

# HEALTHCARE APPLICATIONS OF POWER PLATE® - A SCIENTIFIC REVIEW



# INTRODUCTION

Healthcare applications of Whole Body Vibration (WBV) have been researched and published by internationally renowned scientists in Europe, USA and Asia.

A rich bibliography of thousands of papers on Whole Body Vibration has emerged from this work.

This comprehensive review of the most compelling scientific literature provides an up-to-date analysis of Whole Body Vibration and its various applications, which are no longer limited to only the fitness arena but also highly relevant in healthcare settings. Power Plate has emerged, through the experience and knowledge achieved over years of application, as a new mode of physical exercise applicable not only to healthy adults, but also to patients who suffer from a variety of ailments, such as neuromuscular disorders and debilitating physical conditions.

This brochure is divided into 5 main categories based on the principal WBV applications. Studies relating to the application within children and adolescent population groups can also be found within these sections.

**1** In healthy subjects Whole Body Vibration improves both physical and cardiovascular health as a form of “preventive medicine” from pathologies related to a sedentary lifestyle.

**2** In a rehabilitation setting, Whole Body Vibration offers a new therapy to users regardless of age or physical condition.

**3** In symptomatic treatments, Whole Body Vibration provides a non-invasive, non-pharmacologic alternative technique with no side effects, for conditions often lacking other treatments.

**4** In post-menopausal women, Whole Body Vibration provides a safe and therapeutic alternative to specific concerns related to this stage of a woman's life.

**5** For seniors, both men and women - whether they

are ‘younger’ seniors, wishing to maintain physical fitness or older seniors wanting to maintain their independence - Whole Body Vibration helps with the main challenges related to aging.

Power Plate delivers a harmonic triplanar movement which provides a safe and authentic stimulus mimicking the effects of micro-hits of gravity and ground reaction forces on the body.

The safe application of Power Plate training as an intervention has resulted from years of evidence based practice and observation of the physiological effects of Whole Body Vibration on the body.

Literature research into possible negative side effects has found only one instance out of tens of millions of sessions delivered world-wide - where 1 study in 2007 found a case of renal lithiasis - this study was not performed on a Power Plate machine.

In addition, a study conducted by three independent investigators showed there was no scientific connection between the occurrence of spinal pain and the practice of Whole Body Vibration. Conversely, it has been demonstrated that an adapted protocol of Power Plate training can improve the pain perception of chronic low back pain sufferers.

In 2009, Power Plate received Class IIa Medical Device certification (MDD) in the EU.

Doctor Catherine Bailleul, July 2016



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# 1| MAINTAINING HEALTH


PHYSICAL PERFORMANCE, CARDIOVASCULAR HEALTH, PREVENTIVE MEDICINE

## PERIPHERAL CIRCULATION

Cutaneous Blood Flow, Blood Circulation, Cutaneous Massage, Wound Healing, Passive Vibrations

**TITLE :** The effects of Whole Body Vibration on lower extremity Skin Blood Flow in normal subjects

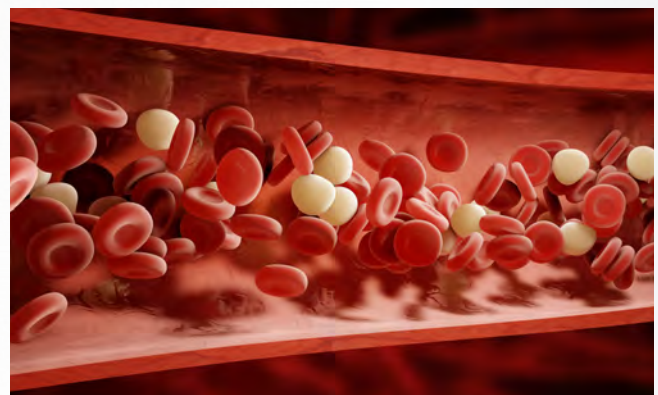
**AUTHORS :** LOHMAN, PETROFSKY, MALONEY-HINDS, BETTS-SCHWAB & THORPE

**LOCATION OF STUDY :** Department of Physical Therapy, Loma Linda University, CA (USA) 

**PUBLICATION REFERENCE :** Medical Science Monitor 2007; 13(2): CR 71-76

The study included 45 healthy volunteers, including 22 women, with median age 23.93 years (18-43 years). The subjects were divided into 3 groups of 15 each: 1 group combined exercise with Whole Body Vibration (WBV), 1 group received WBV only, with sessions lasting 60 seconds on the Power Plate, and 1 group performed only exercise.

Results of the study suggest that short WBV sessions performed on Power Plate can significantly increase peripheral blood circulation for at least 10 minutes after the end of the vibration.



“Significant and prolonged increase in cutaneous blood flow.”

## AEROSPACE MEDICINE

As early as 1970 Russian cosmonauts applied the benefits of Whole Body Vibration training:

- during their physical and mental preparation for space flight
- during intensive space mission flight training, in order to preserve their good mental and physical conditioning and to limit the negative effects of prolonged exposure to a micro-gravity environment (sarcopenia, osteoporosis, etc.)

During spaceflight, cosmonauts had to perform a scheduled 2.5 hours of exercises each day. By applying vibration, the exercise sessions could be reduced to 30-45 minutes per day for the same results, allowing cosmonauts to spend more time on their many other on-board tasks.

- On their return to earth vibration training was used to facilitate rehabilitation of the acquired muscular weakness and walking disorders that had been incurred.






## CUTANEOUS BLOOD FLOW

Skin Massage, Cutaneous Blood Flow, Blood Circulation, Passive Vibrations, 50 Hz, Wound Healing, Skin Tonicity, Physical Inactivity

**TITLE :** The effects of 30 Hz versus 50 Hz passive vibration and duration of vibration on skin blood flow in the arm

**AUTHORS :** MALONEY-HINDS, PETROFSKY & ZIMMERMAN

**LOCATION OF STUDY :** Department of Physical Therapy, Loma Linda University, CA (USA) 

**PUBLICATION REFERENCE :** Medical Science Monitor 2008, 14(3), p CR 112-116

18 subjects were randomised to 2 groups and treated at frequencies of 30 and 50Hz respectively. Each subject's arm was passively vibrated for 10 minutes using a Power Plate machine. The cutaneous blood flow was measured at the baseline, just prior to treatment, and up to 15 minutes after the end of the vibration session.

There was an increase in cutaneous blood flow after treatment, both at 30 Hz and 50 Hz, with the greatest peak being observed at 5 minutes in both groups. Although there were no significant differences between the two groups, blood flow increased more rapidly and reached the highest peak in the Power Plate 50 Hz group. The blood flow during the recovery period remained higher in the 50 Hz group.




“ Significant and prolonged increase in skin blood flow after 30 Hz and 50 Hz sessions

## PERIPHERAL CARDIOVASCULAR SYSTEM

Healthy Subjects, Peripheral Cardiovascular System Function, Blood Flow and Venous Function

**TITLE :** The Influence of Whole Body Vibration on the Central and Peripheral Cardiovascular System

**AUTHORS :** ROBBINS, YOGANATHAN & GOSS-SAMPSON

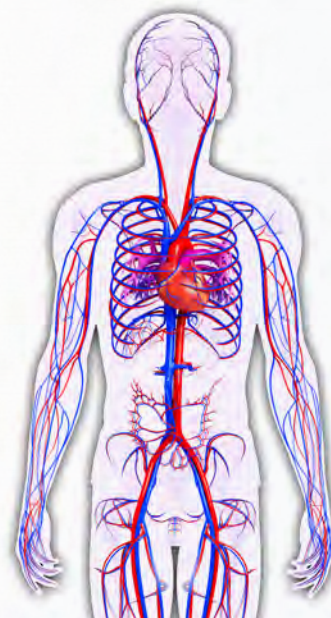
**LOCATION OF STUDY :** Centre for Sports Science and Human Performance, University of Greenwich, Chatham (UK) 

**PUBLICATION REFERENCE :** Clinical Physiology and Functional Imaging 2013

This study evaluated the physiological changes in the cardiovascular system in response to Whole Body Vibration response during a static standing position.

There were no changes in cardiac rhythm, blood pressure or peripheral skin temperature.

Significant increases in blood flow velocity were attributed to a change in peripheral vascular function.



“ Significant increase in blood flow velocity.

## DECREASED ARTERIAL STIFFNESS

Healthy Male Subjects: Post-Exercise Arterial Rigidity, Prevention of Cardiovascular Diseases

**TITLE :** Arterial stiffness acutely decreases after Whole Body Vibration in Humans

**AUTHORS :** OTSUKI, TAKANAMI, AOI, KAWAI & YOSHIKAWA

**LOCATION OF STUDY :** Faculty of Health and Welfare Human Services, Ste Catherine University, Matsuyama, Ehime (Japan)-Department of Inflammation and Immunology, Kyoto Prefecture, University of Medicine- Department of Preventive Medicine for Health Science, Kyoto (Japan) 🇯🇵

**PUBLICATION REFERENCE :** Acta Physiologica 2008; 194 (3): p 189-194

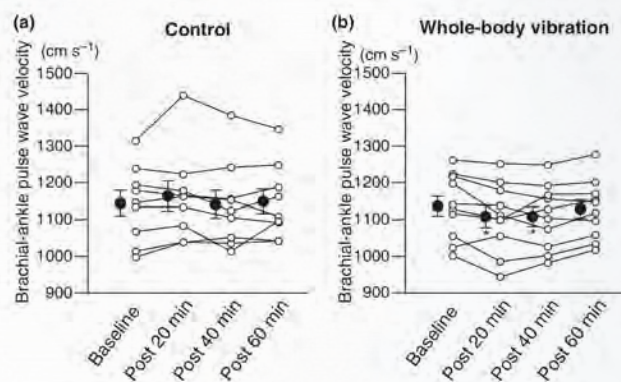
The aim of this study was to investigate the effects of Whole Body Vibration (WBV), using Power Plate, on arterial stiffness.

10 healthy men performed 10 squat exercises at a frequency of 26 Hz for 60 seconds, with a rest period equivalent to exercise time.

WBV training on the Power Plate showed an acute decrease in arterial stiffness that lasted for up to 60 minutes after the exercise session.



“Prevention of cardiovascular disease: acute decrease in post-exercise arterial rigidity.”



## ARTERIAL WAVE REFLEX

Healthy Young Male Subjects: Lower Limb Arterial Stiffness, Aortic Wave Reflection, Prevention of Cardiovascular Diseases

**TITLE :** Acute Exercise with Whole Body Vibration decreases Wave reflection and Leg Arterial Stiffness

**AUTHORS :** FIGUEROA, VICIL & SANCHEZ-GONZALEZ

**LOCATION OF STUDY :** Department of Nutrition, Food and Exercises Sciences, Florida State University, Tallahassee, FL (USA) 🇺🇸

**PUBLICATION REFERENCE :** American Journal of Cardiovascular Diseases 2011; 1(1): p60-67

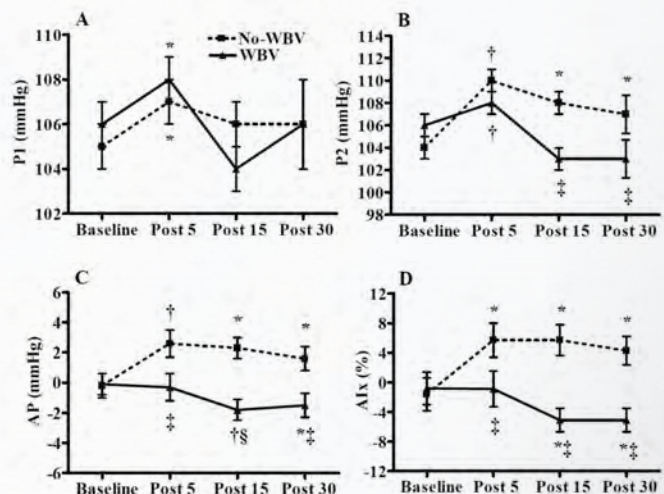
The aim of this study was to determine the effects of static exercises, with or without Whole Body Vibration (WBV), on arterial stiffness.

15 healthy subjects participated in this study. The WBV group, using Power Plate, showed an improvement in all factors influencing arterial stiffness compared to the group not using WBV.

The results of this study show that the intervention of the Power Plate counteracts the increase in arterial rigidity induced by a static squat. Since increase in arterial stiffness is associated with an increased risk of cardiovascular incidents, Whole Body Vibration could offer a therapy to mitigate this risk.



“Prevention of cardiovascular diseases: improvement of all factors influencing post-exercise arterial stiffness”





## ANABOLIC HORMONES

Healthy Young Male Subjects: Hormonal Response, Growth Hormone GH, Testosterone, Cortisol

**TITLE :** Hormonal Responses to Whole Body Vibration in Men

**AUTHORS :** BOSCO, IACOVELLI, TSARPELA, CARDINALE, BONIFAZI, TIHANYI, VIRU, DE LORENZO & VIRU

**LOCATION OF STUDY :** Università di Roma Tor-Vergata (Italy) - Hungarian University of Physical Education, Budapest (Hungary), Università di Roma La Sapienza (Italy), Università degli studi di Siena (Italy), University of Tartu (Estonia)

**PUBLICATION REFERENCE :** European Journal of Applied Physiology 2000, 81, p 449-454

This study explored acute blood hormone levels (testosterone, GH, cortisol) after treatment with Whole Body Vibration (WBV) in 14 young men.

Significant changes were observed after treatment with WBV, including increased testosterone and human growth hormone and decreased cortisol levels.



