Prevention of Fragility Fractures

Dr. Noushin Fahimfar

MD., MPH, Ph.D. of Epidemiology

Broken Bones

Broken Lives

Fracture After Falling

- Fractures occurring in approximately 10-15% of falls
- Almost 90% of fragility fractures in patients with osteoporosis are caused by falls
- Almost half of fallers will experience a repeat fall within the next year

A Multi-pronged Approach to Prevent Fracture

- **Recent expert statements and clinical reports emphasize:**

  - ✓ **Integrating secondary prevention**
  - ✓ **AI-driven detection**
  - ✓ **Precision pharmacology**
  - ✓ **Coordinated post-fracture care**

Multidisciplinary Fracture Liaison Services (FLS)

- **Fracture Liaison Services (FLS) have become the cornerstone of secondary prevention programs.**

- **2025 data show that implementing rehabilitation-based FLS models enhances initiation and adherence to anti-osteoporotic therapy by over 25%, significantly reducing re-fracture risk and mortality rates by up to 13–18% in prospective cluster-randomized studies.**

- **These programs foster coordinated care among orthopedic, geriatrics, endocrinology, and rehabilitation teams, ensuring long-term monitoring and patient adherence.**

Artificial Intelligence and Opportunistic Detection

- **Artificial intelligence (AI) technologies now support opportunistic fracture detection in routine imaging, especially for vertebral fractures.**

- **New NICE guidelines (2025) identify AI as a useful tool for early detection of fragility fractures through CT and MRI scans, enabling targeted early interventions before the onset of symptomatic fractures.**

- **Machine learning algorithms will also aid in identifying high-risk patients by integrating DEXA data with clinical and genomic variables**

Medical Alert Systems With Fall Detection

Automatic notifications

Digital supervision

Fall Prevention ??

Whole body vibration (WBV)

- **WBV is a generic term used when vibrations of any frequency are transferred to the human body.**

- **With whole-body vibration, you stand, sit or lie on a machine with a vibrating platform. As the machine vibrates, it transmits energy to your body, forcing your muscles to contract and relax dozens of times each second. The activity may cause you to feel as if you're exerting yourself.**

- **Humans are generally exposed to many different forms of vibration in their daily lives, such as through a driver's seat, a moving train platform, etc.**

Whole Body Vibration

Fitvibexcel Pro Medical

Hypervibe G17 PRO V2

Galileo Med L Plus

Whole Body Vibration

- **Different training programs, such as resistance and multicomponent trainings, have shown increases in BMD of the femoral neck and lumbar spine in postmenopausal and older women.**

- **Whole-body vibration training is used as an alternative exercise intervention and has shown to also increase bone density via mechanical load.**

- **The vibration training requires a greater response from the muscle and bone tissues to absorb and dampen the energy caused by oscillatory actions.**

- **It has been shown that WBV can produce osteogenic effects counteracting age-related alterations in bone mass.**

Effects of Whole Body Vibration Exercise on the Muscle Strength, Balance and Falling Efficacy of Super-aged Elderly: Randomized Controlled Trial Study

J Korean Soc Phys Med 2020;15(1):33-42
Published online February 29, 2020; https://doi.org/10.13066/kspm.2020.15.1.33

Jin-Hyuk Seo, PT, MS·Myung-Mo Lee, PT, PhD[1†]

PURPOSE: This study examined the effects of a whole body vibration-exercise program on the muscle strength, balance, and falling efficacy of super-aged women.

RESULTS: The experimental group showed a significant increase (p.<05) before and after the intervention in the chair stand test (CST), Korean version of the Berg balance scale (K-BBS), functional reach test (FRT), timed up-and-go (TUG), and Korean version of the fall efficacy scale (K-FES). Compared to the control group, the experiment group showed a more significant increase (p.<05) in the CST, K-BBS, and FRT.

Systematic Review and Meta-Analysis

Medicine®

OPEN

Whole-body vibration training and bone health in postmenopausal women

A systematic review and meta-analysis

Elena Marín-Cascales, PhD[a,*], Pedro E. Alcaraz, PhD[a,b,*], Domingo J. Ramos-Campo, PhD[a,b], Alejandro Martinez-Rodriguez, PhD[c], Linda H. Chung, PhD[a,b], Jacobo Á. Rubio-Arias, PhD[a,b]

Abstract

Background: The aims of the present systematic review and meta-analysis were to evaluate published, randomized controlled trials that investigate the effects on whole-body vibration (WBV) training on total, femoral neck, and lumbar spine bone mineral density (BMD) in postmenopausal women, and identify the potential moderating factors explaining the adaptations to such training.

