Abstract

Background: Tinnitus is often described by patients as the perception of an unspecific ringing, buzzing, clicking, pulsating or hissing sound in the ear or head or both, in the absence of any corresponding external stimuli. If tinnitus is produced by an identifiable source within the body, it is classified as objective tinnitus. If there is no identifiable corresponding source of tinnitus generation, it is classified as subjective tinnitus. When the perception of a specific sound is associated with suffering, emotional distress, cognitive dysfunction and/or autonomic arousal leading to a behavioral change and disability, it is classified as bothersome. More than 740 million adults suffer from tinnitus globally and in 120 million it is a bothersome condition. The underlying pathology of tinnitus is still unclear and there is no standardized treatment. Although there is no cure for tinnitus, there are different treatment options to manage it. The management options for objective tinnitus are based on treatment of the underlying cause leading to tinnitus perception. Management options for subjective tinnitus include auditory prostheses (for restoring the sensory input), neuromodulation (for reversing the neuroplastic changes in the tonotopic map or decreasing the central gain), physiotherapy, cognitive behavioral therapy (CBT), counselling and patient education. Research done in the past has shown that somatosensory input from the cervical spine and jaw (which can be modified by physiotherapy methods, such as electrical stimulation) plays a role in tinnitus generation. Therefore, the aim of this PhD is to evaluate the effects of different physiotherapy methods (i.e. electrical stimulation, somatosensory stimulation combined with auditory stimulation (bimodal stimulation) and complex neck therapy) in the treatment of tinnitus.

Methods: To achieve the above-mentioned aim three studies were conducted.

Firstly, a literature review was performed, to catalogue the current state of knowledge regarding invasive and non-invasive ear electrical stimulation methods and their efficacy in tinnitus treatment.

Secondly, a feasibility study was conducted as a collaborative project between Medical University of Lodz, Poland and University of Antwerp, Belgium. The study looked at the effects of the bimodal stimulation (combined electrical and somatosensory stimulation) for tinnitus treatment.

Finally, an intervention controlled study evaluated the effects of complex neck therapy (kinesiotherapy and interspinal muscles massage) on tinnitus.

Results: The first review study found only low-quality evidence regarding efficacy of ear electrical stimulation methods for tinnitus. It was not possible to draw any conclusions regarding the advantage of particular technique over the others or the optimal stimulation parameters for tinnitus treatment. This was due to quality of the studies, variability in outcome measures, including different definitions of treatment success, and limited use of standardised and validated outcome measures. Gaps in the literature were identified and further research in this area was recommended.

Bimodal stimulation proved to be a feasible and safe method of tinnitus treatment. It has been demonstrated that this method might be an effective treatment for some participants with tinnitus, especially those who have accompanying neck/temporomandibular problems. It was concluded that additional research is needed toward establishing the optimal treatment protocol, as well as selecting the most appropriate participant population for this treatment.

Complex neck therapy (kinesiotherapy and interspinal muscles massage) led to significant reduction of tinnitus symptom severity and loudness, which was accompanied by muscle tension normalization and improvement in cervical spine range of motion, therefore providing a potentially viable option for tinnitus therapy. A powered randomised controlled trial would be the next step to confirm the efficacy of this treatment option for tinnitus.

Conclusions: All three methods investigated showed potential for tinnitus treatment. However, more quality research is needed to confirm the effects of those interventions for tinnitus. Further research should concentrate on better understanding of mechanisms of action of particular interventions, which will facilitate the optimization of the protocols and identification of the best target population.