Experiences of Hearing Loss and Audiological Rehabilitation for Older Adults with Comorbid Psychological Symptoms: A Qualitative Study

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ABSTRACT

Purpose: There is a well-established relationship between hearing loss and psychological symptoms. To ensure audiological rehabilitation is provided appropriately for older adults with comorbid psychological symptoms, a greater understanding of their preferences and experiences is needed. This study sought to understand experiences of hearing loss and audiological rehabilitation from the perspective of older adults with comorbid psychological symptoms (e.g. depression, anxiety, psychosis).

Design: A qualitative study using in-depth semi-structured interviews was conducted with older adults who had attended audiological rehabilitation within the last year and scored above established cut-offs on measures of depression, anxiety and psychosis. A thematic analysis generated themes that related to participants' experiences of hearing loss and audiological rehabilitation.

Results: Participants included 14 older adults (eight males and six females) with an average age of 70.5 years (SD = 4.45, range = 64-80) who received hearing aids or a cochlear implant. Three major themes emerged from the analysis of participant interviews. *The cumulative impact of hearing loss and psychological symptoms* theme describes the two-way, additive relationship between hearing ability and psychological symptoms. *The experience of loss throughout hearing loss and audiological rehabilitation* captures subjective losses, the impact they have and how participants cope with them. In contrast, *The experience of gain throughout hearing loss and audiological rehabilitation* describes the participants' reported gains, their related impacts and coping strategies.

Conclusions: The experiences of participants revealed that the presence of comorbid psychological symptoms can influence the experience of hearing loss and audiological rehabilitation. These findings have implications for how audiological rehabilitation is provided to ensure optimal outcomes for adults with hearing loss and comorbid psychological symptoms.

INTRODUCTION

Hearing loss is highly prevalent globally; approximately 15.9% of the US population are affected by some degree of hearing loss, with a similar prevalence reported in Australia (14.5%) and other developed nations (Deloitte Access Economics, 2017). This percentage also increases with age, with the estimated prevalence of hearing loss rising to 58% in people aged 61-70 years and 74% in people aged 71 years and older (The Senate Community Affairs References Committee, 2010). Hearing loss has been ranked as the third leading cause of years lived with disability globally (GBD 2016 Disease and Injury Incidence and Prevalence Collaborators, 2017), and imposes significant costs on budgets and healthcare systems (Deloitte Access Economics, 2017).

Hearing loss, and the associated breakdown of communication, can have a variety of physical, cognitive, behavioral, social and emotional consequences that negatively affect individuals and their families (Cherko, Hickson, & Bhutta, 2016). Studies have demonstrated a link between hearing loss and embarrassment (Barker, Leighton, & Ferguson, 2017), social isolation (Backenroth & Ahlner, 2000), loneliness (Mick et al., 2018), reduced time outside of home (Mikkola et al., 2016), smaller social networks (Kramer, Kapteyn, Kuik, & Deeg, 2002) and a reduction in meaningful spousal conversations (Ask, Krog, & Tambs, 2010). Given the extensive and pervasive impact of hearing loss on an individual's life, it is not surprising that a body of literature has also explored the relationship between hearing loss and psychological symptoms or mental disorders, particularly symptoms of depression, anxiety and psychosis.

Depressive symptoms and disorders have been the most extensively researched psychological phenomena in relation to hearing loss (Adigun, 2017) and many studies have demonstrated a significant correlation between hearing loss and depression (Abrams, Barnett, Hoth, & Schultz, 2006; Andreeva et al., 2017; Capella-McDonnall, 2005; Gopinath et al., 2009; Kim et al., 2017; Y. Kim, Kwak, & Kim, 2015; Saito et al., 2010). Other research shows no correlation (Andreeva et al., 2017; Mener, Betz, Genther,

Chen, & Lin, 2013; Tambs, 2004), or even that hearing loss is associated with a decreased prevalence of depressive symptoms (Kim et al., 2015). Most of this research has been cross-sectional and therefore unable to establish a causal or directional relationship between psychological symptoms and hearing loss. One study to date has utilized a prospective cohort study design to measure perceived hearing loss at a baseline time, followed by a measure of depressive symptoms 2-3 years later (Saito et al., 2010). The researchers reported that hearing loss significantly increased the future risk of developing symptoms of depression (OR = 2.45, 95% CI = 1.26 – 4.77).

Inconsistencies in research findings with regard to the relationship between hearing loss and depression may be attributed to differences in measurements of hearing loss (e.g. subjective report vs audiometry), depressive symptoms (e.g. diagnosis of depression vs a variety of self-report measures) or a range of study variations (e.g. longitudinal vs cross-sectional) (Chang, Ho, & Chou, 2009; Crawford, Cayley, Lovibond, Wilson, & Hartley, 2011). Overall, a recent meta-analysis of 35 studies reported a statistically significant association between hearing loss and depression, with greater odds of depression in hearing impaired older adults (OR = 1.47, 95% CI = 1.31 – 1.65) (Lawrence et al., 2019). Therefore, taken together, research does suggest the presence of a relationship between depression and hearing loss.

Methodological concerns also arise in studies exploring the association between hearing loss and anxiety. Once again, the methods by which hearing loss or anxiety symptoms are measured can alter the reported associations. Some studies have examined the diagnosis of specific anxiety disorders, such as generalized anxiety disorder or panic disorder; whereas other studies have utilized an assortment of self-report questionnaires to establish anxiety symptom scores. Several studies reported a significant association between hearing loss and diagnosed anxiety disorders (e.g. panic disorder, agoraphobia, specific phobias, social phobias, obsessive–compulsive disorder, post-traumatic stress disorder, and generalized anxiety disorder) (Bernabei et al., 2011; Chung, Hung, Lin, & Sheu, 2015; Hsu et al., 2016). Hearing loss was also significantly related to symptoms of anxiety as measured by self-report questionnaires (Cetin, Uguz,

Erdem, & Yildirim, 2010; Ciesla, Lewandowska, & Skarzynski, 2016; Contrera et al., 2017; Cosh et al., 2017; Hallam, Ashton, Sherbourne, & Gailey, 2006; Vancampfort, Koyanagi, Hallgren, Probst, & Stubbs, 2017). Only two studies did not find a significant relationship between hearing loss and anxiety (Andersson & Green, 1995; Contrera et al., 2017). Once again, very few studies have provided evidence of a directional relationship between hearing loss and anxiety symptoms. Chung et al. (2015) found that participants presenting with a sudden sensorineural hearing loss were significantly more likely to have had an anxiety disorder diagnosis in the past (OR = 1.49, 95% CI = 1.34 – 1.66). A recent systematic review conducted by Shoham et al. (2019) reported that anxiety was significantly more prevalent in people with hearing loss compared to those without hearing loss in eight of the 10 studies that compared samples. A meta-analysis was not conducted so further research is needed to confirm this relationship.