“ Significant increase in anabolic hormone secretion (testosterone & growth hormone) and decreased cortisol in young men

**Table 2** Acute effects of whole-body vibration on blood concentrations of cortisol, testosterone and growth hormone. Values are given as the mean (SD)

Parameter	Before vibration	After vibration	<i>P</i> , paired <i>t</i> -test
Cortisol (nmol · l <sup>-1</sup> )	682 (255)	464 (257)	0.03
Testosterone (nmol · l <sup>-1</sup> )	22.7 (6.6)	24.3 (6.6)	0.026
Growth hormone (ng · ml <sup>-1</sup> )	6.2 (16.2)	28.6 (29.6)	0.014

## ADRENALINE AND NORADRENALINE

Young Male Healthy Subjects: Hormonal Response, Lipolysis, GH, Catecholamines, Free Fatty Acids, Glycerol

**TITLE :** Hormone and Lipolytic responses to Whole Body Vibration in Young Men.

**AUTHORS :** GOTO & TAKAMATSU

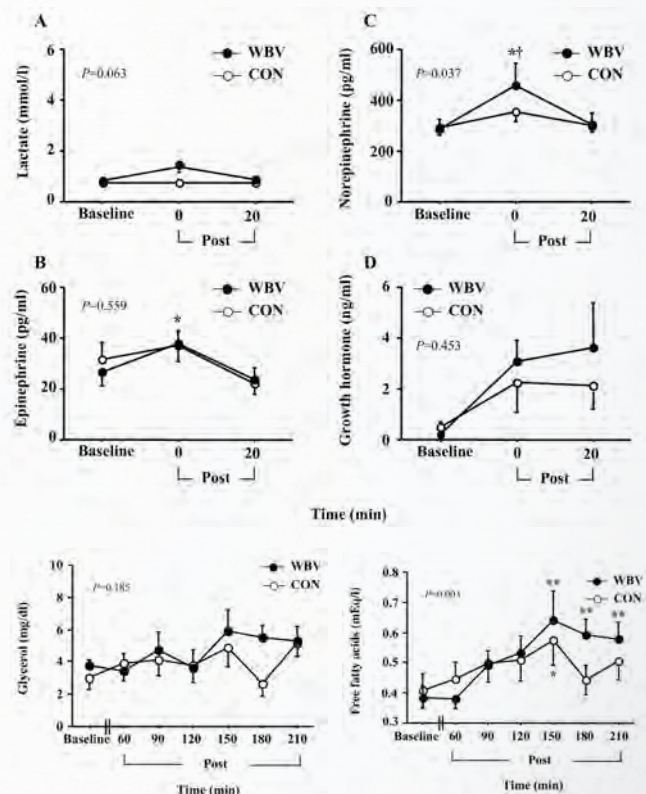
**LOCATION OF STUDY :** University of Tokyo - University of Tsukuba (Japan)

**PUBLICATION REFERENCE :** Japanese Journal of Physiology 2005, 55, p 279-284

This study examined the effects of Whole Body Vibration (WBV) on the responses of lipolytic hormones. 8 healthy young men, with no special training, performed WBV exercises, and a control (group CON) on separate days.

WBV induced catecholamine secretions: epinephrine (adrenaline) and norepinephrine (noradrenaline) and increased the blood concentration of free fatty acids during the recovery period.

“ Increased secretion of lipolytic hormones (catecholamines: adrenaline and noradrenaline) in young men



## IGF-1 AND CORTISOL

Seniors: Hormonal Responses, Anabolic Hormones, IGF-1, Cortisol

**TITLE :** Hormonal Responses to a single session of Whole Body Vibration exercise in Older Individuals

**AUTHORS :** CARDINALE, SOIZA, LEIPER, GIBSON & PRIMROSE

**LOCATION OF STUDY :** Olympic Medical Institute, Northwick Park Hospital, Harrow - University of Aberdeen - Department of Medicine for the Elderly, Woodend Hospital, Aberdeen (UK)

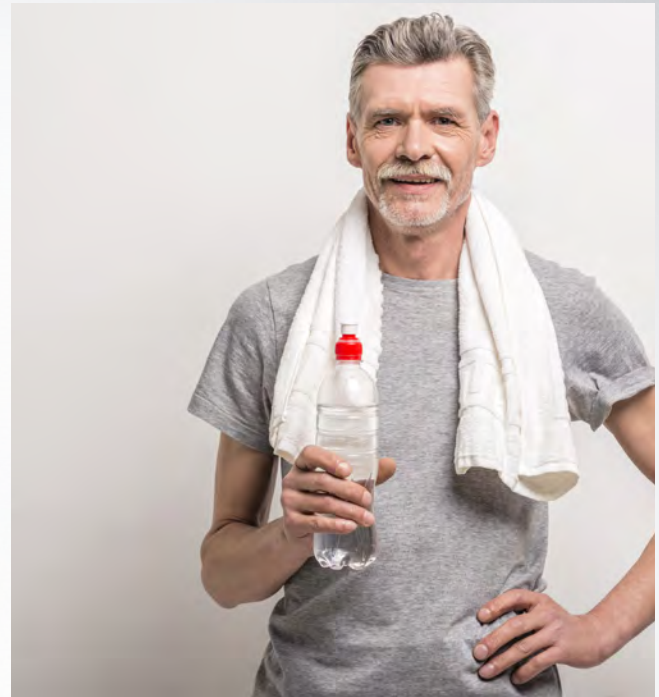


**PUBLICATION REFERENCE :** British Journal of Sports Medicine 2010, 44, p 284-288

The aim of this study was to analyse the acute effects of a single session of Whole Body Vibration (WBV) on the anabolic hormones of the elderly.

In addition to the significant changes observed in the circulating levels of IGF-1 and cortisol after a single session of WBV, a training session of 5 min of static squats associated with WBV in elderly subjects showed it is well tolerated by male and female volunteers (aged 65 to 85), who showed no signs of stress or fatigue.

Moreover, these results indicate that WBV produced an acute increase in the circulating levels of IGF-1 and cortisol greater than that observed by the same exercise protocol performed without WBV.



“ Acute increase in IGF-1 secretion and cortisol in elderly men and women.

## CASE STUDY

# HOW AEROSPACE MEDICINE HELPS PREVENT GENERAL POPULATION ILLNESSES

The damaging effects on the human body induced by the sedentary, contemporary way of life (prolonged sitting at work, little walking or movement, use of escalators rather than stairs, riding in cars or watching TV at night, etc.) are very similar to those associated with the forced sedentary behaviour of astronauts during the confinement of space flight.

Prolonged lack of physical activity, whether on earth or in space, can affect the occurrence of 'general population illnesses'. Muscular wasting (legs, back and abdominals), sarcopenia, low back pain, cardiorespiratory insufficiency, arterio-venous-lymphatic circulatory insufficiency, excess abdominal fat, syndrome X, overweight, pre-diabetes, bone fragility and osteoporosis, amongst others.

By studying the physiological repercussions of long-term aerospace flights on astronauts, much is learned about the effects of long term lack of physical exercise on patients. Aerospace medical research into the absence of weightbearing activity and the effect of lack of gravity on human tissues in space has advanced the recognition of lifestyle diseases in normal populations, for which public health has paid a heavy price.





# BODY COMPOSITION - FAT MASS/LEAN MASS

Body Composition, Adipose Tissue, Muscular Strength, Cardio-Vascular Health, Arterial Aging, Endothelial Function, Proposed Mechanisms of Action

**TITLE :** Effects of Whole Body Vibration training on body composition, skeletal muscle strength and cardiovascular health

**AUTHORS :** PARK, SON & KWON

**LOCATION OF STUDY :** Whitaker Cardiovascular Institute, Boston University School of Medicine (USA), Department of Physical Education, Pusan National University, Busan (Korea), Department of Internal Medicine, University of Utah, School of Medicine Salt Lake City, UT (USA), Korean Society of Exercise Rehabilitation



**PUBLICATION REFERENCE :** Journal of Exercise Rehabilitation 2015 Dec, 11 (6), p 289-95

This 2015 review of the scientific literature investigates the effects of Whole Body Vibration (WBV) on body composition, muscle strength and cardiovascular health.

In summary, it has been demonstrated that WBV improves body

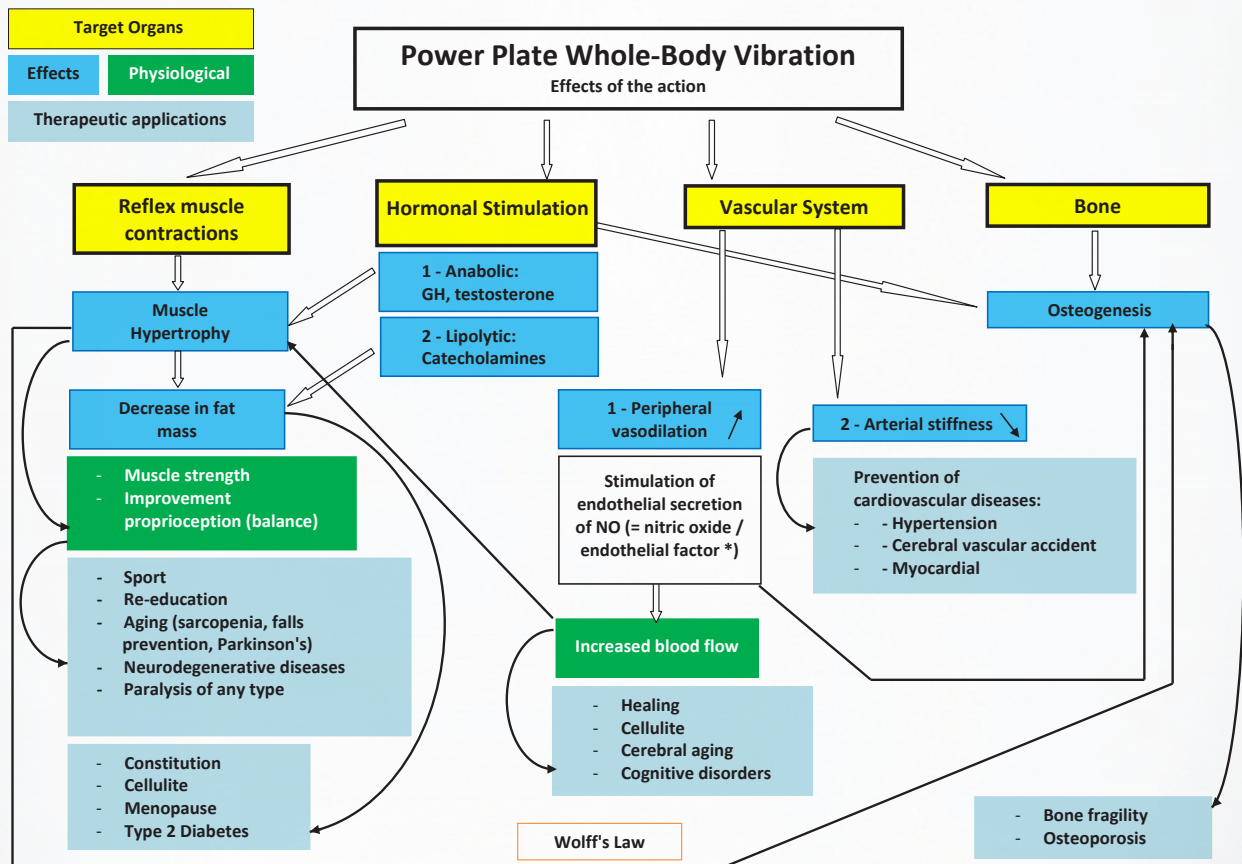
composition, muscle strength and cardiovascular health. In particular, WBV training is a useful exercise for patients and aging populations because it does not require conventional dynamic exercises such as weights.

WBV training uses vibration that induces not only muscle contractions but also local vasodilation of microcirculation by stimulating the endothelium.

WBV is an effective mode of exercise to improve the strength of the muscular and cardiovascular systems, particularly in patients with specific illnesses and the elderly.

This mode of exercise can also be used in immobile populations to improve muscular strength and cardiovascular health simultaneously.

“ Improved body composition, muscle strength and cardiovascular health in healthy or sick subjects, young or elderly



\* NO = at the base, endothelial factor favoring vasodilation, secreted by the venous wall during its stretching / "scrunch" during the PP practice (ref.)

# 2 | REHABILITATION

## CHRONIC LOW BACK PAIN

Chronic Low Back Pain: Physiotherapy, Whole Body Vibration, 6 month follow-up

**TITLE :** Treatment of Chronic Lower Back Pain with Lumbar extension and Whole Body Vibration Exercise : A randomised controlled trial

**AUTHORS :** RITTWEGER, JUST, KAUTZSCH, REEG & FELSEMBERG

**LOCATION OF STUDY :** Freie Universität Berlin - Pain Centre, Berlin (Germany) 

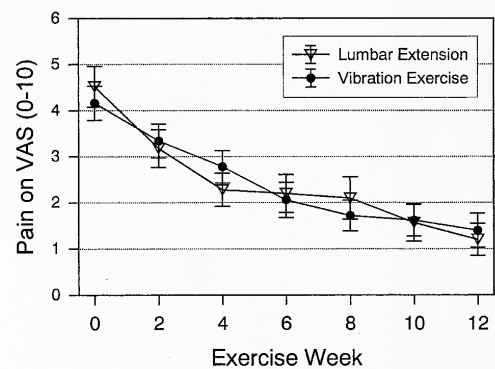
**PUBLICATION REFERENCE :** SPINE 2002, 27(17), p 1829-1834

In 60 patients with chronic low back pain, this randomised, controlled study with 6 month follow-up, compared lumbar extension exercises for 1 group and similar exercises incorporating Whole Body Vibration (WBV) on a Power Plate for the other group.

