Motivational Interviewing for Hearing Aid Use: A Systematic Meta-Analysis on Its Potential for Adult Patients with Hearing Loss

Alice Q. Liu, MD[1] Bella Wu, MD[1] Desmond A. Nunez, MD[1]

[1] Department of Surgery, Division of Otolaryngology Head & Neck Surgery, University of British Columbia, Vancouver, British Columbia, Canada

Address for correspondence Desmond A. Nunez, MD, desmond.nunez@ubc.ca

J Am Acad Audiol 2021;32:332–338.

Abstract

Purpose The aim of the study is to conduct a meta-analysis examining the impact of motivational interviewing (MI) on hearing aid (HA) use compared with standard care.

Research Design The research design is a systematic review and meta-analysis. Cochrane ENT, Central, Medline, Web of Science, ICTRP, and ClinicalTrials.gov electronic databases were searched. Inclusion criteria consisted of randomized controlled trials (RCTs) published between 1988 and 2018 that compared MI to standard care.

Study Sample The study sample consists of four RCTs, investigating a total of 176 patients.

Data Collection and Analysis RevMan 5.3 and a random effect model were used for analysis.

Results The standardized mean difference in data-logged hours of HA use was not statistically significant (0.34 [95% confidence interval or CI: −0.10, 0.78; $p = 0.13$]). The mean difference for user-reported outcomes on the International Outcome Inventory—Hearing Aids of 0.41 [CI: −1.00, 1.82; $p = 0.57$] was also not significant.

Conclusion There is no current evidence that MI significantly improves HA use or user-reported outcomes. However, there were limited studies included in this review and further research is indicated.

Keywords
- motivational interviewing
- hearing aid
- amplification

The 2015 Global Burden of Disease Report estimates that approximately 1.33 billion people worldwide suffer from hearing loss.[1] Hearing impairment is associated with poorer quality of life, communication difficulties, and increased risk of developing mood disorders such as anxiety or depression.[2–4]

Presbycusis, or age-related hearing loss, is believed to result from an accumulation of lifetime auditory system insults.[5] Hearing aids (HAs) are the standard treatment. Unfortunately, they are not frequently used. About 40% of first time HA users do not use their aids on a regular basis.[6] Two systematic reviews, looking at 38 studies, summarized that prefitting expectations of benefit, self-reported hearing loss, and stigma associated with deafness were the main factors affecting HA uptake by older adults.[7,8] When used, HAs improve users' psychosocial conditions and cognitive function.[9]

Foundational counseling skills that must be addressed for successful audiology rehabilitation include encouragements, asking questions, reflection on learning, concreteness, summarizing, and situation clarification.[10] Manchaiah et al[11] demonstrated the utility of a transtheoretical (stages of change) model in assessing attitudes and behaviors of adults with hearing loss. This allows individualized intervention based on the patient's readiness for change.[12] Current literature emphasizes the importance of patient-centric relationships and therapeutic alliances. Qualitative studies have examined

received
June 7, 2020
accepted after revision
December 5, 2020
published online
June 1, 2021

Thieme Medical Publishers, Inc., 333 Seventh Avenue, 18th Floor, New York, NY 10001, USA

DOI https://doi.org/10.1055/s-0041-1728755.
ISSN 1050-0545.

the language used by audiologists and the decision-making process in audiologist–patient interactions.[13,14] Exploring the patient–provider interaction to improve HA outcomes was underscored in a review by Knudsen.[15] They found that motivation by others increased help seeking; conversely, self-motivation positively influenced HA use or satisfaction.

Motivational interviewing (MI) is defined as a flexible "person-centered counseling style for addressing … ambivalence about change,"[16] and was originally used in addiction medicine.[17] Miller[17] stressed that MI de-emphasized patient labeling and instead focused on an individual's internal attribution for change. In a meta-analysis of MI for various health outcomes, it significantly reduced blood pressure, body mass index, and total cholesterol.[18] More research into its potential for the hearing impaired has started.[19] Primarily a clinical communication method, MI is intended to guide patients and enhance their intrinsic motivation to change; patients have final decisions about their care and MI differs from client-centered counseling as it is consciously goal-oriented and rewards change.[20] Parallels have been drawn between MI and self-determination theory, with Markland et al[21] stating both assume there is "innate propensity for personal growth toward cohesion and integration."

