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Table 4a. Overview of studies included on long-term exercise

Author and year	Purpose	Type of study	Subjects	Exercise	Results on muscle performance	Specification of vibration exercise	Specification of muscle performance
Bautmans et al. (2005)	Investigate the effects of 6 weeks of WBVE on linear isokinetic leg extension	Randomized-controlled trial Two groups: 1. WBVE 2. Static exercise	Twenty-four nursing home residents (15 female, nine male, mean age 77.5 ± 11.0)	WBVE in a progressive program using various light exercises. 1–3 × 30–45 s	No significant differences between groups regarding muscle strength or power	A: 2–5 mm F: 30–40 Hz S: 8	Closed chain bilateral leg extension. Linear isokinetic multi-joint dynamometer
Bosco et al. (1998)	Investigate the effects of 10 days of WBVE on jumping performance	Randomized controlled trial Two groups: 1.WBVE 2. Control	14 physically active subjects (age 19–21)	WBVE in various defined postures90 s2 minposition (10 min daily)	Power output, height of best jump and mean jump height in continuous jumping significantly improved (6–12%)	Acc: 54 m/s^2 A: 10 mm F: 26 S: 9	Countermovement jump and continuous jump. Measured on a contact mat
Cochrane et al. (2004)	Investigate effects of 9 days of WBVE on vertical jump, sprint and agility performance	Randomized-controlled trial Two groups: 1.WBVE 2. Control	Twenty-four healthy active (16 men) mean age 23.9 ± 5.9	WBVE exercise for 9 days (5 days training, 2 days recovery, and further 4 days of training) in standardized positions	No significant differences between groups	A: 11 mm F: 26 S: 7 (direction and type not specified)	Countermovement jump, concentric squat jump, sprint tests and agility (505, up and back test)
Delecluse et al. (2003)	Investigate and compare the effects of a 12-week period of WBVE and resistance training on human knee-extensor strength	Randomized-controlled trial Four groups: 1. WBVE 2. Resistance 3. Placebo 4. Control	Sixty-seven untrained females (21.4 ± 1.8 years)	Progressive WBVE with static and dynamic knee-extensor exercise (three times per week: 3–20 min/session)	Static and dynamic knee-extensor strength increased significantly (P<0.001). Static 17% and dynamic 9% Countermovement height enhanced significantly (P<0.001) with 7.6%. No improvement in ballistic strength	Acc: 2.3–5.1 *g* A: 2.5–5 mm F: 35–40 Hz S: 9	Isometric and isokinetic strength tests, ballistic strength and countermovement jump height
Delecluse et al. (2005)	Investigate the effects of a 5-week training period of additional WBVE	Randomized-controlled trial Two groups: 1. WBVE 2. Control group	Twenty-five sprint-trained athletes,18 male, aged 17–30 years	Unloaded static and dynamic standard leg exercises on a vibration platform. The program was progressive, 3 × 6 exercises between 30 and 60 s with rest periods three times per week	No change in isometric and dynamic muscle strength regarding knee-extensors and knee-flexors No significant difference in maximal knee extension velocity No significant difference in jump performance	Acc: 2.3–5.1 *g* A: 1.7–2.5 mm F: 35–40 Hz S: 7 (damping, direction and type not specified)	Isometric and isokinetic tests recorded on a motor-driven dynamometer Velocity recorded on a dynamometer from various angles Vertical countermovement jump (CMJ) with hands positioned on the waist. Obtained flight time calculated

