



THERATEK

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This compendium brings together peer-reviewed clinical research on Whole-Body Vibration (WBV) therapy, organised into nine sections. Each section covers a distinct health area and presents multiple independent studies with methods, results, and key conclusions. Use this guide to navigate directly to the topics most relevant to you.

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- Cancer Patients During Chemotherapy — Feasible, improves jump height & TUG

1 WEIGHT LOSS

Significant Fat Reduction — Systematic Review

Zago et al. (2018). PLoS One. 13(9):e0202866. PMID: 30183742

Objective: Determine outcomes of WBVT on obese individuals (18 papers, 2010–2017).

Methods: Systematic review — Medline, Scopus, Web of Science, PEDro, Scielo. Typical interventions: 3 sessions/week, 25–40 Hz, 1–2 mm amplitude.

Results: Interventions ≥ 6 weeks improved cardiac autonomic function and reduced arterial stiffness. 10 weeks produced significant weight/fat mass reduction and leg-strength gains. No lean-mass losses reported.

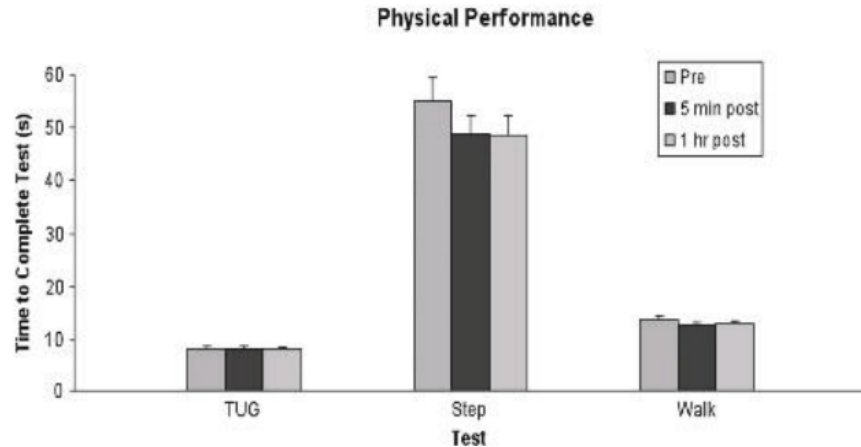
■ WBVT is a promising adjuvant therapy for obese women; further large-scale studies warranted.

Reduction in Abdominal Fat

Vissers D. et al. (2010). *Obesity Facts / European Journal of Obesity*. Vol. 3(2). University of Antwerp.

Method: 79 obese adults randomised into DIET only, FITNESS (diet+exercise), WBV (diet+progressive vibration therapy), or CONTROL. 6-month intervention with 6-month no-intervention follow-up.

Results: WBV group lost twice as much visceral fat vs FITNESS and DIET groups after 6 months. This decrease persisted at 12 months while other groups returned to baseline. Mean weight loss 9.5 kg (>10% maintained at 12 months).



Physical performance tests: TUG, Step, and Walk — Pre vs 5 min post vs 1 hr post WBV

■ WBV + caloric restriction achieves superior, lasting visceral fat reduction.

Visceral Adipose Tissue: Long-Term Weight Loss Effects

Vissers D. et al. Obesity Facts, The European Journal of Obesity.

Methods: RCT; 61/79 participants completed. Data at baseline, 3, 6, 12 months.

Results: Visceral adipose tissue (VAT) changed most in VIBRATION: $-47.8 \pm 41.2 \text{ cm}^2$ at 6 months vs CONTROL (-3.6 cm^2), DIET (-24.3 cm^2), FITNESS (-17.6 cm^2) ($p < 0.001$).

■ WBV reduces visceral fat more than aerobic exercise in obese adults.

Slowing Down Acquisition of Fat in Rats

Maddalozzo GF et al. (2008). Int J Obes (Lond). 32(9):1348–54. PMID: 18663370

Methods: 30 female Fischer rats; vibration group: 30–50 Hz, 6 mm, 30 min/day, 5x/week for 12 weeks.

Results: WBV group weighed ~10% less ($P < 0.03$), had less body fat (20.8 vs 26.8 g, $P < 0.05$), lower serum leptin. Vertebral BMC and BMD significantly greater.

Conclusion: WBV reduced body fat accumulation and leptin without affecting whole-body BMC, BMD, or lean mass. Local vertebral bone increases observed.

■ WBV reduced body fat accumulation and leptin; also increased local vertebral bone mass and density.

WBV as Complement to Weight Loss Programs

Cristi-Montero C. et al. (2013). Nutr Hosp. 28(5):1365–71. PMID: 24160189

Results: WBVT is associated with 3 weight-loss pathways: inhibition of adipogenesis, increased energy expenditure, and increased muscle mass.

■ WBVT is safe and beneficial for weight loss when combined with diet and exercise.

Reducing Fat Mass in the Adult General Population — Meta-Analysis

Omidvar M., Alavinia SM., Craven BC. (2019). Journal of Musculoskeletal & Neuronal Interactions, 19(4), 455–464.

Methods: 7 controlled trials (280 subjects) from Medline, Embase, Cochrane, CINAHL, PubMed.

Results: Mean change in total fat mass: -0.76 kg (95% CI: -1.42 , -0.09). Mean change in % body fat: -0.61 (95% CI: -1.51 , 0.13).

■ Significant effect of WBV on total fat mass (kg) confirmed by systematic review and meta-analysis.

