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Assessment of Influence of Short-Lasting Whole-Body Vibration on the Proprioception of Lower Limbs

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Abstract : Introduction: In whole-body vibration (WBV) high-frequency mechanical stimuli is generated by a vibration plate and is transferred through bone, muscle and connective tissues to the whole body. The research has shown that the implementation of a vibration plate training over a long period of time leads to improvement of neuromuscular facilitation, especially in afferent neural pathways, which are responsible for the conduction of vibration and proprioceptive stimuli, muscle function, balance, and proprioception. The vibration stimulus is suggested to briefly inhibit the conduction of afferent signals from proprioceptors and may hinder the maintenance of body balance. The purpose of this study was to evaluate the result of a single set of exercises connected with whole-body vibration on the proprioception. Material and Methods: The study enrolled 60 people aged 19-24 years. These individuals were divided into a test group (group A) and a control group (group B). Both groups consisted of 30 persons and performed the same set of exercises on a vibration plate. The following vibration parameters: frequency of 20Hz and amplitude of 3mm, were used in the group A. The vibration plate was turned off while the control group did their exercises. All participants performed six dynamic 30-seconds-long exercises with a 60-second resting period between them. Large muscle groups of the trunk, pelvis, and lower limbs were involved while taking the exercises. The results were measured before and immediately after the exercises. The proprioception of lower limbs was measured in a closed kinematic chain using a Humac 360®. Participants were instructed to perform three squats with biofeedback in a defined range of motion. Then they did three squats without biofeedback which were measured. The final result was the average of three measurements. Statistical analysis was performed using Statistica 10.0 PL software. Results: There were no significant differences between the groups, both before and after the exercise ($p > 0.05$). The proprioception did not change in both the group A and the group B. Conclusions: 1. Deterioration in proprioception was not observed immediately after the vibration stimulus. This suggests that vibration-induced blockage of proprioceptive stimuli conduction can only have a short-lasting effect occurring only in the presence of the vibration stimulus. 2. Short-term use of vibration seems to be safe for patients with proprioceptive impairment due to the fact that the treatment does not decrease proprioception. 3. There is a need for supplementing the results with evaluation of proprioception while vibration stimuli are being applied. Moreover, the effects of vibration parameters used in the exercises should be evaluated.

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