

Social representation of hearing aids among people with hearing loss: An exploratory study

Journal:	International Journal of Audiology
Manuscript ID	TIJA-2020-03-0084.R2
Manuscript Type:	Original Paper
Date Submitted by the Author:	n/a
Complete List of Authors:	Chundu, Srikanth; Anglia Ruskin University - Cambridge Campus, Vision and Hearing Sciences Allen, Peter; Anglia Ruskin University, Department of Vision and Hearing Sciences; Vision and Eye Research Unit, Anglia Ruskin University Han, Woojae; Hallym University, Speech Pathology and Audiology Ratinaud, Pierre; LERASS laboratory, University of Toulouse Krishna, Rajalakshmi; All India Institute of Speech & Hearing, Audiology; All India Institute of Speech & Hearing, Manchaiah, Vinaya; Lamar University, Department of Speech and Hearing Science; The Swedish Institute for Disability Research, Department of Behavioural Sciences and Learning; Audiology India, Speech and Hearing
Keywords:	Aging, Hearing Aids, Hearing Aid Satisfaction, Psycho-social/Emotional
	·



2	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	
32	
33	
34	
35	
36	
3/	
38	
39	
40 41	
41 42	
4Z 12	
43	
44	
46	
40	
48	
49	
50	
51	
52	
53	
54	
55	
56	
57	
58	
59	
60	

Social representation of hearing aids among people with hearing loss: An exploratory study

Srikanth Chundu,^{1,2} Peter M. Allen,^{1,2} Woojae Han,³ Pierre Ratinaud,⁴ Rajalakshmi

Krishna,⁵ & Vinaya Manchaiah⁶

- 1. School of Psychology and Sports Sciences, Anglia Ruskin University, Cambridge, United Kingdom
- 2. Vision and Hearing Sciences Research Group, Anglia Ruskin University, Cambridge, United Kingdom
- 3. Laboratory of Hearing and Technology, Division of Speech Pathology and Audiology, College of Natural Sciences, Hallym University, Chuncheon, Republic of Korea
- 4. LERASS laboratory, University of Toulouse, Toulouse, France
- 5. All India Institute of Speech and Hearing, University of Mysore, Mysore, India
- 6. Department of Speech and Hearing Sciences, Lamar University, Beaumont, Texas, USA

Corresponding Author Srikanth Chundu Senior Lecturer of Audiology Vision and Hearing Sciences, School of Psychology and Sports Sciences, Anglia Ruskin University, Cambridge, CB1 1PT, UK Phone: +44(0)1223698653 Email: Srikanth.Chundu@aru.ac.uk

Data can be accessed by contacting the corresponding author via email.

Abstract

Objective: The aim of the current study was to examine the social representation (SR) of hearing aids in people with hearing loss (PHL) in India, the Republic of Korea (ROK), the United Kingdom (UK), and the United States of America (US).

Design: The study used a cross-sectional survey design. The data collected by using a free association task were analysed qualitatively (i.e., content analysis) and quantitatively (i.e., chi-square analysis, similarities analysis, prototypical analysis).

Study Sample: 424 participants with hearing loss

Results: The most commonly reported categories across all countries were 'beneficial', 'cost and time', and 'appearance and design'. Approximately 50% of the associations reported were negative. There were variations in terms of the categories that were predominant in the SR of each country. 'Others' actions and attitude' category was predominantly reported by PHL in India. 'Disturbance' and 'dissatisfaction' of hearing aids and the 'repairs and maintenance of hearing aids' categories were mainly reported from the ROK and the US, respectively.

Conclusions: The current results highlight the main aspects that PHL report spontaneously when they think about hearing aids. The findings will help to further inform public health campaigns and will contribute to develop culturally appropriate media materials regarding hearing aids.

Key Words

Hearing aids, Stigma, Attitude, Social representation, Perception, Cross culture, Hearing loss

Abbreviations

- PHL: People with Hearing Loss
- ROK: Republic of Korea
- heory SRT: Social Representations Theory
- SR: Social Representation
- UK: United Kingdom
- US: United States

Original Paper

Introduction

Hearing loss is considered as one of the most commonly occurring chronic conditions in older adults. Untreated hearing loss can lead to social isolation, communication difficulties, activity limitations, emotional problems and cognitive decline (Arlinger, 2003; Chia et al., 2007; Lin et al., 2013; Meyer & Hickson, 2012). As one of its treatments, hearing aids have been shown to improve communication and minimise the effect of hearing loss on quality of life (Stark et al., 2004). Despite the proven benefits of hearing aids and advances in technology and aesthetics, appropriate adoption and use of hearing aids is still surprisingly low (Smeeth et al., 2002) with only a small percentage (i.e., about 20-30% in western countries) of people with hearing loss (PHL) obtaining hearing aids (Davis et al., 2007; Simpson et al., 2019). Furthermore, hearing aid adoption rate varied across different countries (Wong & McPherson, 2008). For example, hearing aid adoption rates in developing countries (e.g. China and India) were around 1 to 8 % as opposed to the developed countries (e.g. the US and the UK), which were 20 -25% (Wong & McPherson, 2008; Kochkin, 2009).

Various factors have been identified that may contribute towards hearing aid adoption and use or lack thereof (for review see Knudsen et al., 2010). PHL's age and gender seem not to influence hearing aid adoption use and satisfaction (Knudsen et al., 2010). Rather, factors that contribute positively to hearing aid adoption include perceived hearing disability, severity of hearing loss, self-reported activity limitations and socio-economic status (Knudsen et al., 2010; Meyer & Hickson, 2012; Simpson et al., 2019). Moreover, adoption and use of the hearing aids are related to PHL's ethnicity and living status, for example low adoption of hearing aids were reported in PHL from ethnic minorities, whereas, PHL who live alone are more likely to

 use a hearing aid (Tomita et al., 2001; Nieman et al., 2016). Other factors including perceived
benefit from hearing aids, cost, misconception towards hearing loss, and fear of hearing aid
technology contribute to the low uptake of hearing aids.

Most of the research around hearing aid use is largely informed by studying attitudes and stigma. The attitude of PHL towards hearing aids plays an important role in hearing aid uptake, use and satisfaction (Gatehouse, 1993; Wilson & Stephens, 2003). Van den Brink et al. (1996) reported that after consulting their general practitioner, PHL who did not obtain hearing aids had less favourable attitudes towards hearing aids than those who adopted hearing aids. A positive attitude prior to fitting was correlated with more frequent use and high satisfaction with hearing aids (Gatehouse, 1994; Wilson & Stephens, 2003). PHL who experience communication difficulties due to their hearing loss have a more positive attitudes towards hearing aids (Humes et al., 2003; Palmer et al., 2009). However, attitude research focusses on understanding how an individual evaluates a particular subject or object (Howarth et al., 2004). Attitude may not influence behaviour, for example, in a study on hearing protection devices (HPDs) despite the majority of respondents being aware of the consequences of not using HPDs 72% never used them (Crandell et al., 2014). This is a weakness in using attitude-based research (Allport, 1935). Furthermore, attitude measurements are prone to response bias. For example, respondents may not provide socially undesirable views and offer only responses that are socially acceptable resulting in a "social desirability bias" (McCaughey & Strohmer, 2005).

Often, stigma towards hearing aids is reported to be the influencing factor on low uptake and use of hearing aids (David & Werner, 2016). Stigma can be defined as "an attribute that is deeply discrediting" that reduces someone "from a whole and usual person to a tainted, discounted one" (Goffman, 1963, p.3). Poor aesthetics of hearing aids result in self-

stigmatization and a reluctance in PHL to use them (David & Werner, 2016). For example, hearing aids indicate hearing loss and can trigger a social identity threat that impacts social interaction (Gagne, Jennings & Southall, 2009; Hindhede, 2012). Moreover, wearing hearing aids may result in the users being labelled as 'old' (Southall et al., 2010) with this labelling being more pronounced in young adults (Cienkowski & Pimentel, 2001).

Stigma theory is often used in hearing aid research, although it has some limitations. For example, stigma focusses on the negative beliefs (i.e., stereotypes) of a particular disability (Link & Phelan, 2013) and does not consider the disability from a holistic view (Manchaiah et al., 2019). Moreover, stigma research concentrates on the medical aspects relating to a disability without considering the social and behavioural aspects (Granberg et al., 2014). Stigma is considered as one of the factors affecting hearing aid adoption, although, previous work has shown an inconsistency in terms of its predictive power (Jenstad & Moon, 2011). Research published using stigma as a factor for hearing aid adoption is only descriptive and lacks methodological consistency (David & Werner 2016; David et al., 2018). Therefore, it would be ideal to look at other methods and/or theoretical perspectives to better understand perceptions of PHL towards hearing aids. More recently, Social Representation Theory (SRT) has been used in studying the societal perceptions of hearing loss and hearing aids (Manchaiah et al., 2019). The research on factors associated with hearing aid adoption is very quickly outdated because of advances in hearing aid technology and aesthetics.

According to Moscovici social representations are a multi-layered concept focusing on "systems of values, ideas, images and practices" (Moscovici 1963, pp. 251). The core of SRT is that people refer to a socially created truth based on their understanding of "what is acceptable and what is unacceptable" (Moscovici, 2000). The reference to social indicates that

the representations created are social and are formed by multifactorial interactions including cultural, economic practices, political ideas and religious beliefs (Moscovici, 1988). SRT examines the social component by studying perceptions collectively (Lopez & Gaskell, 2015). In other words, SRT examines the perception of a population as a whole rather than attitudes of an individual. SRT offers a more holistic perspective of a disability, unlike stigma research that focusses on negative aspects. Thus, SRT can be used as an alternative to attitudes to study any phenomenon relating to disability.

SRT was used to study social representation of hearing aids and 'hearing loss' among the general public (Manchaiah et al., 2015a; Manchaiah et al., 2015b) and social representation of 'hearing loss' among people with hearing loss (Chundu et al., 2020). The general public reported only 40% positive representations of hearing aid. Representation included aspects such as 'aging,' 'appearance and design,' 'cost (of hearing aid),' 'improved hearing and communication,' and 'disability.' The general public's social representation of hearing loss was predominantly negative and centred on the categories 'causes of hearing loss,' 'communication difficulties,' 'disability,' 'hearing instruments,' and 'negative mental state.' Although SRT has been used extensively it is not without its critics (for a review of the criticisms of SRT see Voelklein & Howarth, 2005). For example, the most common criticism of SRT is that it is too broad and vague without a proper "conceptual precision". Although there are definitions of social representations, Moscovici suggests that a complex social phenomenon cannot be addressed using simple proposals and restrictive definitions (Moscovici & Marková, 2000). Social representations are studied using a more "inductive and descriptive approach" than following an approach (hypothetico-deductive model) which operates on strict "guidelines for testing and operationalising a theory" (Voelklein & Howarth, 2005).