Methods: From a search of electronic databases (PubMed, Web of Science, and Cochrane) up until September 2017, a total 10 studies with 14 WBV groups met the inclusion criteria. Three different authors tabulated, independently, the selected indices in identical predetermined forms. The methodological quality of all studies was evaluated according to the modified PEDro scale. For each trial, differences within arms were calculated as mean differences (MDs) and their 95% confidence intervals between pre- and postintervention values. The effects on bone mass between exercise and control groups were also expressed as MDs. Both analyses were performed in the total sample and in a specific class of postmenopausal women younger than 65 years of age (excluding older women).

Results: The BMD of 462 postmenopausal women who performed WBV or control protocol was evaluated. Significant pre-post improvements in BMD of the lumbar spine were identified following WBV protocols ($P = .03$). Significant differences in femoral neck BMD ($P = .03$) were also found between intervention and control groups when analyzing studies that included postmenopausal women younger than 65 years.

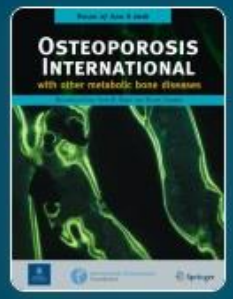
Conclusions: WBV is an effective method to improve lumbar spine BMD in postmenopausal and older women and to enhance femoral neck BMD in postmenopausal women younger than 65 years.

Home › Osteoporosis International › Article

Effectiveness of whole-body vibration on bone mineral density in postmenopausal women: a systematic review and meta-analysis of randomized controlled trials

Review | Published: 25 October 2022

Volume 34, pages 29–52, (2023) Cite this article



Osteoporosis International

Aims and scope →

Submit manuscript →

In total, 23 studies were included in the systematic review and 20 in the meta-analysis.

Thirteen studies showed high methodological quality.

WBV compared with control groups showed significant effects on aBMD.

Effect of Whole-Body Vibration on Balance or Proprioception in Nonspecific Chronic Low Back Pain: A Systematic Review

Nuaima Tariq, MPT, Zainy Khan, MPT, and Zubia Veqar, PhD

ABSTRACT

Objective: This systematic review aimed to investigate the effect of whole-body vibration (WBV) on balance or proprioception for patients with nonspecific chronic low back pain (NSCLBP).

Methods: A comprehensive search was conducted using 5 databases—PubMed, Web of Science, Cochrane Library, Science Direct, and Physiotherapy Evidence Database—from inception to January 2022. Randomized clinical trials that examined the efficacy of WBV on balance or proprioception in patients with NSCLBP were incorporated. The methodological quality of each included study was assessed using the Physiotherapy Evidence Database scale.

Results: Our search strategy yielded 5309 articles, of which 7 published randomized clinical trials (313 patients) met the inclusion criteria. Three of the 4 included studies that investigated balance reported significant improvements after WBV, of which 2 were of high methodological quality. The remaining 3 studies investigating proprioception also showed significant improvements after WBV intervention.

Conclusion: Although some studies seem to provide promising results regarding the efficacy of WBV or WBV combined with exercise in improving balance and proprioception in patients with NSCLBP, at present, no definite conclusions can be drawn due to article heterogeneity and lack of clinical trials. (J Chiropr Med 2023;22:284-293)

Key Indexing Terms: *Vibration; Postural Balance; Proprioception; Low Back Pain*

JRM Journal of Rehabilitation Medicine JRM

ORIGINAL REPORT

EFFECTS OF WHOLE-BODY VIBRATION THERAPY ON KNEE OSTEOARTHRITIS: A SYSTEMATIC REVIEW AND META-ANALYSIS OF RANDOMIZED CONTROLLED TRIALS

Chen Guang QIU, MSC*, Chun Sing CHUI, PHD, Simon Kwoon Ho CHOW, PHD, Wing-Hoi CHEUNG, PHD and Ronald Man Yeung WONG, MBCHB, PHD, FRCSED (Orth)*
*Co-first authors.
From the Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong SAR

Introduction: **Knee osteoarthritis is a leading cause of disability and medical costs. The effect of whole-body vibration in knee osteoarthritis is controversial. The aim of this study was to assess the effects and safety of whole-body vibration on pain, stiffness, physical function, and muscle strength in patients with knee osteoarthritis.**

Methods: **PubMed, Scopus, Web of Science, Physiotherapy Evidence Database (PEDro) and EMBASE databases were searched (date last accessed 1 April 2021) using the key words "vibration" and "knee osteoarthritis", to identify all randomized controlled trials related to whole-body vibration and knee osteoarthritis. Outcomes related to pain, stiffness, physical function, muscle strength, adverse events were included. The risk of bias and quality were assessed by the Cochrane Collaboration tool and PEDro scale. A systematic review and meta-analysis were performed. Subgroup analysis was performed for low- and high-frequency interventions.**

Results: **A total of 14 randomized controlled trials involving 559 patients with knee osteoarthritis met the inclusion criteria. Nine studies were good-quality frequency (30–40 Hz) whole-body vibration were associated with significant changes in pain, physical function, and knee extensor strength ($p < 0.05$). WBV was not associated with significant changes in stiffness, balance ability, quality of life, and knee flexor strength. No adverse events were reported.**

Conclusion: **Meta-analysis showed that low-frequency and high-frequency whole-body vibration had additional positive effects compared with strengthening exercises alone on pain, knee extensor muscle strength, and physical function in individuals with knee OA. Whole-body vibration with strengthening exercises can be incorporated into treatment protocols.**

Key words: vibration therapy; knee osteoarthritis; exercise.