Both groups showed a significant and comparable reduction of pain with the Power Plate group showing a decreased treatment time and greater comfort.




“ Significant reduction in pain with less treatment time and greater comfort compared to conventional lumbar extension physiotherapy.



## CASE STUDY - PREVENTION OF BACK PAIN

### GERMAN SOCIAL SECURITY REIMBURSES POWER PLATE SESSIONS FOR LOW BACK PAIN

In Germany, where chronic low back pain is one of the primary causes of premature retirement, rehabilitation sessions on Power Plate are reimbursed by the health insurance fund. 





## KNEE - POST SURGERY (ANTERIOR CRUCIATE LIGAMENTS, TOTAL KNEE ARTHROPLASTY)

Knee - Post Surgery, Proprioception, Muscle Mass, Ligaments and Muscles, Coordination

**TITLE :** Contribution of proprioceptive vibration training in a physical therapy program following surgical repair of the anterior cruciate ligaments

**AUTHORS :** FELMET & GERNOT

**LOCATION OF STUDY :** Willingen Schweningen (Allemagne)



**PUBLICATION REFERENCE :** Artico Sportklinik 2004

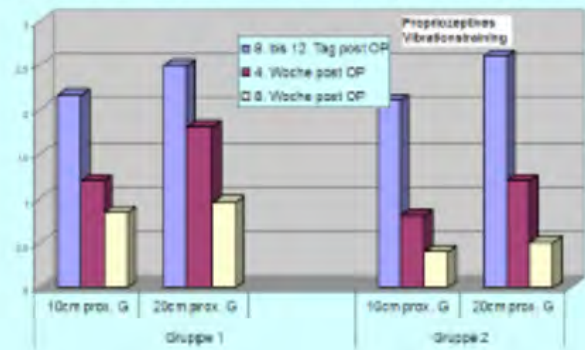
This study was conducted in 60 patients who underwent surgical reconstruction of the anterior cruciate ligaments of the knee. The subjects were divided into 2 groups, Whole Body Vibration (WBV) group using Power Plate and a Control group who received traditional rehabilitation.

The Power Plate group recovered faster than the control group. Patients in the WBV group also showed significantly improved power development and coordination performance.

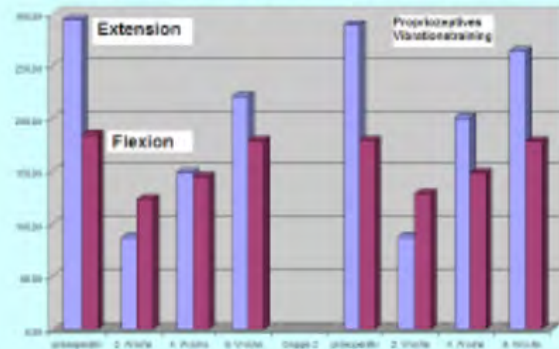


“Faster post-surgical rehabilitation with more strength and muscle mass in the thigh and better muscle coordination compared to conventional physiotherapy

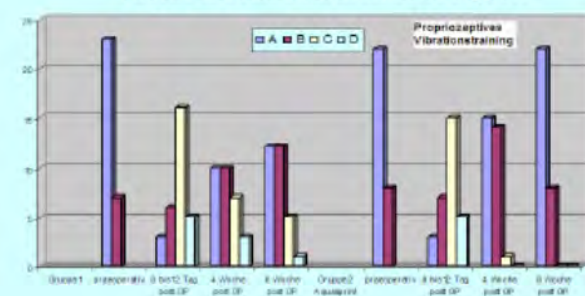
Verlust der Oberschenkelumfangmasse zu prae-OP



Isometrische Kraft der Oberschenkelmuskulatur in Newton



Vastus medialis Koordinationstypen




## KNEE - POST SURGERY

Post-surgical Knee, Cruciate Ligaments, Articular Stabilisation

**TITRE :** Empirical study of the effects of Whole Body Vibration after arthroscopic reconstruction of anterior cruciate ligaments

**AUTEURS :** BASTIAN, TRITTEL & FRANZ

**LOCATION OF STUDY :** Lutrina Klinik, Department of Knee Surgery, Kaiserslautern (Allemagne) 

**PUBLICATION REFERENCE :** Deutsche Zeitschrift für Sportmedizin 2004, 56 (7/8) (special abstract issue), p 228

This study compared rehabilitation time and outcomes after arthroscopic reconstruction of the anterior cruciate ligament between a group using WBV and a group receiving conventional physiotherapy.

It was found that Whole Body Vibration (WBV) training on Power Plate increased results and shortened the recovery time after arthroscopic surgical reconstruction following the rupture of cruciate ligaments.



“ Better functional post-surgical results and faster recovery compared to conventional physiotherapy.

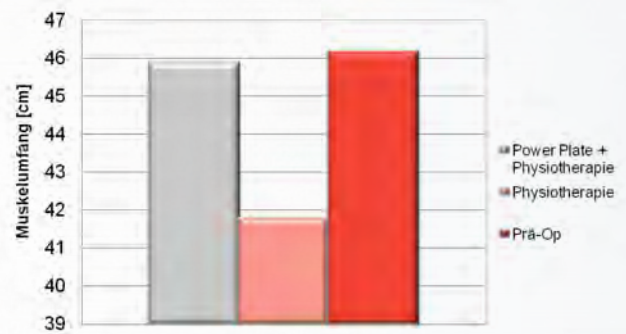
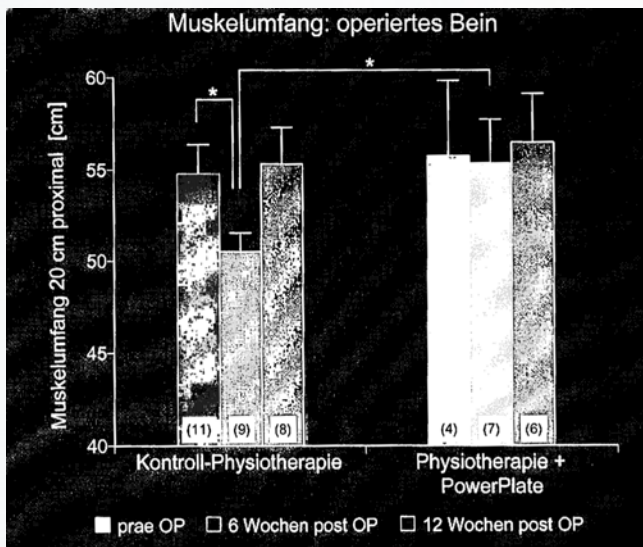
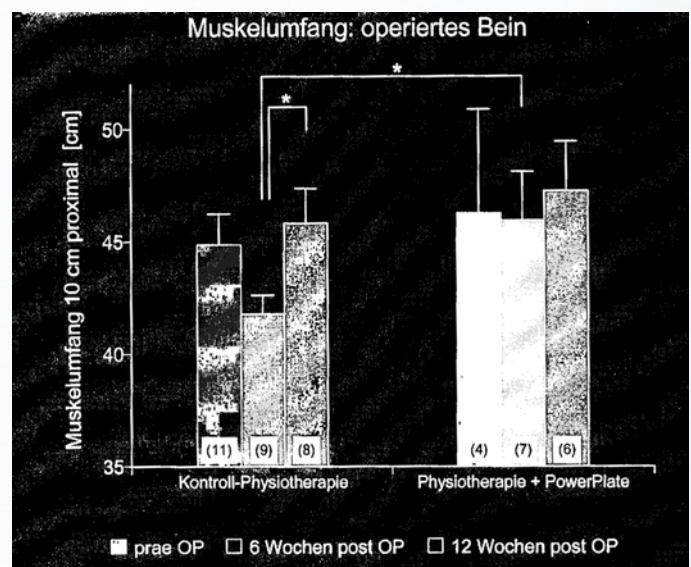
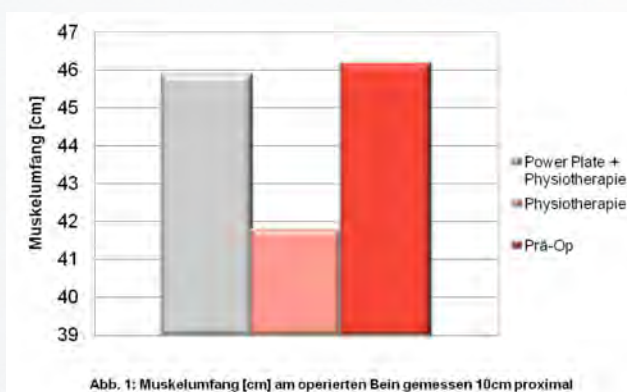


Abb. 1: Muskellumfang [cm] am operierten Bein gemessen 10cm proximal






## KNEE - POST SURGERY

Knee - Post Surgery, Cruciate Ligaments, Athletes, Postural Stability, Proprioception

**TITLE :** A comparative study of Whole Body Vibration Training and conventional training on knee proprioception and postural stability after anterior cruciate ligament reconstruction

**AUTHORS :** MOEZY, OLYAEI, HADIAN, RAZI & FAGHIHZADE

**LOCATION OF STUDY :** School of Rehabilitation, Medical Sciences, Tehran University (Iran) 

**PUBLICATION REFERENCE :** British Journal of Sports Medicine 2008; 42(5):p 373-378

20 male athletes with unilateral reconstruction of their anterior cruciate ligaments of the knee were included in this comparative study and randomly divided into two groups. One group were treated with Whole Body Vibration (WBV) on Power Plate and the other by traditional rehabilitation for 12 sessions .


A significant improvement in postural stability and improved proprioception was found in the Power Plate group compared to the group who underwent traditional rehabilitation.

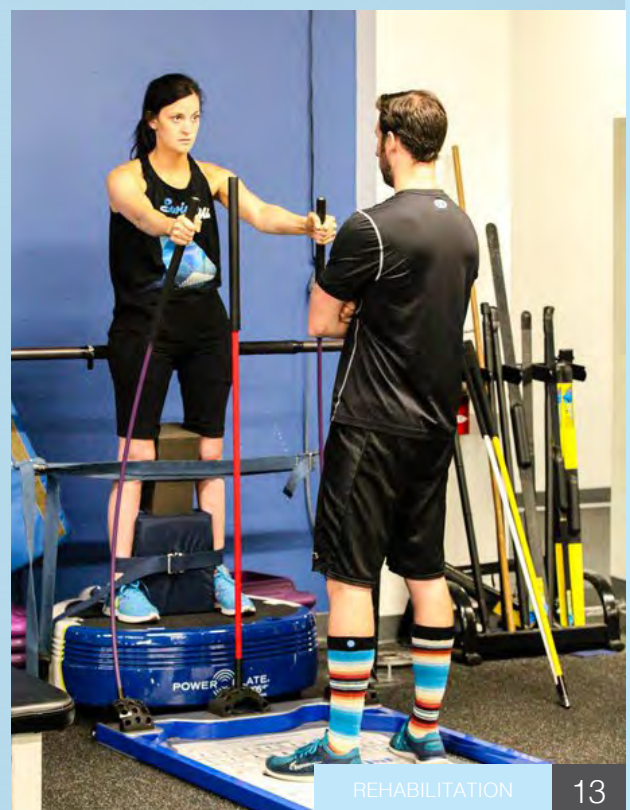


“ Significant improvement in postural stability by improvement of proprioception in post-surgical rehabilitation.

## CASE STUDY - PARTIAL OR TOTAL PARALYSIS OF ALL TYPES

### PROJECT WALK HAS BEEN USING POWER PLATE FOR 3 YEARS

PROJECT WALK is a chain of facilities using an intensive, multimodal, multidisciplinary approach to recovering mobility and preventing pathologies associated with paralysis of any kind (partial and total lesions of the brain, traumatic brain lesions, stroke, Charcot's disease, Sclerosis, Cerebral-Motor diseases). For over 15 years these specialised rehabilitation centers have been helping paralysed subjects (adults & children) in the USA. PROJECT WALK has been using POWER PLATE technology for almost 3 years. 




## TOTAL KNEE ARTHROPLASTY SEE SENIORS PAGE 38

## MULTIPLE SCLEROSIS

Multiple Sclerosis: Walking, Chair Lift, Postural Control, Balance, Mobility, Coordination

**TITLE :** Whole Body Vibration Training in Multiple Sclerosis patients : A pilot study

**AUTHORS :** OHLIN

**LOCATION OF STUDY :** Department of Neurological Physiotherapy, Malmö (Suède) 

**PUBLICATION REFERENCE :** Abstract 2007

10 subjects with multiple sclerosis performed Whole Body Vibration (WBV) sessions twice weekly (10 exercises of 30 seconds each at 30 Hz, a low amplitude) twice a week for 12 weeks.

This study measured the effects with common movements such as standing from a chair and walking, as well as postural control, balance, mobility, strength and coordination.

The results of this pilot study indicate that Whole Body Vibration with the Power Plate may positively influence postural control, balance, mobility, strength, and endurance in Multiple Sclerosis patients.




