Does evidence support audiological internet-based interventions?

Eldré Beukes and Vinaya Manchaiah

A few recent studies have highlighted the true extent regarding the rising prevalence of hearing loss¹, being the second most common impairment in a review investigating 310 diseases². The impact of hearing loss is often not isolated and may co-occur with other distressing prevalent auditory conditions such as tinnitus and loss of vestibular function. The incidence of these conditions increases with age³⁻⁵, which is of concern due to the proportion of elderly people rising⁶. As these are chronic long-term conditions, ongoing management is required, adding both the healthcare and societal economic burden. For hearing loss alone, the resulting annual global costs are \$750 billion dollars (World Health Organization, Deafness and hearing impairment, 2018). Although interventions to address hearing loss, tinnitus, and vestibular disorders are cost-effective, provision of such services is hampered by factors such as a lack of resources⁷, evidence-based treatments, and limited hearing healthcare (HHC) professionals⁸. Uptake of interventions is further complicated by multiple factors surrounding accessibility (in terms of location and time), cost, and barriers surrounding engagement and compliance⁹.

Internet-based interventions (IBI) have emerged as an approach to address these barriers by offering accessibility and affordability of HHC services¹⁰ that encourage self-management and engagement¹¹. They are attractive due to providing great flexibility as either a replacement or supplement to routine care. They can also be provided with or without guidance (i.e., professional support). Perhaps their most attractive aspect is that they can be used as a shared global resource, being based online and not at a specific geographical location. Despite the advantages of IBI in terms of provision of hearing-related rehabilitation, emphasize needs placed on their evidence base. HHC provision should always prioritize clinically effective treatments. To investigate the evidence base for IBI for hearing loss, tinnitus and vestibular disorders, Beukes et al. (2019)¹² undertook a systematic review. This review is important, as it is the first to summarize the evidence base for hearing-related IBI. What set this systematic review apart was its comprehensiveness. It reviewed IBI targeting hearing loss, tinnitus and vestibular difficulties. It furthermore focused on identifying not only their primary effects, but also the secondary and long-term effects. To improve the quality of the evidence, only randomized controlled trials were included.

Main Findings

In this review, 15 studies, amounting to data from 1,811 participants, were suitable for inclusion. The majority (12 studies) were efficacy trials (i.e., tested IBI in controlled conditions) and three were effectiveness studies (i.e., tested IBI in the “real” world conditions). The studies included in the review were undertaken in Sweden, the UK, and Germany. All the Internet intervention arms provided guidance except for the vestibular rehabilitation Internet intervention. There was little overlap in approach in terms of the range of interventions (see Figure 1) and comparators (see Figure 2) used, except for consistent use of Cognitive Behavioral Therapy (CBT) for tinnitus. Comparison of the main finding for each type of IBI is summarized in Table 1.

Figure 1: Range of Internet-based interventions used

Figure 2: Types of comparator treatments used to evaluate the Internet-based interventions

Table 1: Result comparison between the different types of Internet interventions

Type of Intervention	Hearing loss	Tinnitus	Vestibular Disorders
Number of included studies	Five ¹³⁻¹⁷	Nine ¹⁸⁻²⁶	One ²⁷
Effect on hearing loss, tinnitus and dizziness tinnitus	The pre-fitting study showed no effect. If removing this study	Moderate	In this one study, less

	there was a moderate effect		self-reported dizziness
Effect on anxiety	Equivalent findings	Small	Initial reduction not maintained
Effect on depression	Small	Small	Equivalent findings
Effect on quality of life	Only evaluated in 1 study indicating a large effect	Equivalent findings	Not assessed
Effect on insomnia	Not assessed	Small	Not assessed
Duration of post-intervention improvements measured and maintained	6 months	1 year	6 months

Is here evidence for IBI for hearing loss?

Results indicated that IBI for hearing loss can be of great value, although further high-quality studies are required to improve the evidence base. The optimal IBI model for hearing loss needs consideration. This may be a blended approach, where hearing aids are fitted (face-to-face, remotely or provided over the counter), and IBI provide the extensive auditory rehabilitation required. Further considerations are how to provide the varying rehabilitation needs that are required to address each stage of the hearing rehabilitation pathway to include pre-intervention counselling, post-fitting rehabilitation and addressing the emotional and functional effects. There is not always the time or expertise to address the psychological distress associated with hearing problems. IBIs are a very viable options for such help. Further development of these interventions may improve the possible additional effects such as improving quality of life.

Is there evidence for IBI for tinnitus?

The tinnitus IBI stood apart from the other interventions as a more unified approach was followed using the theoretical principles of CBT. Despite the proved effectiveness of CBT for tinnitus^{28,29}, its provision is often hampered as there are not many qualified professionals who can offer this support³⁰. From the present review, CBT IBI for tinnitus indicated clear potential to improve access to evidence-based accessible interventions. They also contributed to assisting in reducing the various comorbidities such as insomnia, anxiety, depression and improving quality of life. The evidence base is further enhanced as results were maintained long term (i.e., measured up to one-year post-intervention). Further work should identify which aspects of these interventions should be modified to further improve the clinical significance impact they can have.

Is there evidence for IBI for vestibular disorders?

There is only one study included in the review that examined efficacy of IBI for vestibular disorders. From these findings it was clear that there is an immediate need to further develop IBI to address the various types of vestibular disorders. This study in this review addressed motion-provoked dizziness. Another IBI for Ménière's disease³¹ was identified but did not meet the inclusion criteria. Considering the high prevalence of different types of vestibular problems, IBI could significantly help address these difficulties. Many vestibular disorders require long term input which is not always possible due to a lack of clinical and financial

resources. IBI could potentially relieve the associated burden and provide rehabilitation to those without such opportunities at present.

Implications of this review for HHC Professionals

Due to the rising prevalence of hearing-related disorders, extensive HHC rehabilitation will be required. This provision is challenging due to time and resource limitations. This review has found that IBI's have the potential to improve accessibility and affordability of HHC, but require a wider and stronger evidence-base. IBI could play a clear role in providing comprehensive rehabilitation, which has been shown to improve outcomes and quality of life³³. The focus regarding the development of these interventions to date has been in Europe. There is an urgent need to adapt and assess the effects of IBI for different cultures and populations. The most efficient way to addressing these needs and reducing the impact of hearing-related difficulties, is a united approach. HHC professionals are uniquely positioned to advocate and implement changes to increase the provision of HHC across the globe³². This may be consideration to include IBI where access to service provision is limited, engagement in the rehabilitation process is required, and/or professional expertise is lacking. Once developed these IBI can be shared in areas where audiology services are particularly limited. IBI can thus unite professionals and provide standardized care, regardless of geographic location.

The greatest challenge will perhaps be getting these interventions implemented in clinical practice. Here again, HHC professionals can play a central role in advocating the inclusion of such interventions to stakeholders. IBI also provide numerous opportunities for promoting self-management in individuals with hearing-related conditions and to promote public-patient involvement, which could furthermore unite and strengthen service provision. In summary, although the evidence needs improving, IBI have clear potential in ensuring cost and clinically effective treatments and improving the global sustainability of audiological rehabilitation services.

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Author Bio's

Dr. Beukes, left, is a post-doctoral researcher in the department of speech and hearing sciences at Lamar University in Beaumont, TX, where Dr. Manchaiah is the Jo Mayo Endowed Professor of Speech and Hearing Sciences.

Correspondence

Email: ebeukes@lamar.edu
Tel: +1 (409) 880 8927

Author Headshots

Attached