Accepted Jan 21, 2022; Epub ahead of print Feb 17, 2022

J Rehabil Med 2022; 54: jrm00266

DOI: 10.2340/jrm.v54.2032

Correspondence address: Ronald Man Yeung Wong, Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong SAR. E-mail: ronaldwong@ort.cuhk.edu.hk

Diabetes Ther (2021) 12:1751–1761
https://doi.org/10.1007/s13300-021-01068-0

BRIEF REPORT

Favorable Effects of 24-Week Whole-Body Vibration on Glycemic Control and Comprehensive Diabetes Therapy in Elderly Patients with Type 2 Diabetes

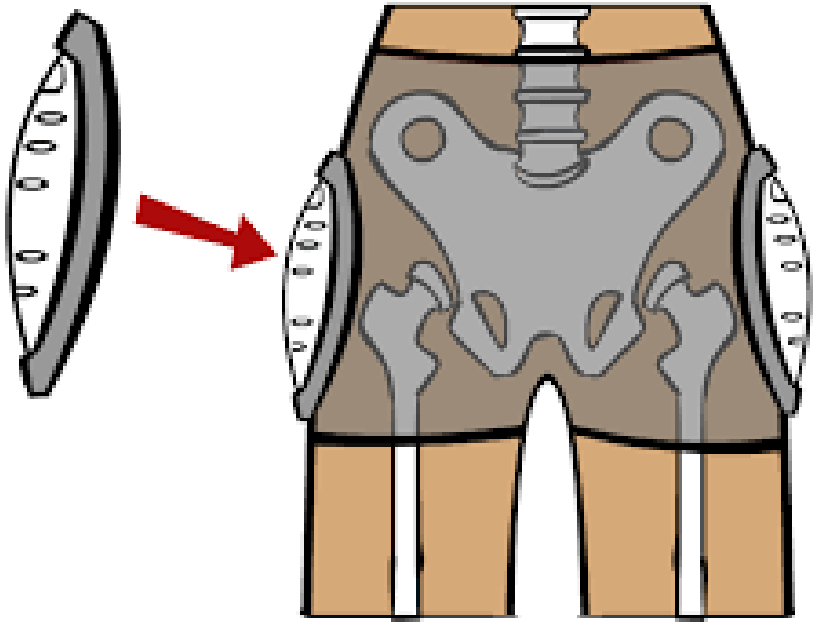
Takumi Kitamoto · Ryuichi Saegusa · Takuma Tashiro · Tomomi Sakurai · Koutaro Yokote · Takahiko Tokuyama

Background: Elderly patients with type 2 diabetes (T2DM) are vulnerable to treatment-inducible hypoglycemia, falls, and depressive symptoms. Although it is challenging for elderly patients to adhere to regular exercise, its positive effect on functional ability, glycemic control, and mental wellness offers comprehensive diabetes treatment. In the present study, we aimed to investigate a novel exercise approach for the elderly, focusing on whole-body vibration (WBV).

Results: Significant improvements in TUG and SST were found only in the WBV group [TUG: 7.1 ± 0.9, 7.1 ± 0.8 to 7.0 ± 1.0, 6.6 ± 0.9 (s), $P = 0.63$, 0.01; SST: 10.4 ± 1.9, 11.3 ± 2.4 to 9.7 ± 2.3, 9.5 ± 2.1 (s), $P = 0.62$, $P < 0.01$, control vs. WBV group, respectively]. The WBV group demonstrated significant improvement of hemoglobin A1C levels (7.2 ± 0.8 to 6.9 ± 0.5, $P < 0.01$) and DTSQ and GDS scores, while the control group did not. There were no hypoglycemic events during the study. The WBV program adherence was 93.3 ± 8.0%.

Conclusion: We demonstrated the favorable effect of WBV training on balance, diabetes treatment, and mood. Therefore, WBV training can be proposed as comprehensive therapy in a safe manner and potentially has a positive effect on health-related quality of life in elderly patients with T2DM.

Hip Protectors



Our Patient: A 71-y Woman

- FLS (Education, treatment, fall prevention)
- Exercise (Active/Passive)
- Walkers (A walker can make it easier to get around after surgery or after a bone break in foot or leg. A walker also can help if the patient has balance problems, arthritis, leg weakness or leg instability)
- Hip Protector
- Falling Alarm Devices

Striving for a world without fragility fractures

Thank You For Attention