“ Beneficial effects in performing common gestures such as standing from a chair or walking, with a positive influence on postural control, balance, mobility, strength and coordination in Multiple Sclerosis patients

Multiple Sclerosis: Physical Functions, Walking, Endurance, Quality of Life

**TITLE :** Effects of Whole Body Vibration training on Physical Function in patients with Multiple Sclerosis

**AUTHORS :** HILGERS, RIEHLE & DETTMER

**LOCATION OF STUDY :** Sportwissenschaftliches Institut der Universität Konstanz - Kliniken Schmieder Konstanz (Allemagne) 

**RÉFÉRENCE DE PUBLICATION :** Neurorehabilitation 2013; 32(3): p655-663

The purpose of this randomised, controlled trial was to test the hypothesis that a 3-week Whole Body Vibration (WBV) training program, added to a standard rehabilitation program, would improve the walking ability of patients with multiple sclerosis. 60 patients with multiple sclerosis were randomly assigned to the WBV group and the control group.

The determinants for the walking ability of multiple sclerosis patients that are specific to endurance, are enhanced by WBV training designed to improve muscular strength endurance. The additional effects of WBV versus standard rehabilitation training demonstrate the effectiveness of WBV in patients with multiple sclerosis.



“ Improved walking and endurance in patients with Multiple Sclerosis.



# CASE STUDY - LYME DISEASE

LYME disease, which follows a tick bite and whose absence or delay in diagnosis, promotes the transition to chronicity in the absence of a suitable and prolonged antibiotic therapy. It causes symptoms very similar to those observed in Multiple Sclerosis or Fibromyalgia (erratic pain, arthralgia, walking disorders, prolonged and unexplained severe fatigue, depressive syndrome, etc.). Differential diagnosis errors can thus occur between these 3 conditions.

Rehabilitation utilising Power Plate helps to alleviate these symptoms, to reduce pain, to improve the functional abilities of the subjects suffering and thus to improve their quality of life




## PARTIAL CHRONIC LESIONS OF THE SPINAL CORD

Chronic Spinal Cord Injury: Spasticity of the Quadriceps, Anti-Spastic Medications

**TITLE :** Effects of Whole Body Vibration on Quadriceps Spasticity in individuals with Spastic Hypertonia due to Spinal Cord Injury

**AUTHORS :** NESS & FIELD-NOTE

**LOCATION OF STUDY :** The Miami Project to Cure Paralysis, Department of Biomedical Engineering, Department of Physical Therapy, University of Miami Miller School of Medicine (USA) 

**PUBLICATION REFERENCE :** Restorative Neurology and Neurosciences 2009; 27: p 623-633

This study involved 16 patients with chronic spinal cord injury during 4 weeks of rehabilitation (12 Power Plate sessions, 3 times per week).

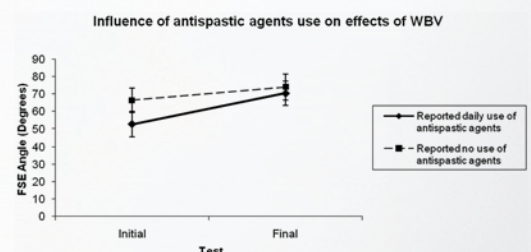
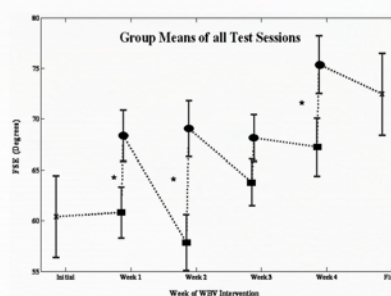
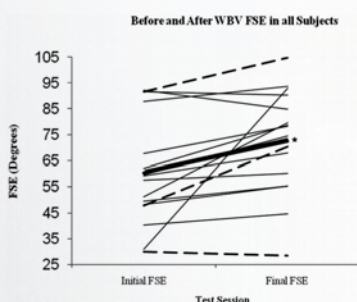
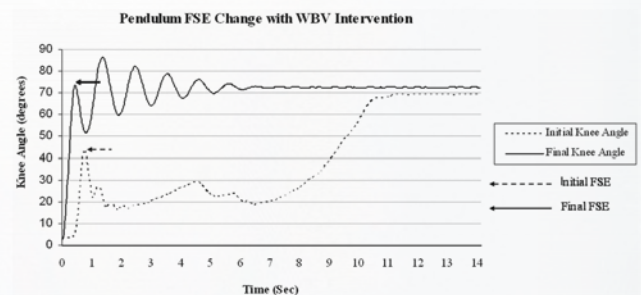
Results demonstrated a significant reduction in quadriceps spasticity following the WBV intervention. The effect of each Power Plate session lasted for at 8 days. The use of Power Plate could be a useful addition to subjects with muscle spasticity.



“Reduction of reflex muscle spasticity in subjects with chronic spinal cord injury.”



Fig. 1. Procedure for a single session of whole-body vibration (WBV).




## CHRONIC PARTIAL LESIONS OF THE SPINAL CORD

Partial SCI (Central Nervous System): Walking Disorders

**TITLE :** Whole Body Vibration improves walking function in individuals with spinal cord injury : A pilot study

**AUTHORS :** NESS & FIELD-NOTE

**LOCATION OF STUDY :** University of Miami Miller School of Medicine, Miami, FL (USA) 

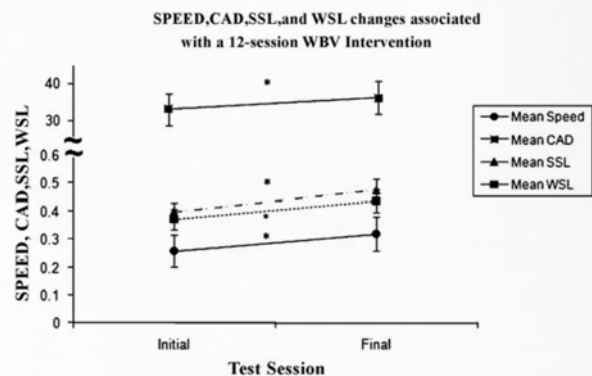
**PUBLICATION REFERENCE :** Gait & Posture 2009; 30(4): p 436-4407

The purpose of this study was to determine whether repeated use of Whole Body Vibration (WBV) is associated with improvements in walking function in individuals with spinal cord injury (SCI). 17 subjects with chronic motor-incomplete SCI were tested before and after participation in a 12-session (3 days/week for 4 weeks) intervention of WBV.

The WBV intervention was associated with statistically significant increases in walking speed, cadence, step length and improved consistency of intralimb coordination. The improvement in walking speed observed with the WBV intervention was comparable to that reported in the literature in association with locomotor training. This magnitude of change has been identified as being clinically meaningful, even in non-clinical populations. These findings suggest WBV may be useful to improve walking function with effects that may persist for some time following the intervention.




“Significant improvement in walking functional abilities in subjects with partial lesion of the spinal cord



## CASE STUDY – TREATMENT OF CEREBRAL MOTOR CONDITIONS

### THE THERASUIT METHOD

The Therasuit method is an intensive biomechanical therapy for motor disorders like cerebral palsy. Practitioners often include Power Plate Whole Body Vibration in the therapy and significantly increase the daily functional abilities of the children that have undergone treatment. 3 weeks of intensive therapy can result in the same results as 9 months of conventional therapy. 

Presented in the USA, Europe, South America, the Middle East, Australia, New Zealand and Asia.

More than 3000 therapists use Therasuit.  
More than 120,000 patients have already been treated.

**3 WEEKS OF INTENSIVE THERAPY WITH THERASUIT GIVES THE SAME RESULTS AS 9 MONTHS OF CONVENTIONAL THERAPY!**






## CEREBRAL PALSY (ADULTS)

Cerebral paralysis, Cerebral Palsy, Adults: Spasticity, Muscle Power, Motor Performance

**TITLE :** Whole Body Vibration Training compared with Resistance training : Effects on Spasticity, Muscle Strength and Motor Performance in Adults with Cerebral Palsy

**AUTHORS :** AHLBORG, ANDERSSON & JULIN

**LOCATION OF STUDY :** Department of Rehabilitation Medicine Stockholm, Danderyd University Hospital - Department of Neurotec, Division of Physiotherapy, Karolinska Institutet, Stockholm (Sweden) 

**PUBLICATION REFERENCE :** Journal of Rehabilitation & Medicine 2006, 38, p 302-308

The aim of this study was to evaluate the effects of 8 weeks of WBV (25-40 Hz) on spasticity, muscle strength and motor performance compared to resistance training in 14 subjects ( 8 men and 6 women) with spastic diplegia.

Spasticity decreased in the knee extensors in the WBV group. The GMFM (measurement of gross motor performance) increased in the WBV group. The data suggests that 8 weeks of WBV therapy or resistance training are able to increase muscle strength without adverse effects on spasticity in adults with cerebral palsy.



“ Increased muscle power without adverse effects on spasticity in adults with cerebral palsy

## CEREBRAL PALSY (PAEDIATRICS)

Cerebral paralysis, Diplegic cerebral palsy, Children: Muscle Strength, Balance

**TITLE :** Effect of Whole Body Vibration on Muscle Strength and Balance in Diplegic Cerebral Palsy : a randomised controlled trial.

**AUTHORS :** EL-SHAMY & SHAMEK

**LOCATION OF STUDY :** Cairo University (Egypt) 

**PUBLICATION REFERENCE :** American Journal of Physical Medicine & Rehabilitation 2014, 93 (2), p 114-121

The aim of this study was to investigate the effects of Whole Body Vibration (WBV) on muscle strength and balance in 30 children with diplegic cerebral palsy.

Fifteen children were assigned to the experimental group, which received Whole Body Vibration training (9 mins per day, 5 days per week).

WBV training was found to improve muscle power and balance in the children with diplegic cerebral palsy.



“ Improvement of muscle strength and balance in children with diplegic cerebral palsy

# 3 | SYMPTOMATIC TREATMENT

## ADJUVANT THERAPY

### ATTENTION DEFICIT DISORDER, HEALTHY AND HYPERACTIVE SUBJECTS

Attention Deficit Disorder, Hyperactivity, Healthy Subjects: Passive Vibrations, Cognitive Disorders, Improving Attention

**TITLE :** Effects of Whole Body Vibration Exercise on Attention in Healthy Individuals and Individuals with ADHD

**AUTHORS :** FUERMAIER, TUCHA, KOERTS, van HEUVELEN & van der ZEE

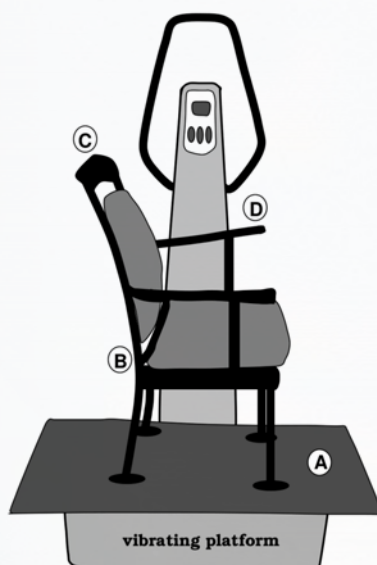
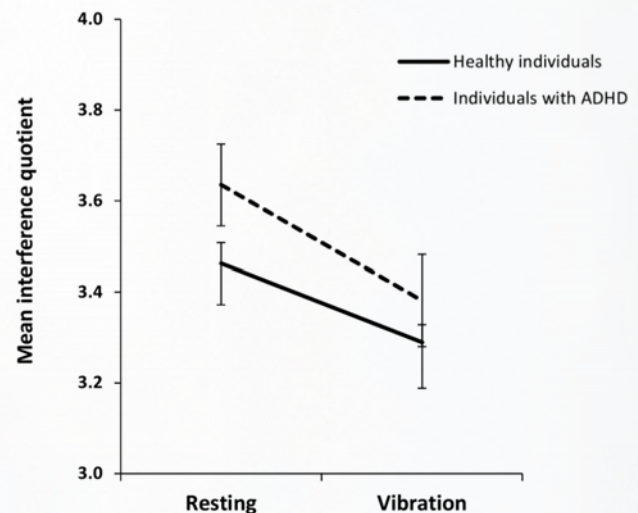
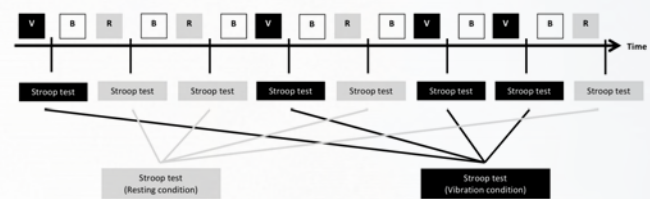
**LOCATION OF STUDY :** University of Groningen (the Netherlands), University of Regensburg (Germany)

**PUBLICATION REFERENCE :** PLoS One 2014, 9(2), : e90747

This study explored the effects of Whole Body Vibration (WBV) on the attentiveness of healthy subjects and on adults who had been diagnosed with ADHD (attention deficit hyperactivity). 83 healthy subjects and 70 adults diagnosed with ADHD participated in this study.

WBV was found to improve cognitive performance in healthy subjects as well as in subjects diagnosed with ADHD. WBV therapy is relatively inexpensive and easy to apply and could therefore have relevant clinical use. The application of WBV as a therapeutic strategy for cognitive augmentation and as a potential treatment for cognitive disorders is envisaged.