Although the views of public relating to hearing aids were explored, those living with a disability offer a more personal and in-depth perception of their disability (Munyi, 2012). For example, if someone is suffering with cancer, they are more likely to accept a radical treatment even when there is a minimal chance of success (Slevin et al., 1990). Moreover, the decision to adopt hearing aids can be influenced by experiencing hearing loss (Robinson & Hames, 2004). Furthermore, differences exist in the social representation of hearing loss among the general public and PHL (Chundu et al., 2020). Hence, it is important to explore PHL's social representation of hearing aids. This will help in developing strategies to better educate PHL regarding hearing aids and ultimately improve the uptake. Differences in adoption rates of hearing aids could be attributed to differences in perception of hearing loss and hearing aids across different countries and /or cultural differences (Zhao et al., 2015). A difficulty in this area of research is that there is no standard acceptable definition of culture. An acceptable definition relating social representations to culture would be "Culture, then, can be taken as referring to a broader network of representations held together as an organised whole by a community. Social representations, in this sense, can be seen as particular cultural forms, and the analysis of social representations will always refer back in some way to the cultural context in which they take shape" (Duveeen, 2007, p. 545). Thus, SRT is a useful technique to use when attempting to understand the effect of cultural differences on the perception of hearing aids across different countries.

The aim of the current study was to examine the social representation of hearing aids in PHL across several countries (India, Republic of Korea [ROK], United Kingdom [UK], and the United States [US]). Cross-cultural similarities and differences will be explored.

Methods

Ethical Considerations

Ethical approval was obtained from universities in each country where data were collected. These include: All India Institute of Speech and Hearing, University of Mysore, India; Hallym University, Gangwon-do, ROK; Anglia Ruskin University, Cambridge, UK and Lamar University, Beaumont, US. The research adhered to the tenets of the Declaration of Helsinki.

Study Design and Participants

A cross sectional survey design was used for this study. A total of 424 participants were recruited from four countries using a consecutive sampling method. Participants were recruited from Audiology clinics based in Mysore (India), Gangwon-do (ROK), Cambridge, London (UK) and Beaumont (US). Table 1 provides the demographic information of study participants. The mean age overall was 58.5 years with the mean age of the UK (68.7 years) being the highest and ROK lowest (50.2 years). Respondents were mainly males (>60%) in India and ROK. In the UK and the US, the respondents' gender was evenly distributed.

[Table 1 near here]

20 Data Collection

The principal researcher (SC) coordinated with the researcher from each country who collected the data. An orientation session that included a description of the aims of the study and that explained data collection procedures in detail was given to researchers from each country. To maintain consistency in data collection across all sites, five practice trials were performed, and any protocol queries raised by researchers answered. These data were not

included in the study. Participants were recruited from local audiology clinics using a consecutive sampling method. All patients who attended clinics for their appointments were approached to participate in the study. Interested participants were given verbal information about the study along with a patient information sheet and were given the opportunity to ask questions. If they agreed to participate then they provided written consent. Data were collected, in person, from both new and existing hearing aid users using a paper-based method either before or after their appointment with their audiologist. The degree of hearing loss of the patient was not recorded. Participation in the study was voluntary. The questionnaire, in English, was used in the UK and the US and was translated to Kannada (India), and Korean (Republic of Korea) using the forward-backward translated back to English by the researchers. Although, no formal validation was performed on the translated questionnaires, it has been used in previous social representation studies (Manchaiah et al., 2015a, 2015b).

Ouestionnaires with less than four responses (three or less) were excluded from the data analysis. A free association task by way of a study questionnaire was used to collect data for this study. As the task required spontaneous responses from participants (up to five) to a stimulus (in this case hearing aids), it minimises the urge to provide politically correct expressions and helps to reduce social acceptability bias (Hovardas & Korfiatis, 2006). This method is commonly used in social representation studies as it allows extraction of semantic content of social representation (e.g., Linton et al., 2013; Danermark et al., 2014; Manchaiah et al., 2019a, 2019b). The study questionnaire had two sections (see Appendix). The first section included questions regarding demographic information such as age, hearing aid use, education and socioeconomic status (see Table 1). The various education categories included in the questionnaire were: *Primary - (Class1-7)/Secondary - (Class 8-10)/Tertiary -

 Undergraduate/ Graduate /Postgraduate (General)/ Professional (Doctor, Engineer, lawyer, etc.
Socioeconomic status was categorised into low, mid, and high and the participants were asked
to choose based on their assumption of their socioeconomic status. The second section included
the free association task. Participants were asked to list up to five words or phrases that
spontaneously come into their mind in response to the stimulus 'hearing aids.' Participants
were then required to rank each word or phrase in the order of importance. Finally, participants
assigned a positive, neutral or negative connotation for each word or phrase.

10 Data Analysis

In the current study, both qualitative (i.e., content analysis) and quantitative analyses (i.e., chi square analysis, similarities analysis, prototypical analysis) were used. The quantitative analyses were performed using the open-source software IRaMuTeQ (Ratinaud, 2014). Traditionally, social representation analysis is limited to one or two analyses such as frequencies analysis or similarities analysis. However, a multimethod analysis yields a more comprehensive understanding of the phenomenon that is being investigated (for further details see Manchaiah et al., 2019). For example, similarities analysis examines the frequency of each category and how it is interconnected with other categories (i.e., co-occurrence of categories), although the rank order (or the importance rating) is not considered in this analysis. Alternatively, prototypical analysis takes into consideration how frequently a category is reported and how important that a particular category is to the respondents by incorporating a rank order, although it does not represent the co-occurrence of categories. More detailed discussion of the data collection and analysis methods are provided by Manchaiah et al. (2019).

Content Analysis (Content coding)

Questionnaires with less than four responses were excluded from the data analysis. Responses to the free association task were categorised using qualitative content analysis (Graneheim & Lundman, 2004). Here, words with similar meaning were grouped into a single category. For instance, responses such as 'older,' 'aging,' or 'old age' were grouped into one category -'aging.' Initially content analysis of the translated data was performed by the primary researcher (SC) and then cross-checked by another researcher (VM). The primary author consulted the researcher from each country when there were any discrepancies between the two researchers who performed the content analysis to ensure responses were categorised appropriately by consensus. This analysis was necessary before conducting the prototypical analysis and similarities analysis, as the software requires responses to be grouped in this way.

Chi Square Analysis

The frequency of positive, negative and neutral connotations by respondents in each country were counted. Chi-square analysis (3x4) was performed to examine the association between connotations and respondents from the different countries.

Similarities Analysis

Similarities analysis is based on mathematical graph theory (Flament, 1965) and provides an understanding of the most important categories in the social representation of hearing aids. Similarities analysis considers the connections between the elements (categories) of social representation. There may be a stronger or weaker relationship between two elements of social representation based on how often both the elements were reported. Therefore, similarities analysis is a useful analysis to elucidate the relationship between elements (Flament, 1965).

IraMuTeQ software calculates the number of people who reported two categories. This will be presented as a cooccurrence score which can vary from zero (if no one has associated both categories) to n (if there were 'n' people in the sample and all of them have associated both categories). This computation produces a similarity matrix, which is a symmetrical matrix with items in lines and in rows. From this matrix, a similarity graph is produced where items are represented as nodes of the graph and the lines between nodes represent the number of times two categories were reported by the same person. The results were presented as a maximum tree which graphically provides information about the frequency of each category and the relationship between categories. The nodes represent the frequency of the category, the bigger the node, the more frequent the reporting of that category. The prominent categories (bigger nodes) are an integral part of the representation and hold the representation together due to their greater links with other categories (Bales & Johnson, 2006). The lines between the nodes represent inter-category associations, i.e., how often people expressed both categories with stronger associations being represented by a thicker line and a higher number.

16 Prototypical Analysis

This analysis offers insight into the content and structure of PHL's social representation of 'hearing aids.' Prototypical analysis highlights the importance of specific elements of the social representation by checking two independent criteria (i.e., rating or ranking of importance and frequency of occurrence) making it a useful analysis in social representation research. This analysis results in four options, usually presented in a 2x2 table (see Table 2). The 'central zone' depicts the most frequently occurring and most important categories. More frequently occurring but less important categories are represented in the 'first peripheral zone' The 'second peripheral zone' represents the categories that are less frequent and less important. Finally, categories that are low frequency and more important are called

1	'contrasted elements' (Abric, 1994). The categories in the central zone offer the
2	representation its meaning and are intensely shared by the group (Abric, 2003). The
3	peripheral elements can vary among people and environments and are considered less stable.
4	The elements in the first periphery are flexible and adapt the social representation to the
5	changes in the environment and everyday experiences. The second periphery is the least
6	useful in defining social representation as it has categories which are low frequency and least
7	important. Finally, the contrasted elements indicate a subgroup that prioritises some
8	categories differently to the majority of the population (Abric, 2003).
9	
10	[Table 2 near here]
11	
12	Results
13	Content analysis (Content coding)
14	Table 3 represents the categories based on content analysis with examples of responses to
15	each category. Some of the responses to free association task were discarded as they were not
16	related to the phenomenon hearing aids. This accounted for less than 1% of the total responses.
17	The analysis reduced the responses into 45 categories. Some of these categories were absent in
18	some countries (e.g., no responses to 'acclimatisation' category in ROK and the UK
19	respondents). The three most frequently reported categories include: 'beneficial' (10.9%),
20	'appearance and design' (9.6%), and 'cost and time' (9.3%). Other commonly reported
21	categories included: 'dissatisfaction' (4.1%), 'improved hearing and communication' (5.7%),
22	'repairs and maintenance' (4.7%), 'negative mental state' (3.9%), and 'aging' (3.8%). The
23	categories 'beneficial' and 'improved hearing and communication' were reported similarly

