

Review

Audiological Rehabilitation for Facilitating Hearing Aid Use: A Review

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Abstract

Purpose: This article reviews and critically analyzes the design of studies on the effect of audiological rehabilitation (AR) programs on hearing aid (HA) outcomes, in order to guide future research.

Research Design: The design of this study was a narrative review. Studies were included in the review if they were randomized controlled trials that investigated the effects of AR on HA use and outcome between 2000 and 2016.

Results: Seven articles that met the inclusion criteria were included in the review. Most used educational rather than counseling approaches. Although educational AR programs seem to be useful in enhancing the use of communication strategies, there is limited evidence for their effect on HA use and self-perceived hearing handicap.

Conclusions: More research is needed in this field. Future studies should (1) investigate the efficacy of AR interventions based on counseling and empathetic listening as opposed to or in addition to educational interventions, (2) use stricter criteria to include only a subpopulation of patients who do not get on well with their HAs, (3) measure the amount of HA use via data-logging and self-report questionnaires, and (4) use a matching comparison intervention for patients in the control group.

Key Words: audiological rehabilitation, hearing aid use, hearing handicap

Abbreviations: ACE = active communication education; AR = audiological rehabilitation; ComStrat = communication strategies group; COSI = Client Oriented Scale of Improvement; CPHI = Communication Profile for Hearing Impaired; ES = effect size; HA = hearing aid; HADS = Hospital Anxiety and Depression Scale; HHDI = Hearing Handicap and Disability Inventory; HHI = Hearing Handicap Inventory; HHIE = Hearing Handicap Inventory for the Elderly; HRQoL = health-related quality of life; Info = informational lectures group; IOI-AI = International Outcome Inventory for Alternative Interventions; IOI-AI-SO = IOI-AI for Significant Others; IOI-HA = International Outcome Inventory for Hearing Aids; IOI-HA-SO = IOI-HA for Significant Others; PS = psychosocial exercises group; RCTs = randomized controlled trials; SADL = Satisfaction with Amplification in Daily Life; SD = standard deviation; SF-36V = Short-Form Health Survey modified for the veteran population; SO = significant other; WHO-DAS II = World Health Organization Disability Assessment Schedule II

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INTRODUCTION

Audiological rehabilitation (AR), also called audiologic rehabilitation, is the process of providing training and treatment to improve hearing for those who are hearing impaired. AR may include provision of hearing aids (HAs) and education about adjusting to hearing loss, making the best use of HAs, managing conversations, and taking charge of communication. In this article, we use AR to refer to aspects of rehabilitation in addition to the provision of HAs.

Research studies suggest that the use of HAs increases the ability to detect and discriminate sounds, enhances speech discrimination, and improves health-related quality of life (HRQoL) for individuals with hearing impairment (McArdle et al, 2005; Chisolm et al, 2007; Hickson and Scarinci, 2007). Chisolm et al (2007) conducted a systematic review of studies assessing the effect of HA use on HRQoL. Their meta-analysis revealed that the mean between-participants effect size (ES) of HAs for disease-specific HRQoL measures was 2.1, with 95% confidence intervals of 0.5 and 3.6. This suggests that HAs have a robust, medium-to-large effect on HRQoL when outcomes are assessed using disease-specific measures. However, several studies have reported that many owners of HAs do not use them regularly and do not achieve an improved quality of life (Stark and Hickson, 2004; Vuorialho et al, 2006; McCormack and Fortnum, 2013; Aazh et al, 2015). Non-use or infrequent use of HAs not only wastes resources but also has other implications: (a) nonuse of HAs has been associated with increased risk of “loneliness” among hearing-impaired individuals (Pronk et al, 2013); (b) failure to communicate adequately may adversely affect the nonuser’s occupational, educational, leisure, and social activities (Hickson and Scarinci, 2007); (c) partners and family of the nonuser may experience activity limitation and participation restriction as a result of their partner’s communication difficulties (Scarinci et al, 2012); (d) nonusers may not benefit from the learning and reorganization of the auditory cortex associated with consistent hearing aid use (Gabriel et al, 2006; Munro and Trotter, 2006; Hamilton and Munro, 2010); and (e) nonusers need to increase their attention, concentration, and “listening effort” to compensate for the reduced audibility of sounds, making them more susceptible to mental fatigue in demanding listening situations (Hornsby, 2013).

Vestergaard Knudsen et al (2010) conducted a review of studies assessing the factors that influence HA use and satisfaction. They reviewed 39 papers and identified 31 factors. After further analysis, they concluded that the main predictors of HA use are self-reported hearing problems and patients’ attitudes toward HAs. Jenstad and Moon (2011) conducted a systematic re-

view of the literature to identify the main barriers to and facilitators of HA uptake in older adults. They included 14 studies in their review. They concluded that self-reported hearing loss and stigma of deafness were the main factors affecting HA uptake.