The aim of this study was to conduct a systematic review examining the impact of MI on adult HA users compared with control groups undergoing standard audiological care. Outcome measures include data-logged HA use and patient-reported benefits. While there has been increased interest in how behaviors of hearing professionals can impact patient outcomes, no meta-analysis has to the best of our knowledge specifically examined the quantitative results of MI.

Materials and Methods

This study was preregistered on the international prospective register of systematic reviews (PROSPERO CRD42019137682). The Cochrane Handbook for Systematic Reviews of Interventions was followed.

Search Strategy

The keywords "hearing aid" OR "amplification" OR "ear mold" OR "earmould," AND "motivational interviewing" OR "counseling" were used to search the Cochrane ENT, Central, Medline, Web of Science, ICTRP, and ClinicalTrials.gov databases for randomized controlled trials (RCTs).

Studies comparing an MI cohort to a control cohort undergoing standard care between January 1988 and December 2018, with participants above the age of 18 years, and quantitative outcome measurements were included. Exclusion criteria included studies on previously reported data, retracted studies, and studies lacking detail. There were no language restrictions. Bibliographies of included papers were screened for additional studies.

Study Identification

Two independent investigators (A.L. and B.W.) completed the search. Afterward, the first author removed any trials that were clearly ineligible based on title. Abstracts were then reviewed by the two reviewers independently. Disagreements were resolved by consensus.

Data Collection

Data was extracted by two investigators (A.L. and B.W.) independently using a predesigned data collection form which included: sample size, randomization method, blinding, intervention, quantitative HA outcome measurements related to HA use, satisfaction or benefit, and adverse effects. Imputations were employed if necessary.[22] The Cochrane Risk of Bias Tool 2.0 was used for studies included.

Data Analysis

The difference in logged hours of HA use pre- and post-intervention, and patient-reported outcomes using the International Outcome Inventory for Hearing Aids (IOI-HA) post-intervention were analyzed. Data was combined and pooled using RevMan 5.3 (Copenhagen, Denmark: The Cochrane Collaboration) with a DerSimonian random effect model. The standardized mean difference and mean difference were calculated with 95% confidence intervals (CIs) for logged HA use and IOI-HA scores, respectively. Measurements were considered significant if the 95% CI excluded zero. Statistical heterogeneity of studies was assessed using the Chi-square and I^2 test.

Reporting Bias and Level of Evidence

Reporting bias was assessed within study (outcome reporting) and between study (publication). Studies were searched for public registration to identify predefined outcomes. Grades of Recommendation, Assessment, Development, and Evaluation (GRADE) guidelines were used to assess the quality and strength of the results.

Results

A total of 626 trials were identified in the initial search. Bibliographic screening did not reveal any additional studies. Four clinical trials, including 176 patients, satisfied the review's inclusion criteria. ►**Fig. 1** displays the review's PRISMA flowchart.

The four included studies' characteristics are summarized in ►**Table 1**. Aazh[23] was deemed to be at low risk-of-bias. Ferguson et al,[24] Zarenoe et al,[25] and the clinical trial by Lewis[26] (NCT 01843777) were at some risk-of-bias from the randomization and outcome measurement processes (►**Fig. 2**).

Data-logged hours of HA use and IOI-HA scores were reported in three studies each. Data-logged hours in Aazh,[23] Ferguson et al,[24] and Lewis[26] were compared. Aazh and Lewis assessed changes in data-logged hours from baseline, while Ferguson et al studied the amount of HA use logged in each group at the first post-intervention follow-up. Imputations were derived for Aazh's standard deviations based off the mean and CIs. The heterogeneity (I^2) of data-logged hours of HA use was 14% and standardized mean difference was 0.34 (95% CI: −0.10, 0.78). Refer to ►**Fig. 3** for complete results.