2		
- 3 4	1	represented in India. Respondents from ROK and the US showed a higher percentage of
5 6	2	responses to the categories 'aging' and 'dissatisfaction.'
7 8 0	3	[Table 3 near here]
9 10 11	4	
12 13	5	Analysis of Positive, Neutral and Negative Connotations
14 15 16	6	The positive, neutral and negative connotations associated with free associations were
17 18	7	counted across all four countries. The most common categories associated with positive
19 20	8	connotation were 'beneficial' and 'improved hearing and communication.' The two
21 22 23	9	categories that were mainly associated with negative connotations were 'cost and time' and
24 25	10	'appearance and design.' The percentage of the positive, neutral and negative connotations
26 27 20	11	connected with the free associations are depicted in Figure 1. Overall, just over half (51%) of
28 29 30	12	the connotations were negative, approximately 14% were neutral and approximately 35%
31 32	13	were positive. India had the highest percentage of positive connotations (50%) and ROK had
33 34 25	14	the highest number of neutral connotations (31%). In both the UK and the US, majority of the
35 36 37	15	connotations (>50%) were negative. Chi square analysis suggests that there was a significant
38 39	16	association between responses from different countries and connotations (Chi square=44.04,
40 41 42	17	p< 0.00001). Overall, this shows that PHL view hearing aids negatively, although the
42 43 44	18	exception to this is in India where more than 50% of the connotations were positive.
45 46	19	
47 48 49	20	[Figure 1 near hear]
50 51	21	
52 53	22	Results of Similarities Analysis
54 55 56	23	The similarities analysis of categories from all four countries is presented in graphical form
57 58	24	(see Figures 2-6). The size of the nodes represents how frequently a category was reported and
59 60	25	the thickness (and number on the line) of the line between categories represents the strength of

the relationship between the categories, i.e., how often two categories are co-occurred. The analysis shows 'beneficial,' 'cost and time,' and 'appearance and design' as the predominant categories (biggest nodes) of the social representation of hearing aids across countries (see Figure 2). This is similar to the frequencies analysis (Table 3). These three nodes have stronger links with each other as indicated by the number of links (i.e., number of people who reported both the categories). The strongest link existed between the categories 'cost and time' and 'appearance and design' (77). In other words, 77 individuals who reported 'cost and time' also reported 'appearance and design' suggesting a strong relationship between these two elements. Along with that, a strong relationship exists between categories 'beneficial' and 'cost and time' (70), 'beneficial' and 'improved hearing and communication' (37), 'cost and time' and 'repairs and maintenance' (38), and 'beneficial' and 'assessment and management' (36). Of the bigger three nodes, 'beneficial' had the highest number of positive connotations. 'Cost and time' and 'appearance and design' had the highest number of negative connotations. The social representation of hearing aids was centred around expressions related to categories 'beneficial,' 'cost and time,' and 'appearance and design' as they exhibited the biggest nodes and highest co-occurrences.

Figures 3-6 represent the similarities analysis of data from India, ROK, the UK, and the US, respectively. These allow for comparison of the data between countries and helps to elucidate the similarities and differences in the social representations across countries. Indian respondents' social representation of hearing aids is mainly structured around two positive categories (i.e., 'beneficial' and 'improved hearing and communication') and two negative categories (i.e., 'appearance and design' and 'others' actions and attitude') (see Figure 3). The category 'beneficial' is the biggest node with highest links to the categories 'improved hearing and communication' (14), 'appearance and design' (13), and 'assessment and management'

(14). In other words, 14 people reported both 'beneficial' and 'improved hearing and communication' categories, 13 participants reported 'beneficial' and 'appearance and design' categories and 14 reported 'beneficial' and 'assessment and management' categories. The category 'improved hearing and communication' had the highest links to 'others' actions and attitude' (14). The other categories which had the highest links were 'others' actions and attitude' and 'negative mental state' (15). Within the social representation of hearing aids in India, there was an emphasis on the benefits of hearing aids, appearance and design of hearing aids and the actions and attitudes of other people towards PHL with hearing aids.

Figure 4 presents the similarities analysis of data from ROK, which shows three main nodes 'cost and time,' 'discomfort' and 'appearance and design.' All three nodes were connoted mainly negatively. More than 15% of the respondents have reported at least two of these main nodes. The highest ties were between 'cost and time' and 'appearance and design' (20) and 'aging' and 'deafness' (19). Further intercategory associations were seen between 'cost and time' and 'beneficial '(14), and also between 'cost and time' and 'discomfort' (17). In ROK, the focus was on the negative aspects of hearing aids such as cost, appearance and design, and the discomfort relating to use of hearing aids.

Figure 5 represents the social representation of hearing aids in the UK, which suggest that the responses are designed around two main nodes 'beneficial' and 'appearance and design.' 21% of the respondents reported both these categories demonstrating that the structure of social representation is solid with only two main categories and their links to other categories. The category 'beneficial' carries a positive association and the category 'appearance and design' carries a negative association. Stronger ties were seen between 'appearance and design' and 'cost and time' (15), and also between categories 'appearance and design' and 'ease or difficulty in using' (14). Overall, these findings suggest that the UK participants considered

hearing aids to be beneficial, although the cosmetic aspects of the hearing aids were viewed negatively.

In the US, the social representation of hearing aids was centred on two main nodes 'cost and time' which carries a negative association and the positive category 'beneficial' (see Figure 6). Like the UK, the representations of the US appear to be more solid with only two main nodes and very strong links between the two nodes (40). Further strong ties were seen between the negative connotations were between 'cost and time' and 'appearance and design' (30) and also between categories 'cost and time' and 'repairs and maintenance' (22). The main aspects that were part of the social representation of hearing aids in the US related to the resources needed to adopt and use a hearing aid and to deal with the cosmetics of the aids.

[Figures 2-6 near here]

Prototypical Analysis

Table 4 depicts the prototypical analysis of the data from all the four countries together in descending order. PHL's representation regarding hearing aids in the central zone include: 'cost and time,' 'beneficial,' 'improved hearing and communication,' 'aging,' 'dissatisfaction,' 'discomfort,' 'improved life condition,' 'attitude of the individual,' and 'deafness.' The top two categories in the first periphery were 'appearance and design' and 'repairs and maintenance.' The top two categories in the second periphery were 'limitations of hearing instrument' and 'other listening devices.' Contrasted elements include 'isolation' and 'positive mental state' and are a priority for a subgroup of PHL. The categories in the central zone are important aspects of the social representation on hearing aids as they take into consideration both frequency and rating of importance (or rank order).

Table 5 represents the central zone for individual countries. There were some similarities and differences between countries; for example, the categories 'beneficial,' 'improved hearing and communication' and 'cost and time' were represented in the central zone in all four countries. The category 'assessment and management' was represented in the central zone of only India. The category 'dissatisfaction' was represented in all three countries other than India. The category 'attitude of the individual' was only represented in the central zone of India and the US. Prototypical analysis of ROK produced more categories in the central zone than the other countries. The categories in the central zone were predominantly associated with negative connotations. The two main categories that were assigned positive connotations were 'beneficial' and 'improved hearing and communication'. There are differences in the categories contained within the central zone of different countries highlighting the impact of culture on the social representation of hearing aid users.

> [Table 4 near here] [Table 5 near here]

17 Discussion

This study employed a new theoretical approach SRT to explore PHL's social representation of hearing aids by highlighting their perception of hearing aids as a whole. In addition, we also examined the similarities and differences in the content and structure of social representation of hearing aids among PHL in India, ROK, the UK, and the US. The main findings were that the social representation of hearing aids was structured around some commonly reported categories such as 'beneficial,' 'cost and time' and 'appearance and design.' Approximately 50% of the connotations associated to the categories were negative. The social representation of hearing aids showed both similarities and differences across countries.

A study by Meister et al. (2014) explored the intention to adopt a hearing aid using theory of planned behaviour. They reported that even though individuals have hearing loss they do not consult their doctor regarding their hearing due to the 'subjective norm' construct, i.e., the social normative pressures highlighting the influence of various societal factors such as media and surrounding society on hearing aid adoption. Thus, it is important to know how society views hearing aids as this will have implications on hearing aid adoption. Furthermore, to date, working on attitudes of the PHL to improve hearing aid adoption has not been fruitful. Therefore, emphasis should be given to developing strategies that could alter the societal norms that would help change the perceptions of PHL towards their hearing aids, resulting in increased hearing aid adoption. However, it is noteworthy that societal views can vary as a result of culture and thus it is important to understand the cultural differences and similarities in the social representation of hearing aids.

In the current study, content analysis produced 45 categories, suggestive of a diverse representation of hearing aids. Across all countries, the most frequent category was 'beneficial' followed by categories 'appearance and design' and 'cost and time.' There was significant association between connotations and where the respondents lived. PHL reported positive (around 35%) and neutral connotations (around 15%) related to hearing aids. PHL from ROK reported a higher percentage of neutral connotations. The social representation of hearing aids among the general public also produced approximately 40% positive connotations (Manchaiah et al., 2015b) and it is in line with the current study. The mean age of participants in Manchaiah et al. (2015b) was 41 years as opposed to 58 years in the current study. The age of the

participants and the presence of hearing loss or not, had no impact on the reported positive
connotations, i.e., they were not less positive towards hearing aids. The categories 'improved
hearing and communication,' 'improved life condition,' and 'beneficial' were predominantly
associated with positive connotations. This is similar to existing literature highlighting the
benefits of hearing aids such as improvement in quality of life (both general and hearing health)
and improvement in listening ability (Ferguson et al., 2017).

The current study findings (prototypical analysis central zone) highlight that PHL consider hearing aids are beneficial and improve hearing and communication. Despite this just over half of their reported connotations were negative. This was similar across all countries suggesting some elements of hearing aids were seen negatively irrespective of the culture. Hearing aids users are considered old and less sociable (Danermark et al., 1998; Southall et al., 2011). In a study by Hetu (1996), PHL refused to use their hearing aids at work as hearing aid use highlights hearing loss that can lead to identity threat. The negative connotations reported by PHL were approximately 10% more than the general public (Manchaiah et al., 2015b) and this could be related to PHL's better understanding of the issues with hearing aids. It may also be that hearing aids are more of an identity threat to PHL than to the general public since PHL need them. Interestingly, PHL from India perceive hearing aids more positively than other countries. This is also evident from the prototypical analysis where the main components of the central zone were related to the benefits of hearing aids. Plausible explanations could be the Indian sample has the least number of PHL who have a hearing aid. It is critical to understand the positives and negatives associated with hearing aids within the context of cultures as this can help in developing population specific management plans and strategies.

E-mail:editor.ija@up.ac.za URL: http://mc.manuscriptcentral.com/tija

The benefit of examining the social representation of hearing aids using similarities analysis is that it elucidates the relationships between categories. In this study, PHL's social representation of hearing aids was centred around three main categories: 'beneficial,' 'appearance and design' and 'cost and time.' The category 'beneficial' was reported by people who also provided expressions about the categories 'assessment and management' and 'improved hearing and communication.' This indicates that PHL consider hearing aids beneficial as there is a possibility to assess and manage hearing loss and that hearing aids can improve hearing and communication. This is consistent with previous research on the benefits of hearing aids which included improved listening ability, speech understanding and enhanced quality of life (Cox et al., 2016; Ferguson et al., 2017; Johnson et al., 2016).

