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Feasibility Study on Evaluating the Effects of Earphone Usage on Reflexive Responses and Reaction Times in Young Adults

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Introduction: The increased use of earphones by young adults has created much concern about its influence on auditory processing and reflexive responses. Since most of them use audio content in a multitude of activities, people raise questions about the cognitive function effects of using earphones, especially regarding reaction time and reflexive response to auditory stimuli. The vestibulo-ocular and vestibulo-spinal reflexes in critical reflex studies are impacted by auditory stimulation. Thus, this report aims at the feasibility analysis of assessing the effect of earphone usage on young adults' response times to reflexive performances.

Aim: The aim of this study is to evaluate the feasibility of assessing how earphone usage and exposure to different sound frequencies affect Vestibulo-ocular Reflex (VOR), Vestibulo-spinal Reflex (VSR), and reaction times in young adults.

Materials and Methods: Healthy young adults (n=230), aged 18 to 25 years, were recruited to assess how different sound frequencies influence vestibular reflexes and motor response times among college-going students recruited for the study. Ethical approval was obtained from the Institutional Ethics Committee with the registration number MMDU/IEC-2670. Subjects were asked to perform head impulse thrust test to examine Vestibulo-Ocular Reflex (VOR), the Fukuda Step Test to examine Vestibulo-Spinal Reflex (VSR) and reaction time were examined through the Ruler drop test.

Results: The findings demonstrated that sound frequencies significantly influenced VOR, VSR, and reaction times. In young adults, sound frequencies of 76-80 dB were found to have the most pronounced effects. A significant negative correlation was observed between these sound frequencies and reflexive responses (VOR, r= -0.29; VSR, r= -0.10), particularly for the VOR and VSR. Similarly, reaction times for both dominant and non-dominant hands showed significant negative correlations at 76-80 dB exposure (r=-0.30, and r=-0.28) respectively. These results suggest that exposure to higher sound frequencies is associated with decreased VOR and VSR responses, as well as increased reaction times.

Conclusion: This study concludes that vestibular reflexes and reaction times are differentially affected by varying sound frequencies. While lower sound frequencies (61-65 dB) showed minimal impact, higher sound intensities (76-80 dB) significantly affected VOR, VSR, and reaction times in both dominant and non-dominant hands. These results underscore the critical influence of sound intensity levels on human reflexive and motor responses, suggesting that exposure to higher sound intensities may compromise neuromuscular performance.

Keywords: Auditory stimulation, Fakuda step test, Vestibulo-ocular reflex.