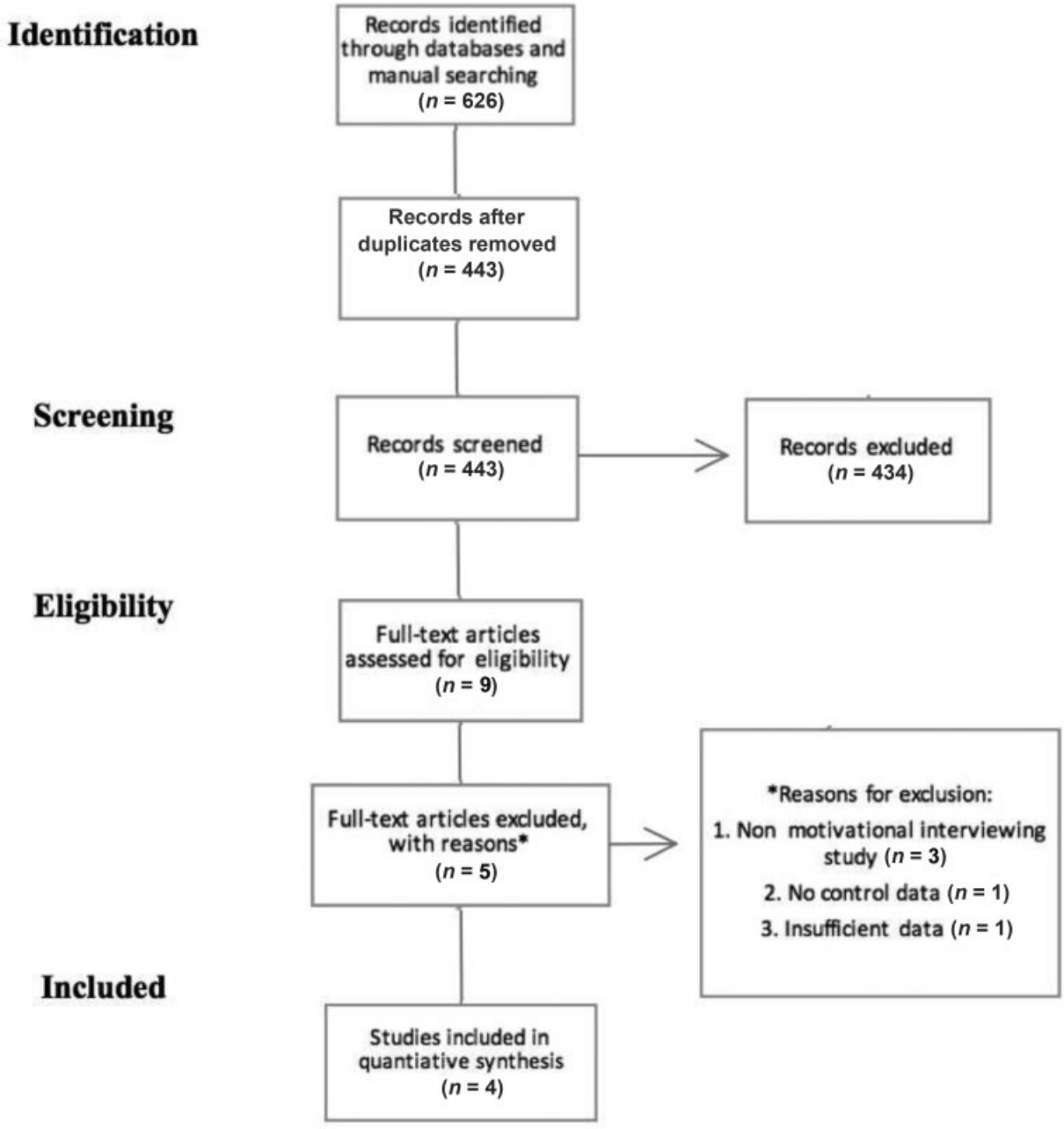

Fig. 1 PRISMA study flowchart illustrating the systematic review process for investigating motivational interviewing for hearing aid use. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