The category 'cost and time' was linked to categories 'dissatisfaction' and 'repairs and maintenance' highlighting PHL consider repairs and maintenance of hearing aids and the dissatisfaction due to hearing aids as an important part of their social representation of hearing aids. Costs relating to the purchase and maintenance of a hearing aid along with the dissatisfaction relating to hearing aids especially when used in background noise were considered as the factors that can affect hearing aid adoption, satisfaction and use. For example, in a MarkeTrak VII survey, approximately half of the respondents reported 'expensive to maintain' and 'can't afford' as the reasons for non-adoption of a hearing aids. Furthermore, dissatisfaction with hearing aids such as 'don't work in noise' and 'unnatural sound' were reported to be the reasons for non-adoption and use of hearing aids (Kochkin, 2007). Nevertheless, PHL's social representation of hearing aids was similar to the social representation of the general public (Manchaiah et al., 2015b). Some differences exist between the social representation of hearing aids by the general public and by PHL. Firstly, the category 'hearing instruments' was reported predominantly by the general public suggesting that they

were considering the benefits of having a hearing aid as opposed to considering it as a hearing
device. Secondly, the general public's social representation of hearing aids highlighted
disability as a main aspect, unlike PHL. This could be due to PHL developing tactics to
overcome the challenges associated with hearing loss (Danermark, 1998), rather than viewing
hearing loss and hearing aids as a disability.

When combining frequency and rank (i.e., prototypical analysis), the two main categories that were part of the central zone were 'beneficial' and 'cost and time' highlighting that PHL view hearing aids in the context of cost benefit. In other words, the cost benefit considerations from PHL may influence their hearing aid adoption and use. Along with these two categories there were other negative categories including 'dissatisfaction,' 'aging,' 'discomfort,' and 'attitude of the individual.' Additional positive elements in the central zone were 'improved life condition' and 'improved hearing and communication.' The prototypical analysis provides information that is not available from other analyses (i.e., frequencies, similarities analyses). Interestingly, the 'appearance and design' is a frequently reported category and also heavily reported in the literature as one of the main reasons for low hearing aid adoption (Kochkin 2007; Rolfe & Gardener, 2016), although it is not represented in the central zone. Thus, although the category 'appearance and design' (which included expressions such as 'too visible,' 'ugly,' and 'compact') was a part of PHL's social representation, participants did not rate this as an important aspect in relation to hearing aids i.e., it was not in the central zone. One possible explanation for this result is a considerable change in the visibility of hearing aids compared to a decade ago, resulting in PHL not considering this aspect as important nowadays when compared to other factors.

An interesting finding from this study is that PHL rank finances and time (appointment and repairs) and the benefits of hearing aids higher (priority) than the visibility of the hearing

 aids. As 'cost and time' was shown to be important to PHL this leads to questions about the affordability of hearing aids. In the US, a pair of hearing aids can cost anywhere between \$1,500 to \$7,000 with an expected life span of approximately four to six years. PHL spend a considerable amount of money buying and maintaining hearing aids in their lifetime, often with hearing aids being the most expensive item bought after their home or car (Donahue et al., 2010). It is important to continue to develop accessible and affordable hearing devices and services worldwide (Sinha et al., 2020).

Some differences exist amongst the social representation of hearing aids across different countries. The main differences apparent in PHL from India was related to their attitudes and attitudes of others towards the use of hearing aids. Expressions such as 'others laugh,' 'others make fun,' and 'friends tease' were part of the 'others' actions and attitudes' and 'do not want,' 'do not like,' and 'manage without it' were part of the 'attitude of the individual' category. This highlights the impact of other people's opinions on hearing aid adoption in PHL in India. The unique social representation of hearing aids in ROK includes categories such as 'discomfort' and 'aging.' This is supported in the literature by Kochkin (2007) who has shown that hearing aids signal 'old age' and is considered as a major barrier for hearing aid adoption and use. McCormick and Fortnum (2013) showed that one of the main reasons for not using a hearing aid once prescribed is discomfort associated with the fitting of a hearing aid. The discomfort due to the fitting of a hearing aid is something which is relatively easy to fix and can be adjusted at the review process of an audiology consultation. The social representation of the western countries (the UK & the US) are concentrated on three main categories ('beneficial,' 'cost and time,' and 'appearance and design') that are included in the main categories from the other countries. The category 'negative mental state' was part of the central zone of the UK participants. Expressions such as 'avoid,' 'shame,' and 'embarrassing' were

included in this category and considered as factors for the non-use of hearing aids (Tomita et al., 2001). Finally, the differences in the social representation among different countries could be attributed to the differences in cultures (Zhao et al., 2015) and other societal factors such as exposure to media, religious beliefs, access to healthcare, and the differences in the demographics of the participants. These factors would need to be examined in more depth in future research.

Study Implications

The present study suggests that aspects relating to 'cost and time' need to be addressed rather than focussing solely on the 'appearance and design' of hearing aids to improve hearing aid adoption. The strengths of this study are : (1) understanding social representation of PHL may help clinicians to be better prepared to address the issues reported during clinical consultations and rehabilitation sessions, (2) as the SRT considers the collective response (i.e., PHL as a whole rather than individual responses), the knowledge gained in this study can be useful when developing public health strategies to improve attitude and perceptions about hearing aids which may result in higher hearing aid adoption, and (3) the aspects identified in this study could help to develop better culturally appropriate media campaigns. Overall, we believe that the current results may help public health efforts to facilitate hearing aid adoption.

20 Study Limitations and Further Research

There are certain limitations that restrict the generalizability of this study. The main limitation relates to the recruitment and sampling, as participants for this study were recruited from a limited number of clinics based in urban settings. In addition, the sample size is relatively small, hence the study results should be considered exploratory. Researcher bias during the content analysis was minimised by two researchers independently categorising the free

associations. There were some free association responses that were unclear and could have been included in more than one category. This is because there was no contextual information provided, unlike typical qualitative studies. However, in such cases, consensus was reached after an in-depth discussion among the researchers and where consensus could not be met these cases were not included. Moreover, the study did not take into consideration some of the influencing factors like exposure to media, social structures, ethnicity and cultural variations which could have an impact on the formation of social representations (Manchaiah et al., 2019), and this is something that need to be looked in future research.

10 Conclusion

This study explored the social representation of hearing aids in PHL across four countries. Approximately 50% of the reported categories were associated with negative connotations. The percentage of positive, neutral and negative connotations reported varied across the four countries suggesting an influence of culture. The prominent elements that were part of the structure of PHL's social representation of hearing aids were 'beneficial,' 'cost and time,' and 'appearance and design.' PHL also considers aspects such as 'improved hearing and communication,' 'repairs and maintenance,' 'discomfort,' and 'dissatisfaction' as a part of their social representation of hearing aids. The structure of social representation showed some similarities and differences across four countries highlighting the cross-cultural influences. The findings can help in the development of culturally sensitive health campaigns. The use of SRT to examine perceptions towards hearing aids is still in early stages. We believe that this exploratory study provides the foundations for future studies in this field.

2 3 4	1	Acknowledgements
5 6 7	2	Data collection in ROK was supported by the National Research Foundation of Korea (NRF)
, 8 9	3	grant funded by the Korea government (MSIT) (2019R1F1A1053060).
10 11	4	
12 13 14	5	Disclosure
14 15 16	6	The authors report no conflicts of interest related to this work.
17 18	7	
19 20 21 22	8	References
23 24	9	Abric JC. (1994) Pratiques sociales et representations. Paris, France: Presses Universitaires
25 26	10	de France; 1994:73–102.
27 28 29	11	
30 31	12	Abric JC. Méthodes d'étude des représentations sociales. RamonvilleSaint-Agne: Eres; 2003.
32 33	13	
34 35 36	14	Allport GW. Attitudes. In A Handbook of Social Psychology. Clark University Press;
37 38	15	1935:798-844.
39 40	16	
41 42 42	17	Arlinger S. Negative consequences of uncorrected hearing loss – a review. Int J Audiol.
45 44 45	18	2003;42 Suppl 2:S17–S20.
46 47	19	
48 49	20	Bales M, Johnson S. Graph theoretic modelling of large-scale semantic networks. J Biomed
50 51 52	21	Inform. 2006;39:451-464.
53 54	22	
55 56	23	Beaton DE, Bombardier C, Guillemin F, Ferraz MB. Guidelines for the process of cross-
57 58 50	24	cultural adaptation of self-report measures. Spine. 2000; 25(24):3186-3191.
60	25	

2.

Chia EM, Wang J, Rochtchina E, Cumming RR, Newall P, Mitchell P. Hearing impairment and health-related quality of life: the Blue Mountains hearing study. Ear Hear. 2007;28(2):187-195. Chundu S, Manchaiah V, Han W, Thammaiah S, Ratinaud P, Allen P. Social representation of 'hearing loss' among people with hearing loss: An exploratory cross-cultural study. Journal of the American Academy of Audiology. Inpress Cienkowski KM, Pimentel V. The hearing aid 'effect' revisited in young adults, Br J Audiol. 2001; 35:289-295. Costalat-Founeau A. Identity dynamics, action and context. J Theory Soc Behav. 1999; 22(3):289-300. Cox RM, Johnson JA, Xu J. Impact of Hearing Aid Technology on Outcomes in Daily Life I: The Patients' Perspective. Ear Hear. 2016;37(4):e224-e237. Crandell C, Mills T L, Gauthier R. Knowledge, behaviors, and attitudes about hearing loss and hearing protection among racial/ethnically diverse young adults. J Natl Med Assoc. 2004; 96(2):176–186. Danermark B, Englund U, Germundsson P, Ratinaud P. French and Swedish teachers' social representations of social workers. European Journal of Social Work. 2014;17(4):491-507.