“Improved cognitive performance in healthy subjects and in patients with attention deficit hyperactivity disorder






## PROLONGED FATIGUE

Prolonged Fatigue: Autonomic Nervous System, Heart Rate, Respiratory Rate

**TITLE :** Evaluation of the effects of a training program for patients with prolonged fatigue on physiological parameters and fatigue complaints

**AUTHORS :** JOOSEN, SLUITER, JOLING & FRINGS-DRESEN

**LOCATION OF STUDY :** University of Amsterdam - Academic Medical Center Department, Universit  de Maastricht - Department of Health Organization, Policy and Economics, Faculty of Health Sciences, Hoofddorp (The Netherlands) 

**PUBLICATION REFERENCE :** International Journal of Occupational Medicine and Environmental Health 2008; 21(3): p 237-246

The aim of this study was to investigate the effects of a 6-week training program including Power Plate on the physiological and subjective parameters of patients complaining of prolonged fatigue. Eighteen patients who reported fatigue to be one of their major health complaints and who were suffering from functional impairments attended a training program of six weeks, three times a week. The training consisted mainly of physical endurance training (bicycle, walking, rowing, Power Plate), relaxation therapy and breathing exercises in rest.

The results of this study suggest that a 6-week training course has a beneficial effect on the physiological and subjective parameters of patients complaining of severe fatigue.




“Improvement of the physiological and subjective parameters of patients complaining of prolonged severe fatigue

## FIBROMYALGIA (FATIGUE AND PAIN)

Fibromyalgia : Pain, Fatigue

**TITLE :** Use of Vibration-assisted exercise in Fibromyalgia patients

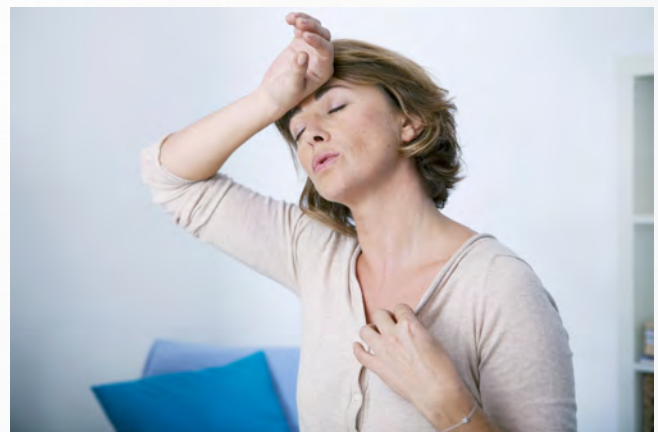
**AUTHORS :** DANKO, LE VU, TODD, CAROL & WAYLONIS

**LOCATION OF STUDY :** Ohio State University (USA) 

**PUBLICATION REFERENCE :** American Journal of Physical Medicine & Rehabilitation, March 2006; 85: p 251

20 patients diagnosed with fibromyalgia underwent training on a vibrating platform (Power Plate & Galileo) twice a week for 8 weeks.

The 12 patients who completed the full 16-session program showed improvements in 16 different symptoms (pain, fatigue, number of days missed, number of days they felt good, physical activity) whereas those who did not complete all the sessions improved in only 8 areas. 10 patients out of the 12 preferred Power Plate to Galileo.



“Objective and subjective improvement of muscle pain and fatigue in patients with fibromyalgia

## FIBROMYALGIA (FATIGUE AND PAIN)

Fibromyalgia: Pain, Fatigue

**TITLE :** Six weeks of Whole Body Vibration exercise improves Pain and Fatigue in Women with Fibromyalgia.

**AUTHORS :** ALLENTORN-GELI, PADILLA, MORAS, HARO & FERNANDEZ-SOLA

**LOCATION OF STUDY :** Laboratoty of Biomechanics, INEF Exercise and Sport Sciences School, University of Barcelona - Department of Medicine, Hospital Clinic Medical School, Barcelona (Spain) 

**PUBLICATION REFERENCE :** The Journal of Alternative and Complementary Medicine 2008; 14(8): p 975-981

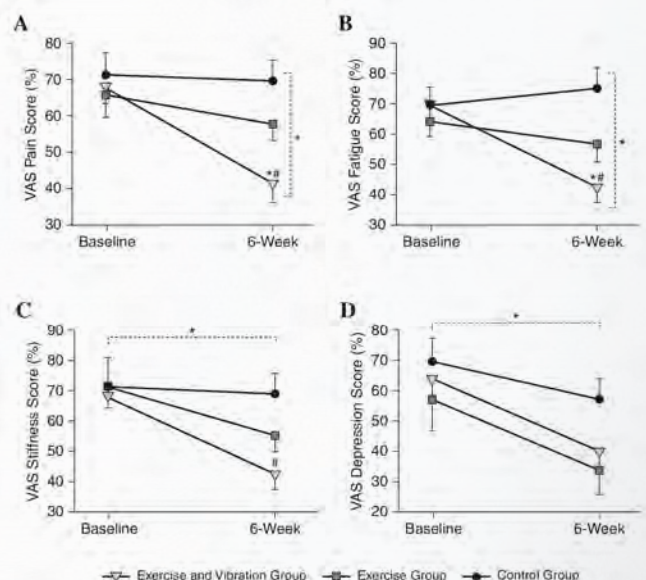
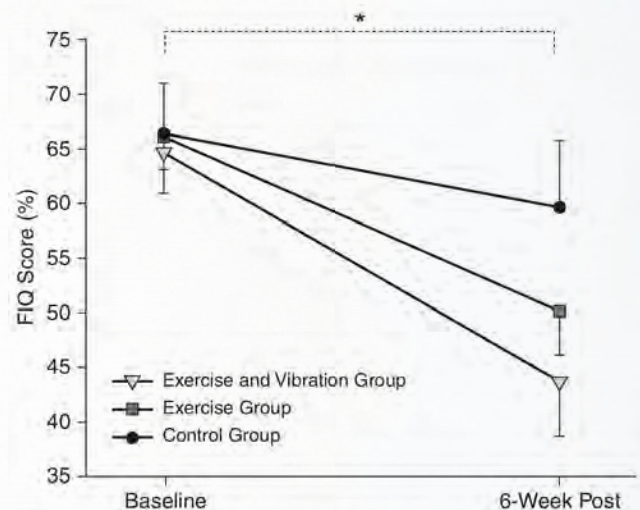
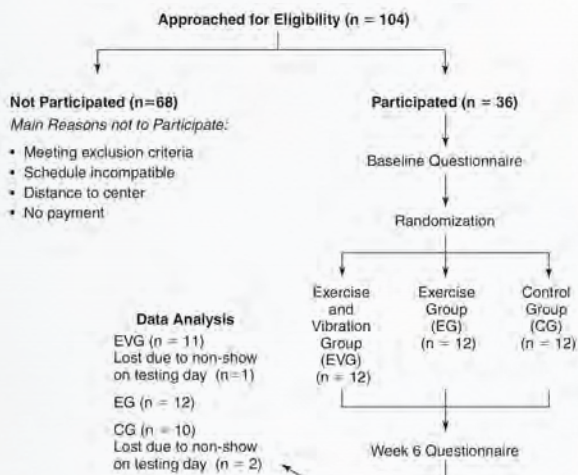
The aim of this study was to investigate the effectiveness of a 6-week traditional exercise program with supplementary Whole Body Vibration (WBV) in improving health status, physical functioning, and main symptoms of fibromyalgia (FM) in women with FM.

36 women with an average age of 55.97 + 1.55 years were divided into 3 groups: 1 Whole Body Vibration (WBV) group using Power Plate, 1 conventional exercise group and 1 control group. An exercise protocol was followed twice a week for 6 weeks.

There was a significant decrease in pain and fatigue in the group whose exercise therapy was supplemented with WBV compared with both the conventional and control groups.



“Significant reduction in pain and fatigue in patients with fibromyalgia





## OVERWEIGHT, OBESITY, METABOLIC SYNDROME

Adolescents, Severe Obesity, Boys, Hospitalised: Lean Mass

**TITLE :** Whole Body Vibration decreases loss of muscle mass during an inpatient weight reduction program in male obese adolescents

**AUTHORS :** RADTKE, KNOPFLI, VANHOMMERI, ROCHAT, BROOKS-WILDHABER, ZEINSTR, WILDHABER, HAMMER & JUNG

**LOCATION OF STUDY :** Alpine Children Hospital Davos (Switzerland) - Dr von Haunersches Kinderspital, München University (Germany) - University Children Hospital Basel (Switzerland) 

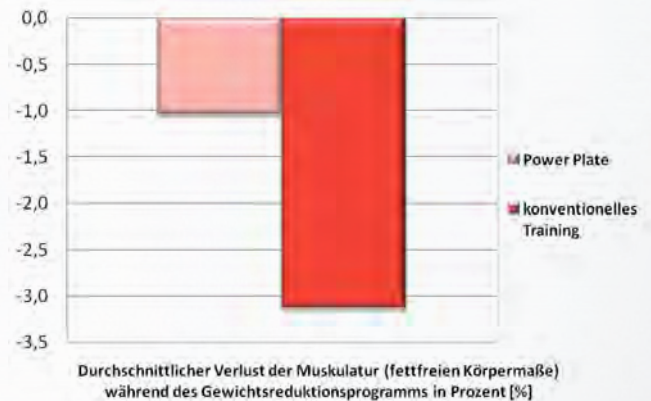
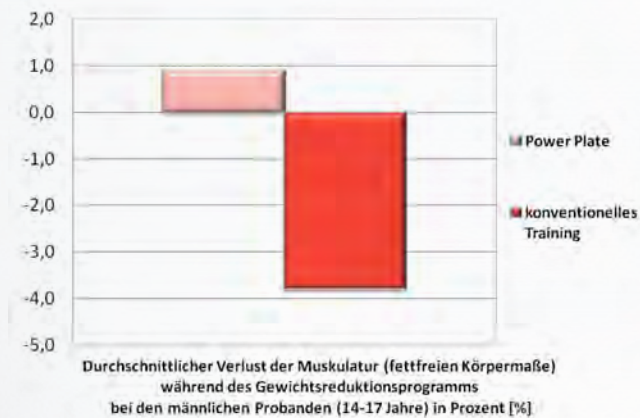
**PUBLICATION REFERENCE :** Gesellschaft für Pädiatrische Sport Medizin, Köln, 13-15/01/2009 (poster presentation)

The aim of this study was to evaluate the effects of Whole Body Vibration (WBV) with Power Plate on body composition (lean mass / fat mass) in severely obese hospitalised adolescents enrolled in a multidisciplinary body weight reduction program. This program included daily physical activity, a balanced diet and behavioral changes.

90 adolescents (33 girls, 57 boys), mean age 14.3 years (12.3-15.8 years) with severe primary obesity and mean BMI of 33.5 kg / m<sup>2</sup> were included in the study.

In conclusion, WBV training can be considered in teenage boys over 14 years of age as a way to prevent the loss of lean body mass (muscle) during a multidisciplinary weight loss program.

“ Maintenance of lean muscle mass during a hospital weight loss program in obese adolescent boys






## WEIGHT LOSS, OBESITY

Overweight and Obese Women: Respiratory gas exchange, Oxygenation and Ventilation

**TITLE :** The effects of Whole Body Vibration short-term exercises on respiratory gas exchange in overweight and obese women

**AUTHORS :** VISSERS, BAEYENS, TRUIJEN, IDES, VERCRUYSSSE & Van GAAL

**LOCATION OF STUDY :** University College of Antwerp, Department of Health Sciences- University of Antwerp & Antwerp University Hospital (Belgium) 

**PUBLICATION REFERENCE :** The Physician and Sports Medicine, Oct. 2009; 37(3): p 84-94

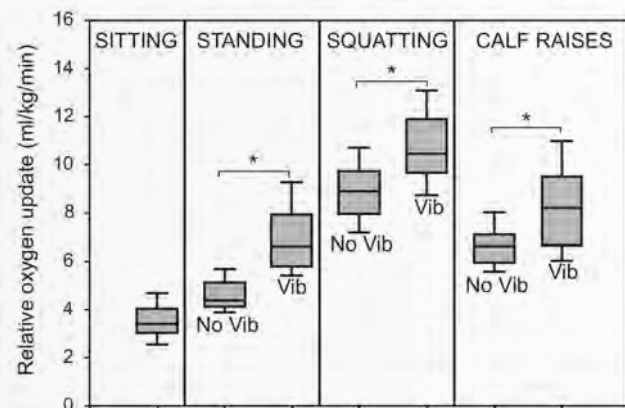
The aim was to study the effects of Whole Body Vibration (WBV), using Power Plate, on O<sub>2</sub> oxygen uptake and carbon dioxide CO<sub>2</sub> production.

The subjects of the study were 20, non-menopausal women (mean age 38 years +/- 7.6), who were overweight (n = 10) or obese (n = 10) with a BMI of 35.13 ± 3.92 kg / m<sup>2</sup>.