All four RCTs looked at various patient-reported outcome measures. These included the IOI-HA, Hospital Anxiety and Depression Scale, Glasgow Hearing Aid Benefit Profile, and others. The IOI-HA was used in three studies: Aazh,[23] Zarenoe et al,[25] and Lewis.[26] Imputations were derived if necessary. The heterogeneity (I^2) of IOI-HA scores was 0% and mean difference was 0.41 (95% CI: −1.00, 1.82). Refer to ►**Fig. 4** for complete results.

Publication bias was not assessed as only three studies were assessed for each outcome. Lewis[26] demonstrates some outcome reporting bias based on the published study protocol as all results were not described. There were no prepublished study protocols for the other three RCTs.

►**Table 2** displays GRADE summary findings of the reviewed studies. The overall certainty of data-logged hours and IOI-HA scores was assessed as low; the true effect may be substantially different from the estimate of the effect.

Discussion

To our knowledge, this is the first systematic meta-analysis looking at the effect of MI on quantitative HA-related outcomes.

Many of the studies included in this review were either feasibility studies or pilot studies, with small sample sizes and short follow-up. While Aazh[23] was deemed to be at a low

Table 1 Summary characteristics of included studies, ordered by date published

Author, year (country)	Objective	Study design	Participant characteristics	Total sample size	Objective measures assessed	Results
Aazh, 2016[23] (UK)	To evaluate the feasibility of conducting RCTs to assess MI's impact on hearing-aid use in patients who do not use their hearing aid on a regular basis.	Single-blind, randomized parallel-group.	Adult patients fitted with hearing aids who reported using less than 4 h/d.	37 participants recruited, 36 at follow-up.	Hours of hearing aid use IOI-HA IOI-HA-SO HADS CERQ WHO-DASII RCR GHABP MICI COSI	The intervention group had greater hearing aid use (7 ± 3.7 h/d) than the control (4 ± 3.6 h/d) at follow-up. There was no significant difference in patient-reported outcomes in both groups at follow-up.
Ferguson et al, 2016 (UK)	To assess the potential benefits of using motivational engagement.	Simple parallel group randomized design.	Patients who were first time hearing aid users over the age of 18.	68 participants recruited, 53 at follow-up.	Hours of hearing aid use HADS HHCIR GHABP PAM AOS MARS-HA SADL	There was no significant difference between intervention and control groups in hours of hearing aid use or patient-reported outcomes at follow-up.
Zarenoe et al, 2016 (Sweden)	To test a brief MI program as an adjunct to patients with tinnitus and sensorineural hearing loss.	Single-blind randomized parallel-group.	Adult patients with mild to moderate SNHL and first-time users of hearing aids who had tinnitus and a PTA <70 db of hearing loss.	50 participants recruited, 46 participants at follow-up.	THI IOI-HA	Significant difference in THI and IOI-HA in both groups. There was a significant improvement in MI group for THI, and no difference between groups for IOI-HA.
NCT 01843777, 2016 (USA)	To apply motivational tools, in the spirit of motivational interviewing to those with hearing loss.	Simple parallel group randomized control trial.	First time hearing aid users with poor adoption of hearing aids and an AC PTA of 70 db HL or less in both years.	25 participants recruited, 14 at follow-up for hearing aid data logging, 18 at follow-up for IOI-HA.	Hours of hearing aid use IOI-HA.	There was an increase in hours of hearing aid use in the MI group compared with the control. There was a negative impact on IOI-HA in the MI group compared with the control.

