

the prevalence of combined hearing and visual loss increases with age (Gohdes et al., 2005; Lundin et al., 2020), with consequences for functioning that warrant an integrated approach to rehabilitation that entails both hearing, vision and dual sensory impairments (WHO, 2017). There is also a connection between combined hearing and vision loss and cognitive decline (e.g., Michalowsky, Hoffman & Kostev, 2019). For these reasons, the HFEQ item concerning vision is important to retain because of its relevance to multisensory functioning. Nevertheless, the results indicate that it is necessary to reword this item to clarify the connection between hearing and vision in order to increase the comprehension and the relevance of the item.

### **Hearing technologies in public places**

In South Africa and in the United States, participants indicated that item 20, concerning technologies for communication, is a relevant aspect to assess. However, participants in India were unfamiliar with the examples given of such technologies. In South Africa and the United States, participants were familiar with assistive devices, but more so with devices that are used at home rather than those available in public places. The results suggest that the content validity of this item is lower than that of the rest of the items in the HFEQ, and if kept in the HFEQ, the item needs to be adjusted or clarified. Alternatively, the result could be more of an indicator of the lack of access to hearing technology in public places rather than evidence that it is irrelevant for people with hearing loss. In the further development of the HFEQ, the item will be retained but modified because it is anticipated that knowledge about and use of assistive technologies is likely to increase and become more widespread, especially given the high value placed on these technologies by organizations for people who live with hearing loss (WHO, 2021).

### **Accessibility in the community**

The relevance of the item concerning hearing accessibility in the community (item 29) was strongly dependent on the cultural context. Specifically, the item was considered to be relevant in India and the United States but not in South Africa. This finding is not surprising given that social policies concerning hearing accessibility for the public vary across local communities and countries (Zhao et al., 2015). In particular, previous studies of barriers to the implementation of the Convention on the Rights of Persons with Disabilities (CRPD) in South Africa showed that attitudinal barriers were central to health and rehabilitation and were linked to political, financial, health system-related, physical, and communication barriers (Hussey et al., 2017). Such attitudinal barriers could influence individuals' expectations of their right to accessibility, as described in the CRPD, as well as to how they interpret life experiences and identify in comparison to others, especially given stigma in terms of negative perceptions toward persons with disabilities and negative self-perceptions (Turner & Reynolds, 2012). Unlike the findings for South Africa, the item concerning accessibility in the community (item 29) was reported to be relevant by most participants in India and the United States. Accessibility is also a part of the United Nations (UN) Agenda 2030 for sustainable development, which highlights the importance of accessible and sustainable solutions in society (UN, 2015). Therefore, the item is considered to capture an important aspect of everyday functioning for people living with hearing loss that has emerged in some countries and will likely become even more important in AR (WHO, 2021).

### **Strength and Limitations**

#### *Sample*

In the current study, the distribution of the participants with regard to individual characteristics, such as gender, age, degree of hearing loss, and educational level, was not

optimal in some respects. Most study participants were men (80%), possibly posing a gender bias that could potentially affect the results. For the variable age, younger, middle-aged, and older adults were represented, which is a strength in the sample. Another strength is that persons with all degrees of hearing loss were represented, including some participants who were new to AR and had no hearing aid experience, while most participants had started AR or were experienced hearing aid users. For the variable educational level, all participants had finished either high school or university, but no one had a lower level of education. Although the sample in the current study may be limited in how representative it was of the general populations of the included countries, it is worth noting that some participants discussed the comprehensibility of the items both from their personal perspective and also from what they considered to be the perspective of people in society in general. Only three participants were included in the sample from South Africa. The responses from this small sample were reasonably consistent with the responses from India and the USA. In future studies, it will be important to include a larger sample from this and other regions to ensure validity across countries/cultures. The study sample represented both women and men, people with a wide range of ages, degrees of hearing loss and levels of education even if the distribution had limitations; however, further validation studies with a larger sample will be needed to investigate the transferability of the results to other populations, including analyses to disaggregate results by sample characteristics such as gender, age or level of education (Ryals & Pichora-Fuller, 2022).

