Vibration Studies and Magazine Articles

Peer Review Study

1 Effect of gaze on postural responses to neck proprioceptive and vestibular stimulation in humans
Yuri P. Ivanenko, Renato Grasso and Francesco Lacquaniti

One of the most important problems the brain has to solve for governing the interaction between the personal and extrapersonal space is the formation of the appropriate reference frame for sensory—motor transformations.

Peer Review Study

2 The anabolic activity of bone tissue, suppressed by disuse, is normalized by brief exposure to extremely low-magnitude mechanical stimuli.
Clinton Rubin,1 Gang Xu, and Stefan Judex

It is generally believed that mechanical signals must be large in order to be anabolic to bone tissue. Recent evidence indicates, however, that extremely low-magnitude mechanical signals readily stimulate bone formation if induced at a high frequency. We examined the ability of extremely low-magnitude, high-frequency mechanical signals to restore anabolic bone cell activity inhibited by disuse.

Peer Review Study

3 Acute physiological effects of exhaustive whole-body vibration exercise in man
J. Rittweger1, G. Beller and D. Felsenberg

Vibration exercise (VE) is a new neuromuscular training method which is applied in athletes as well as in prevention and therapy of osteoporosis. The present study explored the physiological mechanisms of fatigue by VE in 37 young healthy subjects resistant to standard treatment.

Peer Review Study

4 Biomechanical Countermeasure for Disuse Osteopenia
Rubin, Clinton

Osteoporosis, the progressive loss of bone density and strength which cripples tens of millions on our planet, distinguishes itself as perhaps the greatest physiologic obstacle to an extended human presence in space. The principal objectives of this proposal are to establish the efficacy of a unique, biomechanical countermeasure to inhibit bone loss in an animal model of disuse osteoporosis, and correlate this regulatory influence to the expression patterns of several genes critical to bone formation and resorption.
Peer Review Study

5 Effect of 6-Month Whole Body Vibration Training on Hip Density, Muscle Strength, and Postural Control in Post-menopausal Women: A Randomized Controlled Pilot Study  Sabine MP Verschueren, Machteld Roelants, Christophe Delecluse, Stephan Swinnen, Dirk Vanderschueren, and Steven Boonen 4

High-frequency mechanical strain seems to stimulate bone strength in animals. In this random-ized controlled trial, hip BMD was measured in post menopausal women after a 24-week wholebody vibration (WBV) training program.

Cross Over Study

7 Effect of 4-min Vertical Whole Body vibration on Muscle Performance and Body Balance: A Randomized Cross-Over Study  S. Torvinen

The purpose of this randomized crossover study was to investigate the effects of a 4 min long 2-mm vertically-virating vibration exercise on muscle performance and body balance in healthy subjects.

Research Article

9 The influence of vibration on muscle activation and rate of force development during maximal isometric contractions. Brendan Humphries, Geoff Warman, Jason Purton, Tim L. A. Doyle and Eric Dugan

The aim of this study was to address this issue by examining the effects of a superimposed muscle/tendon vibration on muscular activation and maximal isometric contraction. Sixteen participants with a mean age, body mass, and height of 22 ± 4.4 years, 73.2 ± 11.7 kg and 173.1 ± 9.7 cms, respectively, were recruited for this study. Electromyography and accelerometry from the rectus femoris, and maximal isometric force data characteristics were collected from the dominant limb under conditions of vibration, and no-vibration.

Study

10 Initial and Treatment induced Changes to Muscle Activation Patterns in Patients with Adolescent Idiopathic Scoliosis Compared to the Frontal Plane Spinal Configuration as Measured with Surface Electromyography  Raymond Wiegand, D.C.

The purpose of this study is to report paraspinal muscle activity patterns in adolescent idiopathic scoliosis (AIS) patients in comparison to the frontal plane spinal configuration and to report changes to the muscle activity resulting from a multi-factorial treatment program that includes chiropractic manipulation.
Study

11 **New trends in training science: the use of vibrations for enhancing performance** Carmelo Bosco, Marco Cardinale, Olga Tsarpela and Elio Locatelli

The adaptive responses of the human body to training stimuli have been investigated in depth over the past few years. Thanks to the research carried out in different parts of the world, we know that the adaptation to the training stimulus is related to the modification induced by the repetition of daily exercises, which are specific to the movements executed. These adaptations are related to the fact that human skeletal muscle is a specialized tissue, which modifies its overall functional capacity in response to regular exercise with high loads.