Abbreviations: AC PTA, Air Conduction Pure Tone Audiometric Average; AOS, Audiology Outpatient Survey; GHABP, Glasgow Hearing Aid Benefit Profile; HADS, Hospital Anxiety and Depression Scale; HHCIR, Hearing Health Care Intervention Readiness; IOI-HA, International Outcome Inventory for Hearing Aids; MI, motivational interviewing; MARS-HA, Measure of Audiologic Rehabilitation Self-efficacy for Hearing Aids; PAM, Patient Activation Measure; SNHL, sensorineural hearing loss; SADL, Satisfaction with Amplification in Daily Life; THI, Tinnitus Handicap Inventory.

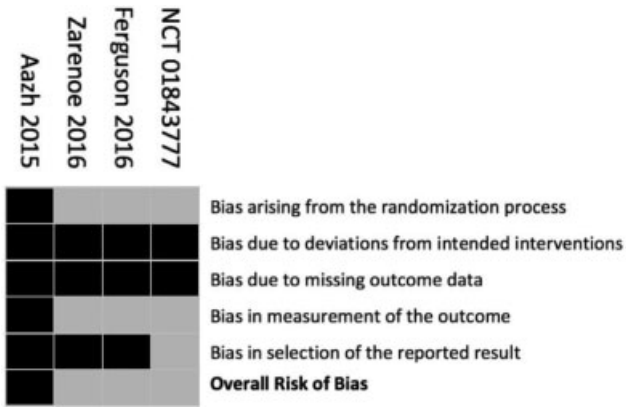

Fig. 2 Risk-of-bias for included studies as assessed by the Cochrane Risk of Bias Tool 2.0 (black = low risk; gray = some risk; white = high risk).

risk-of-bias, the other three studies were of greater concern. There was moderate heterogeneity across the studies. Study populations varied, with Aazh assessing existing HA users and the other three assessing first-time users. All studies were undertaken in first world health care services: Aazh and Ferguson et al[24] in the United Kingdom, Zarenoe et al[25] in Sweden, and Lewis[26] in the United States.

We found a limited number of RCTs examining MI in HA users. There is extensive qualitative work on patient–provider interactions, but less quantitative studies assessing patient outcomes. A complicating factor with analysis of HA outcomes is that often studies use different measures. Perez and Edmonds[27] emphasized the importance of standardized reporting to allow direct comparison of HA outcomes, and our review illustrates this ongoing need. The IOI-HA is one of the more commonly used patient outcome questionnaires. It follows a 35 point scale, with higher scores indicating positive benefits.[28]

MI did not have a significant effect on either data-logged hours of HA use or IOI-HA outcomes when the results of all studies were aggregated. Three studies individually identified a positive impact of MI in their participants. Aazh[23] and Ferguson et al[24] both showed an increase in data logged hours in their intervention groups compared with standard care, but Ferguson et al's results were not significant. Zarenoe et al[25] reported a significant improvement in patient satisfaction for their MI group, as measured by the IOI-HA, but there was no difference compared with their standard care cohort. Lewis[26] demonstrated a negative impact of MI, with IOI-HA scores decreasing in the intervention group; this finding was not statistically significant. Overall, these results suggest that there is insufficient evidence to conclude that MI improves HA user outcomes. The follow-up period in the studies was short, with the longest being 3 months.[25] It is concerning that an effect was not clearly evident with very short post-intervention follow-up periods.

Miller acknowledged in his original 1983 article that MI would not be applicable to every situation. Several published studies have demonstrated that self-motivation does not affect HA use or satisfaction.[29,30] Conversely, Knudsen et al's review suggested that patient–provider interactions addressing motivation may be beneficial. Wilson and Stephens also noted that users' attitudes toward hearing-aids impacted both HA use and satisfaction. Ismail et al's[31] review on hearing providers current practice suggested that perhaps the lack of improvement in HA use and other outcomes is due to ineffective audiological consultations. Their review identified that hearing-aid provider behaviors and strategies had not changed, despite patient concerns and published knowledge of limitations.