3 4	1	Danermark BD. (1998) Hearing impairment, emotions and audiological rehabilitation: A
5 6 7	2	sociological perspective. Scand Audiol. 1998; 49:125-131.
/ 8 9	3	
10 11	4	David D, Werner P. Stigma regarding hearing loss and hearing aids: A scoping
12 13	5	review. Stigma and Health. 2016; 1(2):59-71.
14 15 16	6	
17 18	7	David D, Zoizner G, Werner P. Self-stigma and age-related hearing loss: A qualitative study
19 20	8	of stigma formation and dimensions. Am J Audiol. 2018; 27(1):126-136.
21 22 23	9	
24 25	10	Davis A, Smith P, Ferguson M, Stephens D, Gianopoulos I. Acceptability, benefits and costs
26 27	11	of early screening of hearing disability: a study of potential screening tests and models.
28 29 30	12	Health Technol Assess. 2007;11(42):1–294.
31 32	13	
33 34	14	Donahue A, Dubno JR, Beck L. Guest editorial: accessible and affordable hearing health care
35 36 27	15	for adults with mild to moderate hearing loss. <i>Ear Hear</i> . 2010;31(1):2–6.
37 38 39	16	
40 41	17	Duveen, G. Culture and Social Representations. <i>The Cambridge Handbook of Socio-Cultural</i>
42 43	18	Psychology. Cambridge, UK: Cambridge University Press; 2007:543–559.
44 45 46	19	
47 48	20	Ferguson MA, Kitterick PT, Chong LY, Edmondson-Jones M, Barker F, Hoare DJ. Hearing
49 50	21	aids for mild to moderate hearing loss in adults. Cochrane Database Syst Rev. 2017;
51 52 53	22	9(9):CD012023.
55 54 55	23	
56 57	24	Flament C. Théorie des Graphes et Structures Sociales. Paris, France: Gauthier-Villars; 1965.
58 59 60	25	

3 4	1	Gagné, JP, Southall K, Jennings MB. The psychological effects of social stigma:	
5 6	2	Applications to people with acquired hearing loss. In Montano J, Spitzer JB, editors.	
/ 8 0	3	Advanced practice in adult audiologic rehabilitation: International perspective New York,	
9 10 11	4	NY: Plural Publishing; 2009: 63–92.	
12 13	5		
14 15	6	Gatehouse S. Components and determinants of hearing aid benefit. Ear Hear. 1994;5:30-49.	
16 17	7		
18 19 20	8	Goffman E. Stigma: Notes on the Management of Spoiled Identity. Englewood Cliffs NJ:	
21 22	9	Prentice Hall; 1963.	
23 24 25	10		
25 26 27	11	Granberg S, Swanepoel de W, Englund U, Möller C, Danermark B. The ICF core sets for	
28 29	12	hearing loss project: International expert survey on functioning and disability of adults with	
30 31 32	13	hearing loss using the international classification of functioning, disability, and health (ICF).	
33 34	14	Int J Audiol. 2014;53(8):497–506.	
35 36	15		
37 38 30	16	Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts,	
39 40 41	17	procedures and measures to achieve trustworthiness. Nurse Educ Today. 2004;24(2):105-	
42 43	18	112.	
44 45	19		
46 47 48	20	Hall, D A, Zaragoza Domingo S, Hamdache LZ, Manchaiah V, Thammaiah, S, Evans, C,	
49 50	21	Wong L, International Collegium of Rehabilitative Audiology and TINnitus Research	
51 52	22	NETwork. A good practice guide for translating and adapting hearing-related questionnaires	
53 54 55	23	for different languages and cultures. Int J Audiol. 2018; 57(3):161–175.	
56 57	24		
58 59 60	25	Hétu R. The stigma attached to hearing impairment. Scand Audiol Suppl. 1996;43:12–24.	

1		
2		
4	1	
5 6 7	2	Hindhede AL. Negotiating hearing disability and hearing disabled identities. <i>Health</i> . 2012;
7 8 9	3	16(2):169–185.
10 11	4	
12 13 14	5	Hovardas T, Korfiatis KJ. Word associations as a tool for assessing conceptual change in
14 15 16	6	science education. Learn Instr. 2006;16:416-432
17 18	7	
19 20 21	8	Howarth C, Foster J, Dorrer N. Exploring the potential of the theory of social representations
22 23	9	in community-based health research - and vice versa? J Health Psychol. 2004; 9:229-243.
24 25	10	
26 27 28	11	Humes LE, Wilson DL, Humes AC. Examination of differences between successful and
29 30	12	unsuccessful elderly hearing aid candidates matched for age, hearing loss and gender. Int J
31 32	13	Audiol. 2003; 42:432–441.
33 34 35	14	
36 37	15	Jensted L, Moon J. Systematic review of barriers and facilitators to hearing aid uptake in
38 39	16	older adults. <i>Audiol Res</i> . 2011;1(e25):91–96.
40 41 42	17	
43 44	18	Johnson JA, Xu J, Cox RM. Impact of Hearing Aid Technology on Outcomes in Daily Life
45 46	19	II: Speech Understanding and Listening Effort. <i>Ear Hear</i> . 2016;37(5):529–540.
47 48 40	20	
49 50 51	21	Kochkin S. MarkeTrak VII: Obstacles to Adult Non-User Adoption of Hearing Aids. Hear
52 53	22	J. 2007;60(4):24–50
54 55	23	
56 57 58	24	Kochkin S. MarkeTrak VIII: 25-year trends in the hearing health market . <i>Hearing Review</i> .
59 60	25	2009;16:12 – 31.

1	
2	Knudsen LV, Oberg M, Nielsen C, Naylor G, Kramer SE. Factors influencing help seeking,
3	hearing aid uptake, hearing aid use and satisfaction with hearing aids: a literature review.
4	Trends Amplif. 2010;14(3):127–154.
5	
6	Lin FR, Yaffe K, Xia J, Xue QL, Harris TB, Purchase-Helzner E, Simonsick EM. Hearing
7	loss and cognitive decline in older adults. JAMA Intern Med. 2013;173:293-299.
8	
9	Link BG, Phelan JC. Labeling and stigma. Handbook of the Sociology of Mental Health.
10	Springer, Netherlands, Dordrecht; 2013:525–541.
11	
12	Linton AC, Germundsson P, Heimann M, Danermark B. Teachers' social representation of
13	students with Aspergers diagnosis. Eur J Spec Needs Educ. 2013; 28(4):392-412.
14	
15	Lopes AC, Gaskell G. Social representations and societal psychology. In Sammut
16	G, Andreouli E, Gaskell G, Valsiner J, editors. The Cambridge Handbook of Social
17	Representations. Cambridge: Cambridge University Press; 2015:29-42.
18	
19	Manchaiah V, Danermark B, Ahmadi T, Tom'e D, Zhao F, Li Q, Krishna R, Germundsson P.
20	Social representation of "hearing loss": cross-cultural exploratory study in India, Iran,
21	Portugal and the UK. Clin Interv Aging. 2015a; 10:1857–1872.
22	
23	Manchaiah V, Danermark B, Vinay, Ahmadi T, Tom'e D, Krishna R, Germundsson P. Social
24	representation of hearing aids: cross-cultural study in India, Iran, Portugal, and the United
25	Kingdom. Clin Interv Aging. 2015b; 10:1601–1615.

1		3
2		
3 4	1	
5 6 7	2	Manchaiah V, Danermark B, Ratinaud P, Germundsson P. Disability and Social
7 8 9	3	Representation Theory: The Case of Hearing Loss. Oxon, UK: Routledge; 2019.
10 11	4	
12 13	5	McCaughey TJ, Strohmer DC. Prototypes as an indirect measure of attitudes toward
14 15 16	6	disability groups. Rehabil Couns Bull. 2005;48(2):89-99.
17 18	7	
19 20	8	McCormack A & Fortnum H (2013) Why do people fitted with hearing aids not wear
21 22 23	9	them?. Int J Audiol. 2013; 52(5):360-368
24 25	10	
26 27	11	Meister H, Grugel L, Meis M. Intention to use hearing aids: A survey based on the theory of
28 29 30	12	planned behavior. Patient Prefer Adherence.2014;8:1265–1275.
31 32	13	
33 34	14	Meyer C, Hickson L. What factors influence help-seeking for hearing impairment and
35 36 37	15	hearing aid adoption in older adults?. Int J Audiol. 2012;51(2):66–74.
38 39	16	
40 41	17	Moscovici S. Attitudes and opinions. Annu Rev Psychol. 1963;14:231-260
42 43 44	18	
45 46	19	Moscovici S. Notes towards a description of social representations. <i>Eur J Soc Psychol.</i> 1988;
47 48	20	18:211–250.
49 50 51	21	
52 53	22	Moscovici, S. Social Representations. In Duveen G, editor. Explorations in Social
54 55	23	Psychology. Cambridge: Polity; 2000.
56 57 58 59 60	24	

Moscovici S, Marková I. Ideas and their development: A dialogue between Serge Moscovici and Ivana Marková'. In Duveen G, editor. *Explorations in Social Psychology*. Cambridge: Polity; 2000. Munyi CW. Past and present perceptions towards disability: A historical perspective. Disabil Stud Q. 2012; 32 (2). Retrieved on August 1, 2019 from http://dsq-sds.org/article/view/3197/3068 Nieman CL, Marrone N, Szanton SL, Thorpe RJ Jr, Lin FR. Racial/Ethnic and Socioeconomic Disparities in Hearing Health Care Among Older Americans. J Aging Health. 2016;28(1):68-94. Palmer C, Solodar HS, Hurley WR, Byrne DC, Williams KO. Self-perception of hearing ability as a strong predictor of hearing aid purchase. J Am Acad Audiol. 2009; 20:341 – 347. Ratinaud P. (2014) IRaMuTeQ: R interface for multidimensional analysis of texts and questionnaires (Version 0.7 alpha 2) [Windows, GNU/Linux, Mac OS X]. Retrieved on September 24, 2019 from http://www.iramuteq.org. Robinson J, Hames M. Counseling the significant other in the hearing aid purchase process. Hear J. 2004; 57(3):44-48 Rolfe C, Gardner B. Experiences of hearing loss and views towards interventions to promote uptake of rehabilitation support among UK adults. Int J Audiol. 2016;55(11):666-673.

2 3 4	1	Simpson AN, Matthews LJ, Cassarly C, Dubno JR. Time from hearing aid candidacy to
5 6 7	2	hearing aid adoption: A longitudinal cohort study. Ear Hear. 2019;40(3):468-476
7 8 9	3	
10 11	4	Singh G, Launer S. Social context and hearing aid adoption. Trends Hear. 2016;
12 13	5	20:2331216516673833
14 15 16	6	
17 18	7	Sinha S, Irani UD, Manchaiah V, Bhamla MS. LoCHAid: An ultra-low-cost hearing aid for
19 20 21	8	age-related hearing loss. PLoS One. 2020;15(9):e0238922.
22 23	9	
24 25	10	Slevin ML, Stubbs L, Plant HJ. Attitudes to chemotherapy: comparing views of patients with
26 27 28	11	cancer with those of doctors, nurses, and general public. <i>BMJ</i> . 1990; 300(6737):1458–60.
29 30	12	
31 32	13	Smeeth L, Fletcher AE, Ng ES, Stirling S, Nunes M, Breeze E, Bulpitt CJ, Jones D, Tulloch
33 34 35	14	A. Reduced hearing, ownership, and use of hearing aids in elderly people in the UK—The
36 37	15	MRC Trial of the Assessment and Management of Older People in the Community: A cross-
38 39	16	sectional survey. <i>Lancet</i> . 2002; 359:1466–1470
40 41 42	17	
42 43 44	18	Southall K, Gagné JP, Jennings MB. Stigma: negative and positive influence on help-
45 46	19	seeking for adults with acquired hearing loss. Int J Audiol. 2010;49(11):804–814.
47 48	20	
49 50 51	21	Southall K, Jennings MB, Gagné JP. Factors that influence disclosure of hearing loss in the
52 53	22	workplace. <i>Int J Audiol</i> . 2011;50:699–707
54 55	23	
56 57 58	24	Stark P, Hickson L. Outcomes of hearing aid fitting for older people with hearing impairment
59 60	25	and their significant others. Int J Audiol. 2004; 43(7):390–398.