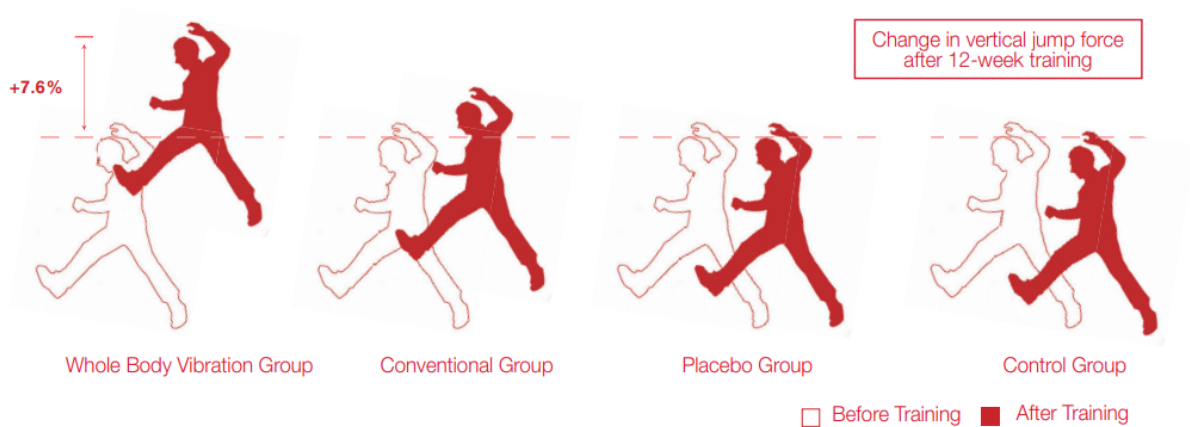
Does Vibration Therapy Reduce Fat Mass? — Meta-Analysis

Alavinia SM, Omidvar M, Craven BC. (2021). *Disability and Rehabilitation*, 43:14, 1935–1947.

Methods: 13 controlled trials from 2,420 studies reviewed. Two meta-analyses performed.

Results: % fat mass: -2.56 (95% CI: $-3.81, -1.31$). Fat mass (kg): -1.91 (95% CI: $-2.64, -1.18$).

Implications: WBV assists obese and bariatric clients with weight loss; augments fat mass reductions when combined with diet and exercise.



Change in vertical jump force after 12-week WBV training: WBV group (+7.6%) vs conventional, placebo, and control groups

■ WBV therapy shows a positive effect on reducing fat mass, especially when combined with conventional weight-loss interventions.

Better Body Composition in Obese Middle-Aged Women

Sunoo S. (2016). *Journal of Exercise Nutrition & Biochemistry*, 20(2), 19–27.

Methods: 33 obese middle-aged women ($34\pm 3\%$ body fat); diet vs diet+WBV vs diet+aerobic; 9 months.

Results: Body fat % decreased in all groups; exercise groups showed greater reduction. Total body BMC increased significantly in the vibration group through the first 6 months.

■ Long-term WBV training is as effective as aerobic exercise for improving body composition in obese middle-aged women.

Weight Loss in Postmenopausal Women

Fjeldstad C. et al. (2009). *Maturitas*. University of Oklahoma.

Method: 55 estrogen-deficient postmenopausal women (60–75 yrs), 32 weeks. Groups: resistance, vibration + resistance, non-exercising control.

Results: Vibration + resistance: total body fat % decreased; lean tissue mass increased in total body, arm, and trunk. Control experienced significant increase in body fat %.

■ WBV added to resistance training decreases body fat and increases lean tissue in postmenopausal women.

Weight Loss in Obese Female College Students

Deng W. (2022). BioMed Research International, Article ID 1041688.

Methods: WBVT (n=17) vs control (n=19); 12 weeks, 5x/week, 30 min (30–40 Hz, 4 mm).

Results: Body fat mass, trunk fat mass, and body fat % significantly decreased; muscle mass increased ($P < 0.01$). Heart rate variability improved significantly.

■ WBVT improves HRV and body composition in obese female college students.

Decrease in Body Fat % in Hispanic Women

Severino G. et al. Journal of Aging and Physical Activity. DOI: 10.1123/japa.2016-0087

Methods: 6-week WBVT (n=13) vs non-exercising control (n=14); obese Hispanic postmenopausal women.

Results: Heart rate, sympathovagal balance, and body fat % significantly decreased. R-R intervals significantly increased.

■ WBVT improves HRV and body fat % in obese Hispanic postmenopausal women; reduces cardiovascular disease risk.

2 REHAB BENEFITS

Walking Without Pain — Knee Osteoarthritis

Salmon JR, Roper JA, Tillman MD. (2012). Journal of Strength and Conditioning Research. University of Florida.

Method: 17 knee OA patients; WBV at 35 Hz, 60 s on/off for 10 min. Tests: Timed-Up-and-Go, step test, 20 m walk.

Results: Step test time improved significantly 5 min after WBV (+11%). Walk test improved by >1 second mean.

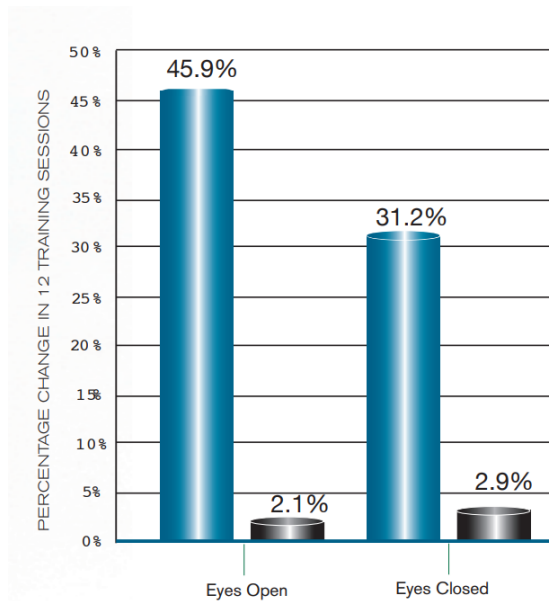
■ WBV training improved functional test performance in individuals with knee osteoarthritis.

ACL Recovery

Moezy A. et al. (2008). *British Journal of Sports Medicine*. Tehran University of Medical Sciences.

Method: 20 male athletes post-ACL reconstruction; vibration therapy vs conventional therapy; 12 sessions over 1 month.

Results: Vibration group showed 22× greater improvement in anterior-posterior stability vs conventional group. Better joint stability and balance in less training time.



Improvement in anterior-posterior stability index: vibration group (blue) vs conventional therapy group (black), eyes open and closed (45.9% vs 2.1% and 31.2% vs 2.9%)

■ WBV is a valuable addition to ACL rehabilitation — superior stability improvement in less time.

Walking Function in Spinal Cord Injury

Ness LL, Field-Fote EC. (2009). Gait & Posture. University of Miami Miller School of Medicine.

Method: 17 subjects with chronic incomplete SCI; vibration therapy 3x/week for 4 weeks (4 × 45-s periods at 50 Hz).