Magazine Article

**Journal of Strength and Conditioning Research, 2005**

12 **Vibration Training: An Overview of the Area, Training Consequences, and Future Considerations**
Matthew J. Jordan

The effects of vibration on the human body have been documented for many years. Recently, the use of vibration for improving the training regimes of athletes has been investigated. Vibration has been used during strength training movements such as elbow flexion, and vibration has also been applied to the entire body by having subjects stand on vibration platforms. Exposure to whole-body vibration has also resulted in a significant improvement in power output in the postvibratory period and has been demonstrated to induce significant changes in the resting hormonal profiles of men than full body weight.

Study

14 **New Insights about the Relationship between Bone Strength and Muscle Strength**
H. Schiebl, J. Willnecker Ph.D.

Postmenopausal bone loss is regarded as a main factor for increased fracture risk in women. Estrogen supplementation is commonly used to prevent this bone loss. But the effects of increased estrogen secretion on bone in girls at puberty have not been well described.

Study

15 **Balance training and exercise in geriatric patients**
M. Runge, G. Regfeld

Objective measures of gait and balance which meet the criteria of reliability and validity are required exercise regimes. We established reference values of clinically relevant locomotor and balance performances for geriatric patients. We are using these data for evaluating the effects of different therapeutic approaches to locomotors and balance disorders.
Study

16 Hormonal Responses To Whole-Body Vibration In Men
Carmelo Bosco

The aim of this study was to evaluate the acute responses of blood hormone concentrations and neuromuscular performance following whole-body vibration treatment.

Study

17 Whole body vibration exercise leads to alteration
K. Kerschan-Schindl

Occupationally used high-frequency vibration is supposed to have negative effects on blood flow and muscle strength. Conversely, low frequency vibration used as a training tool appears to increase muscle strength, but nothing is known about its effects on peripheral circulation.

Study

19 Oxygen uptakes during whole-body vibration exercise: comparison with squatting as a slow voluntary movement
Jorn Rittweger

In this study we investigated metabolic power during whole-body vibration exercise. Specific oxygen consumption and subjectively perceived exertion were assessed in 12 young health subjects.

Study

23 Adaptive responses of human skeletal muscle to vibration exposure
Carmelo Bosco

The aim of this study was to investigate the effects of whole-body vibration on the mechanical behavior of human skeletal muscle. Six female volleyball players were the test subjects.

Controlled Trial

24 Treatment of chronic lower back pain with lumbar extension and whole-body vibration exercise
Jorn Rittweger

Chronic lower back pain involves muscular as well as connective and neural systems. Different types of physiotherapy are applied for its treatment. Industrial vibration is regarded as a risk factor. Recently, vibration exercise has been developed as a new type of physiotherapy. It is thought to activate muscles via reflexes. In this study, 60 patients with chronic lower back pain devoid of specific spine diseases, with a mean age of 51.7 yr and a pain history of 13.1 yr practiced either isodynamic lumbar extension or vibration exercise for 3 months.
Study 25 Influence of vibration on mechanical power and electromyogram activity in human arm flexor muscles
Carmelo Bosco

The aim of this study was to evaluate the influence of vibration on the mechanical properties of arm flexors. A group of 12 international level boxers, all members of the Italian national team, voluntarily participated in the experiment: all were engaged in regular boxing training. At the beginning of the study they were tested whilst performing forearm flexion with an extra load equal to 5% of the subjects' body mass.

Study 26 Short term effects of whole-body vibration on maximal voluntary isometric knee extensor force and rate of force rise.
C.J. de Ruiter

Whole-Body vibration may lead to muscle contractions via reflex activation of the primary muscle spindle. WBV has been reported to increase muscle power in the short term by improved muscle activation. The present study set out to investigate the acute effects of a standard WBV training session on voluntary activation during maximal isometric force production and maximal rate of force rise of knee extensors.

Study 27 Acute and residual effects of vibratory stimulation explosive strength in elite and amateur athletes
V.B. Issurin

Fourteen elite and 14 amateur athletes were subjected to vibratory stimulation during bilateral biceps curl exercises of explosive strength exertion. The athletes performed two separate series of three sets of exercises in random order. The second set of one series was administered with superimposed vibration of 44 Hz and an acceleration of about 30 m/s^2 transmitted through the two-arms handle to the arm muscles. The mechanical power of each repetition was measured by the ‘Power Teach’ instrument.

Study 29 The influence of whole body vibration on jumping performance.
Carmelo Bosco

The effects of Whole-Body vibration on the mechanical behavior of human skeletal muscles were studied in 14 physically active subjects randomly assigned to the experimental or control group. The experimental group was subjected to 5 sets of vertical sinusoidal vibration lasting up to 2 min each, for 10 min daily for a period of 10 days.
Study

31 The effects of vibration on human performance and hormonal profile.
Marco Cardinale

Intensive prolonged strength training is known to induce a specific, neuromuscular and hormonal adaptive response in the human body in few months, while the changes in the morphological structure occur later. The aim of this work was to study the effects of vibrations on human performance and hormonal profile and to provide further information for applying vibration exercise in the athletic setting.