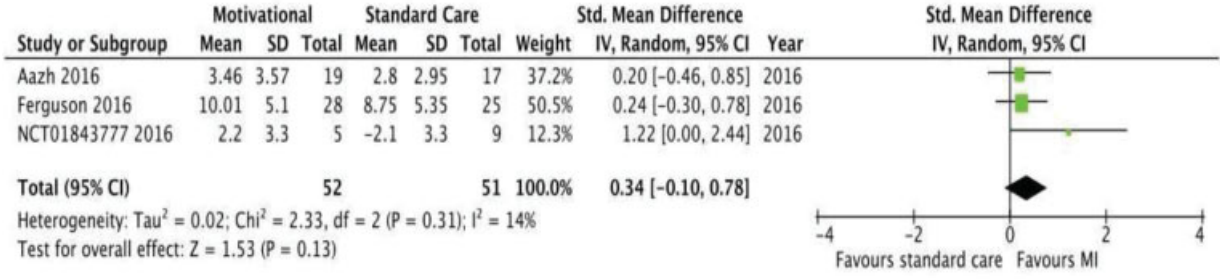

Fig. 3 Forest plot examining the impact of motivational interviewing on data-logged hours of hearing aid use.

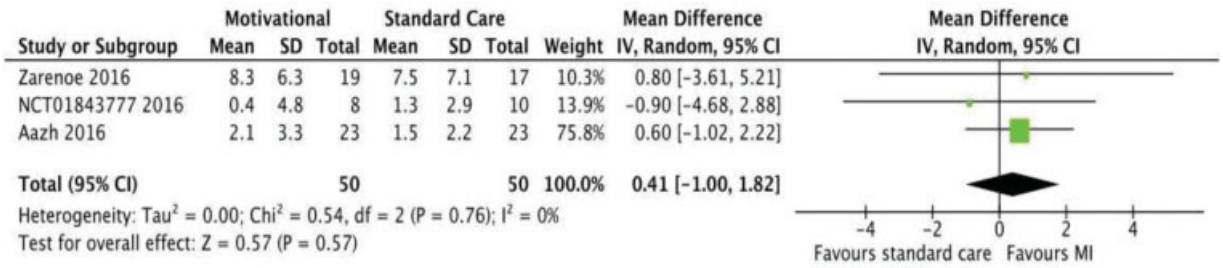

Fig. 4 Forest plot examining the impact of motivational interviewing on patient-reported International Outcome Inventory for Hearing Aids score.

Table 2 GRADE summary of findings on motivational interviewing for hearing aid outcomes

Motivational interviewing compared with standard care for hearing aid users					
Patient or population: hearing aid users					
Setting: hearing aid counselling					
Intervention: motivational interviewing					
Comparison: standard care					
Outcomes	**No. of participants (studies) Follow-up**	**Certainty of the evidence (GRADE)**	**Relative effect (95% CI)**	**Anticipated absolute effects**	
				Risk with standard care	**Risk difference with motivational interviewing**
Data-logged hours assessed with hearing logs	103 (three RCTs)	⊕⊕◯◯ LOW[a]	–	–	SMD 0.34 SD more (0.1 fewer to 0.78 more)
Patient-reported outcomes assessed with International Outcome Inventory for Hearing Aids Scale from: 0–35	100 (three RCTs)	⊕⊕◯◯ LOW[b,c]	–	The mean patient-reported outcomes ranged from 1.3 to 7.5	MD 0.41 higher (1 lower to 1.82 higher)

Abbreviations: CI, confidence interval; RCT, randomized controlled trials; SMD, standardized mean difference; MD, mean difference.
*The risk in the intervention group (and its 95% confidence interval) is based on the assumed risk in the comparison group and the relative effect of the intervention (and its 95% CI).
Note: GRADE Working Group grades of evidence:
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect.
Moderate certainty: We are moderately confident in the effect estimate: the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
Low certainty: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect.
Very low certainty: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect.
Explanations
[a]All three studies included limited participants and wide confidence intervals.
[b]All three studies included limited participants and wide confidence intervals.
[c]There are only three small positive studies and it appears that studies showing no effect or harm have not been published.
[d]This is the appropriate position for this footnote.