Overall, there has been largely consistent evidence of an association between hearing loss and psychotic symptoms. A recent comprehensive meta-analysis of 49 cross-sectional and longitudinal studies analyzed the relationship between hearing loss and psychotic symptoms (Linszen, Brouwer, Heringa, & Sommer, 2016). The meta-analysis revealed that hearing loss was significantly related to hallucinations (cumulative OR = 1.40, 95% CI 1.18-1.65, n = 227,406), delusions and paranoia (cumulative OR = 1.55, 95% CI 1.36-1.78, n = 250,470), psychotic symptoms (cumulative OR = 2.23, 95% CI 1.83-2.72, n = 229,647) and psychotic disorders (cumulative OR = 2.79, 95% CI 1.25-6.22, n = 8,793). For example, one study included in the meta-analysis compared a cohort of patients (mean age of onset 68 years) with late-onset schizophrenia, which the researchers termed paraphrenia, with matched controls and revealed that hearing loss was four times more likely to be present in those with schizophrenia (Almeida, Howard, Levy, & David, 1995). A longitudinal study found that older adults (≥ 65 years) with self-reported hearing loss were 76% more likely to have symptoms of paranoia three years later, compared to those without hearing loss (Blazer, Hays, & Salive, 1996). Overall, these findings are supportive of an independent relationship between hearing loss and psychosis. Minor inconsistencies across study results may again be due to

methodological variations, sample differences and the specific psychotic feature being examined. Whilst there has been some evidence of hearing loss being a risk factor for psychological symptoms, previous research has been unable to establish a causal or directional relationship due to the predominately cross-sectional nature of these study designs.

Audiological rehabilitation and psychological symptoms

The core aim of audiological rehabilitation is to reduce activity limitations and participation restrictions associated with hearing loss; generally, this involves the optimization of hearing and communication ability in people experiencing difficulties as a result of hearing loss, usually through the provision of hearing aids or cochlear implants (Aazh & Moore, 2017). Ideally, audiological rehabilitation will also translate these improvements in hearing and communication ability to improved quality of life for clients and their significant others (Ekberg, Meyer, Scarinci, Grenness, & Hickson, 2015; Montano, 2009). Patient-centred care, which considers the treatment and rehabilitation of the client within their entire life context (Engel, 1977), is the recommended approach to audiological rehabilitation (American Academy of Audiology, 2006; Audiology Australia, 2013; British Society of Audiology, 2016). The audiologist should therefore provide rehabilitation that addresses not only the hearing loss, but the impact of the hearing loss on the emotional, physical and social aspects of that person's life (Erdman, Wark, & Montano, 1994; Hickson & Scarinci, 2007; Grenness, Hickson, Laplante-Lévesque, & Davidson, 2014b).

Given the association of hearing loss and psychological symptoms, it could be suggested that an improvement of subjective hearing ability may also be associated with a reduction of psychological symptoms. Some studies have demonstrated this, with evidence that psychological symptoms have been reduced after the provision of hearing aids or cochlear implants. For example, several studies found that self-reported depressive symptoms were significantly reduced in hearing aid users and cochlear implant recipients from baseline to post-fitting (3, 4, 6 and/or 12-months) (Acar, Yurekli, Babademez, Karabulut,

& Karasen, 2011; Boi et al., 2012; Bruggemann et al., 2017; Castiglione et al., 2016; Choi et al., 2016; Contrera et al., 2015; Mulrow et al., 1990). In contrast, Knopke et al. (2016) found no significant change in depressive symptoms upon provision of cochlear implants. The authors acknowledge however, that the participant cohort already had low scores of depressive symptoms at pre-implantation and thus any further changes were likely to be small. Moreover, a recent meta-analysis found no significant difference in depression symptoms between studies that included some participants with hearing aids and studies where no participants used hearing aids, however the authors stated this finding should be interpreted with caution as there were no specific comparison groups (Lawrence et al., 2019). Studies that employed measures of stress and anxiety found no significant changes with hearing device usage (Bruggemann et al., 2017; Contrera et al., 2017; Knopke et al., 2016). It is possible that anxiety and stress are less responsive to the provision of hearing devices compared with depression. It is also possible that differences in methodology, samples and measurements may contribute to the variable results obtained. Overall, hearing devices alone do not fully, nor can reasonably be expected to, overcome psychological symptoms or predict audiological rehabilitation success (Hickson, Meyer, Lovelock, Lampert, & Khan, 2014; Kobosko, Jedrzejczak, Pilka, Pankowska, & Skarzynski, 2015).

Despite a move towards patient-centered audiological rehabilitation, current practice still focusses heavily on the provision of devices, and services that might acknowledge or address psychological symptoms are rarely offered (Ekberg, Grenness & Hickson, 2014; Grenness, Hickson, Laplante-Lévesque, Meyer, & Davidson, 2015a; Grenness, Hickson, Laplante-Lévesque, Meyer, & Davidson, 2015b). Depression and anxiety can influence rehabilitation success in other settings such as physiotherapy, nursing and primary health care (Mumford, Schlesinger, & Glass, 1982; Nicholas & George, 2011; Nichols, 1985). It is possible that understanding client psychological concerns could help audiologists modify their delivery of rehabilitation to optimize outcomes. However, more needs to be understood about the experience of

hearing loss or audiological rehabilitation for older adults with comorbid psychological symptoms. Thus far, no study has explored the lived experience of this specific population.