~
ຼ
. つ
-

1 2		
3	1	
4	T	
5 6 7	2	Tomita M, Mann WC, Welch TR. Use of assistive devices to address hearing impairment by
7 8 9	3	older persons with disabilities. Int J Rehabil Res. 2001;24(4):279-289.
10 11	4	
12 13 14	5	van den Brink RH, Wit HP, Kempen GI, van Heuvelen MJ. Attitude and help-seeking for
15 16	6	hearing impairment. Br J Audiol. 1996;30(5): 313-324.
17 18	7	
19 20 21	8	Voelklein C, Howarth C. A review of controversies about social representations theory: a
22 23	9	British debate. Culture and psychology. 2005; 11(4): 431-454.
24 25	10	
26 27 28	11	Wilson C, Stephens D. Reasons for referral and attitudes toward hearing aids: do they affect
29 30	12	outcome? <i>Clin Otolaryngol Allied Sci.</i> 2003;28(2): 81–84.
31 32	13	
33 34 35	14	Wong L, McPherson B. Universal hearing health care: China. <u>ASHA Leader</u> . 2008;
36 37	15	13(17):14-14.
38 39	16	
40 41 42	17	Zhao F, Manchaiah V, St Claire L, et al. Exploring the influence of culture on hearing help-
42 43 44	18	seeking and hearing-aid uptake. Int J Audiol. 2015;54(7):435–443.
45 46	19	
47 48 ⊿q	20	
50		
51		
52		
53		
54 55		
55 56		
57		
58		
59		
60		

1 Appendix

2 Social Representation of hearing aids

The intention of the study is for you to think of the five words/expressions linked to the topic above, then you decide how important each word/expression is and whether you feel the word has a positive/neutral/negative connotation. Please follow the instructions below.

7 Instructions

In section one please complete the demographic details. For the second section, first please think of five words and/or expressions that spontaneously come into your mind when you think of 'hearing aids.' Second, in the "Rank" Column please rank the importance of your word/expression by assigning a number (between 1 and 5) against your word/expression. 1 is the most important word/expression and 5 is the least important word/expression. Finally, in the 'Negative – Positive' column, please enter a tick ($\sqrt{}$) in the appropriate cell if you feel vour word / expressions has a negative or positive connotation associated with it (one tick per word/expression). The "0" cell indicates that the word / expression is neither negative nor positive. The "+" cell has the positive association rating while the "-" cell has the negative association rating.

19 Section 1: Demographic details

Age:	Gender:
Do you use hearing aids? Yes/No	Socioeconomic status: Low/Middle/High

	Does someone in your family/friends have	*Education: P	rimary/Sec	condary/Te	rtiary
	hearing loss? Yes/No				
1					
2	*Primary - (Class1-7)/Secondary - (Class 8-10)	/Tertiary - Un	dergradua	te/ Gradua	te /Post
3	Graduate (General)/ Professional (Doctor, Eng	ineer, lawyer,	etc)		
4					
5	Section 2: "Hearing Aids"				
6	• <i>Stage 1:</i> Under the column words or exp	pression, pleas	e write five	e words or o	expression
7	that come spontaneously into your mind	when you thin	nk about th	e term 'hea	aring aids'.
8	• Stage 2: Under the column Rank please	suggest the or	der of imp	ortance of	the
9	words/expressions by tagging "1" as the	most importa	nt answer c	lown to "5'	as the
10	least important.				
11	• Stage 3: Please rate the negative/positive	e association o	f your wor	d/expressio	on by
12	ticking the appropriate cell $(-, 0, +)$.				
13					
	Words or expressions	Rank	Negative	Neutral	Positive
		order		0	+
			2		
			4		
14					
15					
16					

Tables

Table 1: Demographic details of participants

	All Countries (n= 424)	India (n= 111)	ROK (n= 113)	UK (n=100)	US (n=100)
Mean age in years (S.D)	58.5	52.9	50.2	68.7	63.8
	(19.2)	(18.9)	(17.2)	(15.5)	(18.9)
Gender (% Male)	61.5	72	63.7	57	52
Hearing aid use (% yes)	49.6	18	43.4	65.1	76
Family and friends with hearing	48	34.2	31.8	68.5	63
loss (% Yes)					
Education (%)					
Primary	13.4	20.7	11.5	16	5
• Secondary	41.1	57.7	36.3	38	31
• Tertiary	45.5	21.6	52.2	46	64
Socioeconomic status (%)					
• Low	8.7	12.7	11.4	7	3
• Middle	73	60.3	84.1	71	76
• High	18.3	27	4.4	22	21

Abbreviation: SD, standard deviation

Table 2: Example of a 2x2 prototypical analysis table

	Ranks < mean of ranks	Ranks > mean of ranks	
Frequency	Central zone	First peripheral	
> mean of frequency	Central Zone	i ist peripheral	
Frequency	Contrasted elements	Second peripheral	
< mean of frequency	Contrasted ciefficities	Second peripheral	

Table 3: Percentage of 45 categories reported in different countries

Categories (examples of responses)		Percer	ntage of Re	esponses	
-	All	India	ROK	UK	US
Acceptance of hearing loss (e.g., part of life, acceptance of loss, wearable)	1.0	2.4	0.7	0.4	0.4
Acclimatization (e.g., need to use continuously to adjust, adjusting to new sounds, need to adjust)	0.6	1.3	-	-	1.0
Aging (e.g., old, getting older, old age)	3.8	1.1	6.9	4.3	2.8
Appearance and design (e.g., too visible, ugly, compact)	9.6	7.0	8.7	12.7	10.3
Assessment and management (e.g., Doctor's visit, Audiologist, National Health Services)	3.5	5.7	3.1	1.0	3.9
Assistive listening device (e.g., remote mic, assistive device, supplementing additional equipment)	0.3	0.2	0.9	-	0.2
Attitude of the individual (e.g., do not want, do not like, manage without it)	2.9	4.6	0.4	2.7	4.1
Beneficial (e.g., useful, benefit, helpful)	10.9	10.1	6.0	10.6	17.4
Body structure (e.g., cochlea, part of ear, ears)	1.0	-	2.2	0.6	1.2
Causes of hearing loss (e.g., loud noise, otitis media, hereditary)	0.5	0.7	0.2	0.6	0.4
Communication difficulties (e.g., not understand speech, conversation breakdown, can't hear everything)	0.8	0.4	2.2	0.6	-
Cost and time (e.g., price, expensive, time)	9.3	4.0	9.8	6.3	17.6
Deafness (e.g., hearing impaired, deaf, hearing disorder)	2.3	0.4	5.4	2.0	1.0
Dependency (e.g., fear about continuous use, could not live without, dependent)	0.8	0.6	0.7	1.0	0.8
Disability (e.g., disability, disable people, hearing impairment)	1.1	0.6	2.9	0.8	-
Discomfort (e.g., discomfort, uncomfortable, irritation)	3.5	0.7	7.4	5.3	0.4
Dissatisfaction (e.g., clarity not good, echo sound, less clarity	4.1	2.7	4.7	3.5	6.1
Disturbance (e.g., unwanted sound, interference, robotic)	2.6	1.7	5.1	2.5	1.2
Ease or difficulty in using (e.g., simple to use, ease of use, hard to wear)	2.9	2.7	1.6	5.5	2.0

Education, employment and career issues (e.g., able to work, help with	0.5	0.7	0.4	0.2	0.6
studies, work setting) Empathy on others (e.g. feel like					
helping others, sad seeing others, pity seeing other using hearing aids)	0.5	2.0	-	-	-
Empower and compensation (e.g., free device for poor, government	0.6	1.1	1.1	0.2	-
Enhancing sound (e.g., amplification, increase gain, amplifies sounds)	1.1	0.4	1.1	2.3	0.6
Essential (e.g., good invention, must use, cannot live without)	2.3	3.8	0.7	2.3	2.2
Expectations (e.g., expectations, first time experience)	0.5	-	1.5	0.6	-
Friends and family members (e.g., connecting with others, enjoy being with family, family)	1.1	0.4	1.8	1.4	0.8
Hearing instruments (e.g., object in the ear, device, aid)	1.3	0.6	3.1	1.0	0.4
Hesitation to use hearing instrument (e.g., people avoid using, hesitation, feel like avoiding it)	1.2	4.2	-	-	0.2
Improved hearing and communication (e.g., converse with others, can hear clearly, useful for communication)	5.7	8.2	3.6	7.0	4.1
Improved life condition (e.g., can be normal, feel happy, confidence with aid)	2.4	4.4	-	4.9	0.4
Isolation (e.g., isolation, block social activity, alienation)	0.2	4	0.9	-	-
Limitations of hearing instrument (e.g., not perfect, need to be away from water, might press while sleeping)	2.1	1.5	1.5	3.5	2.0
Need for support (e.g., need help, should get more guidance, need assistance)	0.4	0.4	0.4	0.2	0.6
Negative mental state (e.g., avoid, embarrassing, shame)	3.9	5.9	4.7	4.5	0.4
Other listening devices (e.g., alternative to hearing aid, want alternate options, additional equipment)	0.2	0.9	-	-	-
Others' actions and attitude (e.g., others laugh, others make fun, friends tease)	2.5	7.5	1.3	0.4	0.4
Positive mental state (e.g., should not have hesitation, socially acceptable, confident)	1.0	0.6	1.3	2.0	-
Prosthesis (e.g., ear trumpet, extra part to body, prosthesis)	0.5	1.1	0.2	0.6	-

Repairs and maintenance (e.g., care and					
maintain well, battery drains,	4.7	3.8	2.9	5.1	7.1
moulds become loose)					
Reveals hearing loss (e.g., people will					
know, others identify hearing	0.8	2.9	-	-	-
problem, others can easily identify)					
Satisfaction (e.g., like them, like it, love	0.0	0.4	0.4		2.0
them)	0.9	0.4	0.4	-	5.0
Sound and acoustics of the environment					
(e.g., high frequency, high pitch,	0.5	0.4	0.9	0.2	0.4
sound)					
Stigma (e.g., prejudice, hide, avoid)	1.6	1.5	2.2	1.4	1.4
Technology (e.g., directional, new	10	0.6	1 1	16	12
technology, interface with others)	1.8	0.0	1.1	1.0	4.3
Voice and speech functions (e.g.,					
children's voice, family voice,	0.3	0.7	0.4	-	0.2
some people speak loud)					

e speak loud

Table 4: Prototypical	l analysis of hearing	g aid data fron	n all countries
-----------------------	-----------------------	-----------------	-----------------