### ***Group interviews***

The methodological articles used as a foundation when planning the group interviews (Drennan, 2002; Knafl, 2007) focus on individual interviews, but do not preclude using the cognitive interview approach with groups. Criticisms of group interviewing methodology in relation to cognitive interviewing include possible social pressure in the group setting such

that participants may not feel comfortable enough to express their opinions; however, social pressure could also be an issue in individual interviews, if participants want to please the interviewer. Overall, what may be most important is that information is gathered in a trusting and egalitarian climate, whether an individual interview or a focus group approach is adopted. It is possible that the group format might have posed risks in terms of not getting as much information as possible from each participant and/or hindering the interviewer from asking follow-up questions. To minimize these possible risks, all participants were given ample time and encouraged to share their thoughts. In the current study, the participants willingly, and generously, expressed their thoughts and concerns in the groups, resulting in important insights regarding the content of the HFEQ. The climate during the interviews was therefore considered to be appropriate for the goals of the study. Indeed, the group setting may have facilitated discussion amongst participants that yielded deeper insights than might have been achieved in individual interviews. Furthermore, open discussion in the groups created a rich opportunity to follow up questions from participants and the moderator.

Group interviews may be carried out in different ways (Drennan, 2002). In the current study, the participants were not asked to think-aloud when they were administered the HFEQ and asked about response options and each of the items. Such approach would have added valuable information and is therefore recommended for future studies. Topic seven of the interview guide asked “is there anything you would like to add”. Posing this broad question could be seen as a weaker alternative to posing an explicit question regarding experiences that were missing in the HFEQ. Nevertheless, the participants did respond to the general question by discussing missing issues and possible additional issues, but no specific changes were suggested.

### ***Interview format***

When planning the study, one interview group was scheduled to be held in Canada, but it was not possible to conduct in-person group sessions due to COVID-19 protective measures.

Instead, an additional online group interview was held in the USA. Notably, the differing data collection methods (virtual versus face-to-face) did not seem to affect the quality of the responses of participants. Future studies could be conducted using online methodologies, including the potential use of accessibility features such as captioning, to reach a broader representation of people living with hearing loss.

### ***Administration***

Apart from the specific items, the HFEQ introduction with instructions and the response options on the rating scale were reported to be easy to comprehend, indicating that no major changes are needed at this stage of questionnaire development. However, the administration of the HFEQ might vary in other settings (e.g., in-person in a clinic, self-administration on paper at home or as an online survey) and should therefore be re-evaluated in a broader sample and in other settings in the future. It will also be important to investigate the rating scale statistically in the future.

### **Future Research**

The HFEQ is still being refined. The current study addressed item development and the initial validation of the instrument. The results of the study will inform the revision of the HFEQ. To ensure that other test properties (e.g., reliability) are acceptable, it will be necessary to continue with additional psychometric testing (Fayers & Machin, 2007).

The current study illuminated challenges in following recommendations for how a new instrument should be developed to be culturally valid and applicable across countries and cultures (Fayers & Machin, 2007). Adapting an instrument to completely eliminate all cultural



bias is challenging; countries differ in legislation, health care policies, and the delivery of hearing health care and cultural factors may also contribute to variability in individuals' views of hearing loss (Zhao et al., 2015). In future research, translation of the HFEQ into other languages will be conducted to ensure linguistic equivalence across language. Cultural adaptations will also be needed to ensure the appropriateness of the terms used and that the examples given are suitable given culturally specific considerations (Hall et al., 2018). Even if some items have little relevance in some cultures at present, the development of the HFEQ anticipates that they will become relevant in the future as progress is made to improve the rights and opportunities of people living with disabilities, including hearing loss.

## **Conclusions**

The current study demonstrates the potential of the HFEQ to become a valuable new instrument for use in AR practice and research to assess everyday functioning for people living with hearing loss. These preliminary results indicate that content validity was satisfactory, with participants reporting the majority of the items to be relevant and comprehensible. Minor changes in wording will further improve the HFEQ and strengthen its content validity and comprehensibility. In the next step, the first version of the HFEQ will be adapted and further developed based on the results of the current validation study. Future research will be undertaken to produce and evaluate translations adapted to other languages and cultures, together with further studies to evaluate other psychometric test properties of the HFEQ. Finally, future studies will examine the usability of the instrument in AR settings.