Study

32 Whole-body vibration exercises in the elderly people
K. Miyamoto

Although exercise is considered to prevent fall by maintaining muscle power and balance and functional fitness, many old subjects are unable to exercise effectively. The aim of this study is to investigate the effects of the Whole body vibrations (WBV) in the elderly people. These results suggest that WBV possibly prevents fall and femoral neck fracture by improving standing balance in elderly subjects.

Study

34 Effect of Whole Body Vibration Stimulus and Voluntary contraction on Motoneuron Pool
Yoshiaki Nishihira

It is a problem that the elderly cannot perform hard muscular training using weight training machines, because of decreased muscular strength due to aging. The subjects are requested to consciously maintain isometric contraction of the legs in order to oppose the whole body vibration stimulus.

Study

35 Effect of a vibration exposure on muscular performance and body balance. Randomized cross-over study
Saila Torvinen

This randomized cross-over study was designed to investigate the effects of a 4-min vibration bout on muscle performance and body balance in young, healthy subjects. Six performance tests (stability platform, grip strength, isometric extension strength of lower extremities, tandem-walk, vertical jump and shuttle run) were performed 10 min before (baseline), and 2 and 60 min after the intervention. The effect of vibration on the surface electromyography (EMG) of soleus, gastrocnemius and vastus lateralis muscles was also investigated.
Study

37 Effect on muscles of mechanical vibrations produced by the Galileo 2000 in combination with physical therapy in treating female stress urinary incontinence
S. von der Heide

A prospective randomized study was performed to determine whether intensive vibration training (1-4) using the Galileo 2000 in combination with physical therapy improves the continence rate in women with urodynamically proven stress urinary incontinence. The influence on the pelvic floor muscles and the therapeutic effect on stress incontinence were investigated.

Study

39 Efficacy of training program for ambulatory competence in elderly women
Jun Iwamoto

The optimal prevention of osteoporotic fractures in the elderly consists of increasing the bone density and preventing falls. The mean age of the participants was 72.8 years (range, 61–86 years). After 3 months of training, the step length, knee extensor muscle strength, and maximum standing time on one leg were significantly increased, while the walking speed and hip flexor muscle strength were not significantly altered. During the study period, no serious adverse events such as new vertebral fractures or adverse cardiovascular symptoms were observed in any participant. The present preliminary study shows that our training program may have the potential to promote ambulatory competence in elderly women.

Study

40 Acute changes in neuromuscular excitability after exhaustive whole body vibration exercise as compared to exhaustion by squatting exercise
Jörn Rittweger

The effects of hard squatting exercise with and without vibration on neuromuscular function were tested in 19 healthy young volunteers. Before and after the exercise, three different tests were performed: maximum serial jumping for 30 s, electromyography during isometric knee extension at 70% of the maximum voluntary torque, and the quantitative analysis of the patellar tendon reflex. After the exercise, comparable effects were observed on jump height, ground contact time, and isometric torque. It is followed that in exercise unto comparable degrees of exhaustion and muscular fatigue, superimposed 26 Hz vibration appears to elicit an alteration in neuromuscular recruitment patterns, which apparently enhance neuromuscular excitability. Possibly, this effect may be exploited for the design of future training regimes.
Study

41 Controlled Whole body Vibration to Decrease Fall risk and Improve Health-Related Quality of Life of Nursing Home Residents
Olivier Bruyere

To investigate the effects of whole body vibration in the elderly, we assessed gait and body balance using Tinetti test, motor capacity and health related quality of life. After six weeks the vibration group improved by 3.5 points. Controlled whole body vibration can improve elements of fall risk and HRQOL in elderly patients.

Study

42 The Role of Vibratory Massage on Treating Delayed Onset Muscle Soreness.
Carmelo Bosco

Unaccustomed exercise, especially eccentric contractions, may result in delayed onset muscle soreness (DOMS). It may result in pain, stiffness, reduced range of motion, sarcomere disruption, reduced force generating capabilities, swelling and increased creatine kinase (CK) release. Treating or even preventing DOMS may have large implications to athletes. Studies that have aimed to treat delayed onset muscle soreness have found mixed results using several methods such as massage, cryotherapy, electro-stimulation therapy.

Study

48 Comparing the Performance-Enhancing Effects of Squats on A Vibration Platform With Conventional Squats in Recreationally Resistance-Trained Men
Bent R. Rønnestad

The purpose of this investigation was to compare the performance-enhancing effects of squats on a vibration platform with conventional squats in recreationally resistance-trained men. The subjects were 14 recreationally resistance-trained men (age, 21–40 years) and the intervention period consisted of 5 weeks. After the initial testing, subjects were randomly assigned to either the “squat whole body vibration” (SWBV) group (n = 7), which performed squats on a vibration platform on a Smith Machine, or the “squat” (S) group (n = 7), which performed conventional squats with no vibrations on a Smith Machine.