There are many studies assessing the efficacy of various AR programs in facilitating HA use and improving the HRQoL of hearing-impaired individuals (Hawkins, 2005; Barker et al, 2014). Hawkins (2005) conducted a systematic review of the literature regarding the effectiveness of educational and communication strategy-oriented AR programs. He focused his search on AR programs that are implemented in group settings. Such settings are used partly because of limitations in resources but also because there may be some beneficial factors related to group dynamics. Participation in group AR may help hearing-impaired individuals share feelings, problems, and solutions with one another. Group AR may help people to deal with the stigma and the loss of social identity associated with hearing loss, and is potentially an ideal forum for learning and practicing communication strategies (Preminger, 2007). The question posed in the systematic review of Hawkins was, “Do adult group AR interventions that focus on counseling and communication strategies provide measurable benefits over the short or long term in benefit/satisfaction with hearing aids, adjustment to hearing loss, or perceived hearing handicap?” His search strategy identified 22 papers, of which 12 met the inclusion criteria. Hawkins (2005) reported that the majority of studies showed some reduction in the perception of hearing handicap as a result of being in an AR group. However, not all studies gave that result. Also, the impact of AR plus amplification on disability and handicap measures was not significantly different from that for amplification alone. Hawkins reported that the findings of improved use of communication strategies, enhanced personal adjustment, and better use of HAs were not well documented or replicated in the selected studies. Therefore, he argued that drawing a firm conclusion regarding the effectiveness of AR was not possible, due to the lack of well-designed trials. He suggested that counseling and communication strategy-oriented AR programs probably allow the patient to deal with their hearing handicap better, but they do not necessarily reduce the hearing handicap itself.

Recently, Barker et al (2014) conducted a Cochrane review appraising the evidence base for AR interventions that are designed to improve HA use. They included 32 studies in their review, with a total of 2,072 patients. They rated the quality of the evidence to be “low” or “very low.” All studies assessed self-management interventions that were mainly designed to support people in managing their hearing loss and HAs through providing educational materials and practice in application of communication strategies. Barker et al (2014) did

not find any statistically significant effect on adherence to HA use or on quality of life measures. However, a meta-analysis based on two studies including 87 patients showed a reduction in self-perceived hearing handicap as a consequence of being in an AR program. Increased use of communication strategies was also shown in one study with 53 patients. Barker et al (2014) concluded that there was “low” or “very low” quality evidence to support a benefit of the AR programs beyond that received from the fitting of the HAs.

The main aim of the reviews described above was to inform decisions with regard to patient care (i.e., to help in the choice of the appropriate intervention) (Hawkins, 2005; Barker et al, 2014). Hence, the reviews were mainly focused on assessing the outcome of the studies and did not analyze the details of aspects of the research that could have influenced the observed outcomes (e.g., the content of the intervention, the outcome measurement tools, and the type of intervention for the control group) (Hawkins, 2005; Barker et al, 2014). The aim of this article was to review and critically analyze the design of studies assessing the effect of AR programs on HA outcomes, to guide future research.

METHODS

Study Design

This is a narrative review. Narrative review is a comprehensive synthesis of previously published research evidence that provides a summary of the content of the included articles and synthesizes their results in the light of their methodological limitations (Green et al, 2001). The main aim of a narrative review is to guide future research. It is not designed to inform decisions with regard to patient care, for which systematic reviews and meta-analysis are needed (Green, 2005).

Study Selection Criteria

Studies were included in this review if they were randomized controlled trials (RCTs) that investigated the effects of AR on HA use and outcome. Given the susceptibility to several types of bias (e.g., selection bias and placebo effect), studies with other designs (e.g., non-randomized, before-and-after comparisons, case reports, and clinical observations) were excluded. All patients had hearing impairment. Studies were selected in which (a) patients in the experimental intervention group received an AR program administered either in individual sessions, by distance learning, or in group settings; and (b) patients in the control group received either no additional rehabilitation, a matching placebo program, or were assigned to a waiting list. Studies with both new and existing patients were included.

Search, Identification of Studies, and Data Collection

A search of the literature was conducted using the following resources: Allied and Complementary Medicine Database; British Nursing Index; Cumulative Index to Nursing and Allied Health Literature; Embase; Health Business Elite; Medline; PsycInfo; Health Management Information Consortium; the Cochrane Ear, Nose and Throat Disorders Group Trials Register; the Cochrane Central Register of Controlled Trials; The Cochrane Library; the International Standard Randomized Controlled Trial Number register of clinical trials; and ClinicalTrials.gov. The publication date was limited to the period between 2000 and January 2016. The search strategy used was as below:

(Randomized AND controlled AND trial) [In title and abstract]

AND

(Audiological rehabilitation OR aural rehabilitation OR audiological rehabilitation OR rehabilitative audiology OR rehabilitation OR therapy OR education OR training) [In title and abstract]

AND

(Hearing aid OR amplification) [In any field]

To maximize sensitivity, no other filters were employed in the search. In addition, a hand search was conducted on the reference lists of the included studies. The titles and abstracts of the articles retrieved using the search strategy were reviewed. Articles that failed to meet the inclusion criteria were excluded. The full texts of articles that were not excluded based on their titles and abstracts were retrieved and reviewed. Only studies that met all the inclusion criteria were included in the review.