## References

- Alfakir, R., & Holmes, A.E. (2017) Development and Validation of a Questionnaire measuring functioning abilities of older adults living with hearing disability: Implications for audiologic rehabilitation. *Journal of the Academy of Rehabilitative Audiology*, 50, 36-60.
- Alfakir, R., Holmes, A. E., & Noreen, F. (2015). Functional performance in older adults with hearing loss: Application of the International Classification of Functioning brief core set for hearing loss: A pilot study. *International Journal of Audiology*, 54(9), 579-586. doi:10.3109/14992027.2015.1023903
- Alfakir, R., van Leeuwen, L. M., Pronk, M., Kramer, S. E., & Zapala, D. A. (2019). Comparing the International Classification of Functioning, Disability, and Health Core Sets for Hearing Loss and Otorhinolaryngology/Audiology Intake Documentation at Mayo Clinic. *Ear and Hearing*, 40(4), 858-869. doi:10.1097/aud.0000000000000662
- Barker, F., MacKenzie, E., Elliott, L., & de Lusignan, S. (2015). Outcome Measurement in Adult Auditory Rehabilitation: A Scoping Review of Measures Used in Randomized Controlled Trials. *Ear and Hearing*, 36(5), 567-573. doi:10.1097/aud.0000000000000167
- Bennett, R.J., Barr, C., Cortis, A., Eikelboom, R.H., Ferguson, M., Gerace, D., Heffernan, E., Hickson, L., van Leeuwen, L., Montano, J., Preminger, J.E., Pronk, M., Saunders, G.H., Singh, G., Timmer, B.H.B., Weinstein, B., Bellekom, S.. (2021a) Audiological approaches to address the psychosocial needs of adults with hearing loss: perceived benefit and likelihood of use. *International Journal of Audiology*. 60:12-19. doi: 10.1080/14992027.2020.1839680.
- Bennett R.J., Barr, C., Montano, J., Eikelboom, R.H., Saunders, G.H., Pronk M., Preminger, J.E., Ferguson, M., Weinstein, B., Heffernan, E., van Leeuwen, L., Hickson, L.,

- Timmer, B.H.B., Singh, G., Gerace, D., Cortis, A., & Bellekom, S.R. (2021b). Identifying the approaches used by audiologists to address the psychosocial needs of their adult clients, *International Journal of Audiology*, 60:2, 104-114, DOI: 10.1080/14992027.2020.1817995
- Bentler, R. A., & Kramer, S. E. (2000). Guidelines for choosing a self-report outcome measure. *Ear and Hearing*, 21(4 Suppl), 37s-49s. doi:10.1097/00003446-200008001-00006
- Danermark, B., Granberg, S., Kramer, S. E., Selb, M., & Moller, C. (2013). The creation of a comprehensive and a brief core set for hearing loss using the international classification of functioning, disability and health. *American Journal of Audiology*, 22(2), 323-328. doi:10.1044/1059-0889(2013/12-0052)
- De Vet, H.C., Terwee, C.B., Mokkink, L.B. & Knol, D.L. (red.) (2011). *Measurement in medicine: a practical guide*. Cambridge: Cambridge University Press.
- Drennan, J. (2002). Cognitive interviewing: verbal data in the design and pretesting of questionnaires. *Journal of advanced nursing*, 42(1), 57-63.
- Fayers, P. M., Machin, D. (2007). *Quality of life: the assessment, analysis, and interpretation of patient-reported outcomes*. (2. rev. ed.). Chichester: Wiley.
- Gagné, J.-P., Jennings M.B., & Southall, K. (2014). The international classification of functioning. Implications and applications to audiologic rehabilitation. In Montano, J.J., & Spitzer J.B. (Eds.), *Adult audiologic rehabilitation* (2 ed., pp. 37-57). San Diego CA: Plural Pub.
- Gohdes, D.M, Balamurugan A., Larsen, B.A., & Maylahn, C. (2005). Age-related eye diseases: an emerging challenge for public health professionals. *Prev Chronic Dis*  
Retrieved from:  
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1364526/pdf/PCD23A17.pdf>
- Granberg, S. (2015). *Function and disability in adults with hearing loss: Preparatory studies in the ICF Core Sets for hearing loss project*. (PhD-Thesis). Örebro universitet,
- Granberg, S., Dahlström, J., Moller, C., Kähäri, K., & Danermark, B. (2014a). The ICF Core Sets for hearing loss--researcher perspective. Part I: Systematic review of outcome