Results: Walking speed increased mean 0.23 km/h (clinically meaningful). Cadence, step length, and intralimb coordination all improved.

■ Consistent WBV use improves walking speed, cadence, and step length in chronic incomplete SCI.

Parkinson's Disease

Haas CT et al. Institute of Sport Sciences, Johann Wolfgang Goethe-University, Frankfurt.

Methods: 68 Parkinson's patients (mean age 65.0±7.8 yrs); multidimensional WBV, 5 × 1-min, mean 6 Hz, 3 mm amplitude.

Results: Significant improvements in motor score. Significant improvements in postural control. Vibration provides external cues and may normalise supplementary motor area activation.

■ WBV produced significant improvements in motor symptoms and postural control in Parkinson's disease.

Spinal Cord Injury — Spasticity and Leg Strength

Sadeghi M, Sawatzky B. (2014). *Am J Phys Med Rehabil.* 93(11):995–1007. | Bosveld R, Field-Fote EC. (2015). *J Spinal Cord Med.* 38(6):784–91.

Spasticity (Sadeghi): Systematic review; 10 studies, 195 SCI subjects. WBV resulted in decreased spasticity lasting 6–8 days after last session.

Leg Strength (Bosveld): 25 subjects, single-session WBV (50 Hz, 2 mm) vs sham. Voluntary isometric force in WBV group was 1.12 kg greater than sham immediately post-test (P=0.05, ES=0.60).

■ WBV reduces SCI spasticity for up to 6–8 days; even a single session meaningfully increases quadriceps force.

WBV for Multiple Sclerosis

Schuhfried O. et al. *Dept. of Physical Medicine, Medical University of Vienna.*

Methods: Double-blind RCT; 12 MS patients; WBV (2.0–4.4 Hz, 3 mm, 5 × 1 min) vs placebo TENS.

Results: WBV group outperformed placebo on Sensory Organization Test and TUG at each time point. Effects strongest at 1 week post: TUG reduced 9.2→8.2 s vs increased 9.5→10.2 s in placebo.

■ WBV positively influences postural control and mobility in multiple sclerosis patients.

ACL Rehabilitation — Reduced Recovery Time

Berschlin G. et al. (2014). Journal of Sports Science and Medicine.

Methods: 40 post-ACL patients; WBV (n=20) vs standard protocol (n=20); weeks 2, 5, 8, 11 post-surgery.

Results: Rehabilitation time reduced to <50% in WBV group. WBV group showed significantly better stability test results. Equivalent clinical outcomes otherwise.

■ WBV ACL rehabilitation achieves equivalent outcomes to standard rehab in half the time.

Rebuilding Cartilage — Stem Cell Chondrogenesis

Hou W. et al. (2020). Archives of Oral Biology, 118, 104860.

Results: LMHF vibration upregulated chondrocyte-specific markers (Aggrecan, Sox9, BMP7). Glycosaminoglycan increased 56.5% by day 7 and 93.6% by day 14. β -catenin signalling activated.

■ LMHF mechanical vibration promotes stem cell chondrogenic differentiation — potential cartilage rebuilding mechanism.

Decreased Fall Risk in Nursing Home Residents

Bruyere O. et al. (2005). Arch Phys Med Rehabil. 86(2):303–7. PMID: 15706558

Methods: RCT; 42 elderly nursing home volunteers; 6-week WBV + PT (n=22) vs PT alone (n=20).

Results: Gait score: +2.4 pts (control: 0). Balance: +3.5 pts (control: -0.3). TUG: -11.0 s (control: +2.6 s). WBV improved 8 of 9 SF-36 items significantly.

■ Controlled WBV improves fall risk elements and health-related quality of life in elderly nursing home residents.

Numerous Improvements in Total Knee Arthroplasty Patients

He Z. et al. (2022). Aging Clin Exp Res, 34, 1381–1390.

Methods: RCT; 67 osteopenic post-TKA patients; outcomes at baseline, 3 and 6 months.

Results: At 6 months, WBV group improved pain scores, thigh circumference, lower limb strength, joint activity, joint function, bone density, radius/tibia microstructure, and bone turnover markers.

■ WBV shows good therapeutic results for osteopenic patients 6 months after total knee arthroplasty.

3 ANTI-AGING & REGENERATIVE HORMONAL RESPONSE

Fall Prevention and Flexibility in Seniors

Lachance C. et al. (2012). Eur Rev Aging Phys Act, 9, 51–62.

Review of 27 articles: WBV reduces fall risk and improves postural control; as effective as conventional resistance training for lower body strength.

Balance: 12 of 13 studies showed significant WBV benefits. **Strength:** 13 of 14 studies confirmed benefits. After 8 weeks participants lifted 49% more weight on average.

Flexibility: Lower body flexibility improved significantly in 6 weeks. Upper body flexibility improved after 8 weeks of targeted exercises.

■ WBV reduces fall risk, improves postural control, strength, and flexibility in seniors.

Muscle Mass Preservation

Bogaerts A. et al. (2007). Journal of Gerontology: Medical Sciences, 62A(6), 630–635. KU Leuven.

Method: 97 participants: vibration group (max 40 min/session) vs fitness group (max 90 min/session), 3x/week for 1 year.

Results: Both groups increased isometric and explosive strength and muscle mass equally. Vibration training achieved the same results as regular fitness in less than half the training time.

■ Vibration training is equivalent to fitness training for muscle mass and strength — in <50% of the training time.

Anti-Aging Hormonal Response — Growth Hormone

Bosco C. et al. (2000). Eur J Appl Physiol. 81(6):449–54. PMID: 10774867

Background: Growth hormone (GH) declines with age; pharmaceutical GH therapy costs up to \$30,000/year. WBV investigated as a natural alternative.

Results: Researchers demonstrated a 460% naturally occurring GH increase post-WBV in athletic males. Replicated studies found GH increases from 435% (DiLoreto et al. 2004) to 2,600% (Sartorio et al. 2010).

■ WBV naturally triggers GH increases exceeding those of conventional exercise, without pharmaceutical costs or side effects.

Cardiorespiratory Fitness and Muscle Strength in the Elderly

Bogaerts A. et al. (2009). Age and Ageing. KU Leuven, Belgium.