Page 43 of 67	of 67 International Journal of Audiology				
1 2 3 4	Table 4: Prototypical analysis of hearing aid	l data from all countries			
6 7 8 9	Central Zone Beneficial Cost and time Improved hearing and communication	First periphery Appearance and Design Repairs and maintenance Negative mental state			
10 11 12 13	Dissatisfaction Aging Discomfort Attitude of the individual	Assessment and management Ease or difficulty in using Essential Disturbance			
14 15 16 17	Improved life condition Deafness Contrasted elements	Others' actions and attitude Second periphery			
18 19 20 21 22 23 24 25 26 27 28 29	Isolation Positive mental state Communication difficulties Dependency Acceptance of hearing loss Expectations Empathy on others Education, employment and career issues Need for support	Limitations of hearing instrument Other listening devices Voice and speech functions Sound and acoustics of the environment Causes of hearing loss Acclimatization Hesitations to use hearing instrument Empower and compensation Hearing instruments Friends and family members			
30 31 32 33 34 35 36		Assistive listening device Technology Prosthesis Body Structure Enhancing sound Satisfaction Disability			
37 38 39 40		Stigma Reveals hearing loss			
41 42 43 44 45 46					
47 48 49 50 51 52					
53 54 55 56 57					
58 59 60					



Table 5: Elements of central zone in hearing aid data in each country based on prototype analysis

Elements of Central Zone	India	Republic of Korea	United Kingdom	United States
Aging		✓		
Assessment and management	✓			
Attitude of the individual	✓			✓
Beneficial	✓	✓	✓	✓
Cost and time	✓	✓	✓	✓
Deafness		✓		
Disability		✓		
Discomfort		✓		
Dissatisfaction	20	✓	\checkmark	✓
Improved hearing and communication	× 2	10	✓	\checkmark
Improved life condition	•	R.	✓	
Negative mental state		2	✓	

Figures

Figure 1: Percentages of associations ranked positive, neutral and negative among respondents from different countries



Figure 2: Similarities analysis index for all countries highlighting the prominent categories associated with social representation of hearing aids and inter category associations (n=424)



Figure 3: Similarities analysis index for India highlighting the prominent categories associated with social representation of hearing aids and inter category associations (n= 111)



Figure 4: Similarities analysis index for ROK highlighting the prominent categories associated with social representation of hearing aids and inter category associations (n= 113)







Figure 6: Similarities analysis index for US highlighting the prominent categories associated with social representation of hearing aids and inter category associations (n= 100)



Review of Social Representation of 'hearing aids' among people with hearing loss: An exploratory study

We would like to thank the reviewers for their very thoughtful and helpful comments the manuscript is certainly improved as a result of the amendments made from the comments.

In principle this study will be of great interest to readers of IJA. It addresses an interesting and important topic, however, the paper needs some revision before it will be ready for publication.

Thank you

First, it is not clear to me why the authors take so many different approaches to analysing the data. I am not suggesting they should not have done this but they should provide a better explanation for it than 'we applied multiple types to obtain a more accurate...' (P16).

To me this is a throw away sentence that says nothing substantive. Could it be that the analysis is a multistep process rather than being a series of separate analyses? If so, but this does not come across in the text.

We have included more information relating to SR analysis in the methods. SR analysis includes a series of separate analyses offering unique information about social representation. Please see below text.

Data Analysis

In the current study, both qualitative (i.e., content analysis) and quantitative analyses (i.e., chi square analysis, similarities analysis, prototypical analysis) were used. The quantitative analyses were performed using the open-source software IRaMuTeQ (Ratinaud, 2014).

Traditionally, social representation analysis is limited to one or two analyses such as frequencies analysis or similarities analysis. However, a multimethod analysis yields a more comprehensive understanding of the phenomenon that is being investigated (for further details see Manchaiah et al., 2019). For example, similarities analysis examines the frequency of each category and how it is interconnected with other categories (i.e., co-occurrence of categories), although the rank order (or the importance rating) is not considered in this analysis. Alternatively, prototypical analysis takes into consideration how frequently a category is reported and how important that a particular category is to the respondents by incorporating a rank order, although it does not represent the co-occurrence of categories. More detailed discussion of the data collection and analysis methods are provided by Manchaiah et al. (2019).

Second, the data presented are not easy to interpret. While the international comparisons are interesting and important I wonder whether the data could be presented in such a way that makes it easier for the reader to make these comparisons. This goes in particular for Figs 3 to 6 and Table 5. Table 5 could easily be reformatted to facilitate across-county comparisons.

It is not possible to merge the Figures 3 to 6. The figures are presented separately as is the usual practice (e.g. Manchaiah et al, 2015a; 2015b, Chundu et al., 2020). We have reformatted Table 5. Please see below.

Table 5: Elements of central zone in hearing aid data in each country based on prototype

analysis

Elements of Central Zone	India	Republic of Korea	United Kingdom	United States
Aging		×		

1
2
3
4
5
6
7
/ 0
0
9
10
11
12
13
14
15
16
17
18
19
20
21
ר ∠ בר
∠∠ วว
23
24
25
26
27
28
29
30
31
32
33
34
35
36
30 27
2/
38
39
40
41
42
43
44
45
46
47
48
49
50
51
57
52 52
55
54
55
56
57
58
59
60

Assessment and management	×				
Attitude of the individual	~			✓	
Beneficial	✓	\checkmark	V	✓	
Cost and time	×	\checkmark	~	✓	
Deafness		\checkmark			
Disability		\checkmark			
Discomfort	0	✓			
Dissatisfaction	9	\checkmark	~	✓	
Improved hearing and communication	1	5	v	✓	
Improved life condition		2.	~		
Negative mental state		0	~		

Further, it would help me if, in the results, the authors provided a sentence or two summary after each figure or section which provide the key message they want the reader to take from each.

Thank you – good idea - we have included summary statements after each section.

P12 – Connotations - *Overall, this shows that PHL view hearing aids negatively although the exception to this is in India where more than 50% of the connotations were positive.*

P12- Similarities analysis - *The social representation of hearing aids was centred around expressions related to categories 'beneficial,' 'cost and time,' and 'appearance and design' as they exhibited the biggest nodes and highest co-occurrences.*

P13 – Similarities analysis India - *Within the social representation of hearing aids in India, there was an emphasis on the benefits of hearing aids, appearance and design of hearing aids and the actions and attitudes of other people towards PHL with hearing aids.*

P13 – Similarities analysis ROK - *In ROK, the focus was on the negative aspects of hearing aids such as cost, appearance and design, and the discomfort relating to use of hearing aids.*

P14 – Similarities analysis UK - Overall, these findings suggest that the UK participants considered hearing aids to be beneficial, although the cosmetic aspects of the hearing aids were viewed negatively.

P15- Prototypical analysis - *The categories in the central zone are important aspects of the social representation on hearing aids as they take into consideration both frequency and rating of importance (or rank order).*

P15-Protypical analysis Table 5 - *There are differences in the categories contained within the central zone of different countries highlighting the impact of culture on the social representation of hearing aid users.*

Third, methodological details are still missing. Were these questionnaires completed in person via interviews or in written format? I do not see the appendix. Perhaps it would be clearer if I had.

The questionnaires were completed in person either before or after the participant's clinical appointment. We have included this in amended text. The appendix was included as a part of the submission Page 32.

Data were collected, in person, from both new and existing hearing aid users using a paper-based method either before or after their appointment with their audiologist.

Other comments.

Why is 'hearing aids' in inverted commas in the title and elsewhere?

We wanted to highlight that we are studying the phenomenon hearing aids. We have removed inverted commas

P 13: Parag beginning 'stigma is often...' First, what does 'stigma is often used in HA research' mean? Second, I am not sure of the relevance of this paragraph in the context of this study.

We wanted to highlight that stigma was used as a theoretical perspective in Audiology research, in particular, when investigating hearing loss and hearing aids. Stigma primarily focusses on the negative aspects of a disability and does not offer a holistic view. Alternatively, social representation offers a holistic view looking at positive and negative aspects of the phenomenon being studied. We feel that the limitations of stigma research need to be highlighted before moving onto the benefits of studying the social representation of hearing loss.

P15: Chundu (in review). Until published this reference is not helpful to the reader. It might make more sense to briefly summarize the key message from the in review publication here unless it will definitely be published prior to this article.

The article will be published in November/December 2020, we have returned the proofs.

P16: Sentence 'Participants were mainly from...' Where else were they from? The table only has data from the 'main' countries.

You – we have deleted mainly

Participants were recruited from Audiology clinics based in Mysore (India), Gangwon-do (ROK), Cambridge, London (UK) and Beaumont (US)

P16 last sentence: Was there any validation of the forward-backward translation? If not, the possible implications of this should be mentioned in the discussion

We have included some more information in the methods section (under data collection).

An orientation session that included a description of the aims of the study and that explained data collection procedures in detail was given to researchers from each country. To maintain consistency in data collection across all sites, five practice trials were performed, and any protocol queries raised by researchers answered. These data were not included in the study.

The questionnaire, in English, was used in the UK and US and was translated to Kannada (India), and Korean (Republic of Korea) using the forward-backward translation method (Beaton, 2000; Hall et al., 2018). The data collected were subsequently translated back to English by the researchers. Although, no formal validation was performed on the translated questionnaires, it has been used in previous social representation studies (Manchaiah et al., 2015a, 2015b).

P16 line 1: I would expand on the free association task here, when it is first mentioned rather than waiting until the end of the parag.

We have restructured this paragraph. Please see below amended text

A free association task by way of a study questionnaire was used to collect data for this study. As the task required spontaneous responses from participants (up to five) to a stimulus (in this case hearing aids), it minimises the urge to provide politically correct expressions and helps to reduce social acceptability bias (Hovardas & Korfiatis, 2006). This method is commonly used in social representation studies as it allows extraction of semantic content of social representation (e.g., Linton et al., 2013; Danermark et al., 2014; Manchaiah et al., 2019a, 2019b). The study questionnaire had two sections (see Appendix). The first section included questions regarding demographic information such as age, hearing aid use, and socioeconomic status (see Table 1). The second section included the free association task. Participants were asked to list up to five words or phrases that spontaneously come into their mind in response to the stimulus 'hearing aids.' Participants were then required to rank each word or phrase in the order of importance. Finally, participants assigned a positive, neutral or negative connotation for each word or phrase.

Table numbering is wrong – Table 3 is referred to before Table 2.