Previous qualitative studies have provided a phenomenological understanding of hearing loss or audiological rehabilitation from the perspective of older adults. Hallberg and Carlsson (1991) conducted a qualitative grounded theory analysis with 12 participants to understand how people may cope with hearing loss. Two distinct management strategies were identified, controlling the social scene and avoiding the social scene. Participants that controlled the social scene described how they would optimize their environment (e.g. make requests of their communication partners, reduce background noise) or dominate the conversation to minimize listening time. Those that avoided the social scene reported a reduction of participation by not attending situations or by mentally withdrawing from conversations around them. Knudsen, Nielsen, Kramer, Jones, and Laplante-Lévesque (2013) provided an understanding of the experience of audiological rehabilitation via a qualitative thematic analysis of 34 client interviews. Their analysis established an overall theme of *client labor*, which explained the type of effort that participants felt was needed to participate in audiological rehabilitation. *Client labor* was divided into three sub-themes: *emotional labor* (e.g. reaching out, persistence), *cognitive labor* (e.g. problem solving, decision making, adjustment) and *physical labor* (e.g. maintaining hearing device, payments). Other qualitative studies also explored factors influencing audiological rehabilitation decisions (Laplante-Lévesque, Hickson, & Worrall, 2010), barriers and facilitators to audiological rehabilitation (Barnett et al., 2017) and perspectives of patient-centered care in audiological rehabilitation (Grenness, Hickson, Laplante-Lévesque, & Davidson, 2014a). Although these studies have contributed to a general understanding of audiological experiences for older adults, the voices of those with comorbid psychological symptoms have not yet been heard.

The aim of the current study, therefore, was to develop an understanding of the experience of hearing loss and audiological rehabilitation for hearing-impaired older adults with comorbid psychological

symptoms (e.g. depression, anxiety, psychosis). These findings will facilitate improvements in how audiological rehabilitation is provided to meet the needs of older adults with hearing loss and comorbid psychological symptoms and improve their hearing rehabilitation outcomes.

METHODS

A qualitative study using in-depth semi-structured interviews was conducted with older adults who scored above established cut-offs on measures of depression, anxiety, and psychosis. This qualitative study design was guided by the descriptive phenomenological method (Taylor & Francis, 2013) which focuses on understanding individuals' lived experiences (their subjective experience) of a phenomenon. A thematic analysis generated themes that related to participants' experiences of hearing loss and audiological rehabilitation.

Participants

Potential participants were recruited through three Australian audiology clinics. Recruitment invitations were sent to potential participants who satisfied the following inclusion criteria:

- a) Adults aged 60 years and older. Sixty was chosen as the cut-off for old age as this is widely used internationally (United Nations, 2017) and because acquired hearing loss becomes more prevalent at this age (The Senate Community Affairs References Committee, 2010).
- b) Participation in audiological rehabilitation in the previous 12 months. Audiological rehabilitation involved the provision of a hearing aid, cochlear implant or other services provided by an audiologist for the management of hearing loss. Recency of attendance was required to optimize participant recollection of the process.

Potential participants who satisfied the inclusion criteria were provided with an invitation to participate and mailed psychological screening questionnaires. Participants who met the questionnaire screening

criteria were invited to participate in an interview, all other participants' involvement was concluded. Participants were prioritized for interviews in order to obtain the greatest diversity of views via maximum variation sampling. A sampling matrix was produced that ensured diversity of age, gender, hearing device and reported psychological symptoms (see Text, Supplemental Digital Content 1, which shows sampling matrix). Once maximum variation was satisfied, interviews were conducted until theoretical saturation was reached (i.e., until new themes were no longer being generated with additional interviews) (Mason, 2010). Figure 1 provides a flowchart of recruitment numbers and rates.

Procedure

Semi structured interviews were conducted with 14 participants in a private room at The University of Melbourne or in participants' homes. Interview locations were selected for the privacy and comfort of participants, i.e., quiet location, adequate lighting and no interruptions. One participant attended the interview with a family member. Interviews were conducted by one member of the research team (E.C.L), who is a practicing clinical audiologist with an undergraduate psychology degree. An initial pilot interview was also reviewed by C.A.B, a practicing clinical psychologist, to ensure the interview was conducted appropriately. The interviews were guided by a predetermined topic guide containing initial open-ended questions e.g. "What is your experience with hearing loss?" and follow-up prompts to encourage further discussion e.g. "How do you feel about your hearing loss?" (see Text, Supplemental Digital Content 2, which shows interview guide). Interviews lasted an average of 64 minutes (SD = 31.5, range = 27-137) and were audio-recorded and transcribed verbatim for analysis.

Materials

Participants completed and returned three postal questionnaires upon recruitment.

a) Demographic questionnaire

This questionnaire collected data on gender, age, hearing history (type of audiological rehabilitation received) and mental health history (diagnoses, treatment). Participants who reported a current psychiatric diagnosis were eligible for an interview.

b) The Depression, Anxiety and Stress Scale (DASS 21)

The DASS 21 is a 21-item self-report questionnaire commonly administered by non-psychologists (Lovibond & Lovibond, 1995). This questionnaire contains seven items in three symptom scales: depression, anxiety, and stress, with individual symptom scale scores ranging 0 to 42. Items are scored on a four-point Likert scale for the frequency / severity of a symptom over the last week, with response choices “Never”, “Sometimes”, “Often” or “Almost Always”. Psychometric properties in older adults (≥ 60 years) reveal acceptable to excellent reliability [internal consistency: DASS 21 total score ($\alpha = .94$), subscales for depression ($\alpha = .87$ to $.90$), anxiety ($\alpha = .69$ to $.77$) and stress ($\alpha = .88$ to $.89$)], acceptable three-factor model construct validity, and significant convergent validity with scales of similar constructs (Gloster et al., 2008; Gomez, Summers, Summers, Wolf, & Summers, 2014). Scores are considered outside of normal range with a depression scale score ≥ 10 , anxiety scale score ≥ 8 or a stress scale score ≥ 15 . Participants who scored above the cut-off in any symptom scale were eligible for an interview.

c) The Psychosis Screening Questionnaire (PSQ)

The PSQ is a research screening tool administered by non-psychologists to identify possible symptoms of hypomania, thought control, paranoia, unusual experiences and hallucinations (Bebbington & Nayani, 1995). The original interview script (questions and answers conducted verbally) was adapted into a self-report questionnaire suitable for written completion. The questionnaire contains five probe questions with one or two follow-up questions for those who answer positively. Items are scored “Yes”, “Unsure” or “No” for the presence of an experience over the last year. The original PSQ has demonstrated good sensitivity (96.9%) and specificity

(95.3%) for identification of psychosis in in-patient, out-patient and non-clinical adult samples (Bebbington & Nayani, 1995). Participants who answered “Yes” on Questions 3, 5, 8, 10, or 12, indicating the presence of psychotic symptoms, were eligible for an interview.

