



DOSSIER · THERAPY

Whole-Body Vibration

Whole-body vibration is predominantly tested on the musculoskeletal system; the most cited work is a meta-analysis on sarcopenia. Noticeable is the role distribution: the studies almost always test the procedure in addition to exercise, while the review literature itself asks whether it can replace exercise. Safety is an independently investigated topic.

799

STUDIES IN
TOTAL

417

IN HUMANS

221

OF WHICH
CONTROLLED

72

IN ANIMALS

3

IN THE LAB

Figures from the IHR study database · Last updated 2026-10-04

How to Read This Dossier

ESTABLISHED

measured in humans, with a comparison group

PLAUSIBLE

supported by mechanism, animal studies or observation

HYPOTHESIS

a likely connection that still needs to be tested

Whole Body Vibration at a Glance

ORIGIN:
Whole body vibration is not a single device, but a procedure: On a vibrating platform, positions and exercises are performed; the vibration is transmitted via feet, legs or seat surface. Frequency, amplitude, duration and body posture are set; training is done standing, sitting or leaning. The procedure is predominantly investigated in older people as well as in orthopaedic and neurological patient groups.

EVIDENCE BASE:
799 evaluated studies · 221 controlled human studies · 196 observational studies · 67 review articles · 72 animal studies · 2 cell culture studies

- STRONGEST EVIDENCE:**
- Proven: Musculoskeletal system, meta-analysis of 34 studies in older adults: significant effects of WBVT on knee extensors and flexors as well as plantar flexors, no differences compared with other forms of training.
 - Proven: Chronic ankle instability, meta-analysis of 48 studies with 1906 participants: WBVT was significantly more effective than controls for static balance (SMD 1.13) and dynamic balance (SMD 0.56).
 - Bone, randomised controlled study with 58 postmenopausal women over 6 months: Bone mineral density increased significantly under whole body vibration training at the femoral neck (p=0.003) and in L2–L4 (p=0.005).
 - Sarcopenia: In a randomised controlled study with 27 older people, both groups improved after 12 weeks of whole body vibration training and resistance training, without significant between-group differences.

- LIMITATIONS:**
- No uniform intervention: Frequency, amplitude, exercise component, body posture and exposure duration vary; whether vertical and alternating tilting platforms describe the same magnitude remains open.
 - Blinding of participants is not possible with a platform due to its design, and many endpoints are functional or laboratory values; the authors also note heterogeneity and publication bias.
 - Knee osteoarthritis: A meta-analysis of 14 studies reports limited evidence, one study negative effects; in neurological diseases optimal parameters remained undetermined.

CLASSIFICATION:
Whole body vibration is not a single device, but a variable procedure; the effects on the musculoskeletal system are best investigated, the additional contribution of the vibration remains open.

1. What Whole Body Vibration Is

Whole body vibration does not denote a single device, but a procedure: On a vibrating platform, positions and exercises are performed, and the vibration is transmitted to the body via feet, legs or seat surface. Primarily frequency and amplitude are set, that is vibration frequency and deflection, as well as the duration of exposure and body posture. Training is performed standing, sitting or in leaning positions, partly with additional strength or balance exercises on the platform, partly without. The procedure is used in rehabilitation, training and clinical research. The studies in this evaluation predominantly investigate it in older people as well as in orthopaedic and neurological patient groups.

For the assessment of all studies it is decisive that whole body vibration is not a uniform intervention. Frequency, amplitude, body posture, exercise component and exposure duration vary between the studies; whether vertically oscillating and alternating tilting platforms describe the same magnitude remains open. Also decisive is the comparator arm: When compared with movement without vibration, the contribution of the vibration can be separated; when compared with no intervention, the study measures the combination. Endpoints also lie on different levels: Muscle strength and functional measures at one end, laboratory values such as bone metabolism markers or BDNF at the other. A laboratory value does not prove disease course, a functional measure does not prove prognosis. **Hypothesis:** Part of the variation between the studies arises from platform design and body posture.

2. What the Studies Show in Detail

The supporting human studies and the most important reviews — by application area, with population, duration, preparation, measure and result, as the original studies report them. Numbers appear only where the study states them.

