

Multi-Modality Brain Stimulation: A Treatment Protocol for Tinnitus

Authors : Prajakta Patil, Yash Huzurbazar, Abhijeet Shinde

Abstract : Aim: To develop a treatment protocol for the management of tinnitus through multi-modality brain stimulation. Methodology: Present study included 33 adults with unilateral (31 subjects) and bilateral (2 subjects) chronic tinnitus with and/or without hearing loss independent of their etiology. The Treatment protocol included 5 consecutive sessions with follow-up of 6 months. Each session was divided into 3 parts: • Pre-treatment: a) Informed consent b) Pitch and loudness matching. • Treatment: Bimanual paper pen task with tinnitus masking for 30 minutes. • Post-treatment: a) Pitch and loudness matching b) Directive counseling and obtaining feedback. Paper-pen task is to be performed bimanually that included carrying out two different writing activities in different context. The level of difficulty of the activities was increased in successive sessions. Narrowband noise of a frequency same as that of tinnitus was presented at 10 dB SL of tinnitus for 30 minutes simultaneously in the ear with tinnitus. Result: The perception of tinnitus was no longer present in 4 subjects while in remaining subjects it reduced to an intensity that its perception no longer troubled them without causing residual facilitation. In all subjects, the intensity of tinnitus decreased by an extent of 45 dB at an average. However, in few subjects, the intensity of tinnitus also decreased by more than 45 dB. The approach resulted in statistically significant reductions in Tinnitus Functional Index and Tinnitus Handicap Inventory scores. The results correlate with pre and post treatment score of Tinnitus Handicap Inventory that dropped from 90% to 0%. Discussion: Brain mapping(qEEG) Studies report that there is multiple parallel overlapping of neural subnetworks in the non-auditory areas of the brain which exhibits abnormal, constant and spontaneous neural activity involved in the perception of tinnitus with each subnetwork and area reflecting a specific aspect of tinnitus percept. The paper pen task and directive counseling are designed and delivered respectively in a way that is assumed to induce normal, rhythmically constant and premeditated neural activity and mask the abnormal, constant and spontaneous neural activity in the above-mentioned subnetworks and the specific non-auditory area. Counseling was focused on breaking the vicious cycle causing and maintaining the presence of tinnitus. Diverting auditory attention alone is insufficient to reduce the perception of tinnitus. Conscious awareness of tinnitus can be suppressed when individuals engage in cognitively demanding tasks of non-auditory nature as the paper pen task used in the present study. To carry out this task selective, divided, sustained, simultaneous and split attention act cumulatively. Bimanual paper pen task represents a top-down activity which underlies brain's ability to selectively attend to the bimanual written activity as a relevant stimulus and to ignore tinnitus that is the irrelevant stimuli in the present study. Conclusion: The study suggests that this novel treatment approach is cost effective, time saving and efficient to vanish the tinnitus or to reduce the intensity of tinnitus to a negligible level and thereby eliminating the negative reactions towards tinnitus.

Keywords : multi-modality brain stimulation, neural subnetworks, non-auditory areas, paper-pen task, top-down activity

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