- measures identified in audiological research. *International Journal of Audiology*, 53(2), 65-76. doi:10.3109/14992027.2013.851799
- Granberg, S., Möller, K., Skagerstrand, A., Möller, C., & Danermark, B. (2014b). The ICF Core Sets for hearing loss: researcher perspective, Part II: Linking outcome measures to the International Classification of Functioning, Disability and Health (ICF). *International Journal of Audiology*, 53(2), 77-87. doi:10.3109/14992027.2013.858279
- Granberg, S., Pronk, M., Swanepoel de, W., Kramer, S. E., Hagsten, H., Hjaldaahl, J., Mällér, C., & Danermark, B. (2014c). The ICF core sets for hearing loss project: functioning and disability from the patient perspective. *International Journal of Audiology*, 53(11), 777-786. doi:10.3109/14992027.2014.938370
- Granberg, S., Swanepoel de, W., Englund, U., Möller, C., & Danermark, B. (2014d). The ICF core sets for hearing loss project: International expert survey on functioning and disability of adults with hearing loss using the international classification of functioning, disability, and health (ICF). *International Journal of Audiology*, 53(8), 497-506. doi:10.3109/14992027.2014.900196
- Hall, D.A., Zaragoza Domingo, S., Hamdache, L.Z., Manchaiah, V., Thammaiah, S., Evans, C., & Wong, L.L.N. (2018) A good practice guide for translating and adapting hearing-related questionnaires for different languages and cultures, *International Journal of Audiology*, 57:3, 161-175, doi: 10.1080/14992027.2017.1393565
- HEAR. (1996). Terminology, Definitions and Hearing Assessments. European Concerted Action: PL950353. In. European Concerted Action Project on Genetic Hearing Impairment.
- Hussey, M., MacLachlan, M., & Mji, G. (2017). Barriers to the Implementation of the Health and Rehabilitation Articles of the United Nations Convention on the Rights of Persons with Disabilities in South Africa. *International journal of health policy and management*, 6(4), 207–218. <https://doi.org/10.15171/ijhpm.2016.117>
- Humes, L.E. (2021). An Approach to Self-Assessed Auditory Wellness in Older Adults. *Ear and Hearing*, 42(4):745-761. doi: 10.1097/AUD.0000000000001001.

ICF research branch. (2013). ICF Core Set for Hearing Loss. Retrieved from <https://www.icf-research-branch.org/icf-core-sets-projects2/other-health-conditions/icf-core-set-for-hearing-loss>

Karlsson, E., Mäki-Torkko, E., Widén, S., Gustafsson, J., Manchaiah, V., Mahomed- Asmail, F., Swanepoel, D.W., Yerraguntla, K., & Granberg, S. (2021). *Validation of the Brief International Classification of Functioning, Disability and Health (ICF) core set for hearing loss: an international multicenter study. International Journal of Audiology*, 60:6, 412-420. doi: 10.1080/14992027.2020.1846088

Knafl, K., Deatrick, J., Gallo, a., Holcombe, G., Bakitas, M., Dixon, J., & Grey, M. (2007). The analysis and interpretation of cognitive interviews for instrument development. *Research in nursing & health*, 30, 224-234.

Lundin, E., Widén, S.E., Wahlqvist, M., Anderzén-Carlsson, A., & Granberg, S. Prevalence, diagnoses and rehabilitation services related to severe dual sensory loss (DSL) in older persons: a cross-sectional study based on medical records. *International Journal of Audiology*, 59(12):921-929. doi: 10.1080/14992027.2020.1783003.

Manchaiah, V., Danermark, B., Ahmadi, T., Tomé. D., Zhao. F., Li. Q., Krishna. R., Germundsson. P. (2015). Social representation of "hearing loss": cross-cultural exploratory study in India, Iran, Portugal, and the UK. *Clin Interv Aging*, 19;10:1857-72. doi: 10.2147/CIA.S91076.

Manchaiah, V., Granberg, S., Grover, V., Saunders, G.H., Ann, H.D. (2019). Content validity and readability of patient-reported questionnaire instruments of hearing disability. *International Journal of Audiology*, 58(9), 565–575.