Our results display that there is no statistically significant quantitative impact of MI on HA use or global patient-reported outcome scores as recorded by the IOI-HA. However, Aazh's qualitative analysis identified that additional support, clinician effect, and feeling better about self are reasons that influence HA use.[32] Therefore, future research into different communication methods and strategies may be warranted to uncover effective ways of improving HA outcomes.

There are several limitations to this study. As mentioned previously, there was moderate heterogeneity across the studies included and the GRADE quality of evidence was low for both outcomes studied. The true effect may be substantially different from our estimate of the effect, due to the relatively small number of subjects even in the amalgamated dataset. Furthermore, potential publication bias may have prevented access to other studies that showed no benefit. There was difficulty comparing results due to dissimilar outcome measures. We recognize that including unpublished studies may in itself introduce bias as only unpublished studies that could be located were included. Gray literature in systematic reviews has become increasingly accepted over time,[33,34] but we understand that this is debated. There was moderate bias in the studies included and higher quality data are needed to improve on the conclusions of this meta-analysis.

Conclusion

In conclusion, we endorse that more research is needed into how HA use and user-reported outcomes can be improved. MI was not found to have a significant impact on these outcomes, but this finding is limited by the heterogeneity and low quality of the available study data. Further RCTs with detailed descriptions of standardized MI interventions would enhance the quality of data in the field.

Note
This work was presented at the American Academy of Audiology 2020þHearTECH expo (eConference due to COVID-19).

Conflict of Interest
None declared.

Acknowledgment
None.

References

1 Vos T, Allen C, Arora M, et al; GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. Lancet 2016;388(10053):1545–1602

2 Gopinath B, Wang JJ, Schneider J, et al. Depressive symptoms in older adults with hearing impairments: the Blue Mountains Study. J Am Geriatr Soc 2009;57(07):1306–1308

3 Hickson L, Scarinci N. Older adults with acquired hearing impairment: applying the ICF in rehabilitation. Semin Speech Lang 2007;28(04):283–290

4 Li-Korotky HS. Age-related hearing loss: quality of care for quality of life. Gerontologist 2012;52(02):265–271

5 Gates GA, Mills JH. Presbycusis. Lancet 2005;366(9491):1111–1120

6 Aazh H, Prasher D, Nanchahal K, Moore BC. Hearing-aid use and its determinants in the UK National Health Service: a cross-sectional study at the Royal Surrey County Hospital. Int J Audiol 2015;54 (03):152–161

7 Jenstad L, Moon J. Systematic review of barriers and facilitators to hearing aid uptake in older adults. Audiology Res 2011;1(01):e25

8 Nunez DA, Mousavi SM. What determines the older adults use of a hearing aid? Otolaryngol Head Neck Surg 2016(Suppl 1):128. Available at: https://journals-sagepub-com.ezproxy.library.ubc.ca/doi/full/10.1177/0194599816655336f

9 Acar B, Yurekli MF, Babademez MA, Karabulut H, Karasen RM. Effects of hearing aids on cognitive functions and depressive signs in elderly people. Arch Gerontol Geriatr 2011;52(03):250–252

10 Johnson CE, Jilla AM, Danhauer JL. Developing foundational counseling skills for addressing adherence issues in Auditory Rehabilitation. Semin Hear 2018;39(01):13–31

11 Manchaiah V, Hernandez BM, Beck DL. Application of transtheoretical (stages of change) model in studying attitudes and behaviors of adults with hearing loss: a descriptive review. J Am Acad Audiol 2018;29(06):548–560

12 Ekberg K, Grenness C, Hickson L. Application of the transtheoretical model of behaviour change for identifying older clients' readiness for hearing rehabilitation during history-taking in audiology appointments. Int J Audiol 2016;55(Suppl 3):S42–S51

13 Pryce H, Hall A, Laplante-Lévesque A, Clark E. A qualitative investigation of decision making during help-seeking for adult hearing loss. Int J Audiol 2016;55(11):658–665