Data analysis

Interviews were analyzed via an inductive thematic analysis (Braun & Clarke, 2006), where data is coded into meaningful units of information and grouped into categories of similar descriptions or ideas. Patterns across the codes and categories are identified to formulate overall themes within the data (Braun & Clarke, 2012). Each theme captures an important meaning across the data in relation to the research questions (Braun & Clarke, 2006). Codes and categories were assigned by one researcher (E.C.L) and a random 10% of codes were cross-checked with interview transcripts by two other researchers (C.A.B and C.M.B). Any discrepancies were discussed until consensus was reached. Several strategies were implemented to acknowledge and overcome reflexivity or researcher biases: a detailed journal of interviews was kept to increase triangulation of findings, results were discussed across the multidisciplinary research team so that interpretations were considered in both the context of audiology and psychology, and the interviews were listened to and re-read on several occasions.

Ethical approval

This study received ethical approval from The University of Melbourne Behavioural and Social Sciences Human Ethics Sub-Committee (1749305) and the Royal Victorian Eye and Ear Hospital Human Research Ethics Committee (17/1361H). All participants signed informed consent forms prior to both questionnaire and interview participation. Participants were assumed to be intellectually competent and linguistically capable to participate if informed consent, psychological questionnaires and interviews were successfully completed.

RESULTS

Participants were 14 older adults (eight males and six females) with an average age of 70.5 years (SD = 4.45, range = 64-80) who had screened above established cut-off scores for symptoms of depression, anxiety or psychosis. All participants had received audiological rehabilitation via provision of hearing aids (duration of hearing aid use <1 year - 51 years) and four participants had additionally received a cochlear implant within the last year. No other audiological rehabilitation (e.g. assistive listening devices or speechreading training) was reported. Participant characteristics are presented in Table 1.

Three major themes emerged from the thematic analysis of participant interviews: *The cumulative impact of hearing loss and psychological symptoms*, *The experience of loss throughout hearing loss and audiological rehabilitation* and *The experience of gain throughout hearing loss and audiological rehabilitation*.

The cumulative impact of hearing loss and psychological symptoms theme describes the two-way, additive relationship between hearing ability and psychological symptoms. *The experience of loss throughout hearing loss and audiological rehabilitation* is a theme that explores subjective losses, the impact they have and how participants cope with them. In contrast, the final theme, *The experience of gain throughout hearing loss and audiological rehabilitation*, describes the participants' reported gains, their related impacts and coping strategies. Table 2 provides an overview of the themes, categories and examples of codes that contributed to the thematic analysis. Each theme will be described below using participant quotes for illustration.

Theme 1: The cumulative impact of hearing loss and psychological symptoms

Participants described the cumulative impact of psychological symptoms and changes in hearing ability, i.e. the loss of hearing and the improvement of hearing with audiological rehabilitation. Most participants described hearing loss as an additive factor that contributed, at least to some extent, to their psychological symptoms. As illustrated in the following quotes, participants described how hearing loss had a negative

297 impact on their psychological wellbeing, reporting an exacerbation of symptoms such as frustration,
298 inadequacy, worry, paranoia and suicidal ideation.

299 *"I was terribly antisocial [before obtaining the cochlear implant]. My poor boys come around and...*
300 *they said very little to me... because I couldn't hear them... And it was affecting me very badly,*
301 *actually."* (Female, 73 years)

302 *"[Hearing loss] can exacerbate your anxiety a little bit because you... you don't hear very well... it*
303 *limits your communication skills. But that's improving [with the cochlear implant]."* (Male, 63
304 years)

305 *"I'm sure [my experience is different to those without psychological symptoms] ... I can only go*
306 *on what I've experienced, so... it's umm... I'm not particularly happy with what I've experienced*
307 *[with hearing rehabilitation], so... It's as simple as that. You get umm... very disheartened with*
308 *everything... There's uhh... there's not many days of the week, in fact there's none, that I don't*
309 *think about committing suicide."* (Male, 69 years)

310 Many participants also described an improvement in psychological symptoms due to optimized hearing
311 ability following audiological rehabilitation.

312 *"I'm much more confident now [with hearing aids] in joining in a crowded situation and discussions*
313 *with various members. I'm much more confident now in joining that situation rather than*
314 *remaining on the periphery and just smiling throughout quietly at people."* (Male, 80 years)

315 *"I'm not happy, of course. But you know, I'm happier than I was before [hearing aids]. And, and I*
316 *like to converse, you know, as you probably noticed now, you know, I don't stop talking."* (Female,
317 79 years)

318 *"I think the only kind of overall thing I'd say is how pleased I am I've got [hearing aids]. How much*
319 *they have made a difference. And when I, I wear them almost all the time. So there's been a*
320 *definite, definite improvement in the quality of my life."* (Male, 66 years)

321 Conversely, several participants felt that their psychological symptoms were negatively impacting their
322 subjective hearing ability and communicative abilities.

323 *"I guess I tense up and look for trouble ... not so much look for trouble but worry. Whereas,*
324 *someone who expects everything to be just fine... it's very hard to relax to see how the hearing*
325 *aid's working if you're anxious about the whole environment."* (Female, 68 years)

326 *"I noticed when I'm relaxed now and happy, I can hear better. But if, if I'm upset about something*
327 *and I'm, really angry about something; buzzzz, my head goes, you know, and it feels like my, my,*
328 *my head is being squashed."* (Female, 79 years)

329 *"Because if they're a person with depression and they're going to get an implant, it's not going to*
330 *be positive for them. And being that mechanical noise or computer-generated sort of voice, you*
331 *know, you hear it as robots. I feel that they probably wouldn't cope with that sort of thing, so that*
332 *they really need to get help before they went any further in the process [of cochlear implantation].*
333 *Because I think if you're really depressed you're not gonna cope with change, and I've said I*
334 *managed quite well... but it's not easy... accepting that."* (Female, 69 years)

335 **Theme 2: The experience of loss throughout hearing loss and audiological rehabilitation**

336 All participants shared instances of loss throughout their life with hearing loss and audiological
337 rehabilitation. Participants associated many losses with hearing loss: that is, participants reported a loss
338 of communicative ability, social relationships and reduced understanding of meaning behind
339 conversations. Some participants also reported losses that resulted from participation in audiological

rehabilitation; one participant needed to deal with the loss of residual hearing due to cochlear implantation and several others reported the loss of natural sound with use of hearing devices. Many reported experiences of loss were not only unique to those with comorbid psychological symptoms but were more widely applicable to any older adults with hearing loss.

Every participant discussed a loss of hearing and the resultant reduction in communicative ability. Some participants also related hearing loss with disablement (a loss of ability) or the process of aging (a loss of youth).