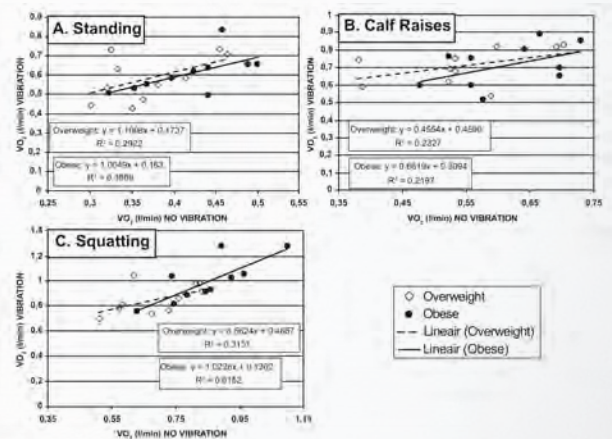
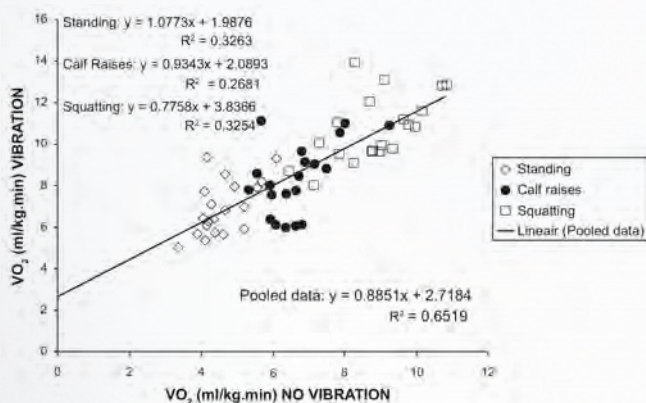
The addition of WBV to both static and dynamic exercises significantly increased oxygen ventilation in overweight and obese women.



Significant increase in oxygen ventilation in overweight and obese women



\*P < 0.001.



Abbreviations: VO<sub>2</sub> oxygen uptake.



## WEIGHT LOSS, OBESITY, METABOLIC SYNDROME

Adults, Obesity, Overweight: Peri-Visceral fat (abdominal fat), Metabolic Syndrome 1-year follow-up

**TITLE :** Effects of long term Whole Body Vibration Training on Visceral Adipose Tissue : A preliminary report

**AUTHORS :** VISSERS, VERRIJKEN, MERTENS, Van GILS, Van De SOMPLEL, TRUIJEN & Van GAAL

**LOCATION OF STUDY :** Department of Health Sciences - Physiotherapy - Faculty of Medicine - Department of Endocrinology, Diabetology and Metabolism, University Hospital Antwerp (Belgique) 

**PUBLICATION REFERENCE :** Obesity Facts, online published April 7 2010

The efficacy of Whole Body Vibration (WBV) on visceral adipose tissue has been demonstrated in animals (Adipogenesis is inhibited by brief, daily exposure to high frequency, low-magnitude mechanical signals, RUBIN & all, Proc. Nat. 2007; 104: p17879-84). It raised the hypothesis of the clinical use in the treatment of human obesity.

This study set out to determine the effect of Whole Body Vibration (WBV), combined with caloric restriction, on weight, body composition and metabolic risk factors in overweight and obese adults. It was a randomized, controlled study with a 6-month intervention period and a 6-month 'no intervention' follow-up.

Combining aerobic exercises or WBV training on Power Plate with a calorie restriction can help to support long-term weight loss of 5 to 10%. The preliminary data shows that WBV training has the potential to reduce visceral fat (VTA) more than aerobic exercise in adults.



“ obese adults experienced a greater decrease in the visceral fat mass after Power Plate training than after aerobic exercises.

## CASE STUDY - NON-COMMUNICABLE DISEASES

### NON-COMMUNICABLE DISEASES CAUSED BY POOR LIFESTYLE AND ACCELERATED AGING OF THE BODY

Power Plate training can provide symptomatic treatment of manifestations linked to non-communicable diseases triggered by sedentary lifestyle and bad eating habits (overweight, metabolic syndrome, muscle and cardiopulmonary insufficiency, etc.). In addition it can offer an overall rehabilitation of the body in order to diminish the damaging effects of these diseases (including muscle weakness, sarcopenia, bone fragility, loss of mobility and autonomy).

In astronauts, all these symptoms are accelerated after a stay of several months in space with the absence of daily intensive physical training. 2 ½ hrs of traditional exercises/day or 35-45 min/day of Power Plate intense training is needed to counterbalance the harmful effects of an extended weightless stay due to the micro-gravity (see p 4 & 8 / Aerospace Medicine).



## MENOPAUSE, OVERWEIGHT, BODY COMPOSITION

Menopause: Body Composition (Body Fat / Lean Mass), Sedentary

**TITLE :** Whole Body Vibration augments Resistance Training effects on Body Composition in Post Menopausal Women

**AUTHORS :** FJELSTAD, PALMER, BEMBEN & BEMBEN

**LOCATION OF STUDY :** Bone Density Research Laboratory, Department of Health and Exercise Science, University of Oklahoma, Norman (USA)

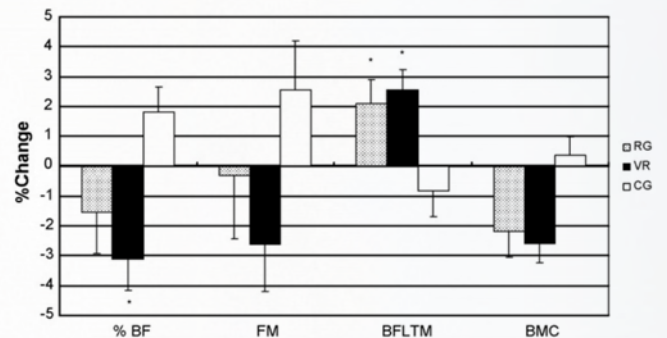
**PUBLICATION REFERENCE :**  Maturitas 2009; 63: p 79-83)

The purpose of this study was to determine the effects of 8 months of resistance training with and without Whole Body Vibration on body composition in sedentary postmenopausal women

In post-menopausal women, resistance training alone or, combined with Whole Body Vibration training on a Power Plate, result in positive changes in body composition by increasing lean body mass. **However, only WBV training combined with resistance exercise was effective in decreasing the percentage of body fat.**



“ Whole Body Vibration training combined with resistance exercise decreased body fat in postmenopausal women





## OVERWEIGHT, OBESITY, YOUNG WOMEN

Young women, obese and overweight, non-hypertensive: Cardiovascular Therapy, Arterial Aging, Endothelial Function, Arterial Rigidity, Blood Pressure, Sympathovagal Balance

**TITLE :** Whole Body Vibration Training reduces arterial stiffness, blood pressure and sympathovagal balance in young overweight/obese women

**AUTHORS :** FIGUEROA, GIL, WONG, HOOSHMAND, PARK, VICIL & SANCHEZ-GONZALEZ

**LOCATION OF STUDY :** The Florida State University, Tallahassee, FL (USA) 

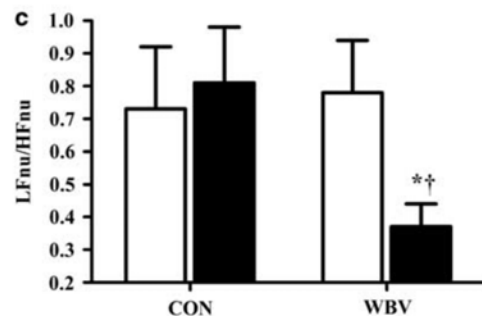
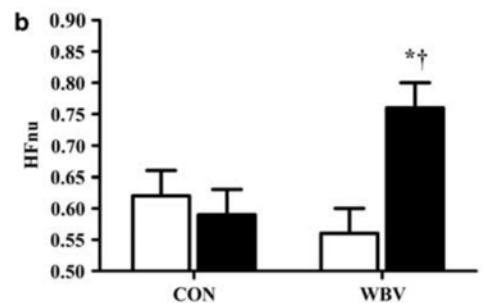
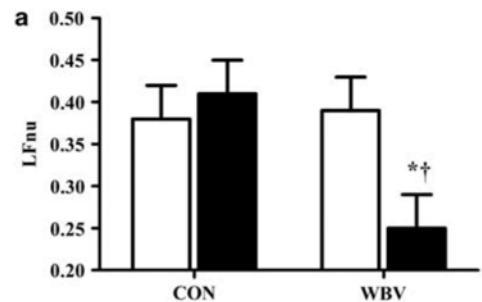
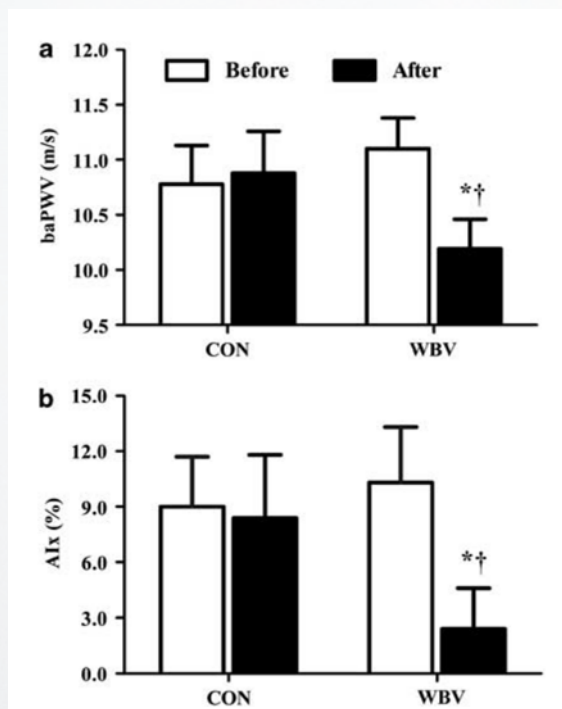
**PUBLICATION REFERENCE :** Hypertension Research 2012, 35, p 667-672

The purpose of this study was to evaluate the effectiveness of a 6-week program of Whole Body Vibration (WBV) training with Power Plate on arterial function, autonomic function, and muscle strength in obese/overweight young women.

In overweight/obese normotensive young women, 6 weeks of WBV training decreased systemic arterial stiffness and aortic systolic blood pressure (aSBP) by improving the reflection wave and sympathovagal equilibrium.

Performing cardiovascular therapy with WBV, could benefit the arterial function and muscle strength in untrained subjects who are not capable of performing conventional exercises.

“Improvement in arterial stiffness, blood pressure and sympathovagal balance in obese/overweight young women




## DIABETES TYPE 2, ADULTS

Type 2 Diabetes, Non-Insulin-Dependent, Glycemic Control, Aerobic Exercise

**TITLE :** Effects of Aerobic Exercise and Whole Body Vibration on Glycemic Control in type 2 Diabetic Males

**AUTHORS :** BEHBOUDI, AZARBYJANI, AGHAALINEIJAD & SALAVATI

**LOCATION OF STUDY :** Islamic Azad University, Tehran - Iranian Research Centre on Ageing, Tehran (Iran) 

**PUBLICATION REFERENCE :** Asian Journal of Sports Medicine 2011, 2(2), p 83-90

Aerobic exercise has been identified as the main treatment modality for type 2 diabetes. However, exercise is frequently rejected by some patients who lack endurance or stamina. The present study compared 8 weeks of aerobic exercise to Whole Body Vibration (WBV) training to control glycemia in 30 men with type 2 diabetes, aged between 45 and 65 years.

Subjects were divided into 3 groups, one practicing aerobic exercises (AE), one receiving WBV and one control group. A significant decrease in fasting glycemia was found in the AE exercise group and the WBV group relative to the control group ( $p = 0.02$ ).

This study shows that WBV training stimulate the metabolic system to similar effect as aerobic exercise. Therefore, WBV is an effective and viable alternative to aerobic exercise amongst type 2 diabetic patients.



“ Whole Body Vibration training showed metabolic improvement identical to that provided by aerobic exercises in men with type 2 diabetes

**Table 2:** Changes in  $V_{O2max}$ , BMI, and fat percentage following aerobic exercise and whole body vibration compared to the control group

Parameter	Group	Pre Test	Mid Test	Post Test
		Mean (SD)	Mean (SD)	Mean (SD)
$V_{O2max}$ (ml.Kg min)	Aerobic	28.30 (8.41)	29.64 (0.52)	31.62 (2.73)
	vibration	31.26 (2.22)	32.80 (2.48)	39.63 (4.93)
	control	37.52 (5.35)	38.80 (6.21)	39.47 (5.56)
Fat percentage	Aerobic	6.61 (2.46)	7.52 (1.20)	7.03 (1.17)
	Vibration	7.18± (2.36)	7.48 (2.43)	7.03 (2.23)
	Control	9.53 (2.23)	9.63 (2.18)	9.68 (2.32)
BMI ( $m^2$ )	Aerobic	28.43 (4.00)	27.45 (2.55)	27.23 (2.49)
	Vibration	26.48 (3.62)	26.76 (3.42)	26.79 (3.09)
	Control	27.87 (3.16)	27.91 (3.21)	27.16 (3.06)

BMI: Body Mass Index / SD: Standard Deviation

**Table 1:** General characteristics of the subjects

	Control	Aerobic training	Vibration	F	P value
Age (year)	52.30 (6.17)	53.10 (6.57)	49.20 (3.94)	1.31	0.285
Weight (kg)	76.43 (9.22)	82.24 (12.33)	75 (10.92)	3.08	0.062
Height (cm)	165.60 (4.99)	172.60 (8.14)	168.40 (5.44)	1.31	0.285

The data are given based on mean values (Standard Deviation)




## TYPE 2 DIABETES, SENIORS

Seniors, Type 2 Diabetes, Overweight: Glycemic Control, Glycosylated Hemoglobin

**TITLE :** Efficiency of Vibration Exercise for Glycemic Control in type 2 Diabetes patients

**AUTHORS :** BAUM, VOTTELER & SCHIAB

**LOCATION OF STUDY :** Institut für Physiologie und Anatomie, Traininginstitut Prof.BAUM, Köln (Germany) 

**PUBLICATION REFERENCE :** International Journal of Medicine Science 2007, 4, p 159-163

In this study the influence of a three month vibration-exercise period on parameters of glucose metabolism in type II diabetes patients was investigated. The results were compared with a control group and a group performing strength training. 40 overweight, non-insulin dependent diabetic senior patients participated in this study.