Michalowsky. B., Hoffman, V., & Kostev, K. (2019). Association between Hearing and Vision Impairment and Risk of Dementia: Results of a Case-Control Study Based on

- Secondary Data. *Frontiers in aging neuroscience*, 11, 1-9. doi:  
10.3389/fnagi.2019.00363
- Montano, J.J. (2007). Defining audiologic rehabilitation. In Montano, J. J. & Spitzer, J.B (Eds.), *Adult audiologic rehabilitation* (2 ed., pp. 23-34). San Diego CA: Plural Pub.
- Mokkink, L.B., Prinsen C.A.C., Patrick. D.L., Alonso, J., Bouter, L.M., de Vet, H.C.V., & Terwee, C.B. (2018) *COSMIN methodology for systematic reviews of Patient-Reported Outcome Measures (PROMs)- User manual Version 1.0*. Retrieved from:  
[https://www.cosmin.nl/wp-content/uploads/COSMIN-syst-review-for-PROMs-manual\\_version-1\\_feb-2018-1.pdf](https://www.cosmin.nl/wp-content/uploads/COSMIN-syst-review-for-PROMs-manual_version-1_feb-2018-1.pdf)
- Nassar-McMillan, C. S. B., L.D. (2002). Use of Focus Groups in Survey Item Development. *The qualitative report*, 7(1).
- Ryals, B., M. & Pichora-Fuller, K. (2022). Editorial: Ear and Hearing's Commitment to Promoting Inclusion, Diversity, Equity, and Accessibility in Research on Hearing and Hearing Healthcare. *Ear and Hearing*, 43(1):1-4. doi:  
10.1097/AUD.0000000000001233
- Stephens, D., Gianopoulos, I., & Kerr P. (2001). Determination and classification of the problems experienced by hearing-impaired elderly people. *Audiology*, 40(6):294-300.
- COSMIN methodology for assessing the content validity of PROMs User manual version 1.0.
- Terwee, C. B., Prinsen, C. A. C., Chiarotto, A., De Vet, H. C. W., Westerman, M. J., Patrick, D. L., Alonso, J., Bouter, L. M., Mokkink, L. B. (2018). COSMIN standards and criteria for evaluating the content validity of health-related Patient-Reported Outcome Measures: a Delphi study. *Quality of Life Research*, 27(5):1159-1170
- Turner, J.C., & Reynolds, K.J., (2012) Self-Categorization theory. In Lange, P.A.M.V., Kruglanski, A.W., & Higgins E.T. (ed.) *Handbook of theories of social psychology*. (2 ed., pp 399- 426). Los Angeles: SAGE.

- van Leeuwen, L. M., Merkus, P., Pronk, M., van der Torn, M., Mare, M., Goverts, S. T., & Kramer, S. E. (2017). Overlap and Nonoverlap between the ICF Core Sets for Hearing Loss and Otology and Audiology Intake Documentation. *Ear and Hearing, 38*(1), 103-116. doi:10.1097/aud.0000000000000358
- Viergever, K., Kraak, J.T, Bruinewoud, E.M., Ket, J.C.F., Kramer, S.E., & Merkus, P. (2021). Questionnaires in otology: a systematic mapping review. *Systematic Reviews, 20;10(1):119*. doi: 10.1186/s13643-021-01659-9.
- Leeuwen, L.M., Pronk, M., Merkus, P., Goverts, S.T., Terwee, C.B., & Kramer, S.E. (2020). Operationalization of the Brief ICF Core Set for Hearing Loss: An ICF-Based e-Intake Tool in Clinical Otology and Audiology Practice. *Ear and Hearing, 41*(6), 1533-1544.
- Zhao, F., Manchaiah, V., St. Claire, L., Danermark, B., Jones, L., Brandreth, M., Krishna, R., & Goodwin, R. (2015). Exploring the influence of culture on hearing help-seeking and hearing-aid uptake, *International Journal of Audiology, 54*:7,435-443, doi: 10.3109/14992027.2015.1005848
- United Nations (2015). Agenda 2030, Sustainable development goals. Retrieved from; <https://www.un.org/sustainabledevelopment/sustainable-development-goals/>
- World health organization. (2001). International classification of functioning, disability and health (ICF). Geneva: WHO.
- World Health Organization (2017). *Integrated Care for Older People: Guidelines on Community-Level Interventions to manage declines in intrinsic capacity*. Geneva: WHO.
- World Health Organization (2018). *Ageing and health*. Retrieved from: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>
- World health organization (2021). *World report on hearing*. Geneva: World Health Organization.