Distribution of **controlled human studies** by application area — the numbers are not additive, as one study may be assigned to several areas:

APPLICATION AREA	CONTROLLED STUDIES
Musculoskeletal system	141
Safety and tolerability	47
Bone and joints	30
Metabolism	28
Cognition and psyche	19

APPLICATION AREA	CONTROLLED STUDIES
Fatigue and stress	14
Heart and circulation	13
Inflammatory processes	11

Musculoskeletal System

In older people with sarcopenia, a systematic review with meta-analysis examined seven publications from six studies with 223 participants. Local vibration therapy and whole body vibration were tested with regard to muscle mass, muscle strength and physical function. The authors report that the evidence for a benefit of vibration therapy in sarcopenia is inconsistent; the work concludes that further research is needed to clarify the effects ¹. A randomised controlled study with 27 older people with sarcopenia (≥ 65 years) compared 12 weeks of whole body vibration training (WBVT, $n=14$) with resistance training (RT, $n=13$), each three times weekly. Primary endpoint was knee extension strength (KES). In the WBVT group significant improvements were shown in body composition (weight, BMI, body fat percentage, ASMI), muscle strength (KES), physical performance (gait speed, SPPB, 5CST), blood biomarkers (IGF-1, growth hormone, follistatin, creatine kinase) and quality of life. The RT group also improved, without significant differences between the groups ⁸.

Primary endpoint was isokinetic dynamometry. In all results only the time effect was significant, not the group or interaction effect. Both groups showed significant increases in isokinetic dynamometry; the increase in mean peak torque was greater in the WBVT group, without significance. Only the WBVT group improved significantly in the SPPB. In the SF-36 only the control group showed significant improvements ¹⁶. A systematic review with meta-analysis of 34 studies in older adults found that WBVT compared with control groups had significant effects on muscle strength of the knee extensors and flexors, the lower extremities and the ankle plantar flexors. Between WBVT and other forms of training no differences were shown. Subgroup analyses indicated that the significant results did not depend on body position, type of vibration, cumulative dose or magnitude. 56 % of the studies had low methodological quality (PEDro < 6) ⁹.

Another systematic review with meta-analysis of 18 randomised controlled trials in older adults (mean age ≥ 65 years) reports significant improvements in lower extremity muscle strength and physical performance through WBVT. A meta-analysis of 18 studies with 156 participants found a significant improvement in neuromuscular activation of the lower extremities immediately after WBV (SMD=0,51; 95 %-KI 0,26–0,76; $p<0,001$; $I^2=38$ %, $p=0,07$) and explosive strength (SMD=0,32; 95 %-KI 0,1–...). The authors point to heterogeneity and publication bias ²⁸.

In chronic ankle instability (CAI), a systematic review with meta-analysis of 48 studies with 1906 participants examined various conservative interventions, including whole-body vibration training (WBVT), balance training and joint mobilisation. WBVT was significantly more effective than controls for static balance (SMD 1,13; 95 %-KI 0,58–1,68; moderate certainty of evidence) and dynamic balance (SMD 0,56; 95 %-KI 0,24–0,88; low certainty of evidence). Balance training and joint mobilisation were significantly more effective than controls for dynamic balance (SMD 0,77; 95 %-KI 0,41–1,14 and 0,75; 95 %-KI 0,35–1,14 respectively), but not for static balance ⁷. A randomised controlled trial with 34 persons with unilateral CAI compared 4 weeks of progressive WBV training (WBV group), WBV with shoe on unstable surface (WBV-S) and no treatment (CON). Modified Star Excursion Balance Test (mSEBT), hop test, muscle strength and joint position sense were measured. A significant group-time interaction was shown for the anterior and posterolateral direction of the mSEBT: reach increased significantly in the WBV and WBV-S groups after the intervention and at follow-up, but not in the CON group. The hop test improved significantly in the WBV-S group after the intervention and at follow-up, but not in the other groups ¹⁸. A systematic review with meta-analysis of eight studies with 315 participants (mean PEDro score 6,1/10) found significant effects of WBV on balance (SMD=0,61; 95 %-KI 0,12–1,09; $p=0,01$), on the posterolateral direction (MD=5,52; 95 %-KI 1,02–10,01; $p=0,02$) and medial direction (MD=3,90; 95 %-KI 0,87–6,94; $p=0,01$) of the Star Excursion Balance Test as well as on peak torque (SMD=0,36; 95 %-KI 0,04–0,69; $p=0,03$) and joint position sense (SMD=0,60; 95 %-KI 0,10–1,11). The authors also report heterogeneous results ³⁶. A review of 11 randomised controlled trials on CAI rehabilitation found that all interventions (balance training, proprioceptive exercises, WBV, stroboscopic vision) showed significant improvements in SEBT, CAIT and FAAM, without any intervention being consistently superior ³⁵.

