

Whole Body Vibration Training Increases Knee Extension Strength and Speed of Movement in Older Women

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OBJECTIVES: To investigate the effects of 24 weeks of whole-body-vibration (WBV) training on knee-extension strength and speed of movement and on counter-movement jump performance in older women.

DESIGN: A randomized, controlled trial.

SETTING: Exercise Physiology and Biomechanics Laboratory, Leuven, Belgium

PARTICIPANTS: Eighty-nine postmenopausal women, off hormone replacement therapy, aged 58 to 74, were randomly assigned to a WBV group (n530), a resistance training group (RES, n530), or a control group (n529).

INTERVENTION: The WBV group and the RES group trained three times a week for 24 weeks. The WBV group performed unloaded static and dynamic knee-extensor exercises on a vibration platform, which provokes reflexive muscle activity. The RES group trained knee-extensors by performing dynamic leg-press and leg-extension exercises increasing from low (20 repetitions maximum (RM)) to high (8RM) resistance. The control group did not participate in any training.

MEASUREMENTS: Pre-, mid- (12 weeks), and post- (24 weeks) isometric strength and dynamic strength of knee extensors were measured using a motor-driven dynamometer. Speed of movement of knee extension was assessed using an external resistance equivalent to 1%, 20%, 40%, and 60% of isometric maximum. Counter-movement jump performance was determined using a contact mat.

RESULTS: Isometric and dynamic knee extensor strength increased significantly ($P < 0.001$) in the WBV group (mean \pm standard error 15.0 \pm 2.1% and 16.1 \pm 3.1%, respectively) and the RES group (18.4 \pm 2.8% and 13.9 \pm 2.7%, respectively) after 24 weeks of training, with the training effects not significantly different between the groups ($P = 0.558$). Speed of movement of knee extension significantly increased at low resistance (1% or 20% of isometric maximum) in the WBV group only (7.4 \pm 1.8% and 6.3 \pm 2.0%, respectively) after 24 weeks of training, with no significant differences in training effect between the WBV and the RES groups ($P = 0.391$; $P = 0.142$). Countermovement jump height enhanced significantly ($P < 0.001$) in the WBV group (19.4 \pm 2.8%) and the RES group (12.9 \pm 2.9%) after 24 weeks of training. Most of the gain in knee-extension strength and speed of movement and in counter-movement jump performance had been realized after 12 weeks of training.

CONCLUSION: WBV is a suitable training method and is as efficient as conventional RES training to improve knee extension strength and speed of movement and counter-movement jump performance in older women. As previously shown in young women, it is suggested that the strength gain in older women is mainly due to the vibration stimulus and not only to the unloaded exercises performed on the WBV platform.