They found a beneficial effect of vibration-exercise on glycemic control without detectable changes in physical performance parameters.

This pilot study showed that vibration exercise may be an effective measure to improve glycemic control in non insulin dependent diabetes type 2 patients. Further studies should be encouraged to optimize frequency, amplitude, and duration of vibration exercises.

“Improved glycemic control in patients with type 2 diabetes



## CLINICAL CASE STUDY: MORBID OBESITY

Ms B, 68 years old, suffered from morbid obesity with a body mass index (BMI) of 34.3 and a weight of 103 kg. She resides in EHPAD due to her loss of mobility and autonomy (chair-bound, she is out of breath after only 20 meters of assisted walking with a carer).

After 3 months of special 'fragile senior' training on Power Plate, she regained her autonomy and mobility. She is now able to leave her chair and walk alone for a distance of 100 meters without suffering from shortness of breath and with satisfactory cardiopulmonary function.

In addition Mrs B has lost 5% of her weight (5kg) and her BMI has decreased from 34.3 to 32.6. This is in the absence of any associated calorie restriction or diet, as there has been no change in the meal plan provided

by EHPAD. The weight loss has occurred as a side effect of the Power Plate training, which was primarily intended to improve balance, increase muscle strength and allow greater independence.

Mrs. B's exercises on the Power Plate began as a few minutes per day of squatting, which was initially performed statically and progressed to dynamic execution.

The difference in weight can be seen by comparing the photo on page 27 taken after 3 months of Power Plate with the one taken at the beginning of Power Plate training on page 24.




## THALASSEMIA: BONE FRAGILITY, FRACTURE PREVENTION

Adults & Children, Thalassemia, Bone Mass: Whole Body Vibrations 30 Hz +0.3g, Bone Density, Follow-up 1 year, Quality of Life, Prevention of Fractures

**TITLE :** The effect of Whole Body Vibration therapy on bone density in patients with thalassemia : a pilot study

**AUTHORS :** FUNG, GARIEPY, HIGA, SAWYER & VICHINSKY

**LOCATION OF STUDY :** Children's Hospital & Research Center, Oakland, California - Department of Pediatric Orthopedic Surgery, University of California, San Francisco - (USA) 

**PUBLICATION REFERENCE :** American Journal of Hematology 2012 Oct, 87 (10)

Patients with thalassemia have low bone mass that can lead to fractures and poor quality of life. Some forms of physical activity that could increase bone mineral density are not tolerated by thalassemia patients with cardiac complications.

The primary aim of this short term trial was to examine the effects of Whole Body Vibration (WBV) on trabecular and cortical bone density and strength variables in subjects with Thalassemia. The WBV intervention consisted of 20-min sessions, 6 days per week for 6 months in the subjects' home standing on an active vibration platform.

The whole body BMC and aBMD increased in adults who had limited physical activity and low bone mass. A net increase in markers of bone formation was also observed for the adult group during the intervention period. This suggests promise of a noninvasive intervention in a group of patients who have a significant risk of osteoporosis morbidity.

“Improvement of bone mass, density and solidity in patients with thalassemia



**TABLE I. Change in Bone Parameters at Baseline, 6 and 12 Months of a Longitudinal Whole Body Vibration Platform Intervention in Adult Subjects with Transfusion Dependent Thalassemia (n = 9)**

Adult subjects	Intervention		Post-Intervention	P-value*
	Baseline	6 month	12 month	
<b>Bone Density by DXA**</b>				
Spine aBMD, g/cm <sup>2</sup>	0.774 (0.620, 1.022)	0.782 (0.616, 1.006)	0.774 (0.614, 0.995)	NS
Spine BMAD, g/cm <sup>3</sup>	0.102 (0.080, 0.127)	0.103 (0.083, 0.125)	0.104 (0.082, 0.128)	NS
Total Hip aBMD, g/cm <sup>2</sup>	0.715 (0.624, 0.821)	0.726 (0.622, 0.815)	0.718 (0.619, 0.781)	NS
Total Hip BMC, g	22.67 (18.6, 27.3)	22.77 (17.8, 25.7)	22.76 (19.5, 25.8)	NS
Whole body BMC, g	1523 (1006, 1916)	1563* (1056, 1985)	1563* (1080, 2003)	0.021
<b>Bone Density by pQCT</b>				
Tibial Trabecular vBMD, g/cm <sup>3</sup>	193 (130, 243)	194 (123, 243)	192 (123, 234)	NS
Total Tibial vBMD, g/cm <sup>3</sup>	221 (163, 268)	223 (158, 270)	220 (159, 271)	NS
Peripheral Circumference, mm	65.1 (56.7, 78.2)	65.2 (57.1, 78.4)	65.2 (56.9, 78.3)	NS
Endosteal Circumference, mm	42.2 (27.7, 59.1)	42.2 (28.0, 59.2)	42.2 (28.1, 59.1)	NS
Tibial Cortical vBMD, g/cm <sup>3</sup>	1190 (1171, 1242)	1193 (1123, 1249)	1193 (1135, 1245)	NS
Tibial Cortical Thickness, mm	3.7 (2.9, 4.6)	3.7 (3.1, 4.6)	3.7 (3.1, 4.6)	NS
<b>Body Composition by DXA</b>				
Whole Body Fat mass, kg	12.7 (5.4, 22.5)	12.8 (4.4, 23.3)	13.0 (5.1, 22.1)	NS
Whole Body Lean mass, kg	39.2 (35.2, 48.0)	39.8* (35.9, 49.4)	39.3 (35.3, 48.7)	0.06

BMC, bone mineral content; aBMD, areal bone mineral density; vBMD, volumetric bone mineral density; BMAD, bone mineral apparent density. Values are denoted as Mean (95%Confidence Interval)

\*p-value is for the repeated measures ANOVA model, \*denotes time points that are significantly different from baseline by a  $P < 0.05$ .

†denotes a trend ( $P < 0.1$ ) from baseline.

\*\*Least significant change (LSC) for our DXA instrument is: spine BMD: 0.022 g/cm<sup>2</sup>; hip BMD 0.025 g/cm<sup>2</sup>; and whole body BMC: 58 g.




# 4 | POST-MENOPAUSE

## FALLS PREVENTION, SARCOPENIA

Post-menopause & Seniors: Falls Prevention, Knee, Muscle Strength

**TITLE :** Whole Body Vibration training increases knee-extension and speed of movement in older women

**AUTHORS :** ROELANTS, VERSCHUEREN & DELECLUSEY

**LOCATION OF STUDY :** Université Catholique de Louvain (Belgium) 

**PUBLICATION REFERENCE :** Journal of the American Geriatrics Society, June 2004; 52(6): p901-908

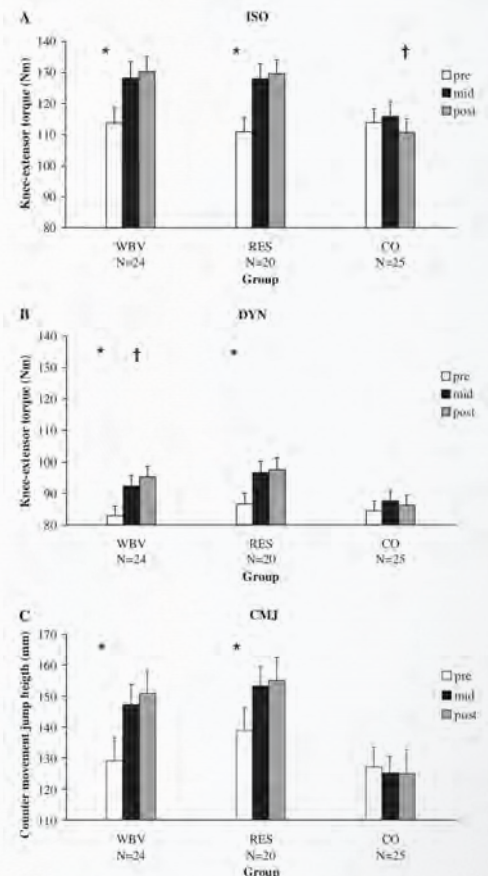
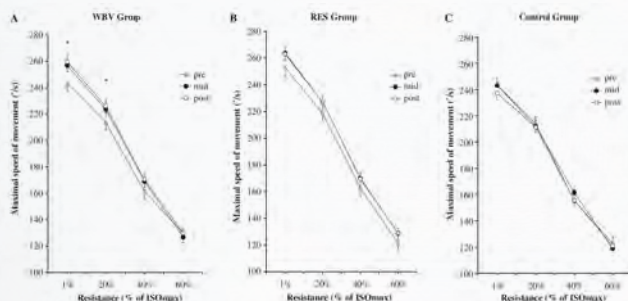
Muscle strength and force production have great functional influence on the elderly in daily activities of daily living, such as walking, climbing stairs or rising from a chair. Risk factors in the elderly, which lead to falls and fractures of the neck of the femur, include muscle weakness and inability of the muscles of the limbs to produce a rapid force.

The elderly lose muscle mass due to a decrease in physical activity. Therefore, prevention of muscle strength loss and muscle atrophy related to age is a public health problem.

This study of 89 post-menopausal women, carried out for 24 weeks, demonstrates that Whole Body Vibration (WBV) training on Power Plate has a great potential for geriatric and therapeutic applications as a safe, low impact method that can be applied to the weak. In addition it it would be an option for those who do not want, or who are unable, to follow traditional resistance training.



“Prevention of loss of muscle strength and muscle atrophy due to aging in elderly women



## BONE MINERAL DENSITY, OSTEOPOROSIS PREVENTION

Post-menopause: Bone Density, Local Effect, Muscular Strength, Postural Control, Risk Fracture of Head of Femur, 6 Month Follow-up, Osteoporosis Prevention

**TITLE :** Effect of 6-month Whole Body Vibration Training on hip density, muscle strength and postural control in postmenopausal women: A randomized controlled pilot study

**AUTHORS :** VERSCHUEREN, ROELANTS, DELECLUSE, SWINNEN, VANDERSCHUEREN & BOONEN

**LOCATION OF STUDY :** Service de Médecine Gériatrique, Centre des Maladies Osseuses Métaboliques, Université de Louvain (Belgium)  - American Society for Bone and Mineral Research 

**PUBLICATION REFERENCE :** Journal of Bone & Mineral Research 2004; 19(3): p 352-359

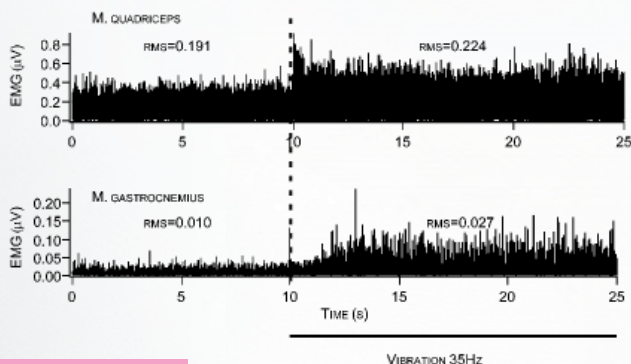
As the world population ages, osteoporosis and osteoporotic fracture occurrence are becoming an increasingly important public health problem. Proximal femoral fracture is the most devastating complication of osteoporosis. The mortality rate in patients with hip fracture is 12–20% higher than in persons of similar age and gender who have not suffered a fracture. Of those who survive the operative intervention for an osteoporotic hip fracture, less than one-third are restored to their prefracture functional state.

Most strategies to treat postmenopausal bone loss have been focusing on antiresorptive medication. Physical exercises to preserve BMD (bone mineral density) and prevent osteoporosis have proved to be effective but require rather vigorous aerobic exercises and muscle strength training. These have the disadvantage of being poorly followed over the long term and lead to an increased risk of fractures. Moreover, there is evidence that the osteogenic effect of load-bearing may decline with aging.

The aim of this randomized controlled trial was therefore to assess musculoskeletal effects of high-frequency Whole Body Vibration (WBV) training in postmenopausal women.

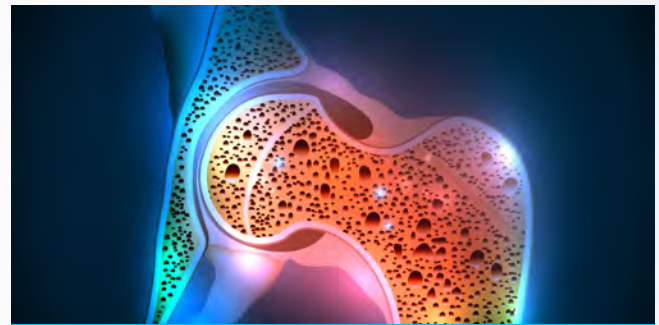
A 6-month exercise program was undertaken, with one group of women incorporating WBV on Power Plate, one performing resistance exercise, and a non-exercising control group. The exercise groups trained three times a week for 24 weeks.

No vibration-related side effects were observed. Vibration training improved isometric and dynamic muscle strength and also significantly increased BMD of the hip. No changes in hip BMD were observed in the non-WBV groups. Serum markers of bone turnover did not change in any of the groups.