Method: 220 participants; vibration group (max 40 min, 3x/week) vs fitness group (max 90 min, 3x/week); 1 year. Measured: VO₂ peak, time-to-peak exercise, isometric strength.

Results: Vibration training increased peak oxygen uptake, time-to-peak exercise, and isometric strength — nearly equal to the fitness group. Participants did not perceive it as hard or strenuous.

■ WBV achieves fitness-group cardiorespiratory and strength improvements in only 40 minutes vs 90 minutes per session.

Prevention of Osteoporosis

Swe M. et al. (2016). Malays J Med Sci. 23(5):8–16. PMID: 27904420

Methods: Systematic review; 9 eligible articles (1,486 participants). 6 trials (2005–2013) found significant BMD increases.

■ WBV is a good adjunctive therapy for prevention and management of osteoporosis in postmenopausal women.

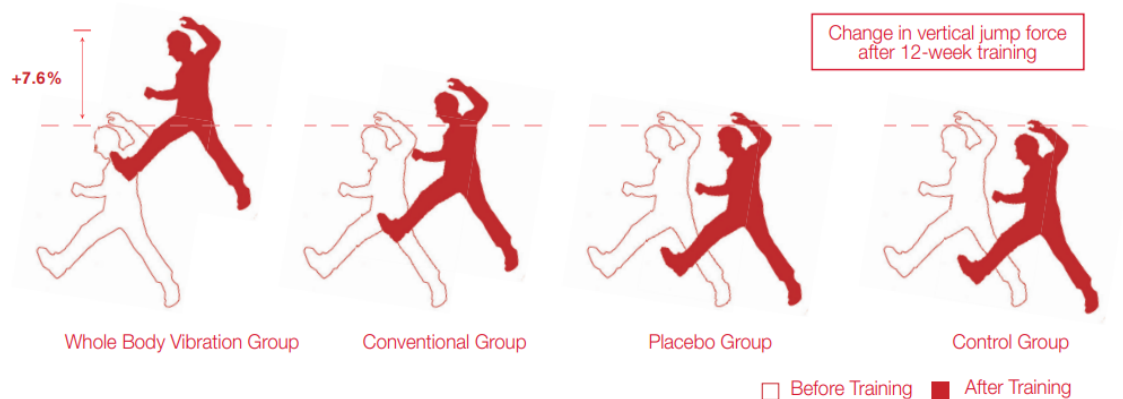
4 FITNESS & SPORTS PERFORMANCE

Strength Gains and Higher Jumps

Roelants M., Delecluse C., Verschueren SM. (2004). *J Am Geriatr Soc.* 52(6):901–8. PMID: 15161453

Methods: 67 untrained subjects, 4 groups, 3x/week for 12 weeks. WBV: 35–40 Hz standing knee extensor exercises.

Results: WBV group: +16.6% isometric strength, +9% dynamic quadriceps strength, +7.6% vertical jump height. Resistance group: +14.4%/+7.0% strength but no jump improvement. Placebo: no gains.



Vertical jump height increase: WBV group (+7.6%) outperformed conventional, placebo, and control groups after 12 weeks

■ WBV achieves superior strength and jump height gains compared to resistance training alone.

Improvement in Hamstring Flexibility

Houston MN et al. (2015). *J Sport Rehabil.* 24(1):77–82. PMID: 25606860

4 of 5 included studies demonstrated statistically significant improvements in hamstring flexibility. Grade B evidence supporting WBV.

■ WBV training effectively improves hamstring flexibility in physically active adults.

Sprint Running Kinematics and Explosive Strength

Paradis G., Zacharogiannis E. *Journal of Sports Science and Medicine. University of Athens.*

Methods: 24 volunteers; 6-week WBV (16–30 min/day, 3x/week, 2.5 mm, 2.28 g acceleration).

Results: Sprint times improved +2.7%. Step length +5.1%, running speed +3.6%. CMJ height +3.3%. Explosive strength endurance +7.8%.

■ 6-week WBV training significantly improves sprint kinematics and explosive strength performance.

Effects on Muscle Strength and Power — Meta-Analysis

Osawa Y., Oguma Y., Ishii N. (2013). *J Musculoskelet Neuronal Interact*, 13(3):380–390.

Methods: Meta-analysis; 10 RCTs on knee extension strength (314 subjects); 7 RCTs on CMJ height (249 subjects).

Results: Significant WBV effect on muscle strength (SMD=0.76, P=0.007) and CMJ height (SMD=0.87, P=0.003).

■ WBV produces significantly greater improvements in muscle strength and jump height than conditions without WBV.

Cycling Sprint Performance

Rønnestad BR. et al. (2017). *Int J Sports Physiol Perform*. 12(7):964–968. PMID: 27967282

Methods: 11 well-trained cyclists; WBV warm-up at 40 Hz vs no-WBV warm-up; 15-s Wingate sprint.

Results: Peak power output: 1,413 W (WBV) vs 1,353 W (no WBV), P=0.04. Moderate practical effect.

■ WBV warm-up at 40 Hz improves sprint peak power in well-trained cyclists.

Footspeed Quickness

Donahue RB. et al. (2016). J Strength Cond Res. 30(8):2286–91. PMID: 27328378

Results: WBV protocol (35 Hz, 4 mm, 60 s) significantly augmented Quick Feet Test: 37.1 vs 35.7 touches ($P \leq 0.0005$, $\eta = 0.581$).

■ WBV warm-up should be included in routines preceding training or events requiring very fast foot movements.