RESULTS

Outcome of the Search Strategy

The search strategy identified 87 articles. Seven articles that met the inclusion criteria were included in the review. Table 1 provides a summary of the design and results of the included studies.

Description of the Included Studies

Abrams et al (2002)

Abrams et al (2002) conducted an RCT to evaluate the additional benefits of combining an AR program with provision of HAs in a hospital for veterans. Fifty-two patients received HAs only and 53 patients received HAs plus AR (HA + AR). The outcome measurement tool was the 36-item Short-Form Health Survey modified for the

Table 1. Summary of the included RCT Studies

Study	Number of Patients	Intervention	Control Intervention	Outcome Measurement	Between-group Differences
Abrams et al (2002)	105	HA fitting + orientation + group education	HA fitting + orientation	SF-36V	NS
Chisolm et al (2004)	106	HA fitting + orientation + group education	HA fitting + orientation	CPHI	NS
Kramer et al (2005)	48	HA fitting + home education program	HA fitting + orientation	HHDl (m), IOI-HA, IOI-AI, IOI-HA-SO, IOI-AI-SO, and open-ended questions	Significant difference in communication strategies on HHDl (m) NS other measures
Hickson et al (2007)	178	ACE in group setting	Social program	HHQ, SAC, SF-36, QDS, Ryff, IOI-AI, COSI, and open-ended questions	NS
Preminger and Yoo (2010)	52	Communication strategies + PS	Lectures + PS or communication strategies only	HHI, WHODAS II, and a class evaluation	NS Minor between-group differences observed in 1 subscale of HHI and 1 subscale of WHODASII
Lundberg et al (2011)	69	A book + 5 tasks + 5 telephone conversations with audiologist	Book only	HHI, HHIE, HADS, COSI, and IOI-HA	Significant difference in HHIE and depression subscale of HADS NS other measures
Thorén et al (2011)	59	Online education program facilitated by an audiologist for HA users	Online discussion forum without any professional contact	HHIE, IOI-HA, SADL and HADS	Significant between-group difference for HHIE and HADS NS for IOI-HA and SADL

Note: HHDl (m) = modified version of the HHDl; HHQ = Hearing Handicap Questionnaire; IOI-SO = International Outcome Inventory-Significant Others; NS = not statistically significant; QDS = Quantified Denver Scale of Communicative Function; Ryff = Ryff Psychological Well-Being Scale; SAC = Self-Assessment of Communication.

veteran population (SF-36V) (Ware and Sherbourne, 1992). This is a multi-item scale that measures eight aspects of general health in two major domains of mental and physical functioning (Ware and Sherbourne, 1992). All patients were fitted with HAs and were provided with a routine HA orientation. Patients in the HA + AR group returned once a week for four weeks for a 2-hr group meeting. The meetings covered (a) education about hearing systems and communication strategies; (b) improving communication in adverse listening conditions; (c) anticipatory strategies, repair strategies, and environmental management; and (d) telephone communication and resources for hard-of-hearing people. The patients in the control group received no additional treatment. Two weeks after the end of the HA + AR group program, all patients completed the SF-36V.

The results revealed that the use of HAs (with or without AR) resulted in significant improvements in the mental health domain of SF-36V. The improvement in the mean score for this domain was 3.0 points for the HA + AR group and 1.4 points for the HA-only group. However, the difference between the two groups failed to reach statistical significance. This study did not have enough statistical power to detect small or medium ESs (between 0.2 and 0.5 [Cohen, 1988]), which are typically obtained for psychosocial interventions.

Chisolm et al (2004)

Chisolm et al (2004) conducted an RCT on 106 patients with adult-onset hearing loss, using the same two groups as described above: HA and HA + AR. Patients in both groups were fitted with HA(s) and provided with routine HA orientation information with regard to HA use, troubleshooting techniques, battery ordering, and what to expect during the HA adjustment period. Patients in the AR group returned once per week for four weeks, for 2-hr group meetings (8 hr of AR intervention in total). The AR sessions provided education on (a) basic anatomy and physiology of the auditory system; (b) improving communication in adverse listening conditions, including a focus on the use of visual cues and listening strategies; (c) practice in the areas of anticipatory strategies, repair strategies, and environmental management; and (d) telephone communication strategies, use of assistive technology, and community resources for the hard of hearing. Patients in the AR and control groups were assessed 2, 6, and 12 mo after fitting. The outcome measurement tool was the Communication Profile for Hearing Impaired (CPHI) (Demorest and Erdman, 1987).

The results showed that HA use improved CPHI scores 2 mo after fitting, and this effect was maintained at subsequent assessments. However, there was no additional benefit from the AR; general linear model analyses of the data showed that the main effect of group,

HA versus AR+HA, was not significant. The authors did not investigate whether there was a difference in the amount of HA use between the two groups.