							from contact mat
de Ruiter et al. (2003b)	Investigate the effects of 11 weeks of WBVE on muscular performance	Controlled trial Two groups: 1.WBVE 2. Control	Twenty healthy students (12 male) mean age 19 and 20 (exp resp control group)	Progressive WBVE without additional loads, three times per week, between five and eight sets of 1 min	No improvement of MVC. No change in jump height compared with the control group	A: 8 mm F: 30 Hz S: 7 (damping, type and direction not specified)	Maximal isometric force production (MVC), maximal of voluntary force rise (MFGC), countermovement jump height
Roelants et al. (2004a)	Investigate effects of 24 weeks of WBVE on knee-extension strength and speed of movement and on countermovement jump performance	Randomized-controlled trial Two groups: 1.WBVE 2. Resistance training 3. Control	Eighty-nine post-meno-pausal women, aged 58–74 years	Progressive WBVE three times per week (maximum 30 min/session) with static and dynamic knee extensor training. The other group performed dynamic leg press and leg extension	Static and dynamic knee extensor strength increased significantly (P<0.001) and also speed of movement, but there were no differences between training groups. Increased countermovement jump height (P<0.001). These changes were observable already after 12-weeks training	Acc: 2.3–5.1 *g* A: 2.5–5.0 mm F: 35–40 Hz S: 9	Knee extension isometric strength, dynamic strength and speed of movement. Countermovement jump performance
Roelants et al. (2004b)	Investigate and compare the effects of 24 weeks of WBVE and fitness training on body composition and muscle strength	Controlled trial Three groups: 1.WBVE 2. Fitness 3. Control	Forty-eight untrained females (21.3 ± 2.0 years)	Progressive WBVE combined with light movements (3–20 min/session). Training group followed a standardized cardiovascular and resistance training program	A significant strength gain in both exercise groups (P<0.001) compared with a control group. WBVE group increased their strength by 7–25%	Acc: 2.3–5.1 *g* A: 2.5–5.0 mm F: 35–45 Hz S: 5 (type and direction specified by manufacturer? posture, damping and vibration source not specified)	Knee-extensor strength evaluated by isometric and isokinetic tests
Russo et al. (2003)	Investigate effects of 6 months of WBVE on muscle power and bone characteristics	Randomized-controlled trial Two groups: 1. WBVE 2. Control	Twenty-nine post-menopausal women (mean age 61 ± 7 years)	Progressive WBVE. Three 2-minute sessions for a total of 6 min/training session, twice weekly	Muscle power increased by about 5% (P=0.004) after 6 months	F: 12–28 Hz S: 6 (magnitude, damping and type not specified)	Muscle power calculated from ground reaction forces of a force platform produced by jumping as high as possible (before take-off)
Rönnestad (2004)	Compare effects on squats performed on a vibration platform (with and withourt vibration) for 5 weeks	Randomized-controlled trial Two groups: 1. WBVE+squat 2. Squat	Sixteen recreationally resistance-trained men (21–40 years)	Squats on a vibration platform (6–10 RM), two to three times per week with and without vibration. Increasing external loads were encouraged	1 RM and countermovement jump increased significantly in both groups. No differences between groups	F: 40 Hz S: 5 (damping, magnitude, direction and type not specified)	Maximum squat (1 RM) on a Smith machine. Countermovement jump (flight time)
Salvarani et al. (2003)	Investigate the effects of 2 weeks of WBVE	Randomized-controlled trial Two groups: 1. WBVE 2. Isometric training	Twenty subjects (17 males) with reconstructed anterior cruciate ligament, mean age 26–29 years	WBVE, 10 sessions, five 1-minute sessions daily with 1 min rest between	Increase in muscle strength among the WBV group (28%) (P<0.005)	F: 30 Hz S: 5 (damping, magnitude, direction and type not specified)	Isometric contraction for 5 s for oblique medial vastus, biceps femoris and soleus. Force measured by a load cell
Torvinen et al. (2002b)	Investigate effects of a 4-month WBVE on	Randomized-controlled trial	Fifty-six healthy non-athletic	Progressive WBVE with 4 min sessions, 3–5 times per week combined with	A 10.2% (P=0.001) improvement in	Acc: 2.5–6.4 *g* A: 2 mm	Jump height (CMJ), maximal isometric strength

	muscle performance and body balance	Two groups: 1. WBVE 2. Control	subjects (21 men) aged 19–38 years	light exercises	jump height, 3.7% (P=0.034) improvement in lower limb strength after 2 months; however, it diminished by the end of the 4month intervention	F: 25–40 Hz S: 9	of the leg extensors
Torvinen et al. (2003)	Assess effects of an 8-month WBVE on bone, muscular performance and body balance	Randomized-controlled trial Two groups: 1. WBVE 2. Control	Fifty-six non-athletic subjects (21 men) aged 19–38 years	Progressive WBVE (4 min/day, 3–5 times per week) combined with light movements	7.8 % net benefit in the vertical jump height (P=0.003). Isometric lower limb strength not improved	A: 2 mm F: 25–45 Hz S: 8 (type not specified)	Maximal isometric strength of leg extensors, vertical countermovement jump test
Verschueren et al. (2004)	To assess musculoskeletal effects of 6 months of high-frequency WBVE	Randomized-controlled trial Three groups: 1. WBVE 2. Resistance 3. Controls	Seventy post-meno-pausal women (60–70 years)	Progressive WBVE three times per week (duration per session maximum 30 min) combined with knee-extensor exercise (static and dynamic)	Vibration exercise improved isometric and dynamic muscle strength (15–16%, P<0.01)	Acc: 2.3–5.1 g A: 1.7–2.5 mm F: 35–40 Hz S: 8 (direction not specified)	Isometric and isotonic strength tests of knee extensors

WBVE, whole-body vibration exercise; Acc, acceleration; A, amplitude; F, frequency; S, score from the evaluation of vibration exercise (maximum=9); g, earth acceleration (9.81 m/s^2).

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