ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 04 | April - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

COMPARISON OF VESTIBULAR EVOKED MYOGENIC POTENTIALS IN YOGA AND NON-YOGA PRACTITIONERS

Speech & Hearing

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ABSTRACT

The current study aimed to compare VEMPs findings in yoga and non-yoga practitioners. A total of 120 participants were recruited and were divided into yoga practitioners and non-yoga practitioners. cVEMP and oVEMP were recorded from both yoga practitioners and non-yoga practitioners and response obtained were subjected to analysis for latencies and peak to peak amplitude between both the groups. The result of the study showed a significant increase in cVEMP and oVEMP amplitude in yoga practicing individuals. This significant improvement in amplitude in yoga practitioners might be due to constant practice of yoga which has altered the plasticity of the otolith system. Hence it provides evidence on the efficacy of yoga on vestibular function.

KEYWORDS

VEMPs. Yoga. Vestibular function. Amplitude.

INTRODUCTION

Vestibular evoked myogenic potential is an electrophysiological test which asses the integrity of the vestibular system, when an intense stimulus is given. This system consist of collection of organs which provide a sense of balance and an awareness of spatial orientation by means of otolith organs and inferior and superior vestibular reflex arc[1]. There two types of VEMP, cVEMP and oVEMP in which, one evaluates the function and integrity of the sacullo- collic pathway and the other evaluates the utriculo-collic pathway. cVEMP is an ipsilateral response representing the vestibulo-collic reflex, obtained as an inhibitory response of the sternocleidomastoid muscle at tension when a sudden intense stimulus is presented [2]. Whereas, oVEMP is a contralateral response of the vestibulo-ocular reflex, obtained as an excitatory action of the inferior oblique muscle when intense stimulus is presented [3].

Posture and balance of the human system is maintained by the Vestibular system with the help of these reflexes. The pathways mediating these reflexes undergoes plasticity if involved in physical movement activities like Dancing [4] and Diving [5].Yoga is one such form of art which strengthens the muscles, providing endurance, stability and thereby improving the balance. It has also been found that yoga is helpful in bringing a better outcome by improving the posture and altering the functioning of the body systems [6]. Studies on normal healthy individuals who practice yoga regularly showed improvement in balance when tested using plank test. The result also reports practicing isha hatha yoga improves the balance and brings in plasticity of the vestibular system. This plasticity is observed at the level of otolith organs and the vestibular pathway [7]. Individuals with musculoskeletal disorders have shown to improve the balance disturbances and gait problems with the practice of yoga [8].

Yoga has a positive impact on posture [9] strengthening the muscles [10] and gait [11]. However, there is a dearth of literature available assessing the effect of yoga on the vestibular system functioning. So the current study is taken up evaluate the functioning of the otolith organs in Yoga practicing individuals.

Aim of the study

The aim of the present study is to investigate the cVEMP and oVEMP responses in yoga practicing individuals.

MATERIALS AND METHOD

The present study incorporated a cross-sectional study design that consisted of 120 participants within an age range of 18 to 40 years. 60 yoga practitioners and 60 non-yoga practitioners were included in this study. All the individuals had undergone audiometric testing and immittance measurement before being selected for the study. Participants from both the group had normal hearing sensitivity. Participants had no histories of any sort of otological symptoms or neurological symptoms. Participants in the non-yoga practitioners group had not undergone any form of physical training activities. Yoga practitioners had a practice duration of 1 year and above.

Procedure

Participants were subjected to measuring of AC and BC thresholds using a calibrated GSI- 61 clinical audiometer. The thresholds were tracked by using the modified "Hughson and Westlake procedure" [12] using "TDH-39 for AC and a B-71 bone vibrator" for BC. Immittance measurement was carried out, using a probe tone of 226Hz. Single channel evoke potential system was used for recording of cVEMP and oVEMP. For cVEMP measurement, participants were made to sit in an upright position and were prepared by cleaning the site for the electrode placement by nuprep gel and Gold plated cup electrodes were adhered using conduction gel and adhesive tape. The "non-inverting electrode was placed on the upper one-third of the SCM muscle and inverting electrode was placed at the sternoclavicular junction along with ground electrode placed at the forehead". Participants were instructed to turn their heads to maintain tonic muscle contraction at 50 to 150 µV during the recording. A tone of 500 Hz using rarefaction polarity was presented at 105dBnHL at a repetition rate of 5.1/sec over 200 sweeps. These signals were amplified 5, 000 times and the filter was set for a high pass of 30Hz and low pass of 1500Hz. The epoch time was set for 60ms where 10ms was the pre-stimulus and 50ms post stimulus time. Threshold estimation was done by reducing the intensity in 5 dB steps until a clear and replicable waveform was visible. Analysis was done for waveforms obtained with initial peak of P1 followed by negative peak N1 to determine the latency and peak to peak amplitude at 105dBnHL in both ears.

