

Effect of Whole Body Vibration on Muscular Performance, Balance, and Bone

Saila Torvinen

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The purpose of this thesis was to investigate the effects of whole body vibration loading on bone, physical performance, and body balance of young and healthy adults, and thus find new regimens to prevent falls and osteoporotic fractures.

This thesis included five studies, of which I and II investigated the short-term effects of a single, 4-min whole body vibration bout on muscle performance and body balance (performance-tests, EMG-recordings from the lower extremities). Vibration loading was different in the study I and II. In the study III, the effects of the 4-month vertical whole body vibration on muscle performance and body balance (performance-tests) were investigated. In the study IV, the effects of 8-month whole body vibration on bone, muscle performance, and body balance were assessed using DXA, pQCT and MRI measurements, serum markers of bone turnover, and performance and balance tests in the randomized, controlled study design. It was also investigated, whether the vibration loading had caused mechanisms, which would have positive effects on prevention of falls and osteoporotic fractures. In the follow-up study (V), the maintenance of the changes observed in the study IV was evaluated.

The vibration studies succeeded well, and intervention was safe to perform, but induced no effect on bone mass, structure or strength at any measured skeletal site. Serum markers of bone turnover changed during the vibration-intervention neither. Vertical jump height in the vibration group, however, improved both after the single bout of vibration stimulus and after the long-term vibration intervention. On the other performance or balance tests, the vibration intervention had no effect.

Although the results of this thesis were not so positive as suggested by the previous experimental and clinical investigations, vibration loading used in this thesis may be seen as a safe and potentially efficient training and rehabilitation method, not only for athletes, but also for frail elderly, since lower limb explosive strength and performance capacity have been suggested to be a very important determinant of falling. On the other hand, this thesis left many questions about the effects of long-term vibration on bone and physical performance open, and future studies are needed before any clinical recommendations for vibration. It can be suggested that future vibration studies should perhaps focus to elderly people or people with disabling conditions (i.e., people who have something to improve in their musculoskeletal system, such as bone mass and muscular performance).