Bones and Joints

A randomised controlled 6-month intervention study with 58 postmenopausal women compared whole-body vibration training (WBV), high-impact training and a control group. Bone mineral density (BMD) of the lumbar spine and femur was measured by DXA, serum osteocalcin (OC) and C-terminal telopeptide of type I collagen, functional mobility (Timed Up and Go, TUG), fall index (static posturography), health-related quality of life (QUALEFFO) and depressive symptoms (Beck Depression Inventory). BMD at the femoral neck ($p=0,003$) and in the L2-L4 region ($p=0,005$) increased significantly in the WBV group compared with the control group. In the high-impact group, no significant effects were shown on the lumbar spine and femoral neck. Serum OC decreased significantly in the WBV group and increased significantly in the high-impact and control groups ($p<0,001$). TUG scores improved significantly in both training groups ².

A systematic review with meta-analysis of 14 randomised controlled trials with 559 patients with knee osteoarthritis examined the effects of whole-body vibration on pain, stiffness, physical function and muscle strength. Nine studies were of good quality (PEDro 6–8), five of adequate quality (PEDro 4–5). Ten studies were included in the meta-analysis. One study showed negative effects of whole-body vibration on knee osteoarthritis. The authors report that the evidence overall is limited and further research is needed to clarify the effect ⁵. A randomised controlled trial with 81 participants with knee osteoarthritis compared 8 weeks of WBV training plus strength training (WBV group), strength training without vibration (ST group) and health education (HE group). Visual analogue scale for knee pain, isokinetic muscle strength, proprioception, TUG and 6-minute walk test (6MWD) were measured. No significant difference was found for pain, proprioception, TUG and 6MWD. A significant interaction effect was shown for isokinetic muscle strength: the WBV group improved significantly compared with the HE group ¹¹.

Further Investigations

A systematic review of 20 studies examined the effects of whole-body vibration training on motor impairments in neurological diseases. Included were patients with multiple sclerosis (4 studies), cerebral palsy (2), stroke (9), Parkinson's disease (3), spinal cord injuries (1) and spinocerebellar ataxia (1). The results showed varying evidence for benefit and no benefit. The authors conclude that weak evidence exists for a positive effect of short-term WBV training

on lower extremity spasticity, mobility, balance and postural control, as well as a positive effect of long-term WBV training on mobility in neurological patients. Optimal training parameters could not be determined ³. A review of 16 systematic reviews with good methodological quality (JBI assessment) found in stroke patients that WBV plays a role in improving gait and balance, while focal muscle vibration is more effective in reducing spasticity. In multiple sclerosis and cerebral palsy there was no evidence for an improvement in some patient outcomes through vibration therapy. The authors emphasise that correct application parameters could not be defined ²⁵.

A randomised crossover study with 32 persons with motor-incomplete spinal cord injury compared single sessions of transcutaneous spinal stimulation (TSS, 50 Hz, 400 μ s, 15 min) and whole-body vibration (WBV, 50 Hz, eight 45-s bouts) regarding quadriceps spasticity, measured with the pendulum test (first swing excursion, FSE). In the overall group analysis, no differences were shown between TSS and WBV in the change of FSE at all post-intervention time points. In the subgroup analysis, participants with more pronounced spasticity showed significant decreases in spasticity immediately after TSS and 45 minutes after TSS. The authors conclude that both interventions are feasible ¹⁷. A network meta-analysis of 31 randomised controlled trials with 904 patients with multiple sclerosis compared seven forms of training (aquatic exercise, aerobic, yoga, Pilates, virtual reality, whole-body vibration, strength training) regarding balance (BBS) and functional walking ability (TUG). Yoga improved BBS scores significantly (SUCRA=79,7 %), aquatic exercise reduced TUG scores significantly (SUCRA=78,8 %). The authors recommend yoga, virtual reality and aerobic for improving balance; aquatic exercise, virtual reality and aerobic for improving walking ability ⁶.