Although the AR program was designed to help patients overcome their activity limitations and participation restrictions (Chisolm et al, 2004), the interventions were mainly focused on providing technical education rather than addressing emotional and psychosocial aspects of hearing loss and HA use through counseling. The authors focused on creating “informed patients” by providing education but with respect to emotional support they relied solely on group dynamics (patients may receive emotional support from one another). The authors did not provide psychological therapies that can help people to deal with their emotional, motivational, or behavioral problems, such as client-centered counseling (Rogers, 1951), motivational interviewing (Miller and Rollnick, 2013), and cognitive behavioral therapy (Wells, 1997).

Kramer et al (2005)

Kramer et al (2005) developed a home education program based on the use of five videotapes/DVDs and an instruction booklet. The videos covered different daily life situations in which a person with hearing impairment typically has problems hearing and communicating. The videos provided education about coping strategies and instructions on communication tactics. The topics of the videos were (a) one-to-one conversation in a quiet room at home (13 min); (b) birthday party in a noisy environment (11.5 min); (c) conversation with a stranger, outside in the street (14.5 min); (d) visit to a doctor in the hospital (11.5 min); and (e) group meeting with strangers (18 min).

Forty-eight hearing-impaired individuals who visited the audiology center were randomly assigned to an intervention group (HA plus home education) or a control group (HA only). The duration of the home education ranged from 5 to 12 weeks. Some of the items of the Hearing Handicap and Disability Inventory (HHDI) (van den Brink et al, 1996) questionnaire were used to assess the patients' emotional responses (e.g., acceptance of loss, interaction with others, and lack of self-confidence). Some items were added addressing the use of communication strategies. They also used open-ended questions as well as the International Outcome Inventory for Hearing Aids (IOI-HA) (Cox and Alexander, 2002), the International Outcome Inventory for Alternative Interventions (IOI-AI) (Noble, 2002), the International Outcome Inventory for Hearing Aids for Significant Others (IOI-HA-SO) (Noble, 2002), and the International Outcome Inventory for Alternative Interventions for Significant Others (IOI-AI-SO) (Noble, 2002).

Based on the HHDI, an improvement in communication strategies was observed for the intervention group

($p < 0.05$) after the treatment while no improvement was observed for the control group. A significant group difference on the communication strategies scale in favor of the intervention group was found. No significant group difference was found for the emotional response scale on the HHDI or for scores on the IOI-HA, IOI-AI, IOI-HA-SO, and IOI-AI-SO. They concluded that the home education program increased awareness of the benefits of communication strategies but did not have an extra effect beyond HA fitting on emotional responses or HA outcome.

Hickson et al (2007)

Hickson et al (2007) conducted an RCT on 178 people with mild-to-moderate hearing impairment. They compared the effectiveness of an active communication education (ACE) program with that of a social program (control group). ACE is a group program designed for older people with hearing impairment, with and without HAs (Hickson et al, 2007). The program runs for 2 hr per week over five weeks (total 10 hr) and involves both people with hearing impairment and their significant others (SOs). During the first session of ACE, the facilitator encourages the group members to identify, discuss, and prioritize their communication difficulties. Depending on the communication problems identified, a series of educational and problem-solving modules is provided. In addition, group members are encouraged to think about what goals they would like to achieve during the ACE program. The sessions are interactive and involve detailed discussions of communication strategies and practical exercises. The teaching topics comprise (a) communication needs analysis, (b) understanding conversation in background noise, (c) communicating around the house, (d) understanding people who do not speak clearly, (e) listening to other signals (e.g., telephone, television), (f) listening to a public address system/listening in church, (g) sound localization, (h) safety issues and maintaining independence, (i) communicating with family members, and (j) concentrating to understand.

Patients in the control group received a social program that involved the same amount of face-to-face contact as for the ACE program. The following topics were covered by the facilitator: introduction to communication, communication and technology, communication changes in ageing, communication and memory changes, and communication and reading and writing. Patients in the control group took part in the ACE program after they had finished the social program.

The outcome measurement tools comprised the Hearing Handicap Questionnaire (Gatehouse and Noble, 2004), the Quantified Denver Scale of Communicative Function (Alpiner et al, 1974), the Self-Assessment of Communication (Schow and Nerbonne, 1982), the con-

densed version of the Ryff Psychological Well-Being Scale (Hoen et al, 1997), the SF-36 (Ware and Sherbourne, 1992), the Client Oriented Scale of Improvement (COSI) (Dillon et al, 1997), the IOI-AI, and open-ended questions. The difference in questionnaire scores between the ACE group and the control group was not significant for any of the measures, but this may reflect a lack of statistical power. As 54% of the participants were HA users, and several hearing handicap and quality of life measures were included, this study had the potential to shed some light on the benefit of AR when combined with amplification. Although the main aim was not related to HA use, the participants' feedback was assessed to determine the main actions taken by participants after the ACE program ended. This showed that only 6% of the participants used their HAs more often or took action to obtain HAs if they did not have them.