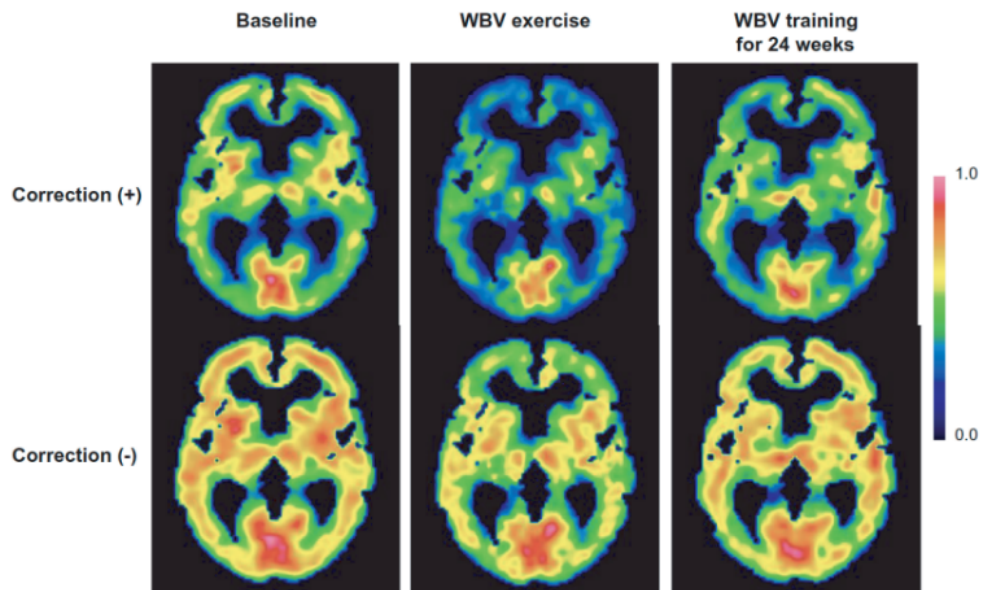
5 BRAIN HEALTH & DISABLED MINORS

Delay Dementia — Increased Cerebral Blood Flow in MCI

Odano I. et al. (2022). Ann Nucl Med, 36, 82–94.

Methods: 16 MCI subjects; 6 completed 24-week WBV (35–40 Hz, twice weekly). SPECT/CBF measured.

Results: Significant improvement in cognitive assessment and Mini-Mental State Examination. Increased regional CBF in parietal and occipital lobes.



SPECT brain images: rCBF ratio at baseline, after single WBV exercise, and after 24 weeks of WBV training — showing progressive improvement in parietal and occipital blood flow

■ WBV may increase cerebral blood flow in MCI patients and delay conversion to dementia.

Reduction of Disability in Cerebral Palsy

Ritzmann R., Stark C., Krause A. (2018). *Neuropsychiatr Dis Treat.* 14:1607–1625.

Systematic review; 28 studies: One acute VT session reduces reflex excitability, spasticity, and coordination deficits. Effects persist up to 30 minutes.

Long-term: Reduced muscle tone and spasticity; improved gross motor function, strength, gait, mobility, muscle mass, and bone-mineral density.

■ Acute and chronic VT application ameliorates CP symptoms and reduces physical disability and sensorimotor handicaps.

Improved Mobility in Children with Cerebral Palsy

Lee BK, Chon SC. (2013). *Clin Rehabil.* 27(7):599–607. PMID: 23411791

Methods: RCT; 30 CP children (15 WBV+PT, 15 PT only); 3x/week, 8 weeks.

Results: Significant improvements in gait speed (0.37→0.48 m/s), stride length, and cycle time. Tibialis anterior and soleus muscle thickness significantly increased.

■ WBV improves mobility in children with cerebral palsy through positive effects on leg muscles.

Multi-Mechanical Waves Against Alzheimer's Disease

Monteiro F. et al. (2021). *Transl Neurodegener.* 10(1):36. PMID: 34560902

Systematic review (37 papers): Mechanical vibrations effective in attenuating functional connectivity deficits, neuronal circuit integrity deficits, and cognitive decline in AD patients and older adults.

■ Mechanical vibrations including WBV attenuate multiple parameters of Alzheimer's disease pathology.

Neuropathy Relief — Diabetic & Chemo-Induced

Kessler NJ et al. (2020). J Bodyw Mov Ther. | Streckmann F. et al. (2019). Support Care Cancer.

Diabetic neuropathy (Kessler): WBV (n=12) vs sham (n=8); 4 weeks, 3x/week. VAS pain scores decreased significantly at 2 and 4 weeks. Pain reduction persisted 1–5 weeks after cessation.

Chemo-induced (Streckmann): WBV superior for pain reduction. Significant improvements in Achilles tendon reflex (P=.017), deep sensitivity (P=.010), and pain (P=.043).

■ WBV is effective for reducing both diabetic and chemotherapy-induced peripheral neuropathy pain.

6 JOINT PAIN, ARTHRITIS & PAIN RELIEF

Knee Osteoarthritis — Meta-Analysis

Zafar H. et al. (2015). *Arch Phys Med Rehabil.* 96(8):1525–32. PMID: 25827655

Methods: Meta-analysis; 83 studies identified, 5 met inclusion. 4 reached high PEDro quality.

Conclusions: Despite parameter variation, WBV training reduces pain and improves function in knee OA.

■ WBV reduces pain and improves function in knee osteoarthritis.

Relief from Knee OA — Comprehensive Meta-Analysis (14 RCTs)

Qiu CG. et al. (2022). *Journal of Rehabilitation Medicine*, 54.

Methods: 14 RCTs (559 knee OA patients); 10 in meta-analysis; duration 4–24 weeks.

Results: WBV + strengthening exercises: significant treatment effect on pain (SMD=0.46), WOMAC-function (SMD=0.51), TUG (SMD=0.82), extensor torque (P=0.05), peak power (P=0.001), isometric strength (P=0.006). No adverse events. Both low-frequency (10–30 Hz) and high-frequency (30–40 Hz) WBV effective.

■ WBV has additional positive effects on pain, knee extensor strength, and physical function beyond strengthening alone.

WBV Training Added to Strengthening for Knee OA

Bokaeian HR. et al. (2016). J Bodyw Mov Ther. 20(2):334–40. PMID: 27210851

Methods: ST group (n=13) vs ST + WBV (n=15); 3x/week, 8 weeks.

Results: ST+WBV improved 2-min walking test, muscle peak torque, total work, and muscle power (all $P < 0.05$).

■ Adding WBV to strengthening training provides better treatment effects for knee osteoarthritis.

Chronic Musculoskeletal Pain — Systematic Review & Meta-Analysis

Dong Y. et al. (2019). Arch Phys Med Rehabil. 100(11):2167–2178. PMID: 31004565

Methods: 16 RCTs pooled; chronic LBP, OA, fibromyalgia.

Results: Medium-term pain alleviation (SMD=-0.67). Long-term (SMD=-0.31). OA (SMD=-0.37, $P < 0.05$), CLBP (SMD=-0.44, $P < 0.05$). Long-term WBVE relieves OA pain (SMD=-0.46, $P < 0.05$).