A randomised controlled trial with 24 male athletes with patellofemoral pain compared 4 weeks (12 sessions) of WBV plus exercise therapy (n=12) with exercise therapy alone (n=12). Pain intensity (numerical rating scale), flexibility (Sit-and-Reach Test), agility (modified T-Test) and vertical jump height were measured. After the intervention, all variables improved significantly in both groups ($p < 0,05$) ¹². A narrative review discusses whole-body vibration as a possible alternative or supplement to conventional training and reports effects on neuromuscular function, bone mineral density, muscle mass and strength, pain relief and proprioception in osteoarthritis and back pain as well as on physical performance in athletes. The authors emphasise that the research is discussed controversially and the mechanisms are not yet fully understood ²⁶.

A systematic review and meta-analysis of 37 studies examined the association between physical occupational risk factors and preterm birth. For whole-body vibration, moderate evidence was found for a positive association with preterm birth. The meta-analysis showed a 44 % higher risk (OR 1,44; 95 %-KI 1,25–1,66) for preterm birth with long working hours and a 63 % higher risk (OR 1,63; 95 %-KI 1,03–2,58) with shift work. The authors conclude that pregnant women in physically demanding occupations, with long working hours or shift work and those exposed to whole-body vibration have an increased risk of preterm birth ³⁴. A review on the harmful effects of whole-body vibration on the spine summarises in vivo, ex vivo and in vitro models. The authors report that the parameters of the vibration stimuli (e.g. frequency and direction) play a critical role in spinal pathologies, yet the specific cause-effect relationships are largely unknown. The relationship between whole-body vibration and back pain in humans has been established mainly through cohort studies, with the vibration inputs leading to symptoms rarely quantified ²⁷.

Oncology

A prospective multicentre randomised clinical trial (STOP) with patients treated with oxaliplatin or vinca alkaloids examined over 5 years at 4 centres in or near Cologne, Germany, whether sensorimotor training (SMT) and whole-body vibration training (WBV) reduce symptoms and decrease the occurrence of chemotherapy-induced peripheral neuropathy (CIPN). The intervention groups performed supervised SMT or WBV sessions of approximately 15 to 30 minutes twice weekly alongside medical therapy. The primary endpoint was the incidence of CIPN. Secondary endpoints included subjective neuropathy symptoms, balance control, physical activity, quality of life and clinical outcome. Recruitment took place from May 2014 to November 2020; data were last analysed in June 2021. The authors report that the results will be available shortly ⁴.

A pilot randomised clinical trial with 22 adult breast cancer patients with aromatase inhibitor-induced musculoskeletal symptoms (AIMSS) compared 4 weeks of physical exercise combined with whole-body vibration (WBV) or sham WBV (1:1). The primary endpoint was pain intensity (numerical pain rating scale, NPRS). Secondary endpoints were muscle strength, physical function, physical performance and quality of life. The WBV group (mean age 51.73 $\pm$ 10.73 years; BMI 25.56 $\pm$ 5.17 kg/m²) showed a statistically significant pain reduction (NPRS: 6.82 $\pm$ 1.17 vs. 5.73 $\pm$ 1.01; $p=0.031$), whereas the sham-WBV group (mean age 58.55 $\pm$ 9.71 years; BMI 27.31 $\pm$ 3.84 kg/m²) did not reach statistical significance (NPRS: 6.91 $\pm$ 2.02 vs. 5.91 $\pm$ 2.51; $p=0.07$). Muscle strength, physical performance and quality of life improved significantly in both groups, without significant differences between the groups. There were no dropouts and no adverse effects. The authors conclude that the combination of physical exercise and WBV may be safe and effective ¹⁴.

Inflammatory Processes

A systematic review with meta-analysis of human and animal studies examined the effects of whole-body vibration in Parkinson's patients and on neuropathological mechanisms. Fourteen studies in Parkinson's patients showed an overall significant but small effect in favour of WBV (Hedges' $g=0.28$), with the strongest effects on stability (Hedges' $g=0.39$) and balance (Hedges' $g=0.30$). Eighteen preclinical animal studies on neuropathological mechanisms showed WBV effects on neuroinflammation (Hedges' $g=-1.12$) as well as on neurotransmitter systems, growth factors, neurogenesis, synaptic plasticity and oxidative stress; such an effect has not been investigated in humans. The authors conclude that the effects in human Parkinson's patients remain inconclusive, yet WBV protocols with sufficient duration (≥ 3 weeks), session frequency (≥ 3 sessions/week) and vibration frequency (≥ 20 Hz) show potential as a treatment method, particularly for motor function ¹⁰.