Preminger and Yoo (2010)

Preminger and Yoo (2010) conducted an RCT to determine whether the content of a group AR program affected the final outcomes. They argued that an AR program should enhance problem- and emotion-focused coping strategies (Lazarus and Folkman, 1984). They stated that educational sessions on HA use and communication strategies should enhance problem-focused coping (e.g., defining the problem and identifying and practicing possible solutions), while exploring and sharing anxieties, fears, sadness, shame, and grief related to hearing loss should address emotional coping strategies. Fifty-two patients were randomly assigned to one of three groups: (a) communication strategies training (ComStrat; $n = 18$), (b) communication strategies training plus psychosocial exercises (ComStrat + PS; $n = 17$), and (c) a group in which no training was given but time was spent on informational lectures and PS (Info + PS; $n = 17$). On average the patients had about 10 yr (standard deviation [SD] = 11) of experience of HA use, and their mean score on the Hearing Handicap Inventory (HHI) (Newman et al, 1990) was 60 (SD = 20), indicating a significant hearing handicap. All AR classes met once per week over a six-week period. At least 60 min was spent each week on ComStart, 30 min on PS, and 60 min on Info. The interventions are briefly described below:

1. ComStrat included training using both anticipatory strategies and repair strategies.
2. PS included stress-reduction exercises and was designed to encourage discussions of (a) problems, feelings, attitudes, and emotions associated with hearing loss; (b) other people's reactions to their hearing loss; and (c) the impact of hearing loss on personal and professional relationships.

3. Info comprised slide presentations on the patients' hearing status, a model of communication, HA features, assistive devices, tinnitus and balance problems, and cochlear implants.

The outcome measurement tools comprised HHI, the World Health Organization Disability Assessment Schedule II (WHO-DAS II) (McArdle et al, 2005), and an evaluation form.

All groups showed significant short-term and long-term treatment effects on HHI and WHO-DASII; repeated measures analyses of variance showed significant time effects with no statistically significant interactions with group. The lack of interactions indicates that there was no difference in the effectiveness of the different training methods. In this study the amount of HA use was not assessed. Therefore it is impossible to know whether any of the training methods improved HA use.

Lundberg et al (2011)

Lundberg et al (2011) conducted an RCT to assess the effect of an educational program delivered through telephone consultations on self-perceived hearing disability, anxiety, and depression, as well as on HA outcome. The idea was to develop an interactive counseling-based AR program to increase self-esteem and motivation to learn. The authors argued that AR based on counseling should promote HA use and consequently reduce self-reported hearing handicap. Thirty-three HA users were randomly assigned to the intervention group and 36 HA users were assigned to the control group. The treatment for each group is described below.

All patients completed the Hearing Handicap Inventory for the Elderly (HHIE) (Ventry and Weinstein, 1982), the Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983), the IOI-HA, and the COSI. The baseline average score on the HHIE was 36 (SD = 11) for the intervention group and 41 (SD = 13) for the control group, indicating mild-to-moderate hearing handicap. Patients in the intervention group received a book plus five tasks that were posted to their homes on a weekly basis as well as five weekly telephone consultations with an audiologist. The book chapters covered basic information about hearing, the audiogram, audiometry results, the speech area on the audiogram, challenges that can occur with inner ear damage, the benefits and the limitations of HAs, and various communication strategies. The weekly tasks were constructed by an audiologist, and the aim was to facilitate learning of the book chapters. To construct the weekly tasks, the audiologist took account of the individual's specific hearing-related problems, as identified using the baseline COSI questionnaire. An example individual weekly task might be "After reading chapters 5 to 8, try out different communication strategies that you

can use during a meeting. For example, think about your location during the meeting." Telephone consultations lasted for ~10–15 min and provided an opportunity to discuss the tasks, book chapters, and any other concerns. Participants in the control group received the same book and were given two weeks to read it. No task and telephone consultations were provided.

For the total scores on the HHIE, there was a significant interaction between group and time. Patients in both groups showed reduced self-reported hearing handicap with increasing time, but patients in the intervention group showed a greater improvement, and the difference from the control group was statistically significant ($p < 0.05$). The estimated ES between pre and post scores for the intervention group was 0.55. The analyses for the HADS showed an interaction between group and time for the total score and the depression subscale. Patients in the intervention group had a better outcome than for the control group, and this difference was statistically significant ($p < 0.05$). No improvement in IOI-HA scores over time was found for either group. This suggests that the education programs had no effect on overall HA outcomes nor did they promote HA usage. Overall, the results suggest that the educational programs used in the study may help hearing-impaired people to learn communication strategies and improve perceived hearing handicap, especially when telephone counseling is used. However, the programs did not improve HA use.

The effect of the educational program including telephone consultations on scores for the HHIE and HADS was larger than has typically been reported in placebo-controlled trials. However, the treatment for the control group was not matched to that for the intervention group with respect to contact time with a professional. Hence, the benefits for the intervention group might have been a consequence of the greater contact time rather than of the content of the treatment.