■ Evidence supports positive WBVE effects on chronic musculoskeletal pain; longer duration is especially beneficial.

Treatment of Chronic Lower Back Pain

Rittweger J. et al. (2002). Spine. 27(17):1829–34. PMID: 12221343

Methods: 60 patients with chronic LBP (mean 13.1-year history); 3 months lumbar extension vs WBV; 6-month follow-up.

Results: Significant and comparable pain reduction in both groups. WBV group: +30.1 Nm/kg lumbar extension torque.

■ Well-controlled vibration may be the cure rather than the cause of lower back pain.

Nonspecific Low Back Pain — Proprioception

Zheng YL. et al. (2019). *Med Sci Monit.* 25:443–452. PMID: 30644383

Methods: 42 NSLBP patients; WBV 3x/week for 12 weeks.

Results: Flexion angle deviation: 3.65→1.90° (P=0.0001). Extension deviation: 3.06→1.61° (P=0.0001). Significant pain reduction (P=0.0001).

■ 12-week WBV significantly enhances lumbar proprioception and reduces pain in nonspecific low back pain.

Osteoporosis — Elimination with WBV

Verschueren S. et al. (2004). *J Bone Miner Res.* 19(3). KU Leuven, Belgium.

Methods: 90 postmenopausal women (58–70 yrs); WBV (≤30 min, 3x/week), conventional weight training (~60 min), or control; 6 months.

Results: WBV: strength increased up to 16% in upper leg muscles; hip bone density increased 1.5%. Improved postural control, balance, and lean mass; body fat decreased.

■ WBV increases bone mineral density, reverses bone loss, increases strength, and improves balance.

7 HEART HEALTH, CIRCULATION & GUT HEALTH

Managing Cardiovascular Diseases — Systematic Review

González I. et al. (2023). Journal of Bodywork and Movement Therapies.

Results: Different WBV protocols improved hemodynamic, cardiovascular, vascular/arterial, and muscle parameters in CVD patients acutely and chronically.

■ WBV is a safe and effective training resource for cardiovascular disease management.

Improved Circulation — Femoral Artery Blood Flow

Mark A., MacDonald M., Rakobowchuck M., Gordon C., Blimkie C. *Metabolic And Cardiovascular Responses During WBV: a pilot study.*

Methods: 6 healthy college-age females; 4 × 3-minute WBV stages at increasing challenge (Galileo 2000). HR, MAP, femoral artery flow, $\dot{V}O_2$, RPE measured.

Results: WBV resulted in increased femoral artery blood flow at highest challenge vs rest. No significant change in artery diameter or MAP. Trend toward increased $\dot{V}O_2$ ($P=0.07$).

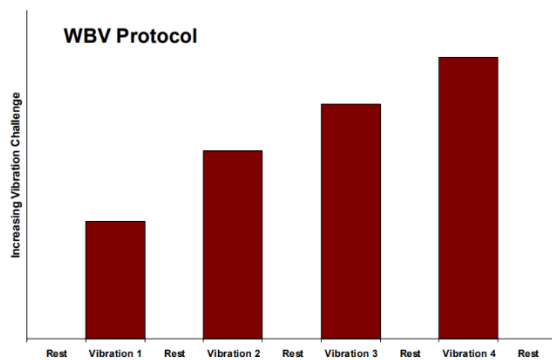


Figure 1: Schematic representation of the testing protocol

Figure 1: WBV Protocol — Schematic of testing protocol (4 increasing vibration challenges separated by rest)

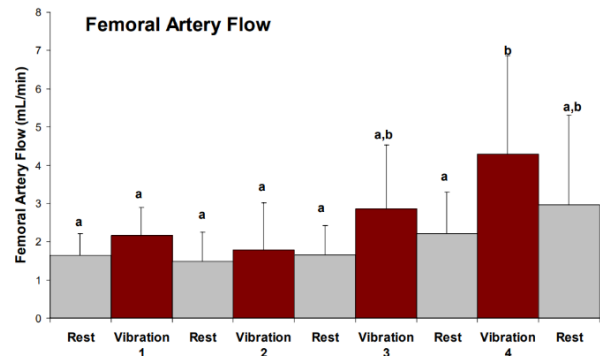


Figure 2: Influence of WBV on Femoral Artery Flow; Letters designate differences from Rest 1 ($p<0.05$)

Figure 2: Influence of WBV on Femoral Artery Flow — Significant increase at highest vibration challenge (b) vs Rest 1 ($P<0.05$)

■ Moderate WBV increases femoral artery blood flow without raising blood pressure.

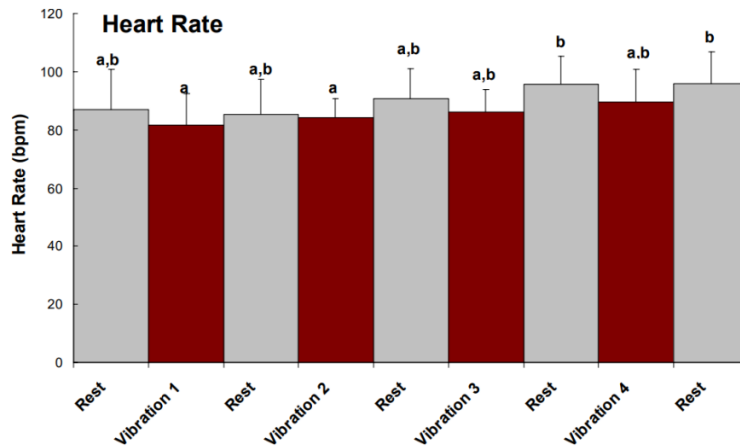


Figure 3: Influence of WBV on Heart Rate: Letters designate differences from Rest 1 (p<0.05)

Figure 3: Influence of WBV on Heart Rate — No significant elevation in heart rate during vibration stages vs rest, confirming cardiovascular safety

Varicose Veins / Chronic Venous Insufficiency

Klyszcz T. et al. (1997). Hautarzt. 48(5):318–22. PMID: 9303905

After 10 days of BMS (18–35 Hz vibration): ankle joint mobility improved 16–19°; venous ulcerations healed. 6 patients successfully treated.