For oVEMP patient were made to sit in a relaxed upright position and were prepared prior to the presentation of stimulus and were instructed to excite the extraocular muscles by looking upward at a fixed target of 2 meter with a visual angle of around 30-35degree azimuth. The participants were instructed not to move their upper torso at the time of recording and to maintain the gaze until the stimulus heard was terminated. The electrode placement included placement of non-inverting electrodes 1 cm beneath the contralateral eye and inverting electrodes 1-2cm below the "non-inverting and ground being on the forehead". A rarefaction stimulus was presented at a rate of 5.1/sec for over 200 sweeps. An epoch time of 60msec was set. These signals were amplified for over 50,000 times and the filter was set for a high pass of 1Hz and low pass of 1500Hz. Threshold was estimated for oVEMP as well, starting at an intensity 105 dBnHL and decreased until clear peaks were obtained. Analysis was done for an initial negative peak n1 followed by a positive p1 to determine the latency and peak to peak amplitude.

RESULTS

The cVEMP mean P1 and N1 latency obtained for yoga practitioners was 15.3 msec (Median=15.16) and 22.20 msec (Median=22) respectively and 15.45 msec (Median=15.36) and 22.04 msec (Median= 21.94) for non-yoga practitioners. The tabulated mean peak to peak amplitude of yoga practitioners was 123.10 µV (Median=123.11) and for the non-practitioner yoga was 78.13 µV (Median=77.12). Mann Whitney U test showed no significant

differences in the latencies of P1 (U=1169, p=0.576) and N1 (U=1197.5, p=0.717) of yoga practitioners and non-yoga practitioners however, a significant improvement was observed in the peak to peak amplitude (U= 574.000, p= 0.000) obtained for yoga practitioners in comparison to non-yoga practitioners.

The mean n1 and p1 latency obtained for yoga practitioners was 12.31 msec (Median=12.38) and 16.62 msec (Median=16.775) whereas, a mean of 12.34 msec (Median=12.255) and 17.26 msec (Median=16.75) for non-yoga practitioners. The mean peak to peak amplitude obtained for yoga practitioners was 8.52µV (Median=6.77) and for the non-practitioners yoga was 5.34µV (Median=3.41). The result of Mann-Whitney U test revealed that there was no significant difference in the latencies of n1 (U=1229, p=0.885) and p1 (U=1056.5, p=0.182) between the yoga and non-yoga practitioners. However there was a significant improvement was observed in the peak to peak amplitude (U=755.500, p=0.001) and in thresholds (U=735.500, p=0.000) of yoga practitioners than non- yoga practitioners.

DISCUSSION

The result showed that there was increased amplitude observed for yoga practitioners than non-yoga practitioners for cVEMP and oVEMP. A similar result was reported and showed an improvement in the latencies, amplitude, and asymmetric ratios of cVEMP for yoga practitioners in comparison to non-yoga practitioners [13]. These changes in yoga practitioner as a result of the plasticity induced in the sacculo-collic pathway. Present study also suggest amplitude is enhanced in yoga practitioner for cVEMP and oVEMP as a result of plasticity induced in sacculo-collic and utriculo-ocular pathways.

There is a positive correlation between the practice of isha hatha yoga and core stability balance which was measured using single stroke test and plank test [7]. Similarly, improvement in body balance through hatha yoga has also been reported [14]. There is a certain amount of neural adaptation taking place in the sacculo-collic pathways in turn bringing changes in the vestibular system of professional divers [5]. Dancers are reported to have changes in the sacculo- collic pathway which was seen as the early latencies and enhanced amplitude of cVEMP [15]. Individuals with multiple sclerosis have been reported to have improvement in balance after yoga practice [16]. Yoga intervention of 8 week have shown to have a great impact on the functional gait, Postural stability and balance control among individuals suffering from Parkinson's Disease [11].

CONCLUSION

Yoga improve the otolith vestibular function by means of constant practice which alters the vestibular plasticity. Therefore, yoga can be suggested as a rehabilitative option for individuals with vestibular Dysfunction.

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