“Over a period, with my increasing [hearing] loss, those sounds became muted and I found I didn't really have the same feeling of inclusiveness in my lifestyle that I had initially.” (Male, 80 years)

“... I can only think the word frustration [in response to hearing loss]. [Hearing loss] is quite debilitating. Really makes you feel like you're disabled.” (Male, 67 years)

“...my experience of the aging process is a loss of friends and not very much gaining of new ones. So your social world does decline. And the hearing loss doesn't help that process.” (Male, 66 years)

“A sort of decline is occurring, and the hearing loss represents that.” (Male, 69 years)

Many participants also emphasized the social degradation and isolation that resulted from hearing loss. Some participants reported a physical withdrawal, no longer attending social events that caused previous difficulties.

“You're missing out on everything... Everything. I can talk on a one-on-one basis... usually, depending on the pitch of the voice. Umm. It just depends, but... Crowds... I might as well walk away and go home.” (Male, 69 years)

“You gradually say no to going to things [due to hearing loss]. You don't go shopping as much as you would have. You just get the bare essentials because it's too traumatic.” (Female, 73 years)

362 Other participants would continue to attend social events but would mentally withdraw from
363 conversations.

364 *"I got to the stage with my deafness when I couldn't hear something, I just turned off."* (Female,
365 69 years)

366 *"You just sit there and eat and drink and you hope everybody else is talking. [Hearing loss] does*
367 *isolate you."* (Female, 67 years)

368 *"So I'd sit there like a zombie, you do withdraw when you become deaf."* (Female, 73 years)

369 Some participants described losing the meaning behind conversations, where they would miss segments
370 of conversation or miss the correct intonation. This resulted in misunderstandings and misinterpretations
371 of spoken content.

372 *"Well, when you approach people, or even a shopkeeper or the bank, you have a perception before*
373 *you go of how that's going to eventuate... And because you don't hear properly, when you leave*
374 *that group, you think, "I've messed that up." Or "I haven't quite comprehended." Because you miss*
375 *words, you don't get the true meaning of what people are saying to you..."* (Female, 73 years)

376 *"That's one thing about deafness is.. it's... comedy disappears. Like music, you know, you can't*
377 *hear music properly anymore. It's just lost... And also comedy. Because it takes you so much longer*
378 *to piece together a conversation, cause you're only getting so much of it... You have to, you have*
379 *to make all these assumptions."* (Male, 63 years)

380 *"We've worked it out that the brain's not hearing what I'm hearing, if you get what I mean? My*
381 *other sister was staying with me at one stage and I said, that tractor's working that paddock again,*
382 *she said, the fridge has just started up... The nerves were not working properly, the brain's not*

383 *registering properly with what I'm hearing, it's putting another label to it... So that has been very*
384 *frustrating.” (Female, 67 years)*

385 Thus far, the losses that participants described were related to hearing loss, however, several participants
386 also discussed loss with regards to audiological rehabilitation.

387 Some participants reported an initial loss of natural hearing with the use of hearing aids or cochlear
388 implants.

389 *“I never knew that I was going to get normal sound back [after cochlear implantation], so it was*
390 *very hard thinking that this is what I'm gonna hear for the rest of my life.” (Female, 69 years)*

391 *“...if you go to a hearing aid specialist or something like that, and you go in there with the*
392 *expectation that you're going to get good hearing back and it can be a umm... it can be pretty*
393 *frustrating, actually. If you don't know that, it can be a pretty frustrating experience.” (Male, 63*
394 *years)*

395 *“With these hearing aids I've got now, I had a hollow sound and I couldn't understand, especially*
396 *when I watch television.” (Female, 79 years)*

397 Of note, only one participant reported difficulty accepting the loss of residual hearing when obtaining a
398 cochlear implant.

399 *“[The audiologist and doctor said] most people are so excited and I said, “well I'm not”...then [the*
400 *audiologist] told me that when you put the cochlear implant in you destroy the hearing of the ear...*
401 *that was an issue that I had to work around. So I said I don't really want to have it, but then, when*
402 *I go places I know I have to have it because you can't hear a damn thing that's going on or being*
403 *said to you. But I said “No, I'm not excited.” And [the audiologist and doctor] all thought that was*
404 *strange.” (Female, 69 years)*

Theme 3: The experience of gain throughout hearing loss and audiological rehabilitation

Participants not only shared their experiences of loss, they also discussed ways in which they had gained throughout hearing loss and audiological rehabilitation. In contrast to the losses, most of the reported instances of gain were associated with audiological rehabilitation. Besides gaining a hearing device (i.e. hearing aid or cochlear implant), participants also described gaining increased social interaction, social inclusion and confidence. These experiences of gain were, again, not unique to only those with comorbid psychological symptoms, but to the wider population of older adults with hearing loss. Not all gains, however, were regarded positively, with some participants describing a gain of unwanted auditory input from their hearing devices. Participants reported that hearing loss was also accompanied by largely negatively associated gains, with some participants describing the onset of phantom auditory perceptions (the perception of sound without external auditory input e.g. tinnitus).

Obtaining a hearing aid or cochlear implant was, for most participants, a positive experience that allowed them to communicate more effectively.

"I could hear them [talking]. And I thought, bloody hell, this is marvelous. I can actually hear what they're saying! I was expecting to have to kind of guess." (Male, 66 years)

"When I got the hearing aids, and I put them on, I could hear conversations from about 40 meters away." (Male, 71 years)

Additionally, several participants found that hearing rehabilitation restored, at least to some extent, their sense of inclusion and social identity.

"I'm much more confident now [with hearing aids] in joining that situation rather than remaining on the periphery and just smiling throughout quietly at people." (Male, 80 years)

"My relationship with my friends is fabulous now [with hearing aids]." (Female, 73 years)

427 *“These [hearing] aids have really restored my capacity and confidence in that way.”* (Male, 80
428 years)

429 Some participants found that the addition of the hearing device was somewhat a burden, another piece
430 of technology that needed to be incorporated into their lives.

431 *“So [with a cochlear implant] you’re sort of living your life on batteries aren’t you.”* (Female, 69
432 years)

433 *“You’ve got to clean [the hearing aids] every day. They are a lot of work. I think it adds to my time*
434 *when getting out of the house... And remember to put them in, that’s something else.”* (Female,
435 68 years)

436 One participant described the onset of unwanted auditory inputs emanating from her hearing device,
437 querying whether her cochlear implant was misinterpreting environmental sounds as voices. Whilst only
438 reported by one participant, the potential emotional consequences of these experiences merit further
439 consideration.