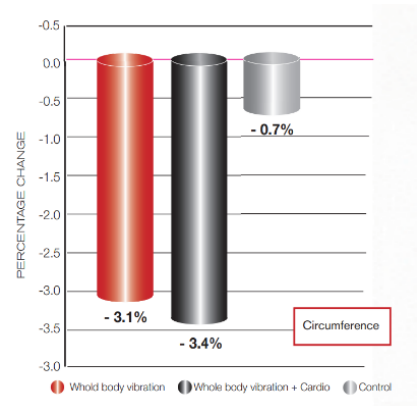
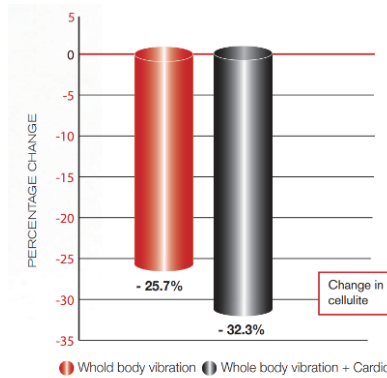
■ Vibration therapy improves mobility and aids healing in chronic venous insufficiency.

Reduction of Cellulite

Frank H., Moos B. (2004). SANADERM Professional Clinic, Bad Mergentheim, Germany.

Methods: 55 subjects; WBV group (2–3x/week, 8–13 min/session) vs WBV + cardio group; 6-month study.

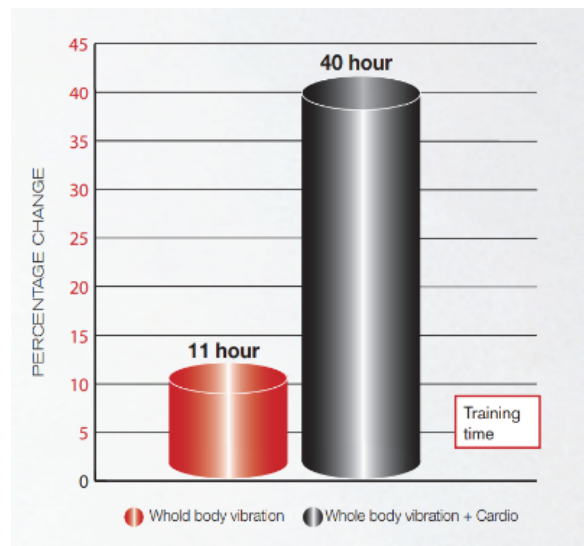
Results: WBV group: 25.7% reduction of cellulite. WBV + cardio group: 32.3% reduction.



Before/After: Visible cellulite reduction after 6-month WBV program

Figure 1: Change in cellulite levels (-25.7% WBV; -32.3% WBV+Cardio)

Figure 2: Change in buttock circumference (-3.1% WBV; -3.4% WBV+Cardio; -0.7% Control)



■ WBV training achieved a 25.7% reduction of cellulite in 6 months.

Anxiety and Insomnia

Tuomi J., Kuurne-Koivisto M., Partinen M. Helsingin Universiteit.

Methods: 16 adults with primary insomnia (ISI ≥ 15); 5 WBV sessions each group.

Results: ISI scores decreased; WHO-5 and EQ-5D improved. SCL-90 scores for anxiety, obsessive-compulsive, and somatization symptoms lowered.

■ WBV has beneficial effects for primary insomnia and also relieves anxiety.

Gut Health — Macrophage Polarization and Microbiome

Yu JC. et al. (2019). International Journal of Molecular Sciences. 20(13):3125.

Key findings: WBV caused M1→M2 macrophage polarization (anti-inflammatory shift). Restored M2 levels in T2DM mice to near-normal. Increased beneficial Bacteroides (genus Alistipes) in fecal microbiome by 17.75x.

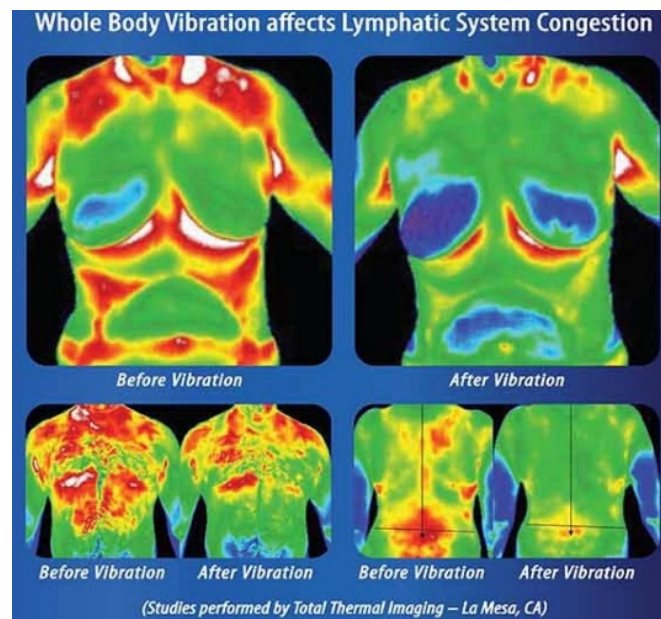
■ WBV improves metabolic status through anti-inflammatory macrophage polarization and beneficial microbiome changes.

Lymphatic Drainage — Lipedema

Rainer Schneider. (2020). *Physiotherapy Theory and Practice*, 36:1, 63–70.

Methods: 30 female lipedema (stage 2–3) patients; 6 treatments of MLD alone vs combined MLD + vibrotherapy.

Results: Very large superiority for combined treatment. Lipedema volume reduction effect sizes: $1.1 < d < 3.2$. Quality of life: $d = 1.0$.



Thermal imaging showing WBV effects on lymphatic system congestion — Before Vibration vs After Vibration (Studies performed by Total Thermal Imaging, La Mesa, CA)

■ Combining MLD with vibrotherapy drastically enhances the effectiveness of lipedema treatment.

8 SPINE HEALTH, DIABETES & BLOOD PRESSURE

WBV Intervention for Type-2 Diabetes — 12-Week RCT

del Pozo-Cruz B. et al. (2014). Maturitas, 77(1), 52–58.

Methods: 50 T2DM patients; 12-week WBV + standard care vs standard care only.