14 Sciacca A, Meyer C, Ekberg K, Barr C, Hickson L. Exploring audiologists' language and hearing aid uptake in initial rehabilitation appointments. Am J Audiol 2017;26(02):110–118

15 Knudsen LV, Öberg M, Nielsen C, Naylor G, Kramer SE. Factors influencing help seeking, hearing aid uptake, hearing aid use and satisfaction with hearing aids: a review of the literature. Trends Amplif 2010;14(03):127–154

16 Miller WR, Rollnick S. Motivational Interviewing: Helping People Change. New York, NY: Guilford Press; 2012

17 Miller WR. Motivational interviewing with problem drinkers. Behav Cogn Psychother 1983;11(02):147–172

18 Rubak S, Sandbaek A, Lauritzen T, Christensen B. Motivational interviewing: a systematic review and meta-analysis. Br J Gen Pract 2005;55(513):305–312

19 Solheim J, Gay C, Lerdal A, Hickson L, Kvaerner KJ. An evaluation of motivational interviewing for increasing hearing aid use: a pilot study. J Am Acad Audiol 2018;29(08):696–705

20 Miller WR, Rollnick S. Ten things that motivational interviewing is not. Behav Cogn Psychother 2009;37(02):129–140

21 Markland D, Ryan RM, Tobin VJ, Rollnick S. Motivational interviewing and self–determination theory. J Soc Clin Psychol 2005; 24(06):811–831

22 Higgins JP, Thomas J, Chandler Jet al, eds. Cochrane Handbook for Systematic Reviews of Interventions. 2nd Edition. Chichester, UK: John Wiley & Sons; 2019

23 Aazh H. Feasibility of conducting a randomized controlled trial to evaluate the effect of motivational interviewing on hearing-aid use. Int J Audiol 2016a55(03):149–156

24 Ferguson M, Maidment D, Russell N, Gregory M, Nicholson R. Motivational engagement in first-time hearing aid users: a feasibility study. Int J Audiol 2016;55(Suppl 3):S23–S33

25 Zarenoe R, Söderlund LL, Andersson G, Ledin T. Motivational interviewing as an adjunct to hearing rehabilitation for patients with tinnitus: a randomized controlled pilot trial. J Am Acad Audiol 2016;27(08):669–676

26 Lewis S. Applying the use of motivational tools to auditory rehabilitation (NCT 01843777). 2016. Published October 7, 2016. Accessed January 21, 2020 at: https://clinicaltrials.gov/ct2/show/study/NCT01843777

27 Perez E, Edmonds BA. A systematic review of studies measuring and reporting hearing aid usage in older adults since 1999: a descriptive summary of measurement tools. PLoS One 2012;7 (03):e31831

28 Cox R, Hyde M, Gatehouse S, et al. Optimal outcome measures, research priorities, and international cooperation. Ear Hear 2000; 21(Suppl 4):106S–115S

29 Hickson LM, Timm MJ, Worrall LE, Bishop K. Hearing aid fitting: outcome for older adults. Aust J Audiol 1999;21(01):9–21

30 Wilson C, Stephens D. Reasons for referral and attitudes toward hearing aids: do they affect outcome? Clin Otolaryngol Allied Sci 2003;28(02):81–84

31 Ismail AH, Munro KJ, Armitage CJ, Dawes PD. What do hearing healthcare professionals do to promote hearing aid use and benefit among adults? A systematic review. Int J Audiol 2019; 58(02):63–76

32 Aazh H. Patients' experience of motivational interviewing for hearing aid use: a qualitative study embedded within a pilot randomized controlled trial. J Phonet Audiol 2016b2(01):1–13

33 Mahood Q, Van Eerd D, Irvin E. Searching for grey literature for systematic reviews: challenges and benefits. Res Synth Methods 2014;5(03):221–234

34 Tetzlaff J, Moher D, Pham B, Altman D. Survey of views on including grey literature in systematic reviews. Paper presented at: 16th Cochrane Colloquium, Dublin, Ireland; 2006

Erratum: An erratum has been published for this article (DOI: 10.1055/s-0043-1764384).