Study

49 The Short-Term Effect of Whole-Body Vibration Training on Vertical Jump, Sprint, and Agility Performance
Darryl J. Cochrane

Previous studies have suggested that short-term whole-body vibration (WBV) training produces neuromuscular improvement similar to that of power and strength training. However, it is yet to be determined whether short-term WBV exposure produces neurogenic enhancement for power, speed, and agility.
Study

50 Mechanical Stimulation in the Form of Vibration, Prevents Postmenopausal Bone Loss in Ovariectomized Rats
J. Flieger

Physical exercise is recommended for the prevention and treatment of osteoporosis. However, its exact role and effectiveness in adulthood is unclear. While vigorous exercise of long duration enhances bone density, few adult individuals comply with such training programs. The present study evaluates the influence of non-physiological mechanical stimulation, in the form of low intensity vibration (frequency: 50 Hz, acceleration: 2 g, 30 min/day for 5 days/week) on the prevention of bone loss in an animal model of postmenopausal osteoporosis.

Study

O. Schuhfried

To examine whether a whole-body vibration (mechanical oscillations) in comparison to a placebo administration leads to better postural control, mobility and balance in patients with multiple sclerosis. Compared with the placebo group the intervention group showed advantages in terms of the Sensory Organization Test and the Timed Get Up and Go Test at each time point of measurement after the application. The effects were strongest one week after the intervention, where significant differences for the change score were found for the Timed Get Up and Go Test with the mean score reducing from 9.2 s to 8.2 s one week after whole-body vibration and increasing from 9.5 s to 10.2 s one week after placebo application.

Study

56 Whole-body vibration slows the acquisition of fat in mature female rats
Gianni F. Maddalozzo

To evaluate the effects of whole-body vibration on fat, bone, leptin and muscle mass. There were significant body composition differences between the whole-body vibration and the control group. The whole-body vibration group weighed approximately 10% less and had less body fat, a lower percentage of body fat, and lower serum leptin levels than the age-matched controls. No differences were observed for total lean mass, bone mineral content, bone mineral density, insulin-like growth factor-I or soleus and extensor digitorum longus mass or function.
Research Article

60 Vibration Exercise and Weight Loss: Getting Past the Hype
Jasper Sidhu

Most of the patients that present were prescribed exercise. This could be in the form of an easy walking program, to joining a gym. However, most of the patients also had medically associated conditions that prevented them from engaging in any exercise program. Their knees hurt when they walked too much. Or they presented to my office with fibromyalgia, which limited them from engaging in an exercise program. You can consider vibration exercise as a very effective early adoption of exercise. The platforms have many therapeutic benefits, from increased circulation to increased flexibility and strength. The most important thing is that there is minimal stress to the joints and ligaments. A patient can start on a very low frequency setting and steadily progress without placing more demands on their joints.

Study

61 The effects of hormone replacement therapy and resistance training on spine bone mineral density in early postmenopausal women.
Gianni F. Maddalozzo

This study evaluated the additive effects of hormone replacement therapy and a 1-year site-specific resistance-training program involving two free weight exercises (i.e., squat and deadlift) 2 days/week as a strategy to reverse or attenuate bone loss at the lumbar spine in early postmenopausal women. In conclusion, resistance-training alone was as effective as hormone replacement therapy in preventing bone loss at the spine and was more effective than hormone replacement therapy alone in attenuating bone loss at the spine. Moreover, there was no additional benefit in combining hormone replacement therapy with resistance-training for preventing bone loss at the spine in this group of early postmenopausal women.

Study

62 Can Whole body vibration Plus Exercise Improve Functional Deficits in Post Hip Surgery Patients
Gianni F. Maddalozzo

Whole body vibration resulted in significant statistical difference among the three experimental groups with respect to outcome measures of balance, lower limb power, and physical performance. These findings suggest that whole body vibration training may have potential beneficial effects on of balance, lower limb power, and physical performance in individuals having undergone hip replacement surgery. Low risk makes whole body vibration training a beneficial, well-tolerated supplement to exercise interventions intended to accelerate recovery from functional deficits in older adults following surgery.
Study

63 Effects of Whole Body Vibration on bone Mineral Density in post Hip Surgery Patients

Gianni F. Maddalozzo

The inactivity associated with recovery from bone fracture can have long term negative effects on musculoskeletal health. To minimize these effects, whole body vibration has been proposed as a safe, effective, and lower-load activity option. A significant group main effect was observed for spine bone mineral density and a significant time main effect was observed for body composition.