Thorén et al (2011)

Thorén et al (2011) conducted an RCT to compare an online education program facilitated by an audiologist with an online discussion forum without any professional contact. Twenty-nine people were randomly assigned to the intervention group and 30 people to the control group. The idea was to inform and guide people with hearing impairment about communication strategies, hearing tactics, and how to handle HAs to reduce activity limitations and participation restrictions imposed by hearing loss and increase satisfaction from and usage of HAs. The patients were experienced HA users, and their average score on the HHI at baseline was 26 (SD = 6) for the intervention group and 28 (SD = 5.5) for the control group,

indicating mild-to-moderate hearing handicap. Baseline HA use as measured via the IOI-HA was 4 and 4.4 (SD = 1.2) for the intervention and control groups, respectively, indicating 4–8 hr daily use.

Patients in the intervention group received a book and weekly interactions with an audiologist via e-mail. The chapters of the book covered (a) introduction and hearing anatomy, (b) measuring hearing loss, (c) five dimensions of hearing, (d) HAs, and (e) coping strategies and future goals. Weekly e-mails contained instructions for several tasks to be performed by patients at home (e.g., listening to different sounds with and without HAs to distinguish the difference and trying to localize the source of sounds). Patients were expected to spend 1.5 hr per week reading designated chapters in the book, performing tasks, and writing about their experiences. The patients in the control group were referred to an online discussion forum without professional interaction with an audiologist. Each week they were assigned a new topic to discuss. The five topics were (a) Tell us about your hearing problems; how do they affect you? (b) How do your hearing problems affect your significant others? (c) Tell us about an ordinary day with your hearing loss. (d) Some people argue that society nowadays demands more from people's hearing than before; what do you think about that? (e) Describe in what way your hearing loss limits you. Outcomes were assessed using the following questionnaires: HHIE, IOI-HA, Satisfaction with Amplification in Daily Life (SADL) (Cox and Alexander, 1999), and HADS. The questionnaires were administered before treatment (baseline), immediately after the intervention, and 6 mo later.

Scores on the HHIE improved significantly for patients in both groups ($p < 0.001$). Post hoc analysis showed that scores for the intervention group decreased significantly from baseline to immediately postintervention ($p < 0.001$) but not from baseline to 6 mo follow-up, whereas scores for the control group decreased significantly from baseline to 6 mo follow-up but not from baseline to immediately postintervention. The ES for the intervention group from baseline to immediately postintervention was 0.54.

Results for the total score of the SADL showed a significant interaction of group and time ($p < 0.05$). However, post hoc analysis did not show a significant effect of group for any time of evaluation. There was no significant difference in HADS total score from baseline to immediately postintervention or 6 mo follow-up for either group. The intervention group showed a significant improvement on the depression subscale of the HADS from baseline to immediately postintervention but not from baseline to 6 mo follow-up. There was no significant difference in the anxiety subscale score of the HADS from baseline to immediately postintervention for either group. However, the intervention

group showed a significant increase (worsening) on the anxiety subscale of the HADS from baseline to 6 mo follow-up. There was no significant change in the IOI-HA total score for either group.

Overall, the results of this study suggest that an educational intervention using a book combined with e-mail interactions may help hearing-impaired people to achieve improvement on perceived activity limitation and participation restrictions (ES = 0.54), although the improvement was not significant at the 6 mo follow-up. The interventions did not show any significant effect on HA use or satisfaction with HAs as measured using the IOI-HA.

DISCUSSION AND RESEARCH IMPLICATIONS

The results of the papers described in this review suggest that although AR programs can be useful in enhancing the use of communication strategies, there is limited evidence for a beneficial effect on HA use, self-perceived hearing handicap, and quality of life. This conclusion is consistent with that of previous reviews (Hawkins, 2005; Barker et al, 2014). In the sections below, several recommendations are made to inform methodological choices in the design of future RCTs aimed at assessing the effect of AR on HA use and quality of life.

Content of Intervention

In the majority of RCTs evaluating the effectiveness of AR, the AR interventions provided were focused on providing additional education, skillfulness, and practice in HA use and listening strategies. Within the AR process, patients are often required to change their behavior (e.g., to use HAs throughout the day and stop avoidance coping strategies) (Laplante-Lévesque et al, 2013). Behavior change is a complex process determined by many psychological and environmental factors. Hence, simply providing people with education and advice may not be sufficient for them to change their behavior (Rollnick et al, 2005; Mosler, 2012). Educating patients and providing practical training on communication/listening strategies are important components of the AR process, but such education does not address psychosocial aspects of living with hearing impairment and HA use. According to many studies, the main determinants of nonregular use of HAs are not lack of knowledge or skill, but are self-reported hearing problems, the patient's attitude toward HAs, stigma, and the patient's readiness and motivation (Vernon and Pratt, 1977; Babeu et al, 2004; Vestergaard Knudsen et al, 2010; Jenstad and Moon, 2011; Abdellaoui and Tran Ba Huy, 2013; Laplante-Lévesque et al, 2013; 2015). There is a need to assess the effect of interventions that are designed to address psychosocial aspects

of hearing impairment and the stigma of using HAs through a more client-centered counseling-based approach as opposed to an educational intervention.