Cognition and Psyche

A randomised controlled trial with 32 women with fibromyalgia syndrome (FMS) examined 6 weeks of whole-body vibration training (WBVT) (intervention group) versus no intervention (control group). Blood BDNF levels, sit-to-stand test (STS), 6-minute walk test (6MWT), Fibromyalgia Impact Questionnaire (FIQ), Pittsburgh Sleep Quality Index (PSQI), Beck Depression Inventory (BDI) and visual analogue scale (VAS) were measured. WBVT produced a group-by-time interaction effect: the intervention group showed increased blood BDNF levels ($p=0.045$), a higher number of repetitions in the STS test ($p=0.011$) and a greater walking distance in the 6MWT ($p=0.010$) compared with the control group. In addition, scores for FIQ ($p=0.001$), PSQI ($p=0.001$), BDI ($p=0.017$) and pain (VAS, $p=0.008$) decreased in the intervention group. The authors conclude that WBVT increases blood BDNF levels and is accompanied by improvements in sit-to-stand performance, walking distance, clinical symptoms and quality of life ¹³.

A systematic review examined the effects of whole-body vibration on cognitive functions in adults. The authors report that whole-body vibration therapy improves a broad spectrum of cognitive functions in adults, although the literature on the biological consequences of whole-body vibration on the human brain is sparse. There is still insufficient evidence to design a standardised protocol for optimal cognitive improvement²⁹. An observational study with 16 patients with amnesic mild cognitive impairment (aMCI) examined whether whole-body vibration exercise and a 24-week WBV training protocol increase regional cerebral blood flow (rCBF) and improve cognitive function. Using [99mTc]-ECD and SPECT, rCBF measurements were performed at baseline, during WBV exercise and after 24 weeks of WBV training in 6 of the 16 patients. The authors report that WBV exercise and training can increase rCBF and improve cognitive function, yet the underlying mechanism remains unclear³⁰.

A review article examined the effects of whole-body vibration on driver drowsiness. The authors report that drowsiness is influenced by interactions between frequency, amplitude, waveform and duration of the vibration. Under optimal conditions, whole-body vibration can induce significant drowsiness within 30 minutes. Low-frequency whole-body vibrations, particularly 4–10 Hz, are most effective at inducing drowsiness. The authors point out limitations of the current studies and suggest directions for future research³³.

Metabolism

A randomised controlled study with 11 healthy adults (age 33 ± 2 years; BMI 23.6 ± 1.1 kg/m²) examined the microvascular muscle responses to acute whole-body vibration (WBV) compared with knee-extension training (KEX). The participants completed either 3 minutes of WBV or 3 minutes of KEX at 25 % of one-repetition maximum in randomised order with at least 72 hours between sessions. Femoral arterial blood flow was measured by Doppler ultrasound; microvascular blood flow in the thigh muscle was measured by contrast-enhanced ultrasound at baseline and during the 3-minute recovery phase. Both interventions significantly increased peak microvascular blood flow (WBV: 5.6-fold; KEX: 21-fold; both $p < 0.05$). Despite similar increases in femoral arterial blood flow (approximately 4-fold; both $p < 0.05$ vs. baseline) and whole-body oxygen consumption (WBV: 48 %; KEX: 60 %; both $p < 0.05$ vs. baseline), microvascular blood flow was more strongly stimulated after KEX. The authors conclude that a single 3-minute WBV session stimulates microvascular blood flow in skeletal muscle¹⁵.