Results: HbA1c: -0.55% (95% CI -0.15 to -0.76). Fasting glucose: -33.95 mm/dl. Cholesterol, triglycerides, atherogenic index all reduced ($P < 0.05$).

■ 12-week WBV in primary care is feasible, safe, and effective for improving glycemic profile and cardiovascular risk in T2DM.

WBV in Older Adults with Type-2 Diabetes — Meta-Analysis

Gomes-Neto M. et al. (2019). Canadian Journal of Diabetes, 43(7), 524–529.

Methods: 7 studies (279 T2DM patients).

Results: WBV improved mobility (WMD -0.24 s), balance (SMD 2.34), and aerobic capacity (SMD 0.70). Improvements also in pain, blood flow, HbA1c, and fasting glucose.

■ WBV is a useful strategy for managing symptoms and disabilities associated with type 2 diabetes.

Glucose Level Decrease in Elderly Diabetic Women

Pessoa MF. et al. (2018). Rehabilitation Research and Practice, Article ID 3820615.

Methods: 14 elderly diabetic vs 15 healthy women; acute WBV session (10 × 2-min bouts, 35 Hz, 4 mm).

Results: Both groups decreased glycemic levels; most important results in diabetic women. WBV shown effective in acute session even for patients with poor exercise compliance.

■ Acute WBV significantly decreases glucose levels in elderly diabetic women.

Relief From Lumbar Spine Degeneration

Wang S. et al. (2017). Medical Engineering & Physics, 39, 83–93.

Results: Traction + vibration more effectively decreased intradiscal pressure. Lower stress concentration at posterior nucleus. Disc deformations improved. Grade 1 degeneration (~41–50 yrs) achieved best results.

■ Combining traction with vibration decompresses discs and spinal nerves, effectively relieving low back pain.

Reducing Blood Pressure and Arterial Stiffness

Figuroa A. et al. (2012). Hypertens Res. 35(6):667–72. PMID: 22357522 | Figuroa A. et al. (2014). J Hum Hypertens. 28(2):118–22.

2012 Study: 10 young overweight/obese women; 6-week WBV (3x/week, 25–30 Hz); brachial-ankle pulse wave velocity: -0.9 m/s; brachial SBP: -5.3 mmHg; leg extension 1RM: $+8.2$ kg.

2014 Study: Post-menopausal hypertensive and pre-hypertensive women. Significant reductions in arterial stiffness and systolic BP over 6 weeks. Even stroke survivors with paralysed lower limbs showed reduced BP.

Background: Pharmaceutical interventions for arterial stiffness are costly and complex. WBV provides a non-invasive reflexive alternative.

■ WBV is an effective treatment for decreasing cardiovascular risk in hypertensive and pre-hypertensive women.

9 OTHER AILMENTS & BENEFITS

Restless Legs Syndrome

Burbank F., Buchfuhrer MJ., Kopjar B. Journal of Parkinsonism and Restless Legs Syndrome.

Methods: Meta-analysis; 15 RCTs (3,455 patients); vibratory pads vs sham vs FDA-approved drugs.

Results: Sleep improvement greater with vibratory pads than sham (Hedges' $g=-0.39$, $P<0.02$). No significant difference vs FDA-approved drugs (-0.39 vs -0.44 , $P=0.70$). Equivalent adverse event rates.

■ Vibratory stimulation pads are more effective than sham and as effective as FDA-approved drugs for moderately severe RLS.

Improved Quality of Life in Women with Systemic Lupus

Lopes-Souza P. et al. (2021). Journal of Bodywork and Movement Therapies, 27, 191–199.

Methods: 21 SLE women; WBVE vs isometry; 2x/week, 12 weeks.

Results: Fatigue reduced at 6 weeks ($P=0.04$) and 12 weeks ($P=0.03$). Functional ability (HAQ) significantly improved ($P=0.03$).

■ WBVE is a useful intervention for controlling fatigue and improving functional ability in women with SLE.

WBV for Fibromyalgia — Systematic Review & RCT

Collado-Mateo D. et al. (2015). *Evidence-Based Complementary and Alternative Medicine*, Article ID 719082. | Alev A. et al. (2017). *Complementary Therapies in Clinical Practice*, 28, 200–203.

Systematic review (8 studies): WBV improved balance, disability index, HRQOL, fatigue, and pain (Dutch CBO B-level evidence).

RCT (20 FM patients): 4-week WBV at 30 Hz, 2 mm. FIQ score significantly better at 6-month evaluation (P=0.043).

■ WBV is an adequate treatment for fibromyalgia as main therapy or adjunct to physical exercise.

COPD — Exercise Capacity

Gloeckl R., Heinzelmann I., Kenn K. (2015). *Chron Respir Dis*. 12(3):212–21. PMID: 25904085

Methods: Systematic review; 6 studies included. All RCTs reported significantly superior benefit on 6-minute walking distance in WBVT group.

■ WBVT is an effective exercise modality to improve functional exercise capacity in COPD patients.

WBV Stimulates Stem Cells & Has Anti-Inflammatory Effects

Alghadir AH et al. (2016). *RCT, adults with metabolic syndrome*. | Jawed Y. et al. (2020). *Military Medicine*, 185(Supplement 1), 404–412.

Stem cells (Alghadir): 12-week WBV (3x/week, 20 min) significantly upregulated CD34 (hematopoietic stem cell marker) expression. No significant changes in control group.

Anti-inflammatory (Jawed): WBV alone increased circulating progenitor cells 33% in younger participants (P=0.02). Anti-inflammatory IL-10 increased significantly (P<0.03). Inflammatory IL-6 decreased (P=0.056).

■ WBV has positive vascular and anti-inflammatory effects; modulates stem cell markers and serves as an exercise surrogate.

WBV for Cancer Patients During Intensive Chemotherapy

Pahl A. et al. (2018). BMC Cancer. 18(1):920. PMID: 30253746

Methods: 20 hospitalised haematological malignancy patients; WBV (IG) vs cycling control (CG); similar compliance (~62–67%).

Results: IG improved jump height (+2.3 cm, $P=0.028$) and TUG performance (−1.3 s, $P=0.027$). No worsening of side effects or blood pressure increase.

■ WBV is feasible during intensive chemotherapy and produces functional benefits relevant to patients' autonomy.

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