440 *“...certain noises it interprets as words. There’ll be a noise and it just sounds like a voice or a word,*
441 *not that you can actually hear the word but that’s how it’s coming through as speech instead of*
442 *something else... As I’ve gone on that has got better because [the audiologist] said it just takes*
443 *your brain a while to train to identify what it is, but it still happens with just different things...”*
444 (Female, 69 years)

445 Lastly, some participants reported that their hearing loss was accompanied by the onset of phantom
446 auditory perceptions, that is, the subjective presence of sound when there was no external auditory input
447 present. These perceptions were sometimes described as simple ringing or buzzing sounds (i.e. tinnitus),
448 however, other participants reported phantom auditory perceptions that were accompanied by semantic

content or associated meaning (e.g. music, trucks, voices). Of these participants, most were aware that the sounds were internally generated once provided with evidence that there were no externally produced auditory inputs.

"It was scary actually, in that I'm in the house by myself and I could hear somebody outside calling my name... And I've got out, put my dressing gown on and gone out and nobody there. Another time I heard probably three or four men talking outside, couldn't hear what they were saying but they were talking amongst themselves, having a conversation and when I went out, nothing... So, it's other noises that the brain is interpreting different ways, but it did really scare me when I started hearing my name being called and conversation being held outside my house but there was nobody there." (Female, 67 years)
"Umm, and I've realized it's not trucks, there's no trucks passing. But it's inside the head, and then you get music in there, that plays on something, it's a bit like a umm, a broken record. You know, and it plays inside the ear, inside the head... totally different [to normal tinnitus], tinnitus with normal people is just a, a ringing in the ear. Most people have got it. This. I've got, I've got very loud noises and music and trucks, and things like that." (Male, 69 years)

"I found my hearing deteriorated big time [during a high stress time]. To the point of a lot of extreme head noise. Helicopters landing on the roof, ship bellowing, tractors working in the paddock when they shouldn't have been, trucks changing gears outside, the whole gamut of so much head noise. All the doctors did was put me onto depression tablets and anxiety tablets, all those sorts of things, to try and get me through it, because I was a mess." (Female, 67 years)

One participant perceived these sounds to be caused by an external agent, that is, they perceived the phantom auditory perceptions to be purposely placed into their head by another person. The participant reported that these sounds were the cause of his hearing loss.

"He didn't like me, so he got a friend of his, who lives next to me to get what they call a mind machine... It could be a French police siren, 'Ee-or, ee-or, ee-or'. Or they could be, a few times the American national anthem. Over and over and over. And then the British national anthem over and over. And then the Australian national anthem. And then a couple of other different national anthems. And then all different noises like that which irritate you." (Male, 71 years)

(e.g. using communication strategies, requesting communication partner assistance) was associated with maintaining social interactions and a positive social identity. In contrast, avoiding the social scene was linked with diminished social interaction and a negative social identity. It is possible that comorbid psychological symptoms could influence the way participants cope with their hearing loss, with a skew towards withdrawal and isolation. This could be of particular concern in older adults with comorbid depression, where impaired social support and loneliness are significant contributors to depressive symptoms (Aziz & Steffens, 2013).

Previous research has described the emotional, cognitive and physical effort that was required to commence and persevere with audiological rehabilitation in the theme of *client labor* reported by Knudsen et al. (2013). Participants in the current study reported similar physical effort (e.g. maintaining hearing devices, financial outlay) and cognitive effort (e.g. deciphering speech with hearing device, decision making) as the interviewees in Knudsen et al.'s study (2013). However, Knudson et al. (2013) reported that emotional effort was required only when 'reaching out' to obtain audiological rehabilitation and for persistence with hearing devices. The participants in the current study appeared to recall emotional effort in greater detail, and throughout many aspects of their rehabilitation, as described throughout the three themes of this study. This may be due to the presence of comorbid psychological symptoms; however, the interview did encourage further discussion about emotional reactions to audiological rehabilitation. This finding is consistent with research suggesting that psychological symptoms can negatively impact motivation, goal attainment, concentration, energy and self-efficacy (Dickson & Moberly, 2013; Hanson & Young, 2017). These findings imply that those providing audiological rehabilitation need to be cognizant of the different support needs of this sub-population of older adults with comorbid hearing loss and psychological symptoms.

The cumulative impact of hearing loss and psychological symptoms is a novel theme previously not described in the literature. Whilst there has been quantitative evidence of an association between hearing

loss and psychological symptoms such as depression, anxiety and psychosis, there has been a lack of understanding of the lived experience (Lawrence et al., 2019; Linszen et al., 2016). Participants in the current study described their subjective experience of a bidirectional relationship between hearing loss and psychological symptoms. That is, hearing loss was reported to negatively impact psychological symptoms, and psychological symptoms were reported to interfere with subjective hearing ability. This understanding of a bidirectional relationship has not yet been established in quantitative research, with almost all studies reporting correlations, without evidence to support the directionality of the relationship. The few longitudinal studies conducted previously offer some support for a bi-directional relationship, for example, Saito et al. (2010) reported that hearing loss increased the risk of subsequently developing depressive symptoms, whereas Chung et al. (2015) found that a previous anxiety diagnosis was a risk factor for sudden sensorineural hearing loss. The underlying mechanisms of this directional relationship are not yet understood; however, it has been suggested that the cochlea may be vulnerable to the circulatory and sympathetic nervous system changes that can arise with anxiety disorders (Chung et al., 2015). Further investigation of this relationship would offer audiologists the opportunity to better understand and support their clients and ultimately obtain improved outcomes.

For most participants in this study, comorbid psychological symptoms largely pre-dated the onset of hearing loss. This may suggest that hearing loss was an exacerbating or cumulative factor for psychological symptoms. This finding is consistent with psychological theories that postulate that the presence of life stressors may trigger or exacerbate predispositions for mental disorders or psychological symptoms (Livingston & Hinchliffe, 1993; Patrick & Bernat, 2010; Aziz & Steffens, 2013). Hearing loss can have considerable detrimental consequences on individuals and their families, undoubtedly acting as a stressor and potential trigger for psychological symptoms in those who are susceptible (Arlinger, 2003). It is still unknown, however, if pre-existing psychological symptoms could alter the perceived development, severity or impairment of hearing loss. Participants in the current study discussed how their psychological

symptoms interfered with their subjective hearing ability. Further investigation into the impact of psychological symptoms on self-perceived hearing ability is necessary as this has not yet been explored.

