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## The effects of whole body vibration on physical and physiological capability in special populations

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### CRD summary

This review concluded that whole body vibration had beneficial effects on balance, stability and gait, and physical and physiological properties in the elderly, postmenopausal women and neurological patients compared with conventional treatment. Possible error and bias, poor primary study quality, small sample sizes and possible inappropriate pooling of studies for some outcomes suggests the conclusions should be viewed with caution.

### Authors' objectives

To evaluate the effects of whole body vibration in elderly, postmenopausal women and neurological patients.

### Searching

MEDLINE, ProQuest, ProQuest5000, IngentaConnect, Meditext, SPORTDiscus, Web of Science, ProQuest Health and Medical Complete and the search engine Google Scholar were searched (dates not reported). Peer-reviewed studies written in English or German or Dutch with an English abstract were included. Search terms were reported,

### Study selection

Studies that used whole body vibration as a training method for treatment and provided additional information on an aspect of whole body vibration as an intervention method were eligible for inclusion. Articles that reported occupational health risks of exposure to whole body vibration were excluded.

Randomised controlled trials (RCTs) and controlled trials and non-controlled study designs were included. In the controlled trials, whole body vibration groups were compared with control (varied) or a resistance training group, cross-over design or parallel design. The largest population studied was postmenopausal women. Other populations included were the elderly, stroke patients and those with spastic diplegia, Parkinson's disease and multiple sclerosis. Included participants were 32 to 81.9 years old. Whole body vibration varied in frequency (3Hz to 40Hz), amplitude (2mm to 7mm) and work (45seconds/set to 120seconds/set) between studies and in the vibration equipment used. Study duration ranged from six to 37 weeks (average duration 14.1 weeks). A number of assessments were used, the most common were timed up-and-go (TUG), balance, sit and reach, bone mass density, isometric strength, Tinetti test, functional ability and isotonic strength.

One reviewer selected articles in two screening phases.

### Assessment of study quality

Two reviewers independently assessed methodological quality using the PEDro Scale to give a score out of 10. Disagreements were discussed and rescored.

### Data extraction

Cohen's effect sizes (ES) were calculated for studies that provided sufficient data and categorised as trivial (<0.2), small (<0.41), moderate (0.41 to 0.7) and large (>0.71). Percentage change was extracted. The number of reviewers who performed data extraction was not reported.

### Methods of synthesis

Studies were combined in a narrative synthesis and individual study details were presented in a table. It appeared that effect sizes were combined where available.

### Results of the review

Fourteen studies were included (n=622, samples sizes ranged from 9 to 89): 10 RCTs (n=440), three controlled trials (n=173) and one uncontrolled trial (n=9). The average PEDro score was 4.64. The authors reported that some

limitations in quality were small sample sizes, sample homogeneity, poor blinding and limited or no randomisation of participants.

There were benefits reported with all named whole body vibration devices (NEMES, Power plate/Fitvibe, ZEPTORmed and Galileo); some were used only in the treatment of a specific group of participants.

Whole body vibration training was associated with a benefit in body balance, timed up-and-go and function/gait in elderly participants (three studies), improved body balance and function/gait in postmenopausal women (two studies) and Parkinson's disease patients (three studies), and improved timed up-and-go and function/gait in multiple sclerosis patients (one study). In patients with spastic diplegia there was no improvement in timed up-and-go and a negative effect on functional performance (one study).

Whole body vibration was associated with improved body balance compared with control groups in eight out of eight studies (ES 1.38 in whole body vibration groups versus 1.14 in control groups). For the outcome stability and gait, one study found no difference between whole body vibration and control/resistance groups (ES 0.14), one study reported an improved gait score in the intervention group (ES 0.92) compared with control and one study reported improvements in reach tests for both intervention (ES 0.42) and control (ES 0.35). Timed up-and-go was improved with whole body vibration compared with control in three studies (ES ranged from 0.6 to 0.92). One study reported no change in timed up-and-go with whole body vibration, but a decrease in timed up-and-go in the control group.

Two studies reported that bone mass density increased more with whole body vibration than with resistance training, but only one study showed a significant effect (ES 0.59). Isokinetic strength (one study) and power (one study) were improved in the whole body vibration groups compared with control and resistance groups. There was no significant difference in counter movement jump between whole body vibration and control groups in one study.

Isometric strength showed greater improvement in the resistance training group (ES 15.60) compared with the whole body vibration group (ES 12.70) and control (ES -3.75) in one study.

### **Authors' conclusions**

Whole body vibration provided alternative and/or additional therapeutic interventions to improve physical and functional performance. Based on this review, whole body vibration had beneficial effects on balance, stability and gait, and physical and physiological properties compared with conventional treatment (resistance training and physiotherapy).

### **CRD commentary**

The research question was supported by inclusion criteria for intervention, outcomes and participants (although these were not specifically stated for participants). Only specific languages were included, which increased the risk of language bias. Unpublished sources were not searched, so the review may have been prone to publication bias. Two reviewers performed validity assessment, which reduced the risk of error and bias. However, only one reviewer selected studies and the process of data extraction was not described. Study quality was assessed using an appropriate tool, however, the general low quality of studies did not appear to be given sufficient consideration in the analysis. The narrative synthesis appeared appropriate, but combined effect sizes may not have been appropriate given the heterogeneity between studies. Due to the possibility of error and bias, poor quality of primary studies, small sample sizes and possible inappropriate pooling of studies for some outcomes, the authors' conclusions should be viewed with caution.

### **Implications of the review for practice and research**

**Practice:** The authors did not state any implications for practice.

**Research:** The authors stated that optimal frequency and intervention time in neurological patients could be important. Also, the effects of different types of vibrations applied to the whole body or target area should be investigated. Different types of equipment used should be studied further and optimum parameters determined. All means and variances from pre- and post-tests should be presented in tables as quantitative values, effect size and percentage change; use of graphical presentation only should be avoided.

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