Effects on leg muscular performance from whole-body vibration exercise: a systematic review

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CRD summary
This review investigated the effects of whole-body vibration exercise on leg muscular performance. The authors concluded that there is evidence that long-term whole-body vibration exercise can have positive effects among untrained people and elderly women. However, the evidence for effects after short-term vibration stimuli is unclear. These suitably cautious conclusions are supported by the results presented in the review.

Authors' objectives
To investigate the effects of whole-body vibration exercise on leg muscular performance.

Searching
PubMed, CINAHL, ISI Web of Science and EMBASE: Rehabilitation and Physical Medicine were searched until February 2006; the keywords were reported. The authors stated that the Cochrane CENTRAL Register and HSELINE databases were excluded from the search after no articles about the topic had been found; SPORTDiscus and PEDro were also excluded as they had only contributed duplicates. The authors also appeared to have searched reference lists. Inclusion was limited to English language articles.

Study selection
Study designs of evaluations included in the review
Inclusion criteria were not specified in terms of the study design. All study designs appeared to be eligible. Randomised controlled trials (RCTs), controlled trials and before-and-after studies were included in the review.

Specific interventions included in the review
Studies of whole-body vibration exercise were eligible for inclusion in the review.

Participants included in the review
Inclusion criteria were not specified in terms of the participants. With the exception of one study which enrolled nursing home residents, the participants in the included studies were healthy individuals. Several of the included studies enrolled only postmenopausal women.

Outcomes assessed in the review
Studies that reported leg muscular performance after whole-body vibration exercise were eligible for inclusion. The included studies assessed various outcomes of isometric and isokinetic tests. They were divided into studies of long-term exercise (assessment after regular vibration exercise) and short-term exercise (assessment immediately after application of a single bout of vibration stimuli).

How were decisions on the relevance of primary studies made?
Two reviewers independently conducted the searches. Any disagreements on inclusion were resolved through discussion until a consensus was reached or, if necessary, a third reviewer was consulted.

Assessment of study quality
The validity of the studies was assessed using a modified list of criteria developed by the Cochrane Back Group, while a scoring system was used to assess the quality of the intervention. Two reviewers, blinded to title, journal, authors and institution, carried out the ratings independently. Any disagreements between reviewers were resolved by discussion or, if necessary, by a third reviewer.
Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction. The data extracted included: aspects of methodological quality, objective, type of study, individuals, exercise, results on muscle performance, and specification of vibration exercise and of muscle performance.

Methods of synthesis
How were the studies combined?
The studies were generally grouped according to the type of intervention (short-term or long-term exercise) and combined in a brief narrative. Further details of the individual studies were apparent from the evidence tables.

How were differences between studies investigated?
Differences between the studies were discussed in the text with reference to aspects of study validity, type of outcome assessment, intervention and study population.

Results of the review
Nineteen studies (n=634) were included in the review. Fourteen studies investigated long-term exercises (n=558); 12 of these were RCTs (n=490) and 2 were non-randomised controlled trials (n=68). Five studies investigated short-term exercises (n=76); 3 of these were randomised crossover designs (n=50) and 2 were simple before-and-after designs (n=26).

Studies of long-term exercise.
Nine studies (out of 14) showed a statistically significant increase (p<0.01) in measures of leg strength or power. Most of these studies were high- or moderate-quality RCTs.

Studies of short-term exercise.
Three studies (out of 5) showed an increase in leg strength or power, and in 1 study it was clear that the results were statistically significant (p<0.001). The quality of these studies was rated high to moderate.

Authors’ conclusions
There was strong to moderate preliminary evidence that long-term whole-body vibration exercise can have positive effects on the leg muscular performance among untrained people and elderly women. The evidence for effects after short-term vibration stimuli was unclear.

CRD commentary
The review addressed a research question which was broadly defined in terms of the intervention and outcome. It appeared that all study designs were eligible. Several relevant sources were searched and attempts were made to locate unpublished studies, thus limiting the possibility of publication bias. The practice of performing preliminary searches and excluding databases afterwards if they do not seem to contribute additional studies appears rather unusual. The methods used to select the studies and assess validity were appropriate. The authors correctly highlighted and took account of the fact that there were considerable differences between studies of long- and short-term exercise in terms of study population and study design. It is not possible to assess the potential for reviewer error and bias in the data extraction process, as details of those involved at this stage of the review were not reported clearly.

Some details of the included studies were presented, although more information would have been desirable, e.g. number of drop-outs, significance levels, significance values and confidence intervals (or a note if they were not available). In view of the clinical heterogeneity between the included studies, a narrative synthesis was appropriate and the authors’ suitably cautious conclusions are supported by the results presented.
Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated that more research on the physiological mechanisms behind the effect of whole-body vibration is needed. Further, the ideal combination of various vibration parameters has not been found and there is a need for more studies of short-term exercise.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.