The experience of loss throughout hearing loss and audiological rehabilitation, described the loss of communicative ability, social involvement, meaning behind conversations and loss of natural sound with hearing devices. Hearing loss is the loss of a primary sense in which most people rely upon heavily for their social participation. Participants described how the loss of hearing ability precipitated further losses in their lives, especially losses related to feeling connected with people and their environment. For example, several participants described how losing segments of conversation due to hearing loss would result in a misinterpretation of spoken content. Often this misinterpretation was accompanied by frustration, embarrassment or arguments with the communication partner. While these consequences of hearing loss are not exclusive to those with comorbid psychological symptoms (Kamil & Lin, 2015; H. Abrams, 2017; Vas, Akeroyd, & Hall, 2017), what is unique to this participant group is how they managed the misunderstandings. For example, it was reported that missing segments of conversation were interpreted not only in the context of the sentence, but also within the context of the participant's emotional state. When the participant was anxious or self-conscious, participants reported that their interpretations were negatively skewed and often persecutory. Another example of the uniqueness to this subgroup is that with a loss of hearing, an individual's capacity for testing reality can be diminished (Barry Jr, 1957). In the case of paranoia, if an individual is capturing only segments of communication, these gaps may be interpreted by subconscious paranoid ideation that may otherwise not present (Barry Jr, 1957). One participant who screened positively in the Psychosis Screening Questionnaire reported that her thoughts were being interfered with; when discussed further she clarified that hearing loss reduced her ability to accurately evaluate social interactions; "*you have a perception before you go of how [the conversation is] going to eventuate... Because you miss words, you don't get the true meaning of what people are saying to you... [you will perceive the conversation negatively]*". An experimental study by

Casanova, Katkovsky, and Hershberger (1988) revealed that simulating a hearing loss significantly increases negative emotions and paranoid reactions to taped conversations, where participants believed the content was a personal evaluation. Therefore, whilst losses associated with hearing loss are not only experienced by those with psychological symptoms, it is important for audiologists to understand how these may be compounded by psychological symptoms.

The experience of gain throughout hearing loss and audiological rehabilitation explored the gaining of communication, social inclusion, a new device and unwanted auditory input. Many participants discussed the gain of hearing and communicative ability following the provision of a hearing device. These gains were often accompanied by an improvement in social interaction and, in turn, an improvement of psychological symptoms, consistent with previous longitudinal studies (Acar et al., 2011; Boi et al., 2012; Bruggemann et al., 2017; Castiglione et al., 2016; Choi et al., 2016; Contrera et al., 2015). However, gain was not always regarded positively; obtaining a new device, and the associated difficulties of its management, were mentioned by several participants as hurdles to continuing their audiological rehabilitation. Additionally, some participants gained an array of unwanted auditory inputs, either emitted from their hearing device (e.g. a cochlear implant would misinterpret some environmental noises as speech sounds), or via phantom auditory perceptions (i.e. the perception of sound without external auditory input) (Vanneste, Song, & De Ridder, 2013). When auditory perception is compromised, either through hearing loss or hearing devices, it is possible that interpretation and comprehension of sounds can be influenced by psychological symptoms. Participants reported phantom auditory perceptions in a variety of ways; many participants reported simple phantom auditory perceptions (i.e. tinnitus) in which they perceived simple sounds such as hissing or buzzing. Several participants also reported complex phantom auditory perceptions, where sounds had semantic quality e.g. trucks, music, voices. It may be beneficial for audiologists to differentiate types of phantom auditory perceptions, not only because some participants reported anxiety, discomfort or frustration in response to these sounds, but also because

there are differences in their underlying psychopathology and mechanisms (Fischer, Marchie, & Norris, 2004; Vanneste et al., 2013; Hemming & Merrill, 2015; Rocha et al., 2015). No studies to date have investigated perceptual misinterpretation with hearing devices, but several case studies and cohort studies have identified complex phantom auditory perceptions (variously termed musical or auditory hallucinations or pseudo-hallucinations) in acquired hearing loss (Balan et al. 1996; Bernard & Quante, 2011; Brunner & Amedee, 2015).

Clinical implications

Participants described a bi-directional relationship between psychological symptoms and hearing loss, including how psychological symptoms can impact on one's approach, adherence to, and ability to cope with audiological rehabilitation. Thus, in order to provide optimal audiological rehabilitation, audiologists need to identify and address the psychological needs of their clients in the audiology context; and it is the audiologists' responsibility as healthcare professionals to ensure client mental health has been considered. Audiologists can provide psychological support to their clients through providing informational counselling, emotional support, involving significant others, and/or recommending additional support outside of the audiology setting (such as a General Practitioner or psychologists) (Bennett, et al. 2020a). In order to provide psychological support, the audiologist must first recognise that the client requires psychological support. It is possible that the client might directly report their psychological symptoms during client interactions; however, the audiologist may also need to recognise signs and behaviours that indicate psychological distress. This could be facilitated through use of psychological screening questionnaires, such as the DASS 21 (Lovibond & Lovibond, 1995), which has been received positively by hearing aid and cochlear implant clients within a clinical setting (Muñoz, McLeod, Pitt, Preston, Shelton & Twohig, 2017). However, recent research has demonstrated that audiologists lack the knowledge and skills required to adequately detect and discuss mental health during audiology consultations (Bennett et al., 2020a; Bennett et al., 2020b). This is likely due to the lack of mental health

education and counselling included in audiology training programs (Whicker et al., 2017), and thus practicing clinicians may need to upskill with specific training. Mental Health First Aid (MHFA), for example, is an international, evidence-based training program that teaches how to approach, assess and assist with mental health crises via counselling, support and appropriate referral (Kitchener & Jorm, 2002). With appropriate identification of psychological symptoms, audiologists can integrate discussion of emotional and psychological difficulties into their appointments with clients, and ensure that their clients obtain appropriate support for their psychological needs.