Possible benefits of using motivational tools and application of a client-centered counseling approach have recently become popular topics in the audiology literature (Milstein and Weinstein, 2002; Beck et al, 2007; Hogan, 2010; Erdman, 2009; Montano and Spitzer, 2009; Saunders and Forsline, 2012; Laplante-Lévesque et al, 2013; Aazh, 2016a; 2016b). Client-centered counseling was developed by Carl Rogers and emphasizes respecting and trusting the patient's capacity for growth, development, and creativity (Rogers, 1951). According to Carl Rogers, a nonauthoritarian and nondirective approach by the clinician facilitates the change process. The core conditions of client-centered counseling are (a) the therapist is transparent about his or her feelings and motivations, (b) the therapist has an unconditional positive regard toward the client, and (c) the therapist has an empathic understanding of the patient's internal frame of mind (Rogers, 1951; Merry, 2002). Recent studies suggest that application of the client-centered counseling method in an audiological context is acceptable to patients and audiologists (Grenness et al, 2014a; 2014b; Laplante-Lévesque et al, 2014). Future studies should focus on the evaluation of AR programs encompassing client-centered counseling-based interventions as opposed to focusing exclusively on educational interventions.

Patients

The characteristics of the patients varied markedly across the RCTs of AR reviewed here. Some studies included new patients only (Abrams et al, 2002; Chisolm et al, 2004), some studies included experienced HA users (Preminger and Yoo, 2010; Lundberg et al, 2011; Thorén et al, 2011; Garnefski and Kraaij, 2012), and some studies included a mix of new patients and experienced HA users (Kramer et al, 2005; Hickson et al, 2007). The magnitude of the baseline hearing-related handicap and the amount of HA use at the baseline also varied markedly across studies. In some studies, the patients had substantial self-reported hearing handicap at the baseline, giving more scope for improvement as a consequence of taking part in the study (Preminger and Yoo, 2010). In contrast, in some studies the self-reported hearing handicap of the patients at the baseline was only mild, and their baseline HA use was over 4 hr per day, leaving little scope for improvement during the study (Hickson et al, 2007; Thorén et al, 2011). It is possible that only a subgroup of hearing-impaired patients, those with substantial hearing handicap and/or difficulty in using HAs, would benefit from a comprehensive AR program beyond that typically offered by audiology services, namely the fitting of HAs and minimal education/instructions.

Approximately 70% of people who own HAs use them regularly (Stark and Hickson, 2004; Vuorialho et al, 2006; Takahashi et al, 2007; Brännström and Wennerström, 2010; Hickson et al, 2010; Aazh et al, 2015), and the use of HAs, even without any additional AR, leads to a large ES for disease-specific HRQoL measures (Chisolm et al, 2007). This large effect may make it difficult to demonstrate any extra benefit of additional AR. Therefore, the inclusion criteria for potential patients in trials of AR interventions aimed at promoting HA use should be carefully considered. For example, it may not be appropriate to include all new patients in an RCT, as many of them may not need any additional intervention beyond the actual fitting of the HA(s) and minimal education/instructions. Rather, it might be more appropriate to include only those who have a large hearing handicap or who have special difficulty in using HAs.

Outcome Measures

The majority of RCTs evaluating AR used validated self-report questionnaires as their outcome measurement tool. The questionnaires varied across RCTs. Some RCTs used only one questionnaire (Chisolm et al, 2004; Garnefski and Kraaij, 2012), but the majority used a wide range of questionnaires. Most of the questionnaires assessed the dimensions of benefit/satisfaction from amplification, hearing-related activity limitation and participation restrictions, use of communication strategies, cognitive and emotional coping, and anxiety and depression symptoms. Although HA use was not the primary outcome measure in most RCTs evaluating AR, some studies assessed the amount of HA use as one of their secondary outcomes (Lundberg et al, 2011; Thorén et al, 2011). In these studies, the main tool used was the IOI-HA, which assesses the number of hours per day the patients used their HAs over the past two weeks. The IOI-HA uses predefined categorical options (e.g., <1 hr per day).

The amount of HA use can also be measured objectively via built-in data logging systems in HAs. This can provide an excellent tool for future research. A recent systematic review of studies measuring and reporting HA usage suggested that both types of outcome (i.e., the amount of HA use as measured via data logging and usage derived from self-report questionnaires) need to be included to help cross-validate the data (Perez and Edmonds, 2012). Although the main question of interest is whether HAs make any difference to the patient's life, the consistent use of HAs is a crucial first requirement. Generally, the more patients use their HAs, the greater the benefit that is obtained. However, use of HAs does not guarantee a successful outcome; a patient may wear his or her HA(s) all day but find it to be of little benefit.