Oxidative Stress

A review article discusses the biophysical modulation of mitochondrial metabolism and redox status in bone homeostasis and osteoporosis. The authors describe that moderate mechanical stimuli such as weight-bearing, physical activity, ultrasound, vibration and electromagnetic-field stimulation are beneficial for the activity of bone-forming cells and promote bone anabolism, thereby attenuating the development of osteoporosis. A variety of molecules, including ion channels, integrins, focal-adhesion kinases and myokines, are mechanosensitive and convert mechanical stimuli into intercellular signals that regulate growth, biosynthesis of the mineralised extracellular matrix and resorption. Mechanical stimulation alters mitochondrial respiration, biogenesis, dynamics, calcium influx and redox status, whereas mechanical inactivity induces mitochondrial dysfunction and oxidative stress, which amplify apoptosis, senescence and dysfunction of bone-forming cells. Control of the mitochondrial-biogenesis activator PGC-1 α by NAD⁺-dependent deacetylases (sirtuins) or the myokine FNDC3/irisin, or suppression of oxidative stress by the mitochondrial antioxidant Nrf2, modulates biophysical stimulation to promote bone formation³¹.

Overall Picture

Across all areas, whole-body vibration (WBV) has been investigated in a wide range of populations and research questions. The most robust findings concern improvements in lower-extremity muscle strength and physical performance in older adults, supported by several systematic reviews with meta-analyses^{9,32}. Meta-analytic evidence also exists for improvements in balance, strength and joint-position sense in chronic ankle instability³⁶; another review considers conservative interventions overall and therefore many modalities, not only whole-body vibration⁷. For bone metabolism in postmenopausal women, a randomised controlled study examining whole-body vibration and high-impact exercise showed significant gains in bone mineral density at the femoral neck and lumbar spine together with changes in bone turnover². Evidence in knee osteoarthritis is heterogeneous: a meta-analysis of 14 studies reports limited evidence and a study with negative effects⁵, whereas a randomised controlled study found no significant differences in pain and function but a significant interaction effect on isokinetic muscle strength¹¹.

In neurology, a differentiated picture emerges: In stroke patients, WBV appears to improve gait and balance, while in multiple sclerosis and cerebral palsy no evidence for improvements was found²⁵. In Parkinson's patients, the effect on motor functions is small and the authors rate the evidence as inconclusive¹⁰. In oncology, a pilot study on exercise with or without whole-body vibration suggests pain reduction in aromatase inhibitor-induced musculoskeletal symptoms¹⁴. The STOP study investigated neuromuscular training rather than whole-body vibration⁴. For cognitive functions, there are indications of improvements, but the biological basis is still unclear and standardised protocols are outstanding^{29,30}. The methodological quality of the included studies is often limited: In the review by⁹, 56 % of the studies had low methodological quality (PEDro < 6).

Methodology of the Evidence Base

The included works comprise randomised controlled trials, systematic reviews with meta-analyses, network meta-analyses, observational studies and narrative reviews. WBV intervention duration ranges from single sessions (e.g. 3 minutes WBV in¹⁵) through 4 weeks (^{12,14,18}) up to 6 months (²). The 5-year follow-up attributed to the STOP study⁴ does not describe a whole-body vibration intervention. Typical endpoints are muscle strength (isokinetic dynamometry, hand grip), physical performance (SPPB, TUG, 6MWT, gait speed), balance (Star Excursion Balance Test, Berg Balance Scale), pain (VAS, NPRS), bone mineral density, blood biomarkers (BDNF, IGF-1, osteocalcin, inflammatory factors) and cognitive functions. Standardised WBV protocols are frequently absent: optimal frequency, amplitude, duration and session frequency are not defined^{3,25}. In addition, many studies are small (e.g. $n=11$ in¹⁵, $n=22$ in¹⁴, $n=27$ in⁸) and methodological quality is variable. Some reviews report high heterogeneity (e.g. $I^2=58$ % in³²) and publication bias²⁸. Transferability of results to clinical practice is therefore limited, and studies with large samples and long-term follow-up are lacking.

Replacement for Exercise or Adjunct?

The common expectation is that whole-body vibration constitutes a gentle alternative to strength training. The evidence base predominantly examines something else: In many of the most-cited works, vibration is an adjunct to exercise, and comparison is made against the same exercise without vibration. This measures the additional contribution of the oscillation, not suitability as a replacement. Direct comparisons exist, for example twelve-week vibration training versus strength training in older adults with sarcopenia, and one review already poses the replacement question in its title. Most studies have therefore answered a different question from the one with which the method is promoted.

Decisive for resolution is the comparator arm. Two designs can separate the question: the adjunct comparison, in which both groups perform the same exercise and only one additionally receives vibration, and the direct comparison against another training modality at comparable load. Numerous works are available for the adjunct comparison. The group for the direct comparison is smaller, and it would additionally need to be clarified whether frequency, amplitude and exposure duration are reported in a comparable manner. It is plausible that part of the observed effects stems from practising on the platform rather than from the oscillation; this can be separated only through the experimental design.