We have deleted the statement referring to table 3 and replaced it with an example so now Table 3 is not referred before Table 2.

Here, words with similar meaning were grouped into a single category. For instance, responses such as 'older,' 'aging,' or 'old age' were grouped into one category - 'aging.'

P18 first sentence: What is meant by questionnaires with less than 4 responses'? Are you suggesting that people didn't complete the questionnaires and that some gave up after 3 questions or something else?

Yes, there were some questionnaires with less than 4 expressions (3 or less) reported by the participants, and they were not included in the analysis.

In content analysis one typically uses multilevel coding, having categories within themes, and codes within categories. This makes it easier for the reader to interpret the data. Perhaps this approach was deliberately not sued so that the next analysis could be conducted? Please provide more details about this. We have deliberately not created themes and codes within categories as this helps with the analyses we have used. To aid clarity, we have (in parentheses) included the 'content coding' next to the Content Analysis heading in an attempt to demonstrate that that we have not used multilevel coding. For example, words or expressions with similar meaning were coded into same category. For example, old, older, ageing, elderly. etc

Content Analysis (Content coding)

P18 last parag: what is connexity?

We meant connection. We have changed the wording now.

Similarities analysis considers the connections between the elements (categories) of social representation.

P21 last line: 'stronger' than what?

We have amended the wording. Please see below

Along with that, a strong relationship exists between categories 'beneficial' and 'cost and time' (70), 'beneficial' and 'improved hearing and communication' (37), 'cost and time' and 'repairs and maintenance' (38), and 'beneficial' and 'assessment and management' (36).

P22: The authors say 'this allows for easy comparison'... I disagree. As noted previously, I found it very hard to compare across the figures.

As discussed above, we would not be able to merge the figures. We removed the word 'easy'

These allow for comparison of the data between countries and helps to elucidate the similarities and differences in the social representations across countries.

P28 sentence 'they did not consider this aspect a priority'. Where does prioritization come from? Are you saying this based on frequency and rank? Is this legitimate?

We have changed the wording to reflect that the category is not in the central zone and respondents have not ranked it as important.

Thus, although the category 'appearance and design' (which included expressions such as 'too visible,' 'ugly,' and 'compact') was a part of PHLs' social representation, participants did not rate this as an important aspect in relation to hearing aids i.e., it was not in the central zone. One possible explanation for this result is a considerable change in the visibility of hearing aids compared to a decade ago, resulting in PHL not considering this aspect as important nowadays when compared to other factors.



Reviewer 2

Comments to the Author

Thank you for the opportunity to review Manuscript ID TIJA-2020-03-0084.R1 entitled "Social representation of 'hearing aids' among people with hearing loss: An exploratory study" for the International Journal of Audiology. The authors present an important and interesting paper and have made significant improvements to the paper following its previous review. I believe that they have adequately addressed the previous comments.

However, I have some additional comments that I feel need to be addressed prior to publication. In particular, there are some expansions of the Methods section that would make the approach that the authors have taken clearer and easier to follow. Given the relatively novel approach that they have taken, I believe that these inclusions wold help ensure that the paper is useful to researchers in the future.

Again, my thanks.

P1 L43 – Please complete the reference. There also appears to be a spelling mistake in the reference on L45 and L50.

Thank you for this, we have included the year and corrected the spelling mistake in the reference.

Various factors have been identified that may contribute towards hearing aid adoption and use or lack thereof (for review see Knudsen et al., 2010). PHLs' age and gender seem not to influence hearing aid adoption use and satisfaction (Knudsen et al., 2010). Rather, factors that contribute positively to hearing aid adoption include perceived hearing disability, severity of hearing loss, self-reported activity limitations and socio-economic status (Knudsen et al., 2010; Meyer & Hickson, 2012; Simpson et al., 2019).

P5 L15 – "Therefore, SRT can ..." I don't think that this deduction follows from what you've said before. Certainly, a better understanding of the social representation of hearing aids could "help in developing strategies to better educate ..."

Thank you we agree that the statement does not follow from what we have said, we have removed that statement and included new text at the end of the paragraph.

Thus, SRT is a useful technique to use when attempting to understand the effect of cultural differences on the perception of hearing aids across different countries.

P6 L22 - should read "respondents" not "respondent's".

Thank you, we have amended it

Respondents were mainly males (>60%) in India and ROK. In the UK and the US the respondents gender was evenly distributed.

P6 L29 – It would be helpful to have a definition of how Socioeconomic Status was determined, and make it clear what the Education categories mean.

The education categories and examples are given as part of the questionnaire included in the appendix. We have asked participants their socioeconomic status in the demographic part of the questionnaire, it was open to participants to decide their own socioeconomic status. We have included the following statement in the data collection section.

The various education categories included in the questionnaire were: *Primary -(Class1-7)/Secondary - (Class 8-10)/Tertiary - Undergraduate/ Graduate /Postgraduate (General)/ Professional (Doctor, Engineer, lawyer, etc. Socioeconomic status was categorised into low, mid, and high and the participants were asked to choose based on their assumption of their socioeconomic status

P7 L38 – "multimethod" might be a better word than multidimensional for the kind of analysis that you're performing, as multidimensional suggests that the dimensions are orthogonal, or at least separable.

We have changed to multimethod

However, a multimethod analysis yields a more comprehensive understanding of the phenomenon that is being investigated (for further details see Manchaiah et al., 2019).

P8 L4 – It isn't clear how you determined that your content analysis should "stop" – i.e. how did you determine that two categories were conceptually distinct and shouldn't be merged?

We are not sure what you are asking. We have attempted to answer it based on our understanding.

No sample size estimates were developed for social representation studies. In previous studies, typically for exploratory studies sample size was in 100s (Manchaiah et al., 2015a, 2015b and Chundu et al., 2020) and confirmatory studies used thousands using multiple methods. This is an exploratory study

We followed a typical content analysis by Graneheim and Lundman, 2004. We grouped the expressions into categories, (examples in table 3). Based on the previous research and preliminary responses from this research, we created a code book. If there was a new expression or word that did not fit into the existing code book, a new category was created (following consensus with another researcher).

P9 L3 – The methodology here isn't entirely clear. I believe that you created the connected weighted graph of all cooccurrences and then calculated the maximum spanning tree (presumably using Kruskal's algorithm) – is that correct? Please expand on this section to make it clear. Also, have you dealt with transitivity at all, or just deleted the low-weighted links?

Please see some more details below. We have included new text This is an analysis of co-occurrences, that is the number of times the two categories were reported together. The maximum tree is computed by creating the connected weighted graph of all cooccurrences. Subsequently, the weight of links is converted into distances and the minimum spanning tree function (Prim's algorithm).

We believe the below paragraph explains it to readers who may not be well versed with the algorithms and included in manuscript

For similarities analysis, IraMuTeQ software counts the number of people who have reported two categories. This will give a cooccurrence score which can vary from zero (if no one has associated both categories) to n (if there were 'n' people in the sample and all of them have associated both categories). This computation produces a similarity matrix, which is a symmetrical matrix with items in lines and in rows. From this matrix, a similarity graph is produced where items are represented as nodes of the graph and the lines between nodes represent the number of times two categories were reported by the same person.

P9 L26 – It would be clearer to talk about the "rating of importance" of the items here, rather than the "rank", as rank seems to refer to the ordering of the item in the frequency list (i.e. most frequent to least frequent).

We have rewritten this paragraph. Rank is the terminology used within the social representation literature and was the term used in the questionnaire. We have amended to 'rating of importance' to make it easy for the reader. Please see below

This analysis offers insight into the content and structure of PHL's social representation of 'hearing aids.' Prototypical analysis highlights the importance of specific elements of the social representation by checking two independent criteria

(i.e., rating or ranking of importance and frequency of occurrence) making it a useful analysis in social representation research. This analysis results in four options, usually presented in a 2x2 table (see Table 2). The 'central zone' depicts the most frequently occurring and most important categories. More frequently occurring but less important categories are represented in the 'first peripheral zone' The 'second peripheral zone' represents the categories that are less frequent and less important. Finally, categories that are low frequency and more important are called 'contrasted elements' (Abric, 1994). The categories in the central zone offer the representation its meaning and are intensely shared by the group (Abric, 2003). The peripheral elements can vary among people and environments and are considered less stable. The elements in the first periphery are flexible and adapt the social representation to the changes in the environment and everyday experiences. The second periphery is the least useful in defining social representation as it has categories which are low frequency and least important. Finally, the contrasted elements indicate a subgroup that prioritises some categories differently to the majority of the population (Abric, 2003).

P9 L40 – This whole section is very confusing as the reader tries to work out what "low number" and "high rank" and "high importance" mean for each category. it would be helpful to establish a single wording and go with that (probably importance). Is it possible that the first peripheral has to do with social discourse around the representation (things that are said a lot but don't have high importance for the person) and that the contrasted elements have to do with the individual differences within the representation (things that are highly important to a small number of people)?

Please see above amended paragraph. Yes, the peripheral elements could be due to Social discourse and the contrasted element highlights individual difference. The contrasted elements indicate a small some group of individuals who are different, in a way indicating the individual differences.

P13L40 – "relates" should read "related".

We have changed to related

The main aspects that were part of the social representation of hearing aids in the US related to the resources needed to adopt and use a hearing aid and to deal with the cosmetics of the aids.

P15L37 – "Even though individuals..." Is this drawn from the Meister et al. paper? Please make this clearer.

We have clarified. Please see below amended text

A study by Meister et al. (2014) explored the intention to adopt a hearing aid using theory of planned behaviour. They reported that even though individuals have hearing loss they do not consult their doctor regarding their hearing due to the 'subjective norm' construct

P16L38 – "although PHL accept that..." I'm not sure where this assertion has come from. Please expand on this point, as it is very interesting.

This is the finding from the study as the categories beneficial and Improved hearing and communication are most frequently reported and rated important by the respondents (prototypical analysis). We have added new text to the paragraph to highlight this.

P19L35 – There appears to be an extraneous footnote that doesn't appear elsewhere.

Thank you- we have deleted it

P21L1 - "Some of the free associations..." This should already be reported in the Results.

Thank you. We have moved the sentence to Results - content analysis.

. setence to

06/11/2020

Dear Editor,

We are submitting a revised version (R2) of our original research article entitled "Social representation of 'hearing aids' among people with hearing loss: An exploratory study" for consideration by International Journal of Audiology.

We have no conflicts of interest to disclose.

Please address all correspondence concerning this manuscript to me at Srikanth.Chundu@aru.ac.uk

Thank you for your consideration of this manuscript. у у Sincerely,

Dr Srikanth Chundu Senior Lecturer in Audiology Anglia Ruskin University Cambridge, UK