In some of the RCTs reviewed in this article, patients were asked some questions that were not part of a

formal questionnaire, to gain more insight with regard to their experience of taking part in the studies (Kramer et al, 2005; Hickson et al, 2007). This provided an opportunity for the patients to discuss wider effects of the intervention on their lives. For example, in the study of Hickson et al (2007), patients were asked several open questions (e.g., What did you like about the ACE sessions?). Results of their qualitative analysis of the patients' comments showed that the most commonly occurring comments provided by patients regarding what they liked about the program were (a) learning specific strategies and (b) sharing of their problems. Since the determinants of HA use and factors related to benefit from amplification are not fully understood, including such questions in future RCTs assessing the effect of AR programs could provide valuable insights into the mechanisms by which use of HA(s), participation in an AR program, and/or taking part in research can lead to changes in patients' self-reported hearing-related quality of life.

Some of the reviewed studies included questionnaires assessing the views of SOs of the hearing-impaired person (Kramer et al, 2005). It seems that the perspective of SOs can provide some additional insight about the process and outcome of the AR interventions, because SOs also bear some of the burden of hearing impairment (Chmiel and Jerger, 1996). A recent feasibility study reported that there was a strong correlation between data logging measures of the number of hours HAs were used and SOs' reports of daily use as measured using the IOI-HA-SO ($r = 0.8, p < 0.005$) (Aazh, 2016a). This supports the relevance of assessing the views of SOs with regard to their partner's HA use. However, it was also highlighted that almost half the patients did not have an SO who was willing to take part in the study (Aazh, 2016a). This limits the usefulness of SOs' views in trials of AR.

Intervention for the Control Group

The content of the interventions used for patients assigned to the control groups varied markedly across the RCTs evaluating AR. Some studies assigned patients to a waiting list control group with no active treatment (Garnefski and Kraaij, 2012). When no intervention is offered to people in the control group, it is difficult to assess whether any effect of the intervention/treatment group is due specifically to the target intervention or is due to the psychological effect of being treated in some way (Pocock, 1983). The latter can increase the apparent effect of the target intervention. Some studies offered minimal intervention for people in the control group, for example, by referring them to an online discussion forum or asking them to read a book (Lundberg et al, 2011; Thorén et al, 2011). In these studies the treatments for the control group were

not matched with the treatments for the intervention group with respect to the amount of contact with professionals. Therefore, it is again not clear whether any effects were due to the AR or the effect of receiving attention from a professional.

In some studies, patients in the control group received HAs (HA only) and patients in the intervention group received HAs plus AR in the form of additional education, communication training, and psychosocial support (HA + AR) (Abrams et al, 2002; Chisolm et al, 2004; Kramer et al, 2005). In such studies, the treatments for the intervention group were not matched with the treatment for the control group with respect to the duration and amount of time that patients were engaged in the treatment activities. For example, in one study, patients in the control group received HA only with a total contact time of ~ 2 hr, while patients in the intervention group received HA + AR with a total contact time of ~ 10 hr (Chisolm et al, 2004). Therefore, it is not clear whether the observed outcomes were caused specifically by the intervention content or whether they were caused by the fact that patients in the HA + AR group had more contact time.

The use of a matching comparison intervention for patients in the control group is very important, as it helps to control the possible confounding effects of social/professional contact and the general research participation effect (Parsons, 1974; McCambridge et al, 2014). However, for some interventions, it may not be feasible to use a matching comparison intervention for patients in the control group. Developing a comparison intervention is a challenge in RCTs assessing the efficacy of complex psychosocial interventions because often the "active ingredient" of the target intervention is not clear (Medical Research Council, 2008). Therefore, it may be difficult to develop a placebo intervention that is similar to the true intervention except for the active ingredient. Assigning patients to a standard care group could be an alternative, but for some novel interventions there may not be any comparable standard care.

CONCLUSIONS

Consistent with other reviews, this review suggests that there is limited evidence supporting the efficacy of any AR program with respect to HA use and quality of life. More systematic studies are needed in this field, as there may be a subpopulation of HA users who could benefit from AR beyond the actual fitting of HAs and basic orientation. Several recommendations are made for future studies:

1. There is a need for studies investigating the efficacy of AR interventions based on counseling and empathetic listening as opposed to or in addition to educational interventions.

2. Stricter inclusion criteria should be used in RCTs evaluating AR, focusing on patients who do not get on well with their HAs or do not use them regularly. Including all new patients in an RCT may not be appropriate, as many of them may not need any additional intervention beyond the actual fitting of HA(s) and minimal education/instructions.
3. Although regular HA usage does not guarantee a successful patient outcome, it is important to know whether and how often patients use their HA(s). The amount of HA use as measured via data logging and self-report questionnaires should be assessed in RCTs of AR. The views of SOs may also be useful.
4. The use of a matching comparison intervention for patients in the control group is very important as it helps to control the possible confounding effects of social contact and the general research participation effect.

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