3. How Robust the Research Is

The field is broad and unevenly distributed. Controlled human studies focus clearly on the musculoskeletal system; sarcopenia, knee osteoarthritis, chronic ankle instability and balance in older adults constitute the largest block. Safety studies form a separate area, alongside works on bone, metabolism, cognition, fatigue, cardiovascular system and inflammation. Oncology and skin are represented by individual controlled studies, for example a pilot study of exercise with or without vibration in breast-cancer patients with aromatase-inhibitor-related complaints. The database also includes basic-science, mechanistic and animal studies; these contribute to the mechanism of action but do not replace human studies.

Methodologically, the literature includes several systematic reviews and meta-analyses, including network meta-analyses, that pool the primary studies on sarcopenia, knee osteoarthritis, balance and neurological rehabilitation. This is an advantage because individual findings are placed in context. However, pooling reaches a limit inherent in the subject itself: When protocols, devices and comparator arms vary, a meta-analysis averages across different interventions. Blinding of participants is impossible by design with a platform, and many endpoints are functional or laboratory values. Preclinical findings, for example on depression-like behaviour in rats or mitochondrial function in bone, support the mechanism of action; whether they are confirmed in humans remains to be clarified.

4. What Is Frequently Claimed — and What the Data Provide

CLAIM	EVIDENCE BASE
Whole-Body Vibration as a Replacement for Strength Training	Some studies make direct comparisons, for example twelve-week vibration training versus strength training in sarcopenia. The majority of studies, however,
Bone in Postmenopausal Women	Bone metabolism and functional mobility are investigated. Bone metabolism serves as a marker; an influence on fracture rate has therefore not been examir
Neurological Disorders	Reviews and meta-analyses address motor function, balance and walking ability in Parkinson, multiple sclerosis and chronic ankle instability. Der Krankheits
Safety and Tolerability	Safety is a separate area with controlled studies. For a training procedure this is unusual and makes tolerability an independently investigated topic.

5. The Most Robust Studies

Ordered by strength of evidence, not by prominence. The complete evaluation comprises considerably more studies; the most robust are presented here.

Controlled Human Studies

- 1 Effects of vibration therapy on muscle mass, muscle strength and physical function in older adults with sarcopenia: a systematic review and ... (2020)
- 2 Effects of whole-body vibration and high impact exercises on the bone metabolism and functional mobility in postmenopausal women (2020)
- 3 Effects of Whole-Body Vibration on Motor Impairments in Patients With Neurological Disorders: A Systematic Review (2019)
- Preventive Effect of Neuromuscular Training on Chemotherapy-Induced Neuropathy: A Randomized Clinical Trial (2024)
- 5 Effects of Whole-Body Vibration Therapy on Knee Osteoarthritis: A Systematic Review and Meta-Analysis of Randomized Controlled Trials (2022)
- Effects of Different Exercise Therapies on Balance Function and Functional Walking Ability in Multiple Sclerosis Disease Patients-A Network ... (2022)
- Effects of Conservative Interventions on Static and Dynamic Balance in Individuals With Chronic Ankle Instability: A Systematic Review and ... (2023)
- 8 Effects of 12-week whole-body vibration training versus resistance training in older people with sarcopenia (2025)