Strengths, limitations and future research

There are several strengths and weaknesses that need to be discussed in relation to the current study. A qualitative study of this scope has not previously been conducted, and the generated themes have provided novel insight into the experience of hearing loss and audiological rehabilitation for older adults with comorbid psychological symptoms. The input from a team of multi-disciplinary researchers from audiology and psychology also enabled a rich interpretation of the qualitative data that was obtained. While the results cannot be generalized to all older adults with hearing loss and psychological symptoms, the themes capture the shared lived experiences for a diverse group of participants and offer previously unreported perspectives. There was a considerable variation in the duration (less than 1 year to 51 years) and type (hearings aids and/or cochlear implants) of audiological rehabilitation that participants undertook; whilst this variation is helpful in capturing the diversity of experiences, there may be differences in reports due to audiological rehabilitation that have not been captured in this study. Participant recruitment bias is also an issue to consider in this study; there are likely to be differences in the experiences between participants and those who chose not to participate, it is also possible that those with significant psychological symptoms or disorders were not recruited due to inability or unwillingness to participate.

The results of this study indicate that further research is required to better understand the relationship between hearing loss and psychological symptoms. Given that a major theme of the current study suggested a bidirectional relationship, further research is required to determine the extent and applicability of this finding beyond this group of participants. It is also of interest to further investigate the impact of psychological symptoms on self-perceived hearing ability. The themes of loss and gain throughout hearing loss and audiological rehabilitation highlighted the influence of psychological symptoms on the interpretation of missing or additional auditory information. Further research is needed to understand these experiences as little is currently known. Lastly, it is recommended that an investigation of the barriers and facilitators to audiological rehabilitation for older adults with comorbid psychological symptoms be conducted to extend the understanding of the current study.

CONCLUSION

This study provides insight into the experiences of hearing loss and audiological rehabilitation for older adults with hearing loss and psychological symptoms. The themes developed from the current participant data add new perspectives to previous qualitative studies with broader samples of hearing-impaired participants. The experiences of the current participants revealed that the presence of comorbid psychological symptoms can influence the phenomenology of hearing loss and audiological rehabilitation. These findings have implications for how audiological rehabilitation is provided. For example, due to the potential impact of psychological symptoms on the experience of audiological rehabilitation, it may be beneficial for audiologists to integrate discussion of emotional and psychological difficulties into their appointments with clients. At the least, this enables the audiologist to better understand the client and provide a patient-centered service and, at most, may potentially allow clients to obtain improved rehabilitation outcomes.

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- 962

963 **Table 1.** Participant characteristics

Characteristics	Participants (N = 14)
Gender, <i>n</i>	
Male	8
Female	6
Age, <i>M (SD)</i>	70.5 (4.45)
Current psychiatric diagnosis reported, <i>n</i>	
Depression	4
Anxiety	4
Psychosis	1
Post-Traumatic Stress Disorder	1
Psychological symptoms reported, <i>n</i>	
DASS 21 Depression scale score ≥ 10	12
DASS 21 Anxiety scale score ≥ 8	6
DASS 21 Stress scale score ≥ 15	7
PSQ "Yes" on Question/s 3, 5, 8, 10, or 12	4
Hearing device, <i>n</i>	
Cochlear implant and hearing aid	4
Hearing aid/s	10
Duration of audiological rehabilitation, <i>n</i>	
Less than 1 year	6
1 – 9 years	3
10 – 19 years	2
20 years or longer	3
<i>Note.</i> DASS 21 = Depression, Anxiety and Stress Scale; PSQ = Psychosis Screening Questionnaire	

964

965 **Table 2.** Thematic analysis results (themes and categories) and examples of content from participant interviews

Theme	Categories	Example Content
1: The cumulative impact of hearing loss and psychological symptoms	Hearing loss had negative impact on psychological wellbeing	<ul style="list-style-type: none"> Participant recognizes that past social anxiety has been in at least some part a result of hearing loss Hearing loss adds to the overall psychological symptoms and awareness of a declining body
	Audiological rehabilitation improved psychological symptoms	<ul style="list-style-type: none"> Improvement of hearing with hearing aids was noted as a factor in reducing anxiety for the participant Participant found a loss of confidence with hearing loss and confidence was restored with hearing aids
	Psychological symptoms had negative impact on subjective hearing ability	<ul style="list-style-type: none"> Participant feels hearing is better when happy and worse when upset or angry Anxiety makes hearing more difficult and hearing troubles exacerbates anxiety for participant
2: The experience of loss throughout hearing loss and audiological rehabilitation	Loss of communicative ability and social connection	<ul style="list-style-type: none"> Participant feels that there is no point going out to interact with people because of hearing loss Participant would unconsciously “switch-off” when unable to hear the conversation
	Loss of meaning behind conversations	<ul style="list-style-type: none"> Participant feels that mood has influenced the way missed sections of conversations are perceived Participant would pretend to understand conversation, but this caused misunderstandings and interpersonal problems.
	Loss of residual hearing with cochlear implantation	<ul style="list-style-type: none"> Participant found it very challenging accepting that the remaining hearing was going to be lost Participant had difficulty accepting any remaining hearing in the implant ear would likely be lost
	Loss of natural hearing with hearing device	<ul style="list-style-type: none"> Frustration with inability to have hearing restored to ‘normal’ with hearing aid Speech sounded computer generated and initially could not discriminate between different speakers
3: The experience of gain throughout hearing loss and audiological rehabilitation	Gain of communicative ability and social inclusion following audiological rehabilitation	<ul style="list-style-type: none"> Cochlear implant has improved life, increased social interaction and improved social bonds Hearing aid has in turn improved the experience of going out and communicating with other people
	Gain of another gadget (i.e. hearing device) to manage in life	<ul style="list-style-type: none"> Hearing aid maintenance seen as a lot of work and adds to the time it takes to get ready in the morning Hearing aids (particularly rechargeable ones) are another device that needs to be added to your life
	Gain of unwanted auditory inputs from hearing devices	<ul style="list-style-type: none"> Cochlear implant misinterprets some environmental sounds as words or indistinct voices Misinterpreted sounds with a cochlear implant when alone was source of anxiety (voices outside bedroom)
	Gain of phantom auditory perceptions (i.e. tinnitus, auditory hallucinations)	<ul style="list-style-type: none"> Phantom auditory perceptions (“head noise”) presented like auditory hallucinations of voices Participant experiences tinnitus in the form of loud trucks and music (like a broken record)

967 **Figure 1.** Flowchart of participant recruitment

968

969 **Supplemental Digital Content 1** (text): Sampling matrix containing number of participants fulfilling
970 criteria (gender, age, hearing device, psychological symptoms) to obtain maximum variation sampling

971

972 **Supplemental Digital Content 2** (text): Interview topic guide containing initial and follow-up open-ended
973 questions

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