- ⁹ Impacts of Whole-Body Vibration on Muscle Strength, Power, and Endurance in Older Adults: A Systematic Review and Meta-Analysis (2023)
- ¹⁰ Potential of Whole-Body Vibration in Parkinson's Disease: A Systematic Review and Meta-Analysis of Human and Animal Studies (2022)
- ¹¹ Comparison of whole-body vibration training and quadriceps strength training on physical function and neuromuscular function of individuals with knee ... (2021)
- ¹² Effects of whole body vibration with exercise therapy versus exercise therapy alone on flexibility, vertical jump height, agility and pain in ... (2020)
- ¹³ Efficacy of Whole-Body Vibration Training on Brain-Derived Neurotrophic Factor, Clinical and Functional Outcomes, and Quality of Life in Women with ... (2021)
- ¹⁴ Physical Exercise with or without Whole-Body Vibration in Breast Cancer Patients Suffering from Aromatase Inhibitor-Induced Musculoskeletal Symptoms ... (2021)
- ¹⁵ Whole-Body Vibration Stimulates Microvascular Blood Flow in Skeletal Muscle (2021)
- ¹⁶ Effectiveness of Whole-Body Vibration Training to Improve Muscle Strength and Physical Performance in Older Adults: Prospective, Single-Blinded ... (2021)
- ¹⁷ Efficacy of Transcutaneous Spinal Stimulation versus Whole Body Vibration for Spasticity Reduction in Persons with Spinal Cord Injury (2021)
- ¹⁸ The effect of the combination of whole body vibration and shoe with an unstable surface in chronic ankle instability treatment: a randomized clinical ... (2021)
- ¹⁹ Does whole-body vibration training have a positive effect on balance and walking function in patients with stroke? A meta-analysis (2022)
- ²⁰ Efficacy and safety of whole-body vibration therapy for post-stroke spasticity: A systematic review and meta-analysis (2023)
- ²¹ Whole-body vibration training versus conventional balance training in patients with severe COPD-a randomized, controlled trial (2021)
- ²² Efficacy of whole body vibration therapy on pain and functional ability in people with non-specific low back pain: a systematic review (2020)
- ²³ Effect of stabilization exercise combined with respiratory resistance and whole body vibration on patients with lumbar instability: A randomized ... (2022)
- ²⁴ Optimal frequency of whole body vibration training for improving balance and physical performance in the older people with chronic stroke: A ... (2022)

6. Summary

Proven: In humans, several systematic reviews and meta-analyses support the findings on the musculoskeletal system. Compared to control groups without intervention, whole-body vibration training showed significant effects on knee extensors and flexors, plantar flexors and physical performance in older adults. In chronic ankle instability, a study of whole-body vibration combined with shoes with an unstable surface showed improvements in static and dynamic balance compared with controls. In direct comparison with other forms of training, no differences were found. A single randomised controlled study in 58 postmenopausal women provides an indication of an increase in bone mineral density at the femoral neck and in L2–L4.

Plausible: The mechanism of action is based on preclinical studies, for example on depression-like behaviour in rats or on mitochondrial function in bone; whether these mechanisms apply in humans has not yet been tested. It could follow from this that effects only become clear when studies disclose frequency, amplitude, posture and exercise component and distinguish between vertical and reciprocating tilting platforms. Likewise, the question of whether the vibration replaces or supplements movement could organise the results.

To be clarified would be a randomised controlled study that compares whole-body vibration and identical exercises without vibration in the same protocol, with documented frequency, amplitude, posture and exposure duration as well as specification of the platform type. It would answer the question of whether the contribution of the vibration goes beyond the exercise — the review literature itself asks whether the procedure can replace movement, while the studies almost always test it additionally. Also remaining open is how laboratory values such as bone metabolism markers or BDNF relate to functional measures and to the clinical course.

7. What Remains Open

- **Dosimetry:** A common dose measure for frequency, amplitude and exposure duration is still lacking. Without it, it remains open which studies have tested the same thing.
- **Addition or replacement:** What proportion of an effect comes from the vibration itself and what from exercising on the platform is the central open question.
- **Transfer:** Whether the biophysical mechanisms from cell and animal studies, for example on mitochondrial function in bone, apply in the same way in humans is unresolved.

Frequently Asked Questions

How is the procedure dosed in the studies?

Reported are frequency, amplitude, duration of exposure, body posture and exercise component. A uniform dose specification is still outstanding because the works describe the settings differently. For practice, this means that no single setting can be derived from the literature. Whether the parameters can be summarised into a common dose size is an open research question.

Can whole-body vibration replace strength training?

The studies predominantly test the procedure as an addition to exercise, compared against the same exercise without vibration. Direct comparisons against strength training exist, for example in sarcopenia and knee osteoarthritis, but they form a smaller group. Whether replacement succeeds is decided by comparisons with matched loading. Until then the question remains open.

What do animal and cell studies contribute?

They provide the mechanism of action. For example, depression-like behaviour in the rat model and biophysical effects on mitochondrial metabolism in bone are investigated. Such findings are preclinical: they support hypotheses but say nothing about application in humans. Mechanism and clinical benefit are therefore to be assessed separately.

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