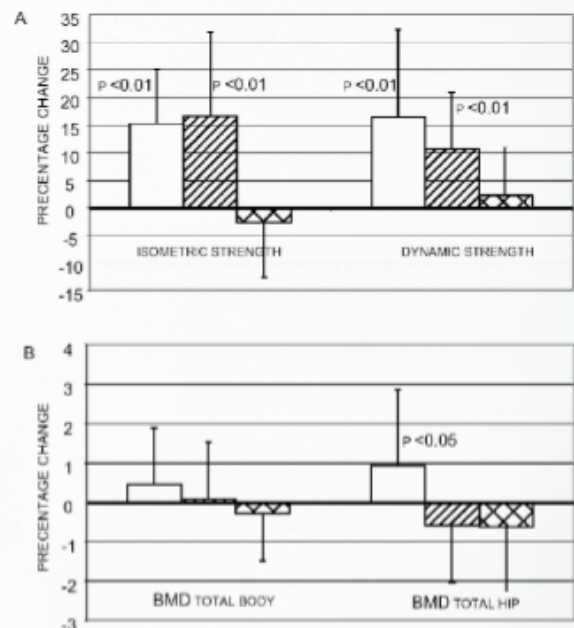


The absence of effect on the BMD of the spine or the total BMD indicates a specific local effect of the WBV. The 6-month training program on Power Plate, which represents a mechanical load of the bone and causes reflex muscle contractions, does not cause any side effects. WBV training induces a significant increase in bone density of the hip (+1.5%) as well as an increase in muscle strength and postural control in postmenopausal women.

These results suggest that the WBV training could be an effective alternative to preventing osteoporosis in postmenopausal women by improving the BMD (bone mineral density), muscle strength and postural control that governs the balance, 3 factors recognised as risk factors for hip fracture.



“After 6 months, the increase in bone mineral density of the hip in postmenopausal women is similar to that obtained after drug therapy.”






## URINARY STRESS INCONTINENCE

Seniors, Women: Urinary Stress Incontinence, Cognitive Disorders, Quality of Life

**TITLE :** Does Whole Body Vibration Training Help in a Geriatric Population suffering from Urinary Incontinence?

**AUTHORS :** De JONG, FRICK, KUHN & De BRUIN

**LOCATION OF STUDY :** Interlaken,- Department of Urogynaecology, University Hospital of Bern, - Institute of Human Movement Sciences and Sport, ETH Zürich (Switzerland) 

**PUBLICATION REFERENCE :** Oral Presentation 2011

The aim of this study was to investigate the influence of Whole Body Vibration training (WBVT), with or without pelvic floor muscle training (PFMT), on urinary leakage in a female geriatric population compared to Control group receiving placebo treatment.

49 women of average age 83.6 years, with predominantly persistent stress urinary incontinence for the past 3 months or more, were recruited from a nursing home to attend a 14-week program.

The participants were divided into 3 groups: [1] received WBVT three times-a-week (WBVT, no cognitive resources required), [2] WBVT in combination with PFMT (WBVT and physiotherapy sessions once a week combined with home exercises, cognitive resources needed), and [3] control group receiving a placebo WBVT (off-set standing on a vibration platform, no cognitive resources required).

There was a significant decrease in urinary leakage in the intervention group who received PFMT and WBVT. The intervention group who received only WBVT showed a reduction in urinary leakage, especially in the first 7 weeks, but the result was not significant. There were no changes in the placebo group.

The results indicate that WBV training could be a useful treatment in incontinent patients with cognitive impairment. In subjects capable of performing PFMT, the combination of WBVT + PFMT is clearly the most effective. It remains to be determined which frequency and / or intensity adaptations would be able to increase the effects of WBVT therapeutic vibration training in patients with cognitive impairment.



“Use of vibration in cognitive impairment or associated with exercises of pelvic floor muscles in seniors suffering from urinary incontinence

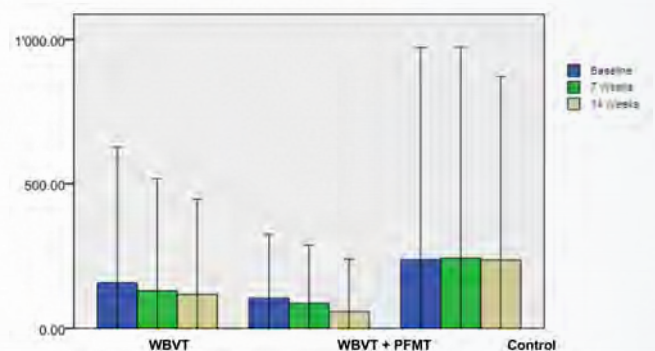



Fig. 1. Comparison of the groups between baseline and post-treatment

## CASE STUDY - PREVENTION OF OSTEOPOROSIS

### VIBROS STUDY AT THE ST. ETIENNE UNIVERSITY MEDICAL CENTRE.

A VIBROS study on the prevention of osteoporosis using Power Plate Whole Body Vibration in 240 sedentary patients aged 55 to 75 years, with low BMD (bone mineral density) and not receiving osteoporosis medication, is currently underway at the INSERM and at the CHU de St Etienne. 




## HYPERTENSION, CARDIOVASCULAR RISK

Post-menopause, Obesity, Hypertension, Cardiovascular Risk Prevention

**TITLE :** Effects of Whole Body Vibration exercise training on Aortic Wave Reflection and Muscle Strength in Postmenopausal Women with Prehypertension and Hypertension

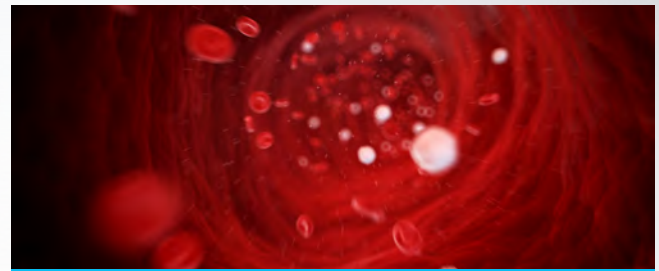
**AUTHORS :** FIGUEROA, KALFON, MADZIMA & WONG

**LOCATION OF STUDY :** Department of Nutrition, Food and Exercise Sciences, The Florida State University, Tallahassee, FL (USA) 

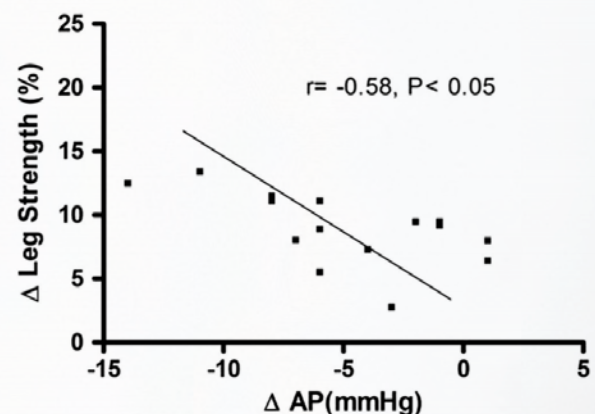
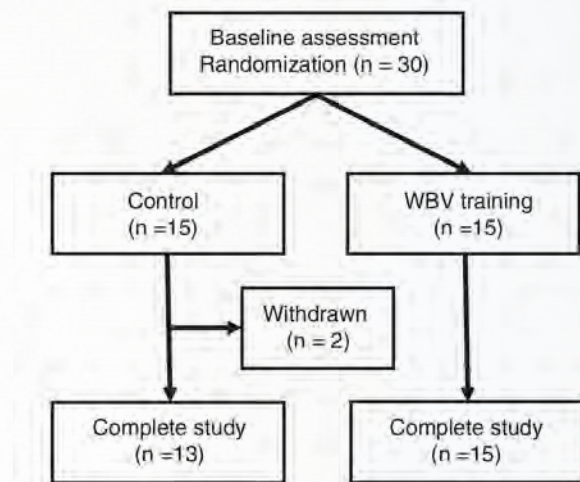
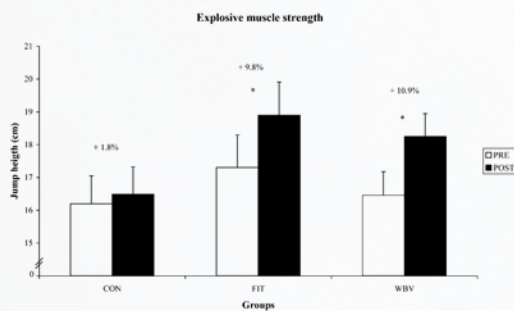
**PUBLICATION REFERENCE :** Journal of Human Hypertension 2014; 28: p 118-122

Increased wave reflection (augmented pressure (AP) and augmentation index (AIx)) and reduced muscle strength may increase cardiovascular risk in postmenopausal women. The aim of this study was to investigate the effects of Power Plate Whole Body Vibration (WBV) on the aortic haemodynamics and muscle strength of postmenopausal women with pre-hypertension or hypertension.

Our data demonstrated that WBV exercise training reduced pressure wave reflection magnitude and aortic blood pressure in postmenopausal women with prehypertension or hypertension. Our study suggests that WBVET may decrease cardiovascular risk in postmenopausal women by improving wave reflection and muscle strength.



“Reduced cardiovascular risk and disability in hypertensive and obese menopausal women






# 5 | SENIORS

## FALLS PREVENTION

Elderly: Postural Control, Falls Prevention, 1 Year Follow-up

**TITLE :** Effects of Whole Body Vibration training on postural control in older individuals : A 1-year randomized controlled trial

**AUTHORS :** BOGAERTS, VERSCHUEREN, DELECLUSE, CLAESSENS & BOONEN

**LOCATION OF STUDY :** Service de Rééducation Musculaire, Centre de Recherches sur l'Exercice et la Santé, Centre des Maladies Osseuses Métaboliques et Service de Médecine Gériatrique, Université Catholique de Louvain (Belgium) 

**PUBLICATION REFERENCE :** Gait & Posture 2007; 26: p 309-316

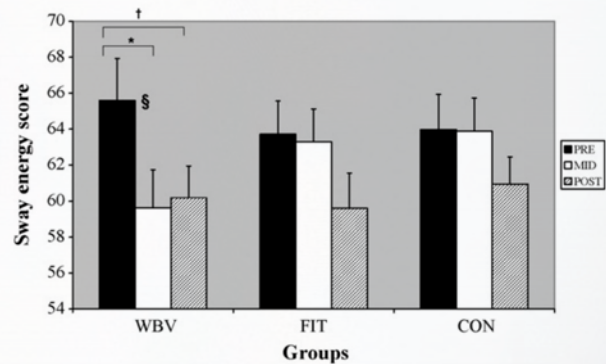
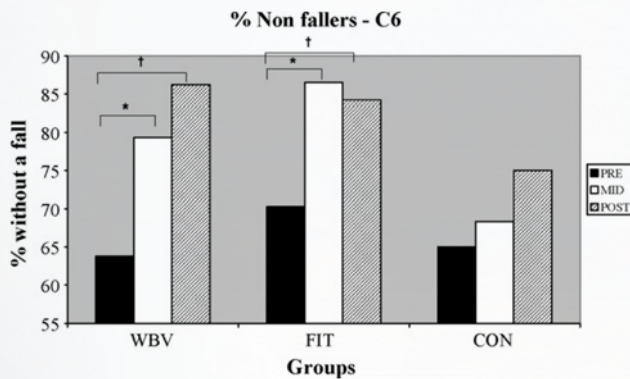
This randomized controlled trial investigated the effects of a 12 month Whole Body Vibration (WBV) training program on postural control in healthy older adults. Two hundred and twenty people were randomly assigned to a Whole Body Vibration group (n=94), a fitness group (n=60) or a control group (n=66). The Whole Body Vibration and fitness groups trained three times a week for 1 year. The vibration group performed exercises on a vibration platform and the fitness group performed cardiovascular, strength, balance and stretching exercises

Some physical workouts like fitness are likely to improve postural control, even in the elderly. WBV training can be considered as an alternative to increasing muscular strength through simultaneous stimulation of the proprioceptive system and is therefore likely to improve the balance of the elderly. As a result, the increased sensory stimulation and more effective use of proprioceptive feedback, shown in the WBV group, appears to be partly responsible for the improvement of some factors in postural balance.

This study showed that 1 year of WBV training on Power Plate decreased falls and improved responses to surface rotations in older adults.



“Increasing muscle strength and postural balance by stimulating proprioceptive feedback in the elderly




# FALLS PREVENTION AND CARDIORESPIRATORY FUNCTION

Elderly Population (Male & Female) in Residential Care: Muscular Strength, Cardiopulmonary Function, 1-year follow-up, Whole Body Vibration

**TITLE :** Effects of the Whole Body Vibration Training on cardio-respiratory fitness and muscle strength in older individuals : A 1-year randomized controlled trial

**AUTHORS :** BOGAERTS, VERSCHUEREN, DELECLUSE, CLAESSENS & BOONEN

**LOCATION OF STUDY :** Service de Rééducation Musculaire, Faculté de Kinésiologie et des Sciences de Rééducation, Faculté de Médecine, Université de Louvain (Belgium) 

**PUBLICATION REFERENCE :** Age & Ageing, May 2009; 38(4): p 448-454

This study evaluated the effect Whole Body Vibration (WBV) on cardiovascular fitness and muscle strength of older community-dwelling people.

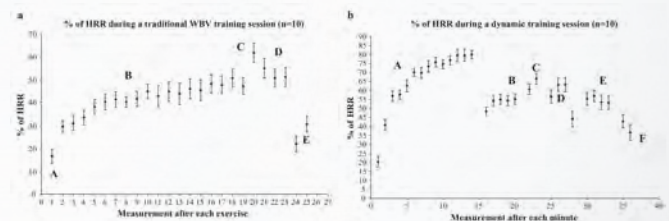
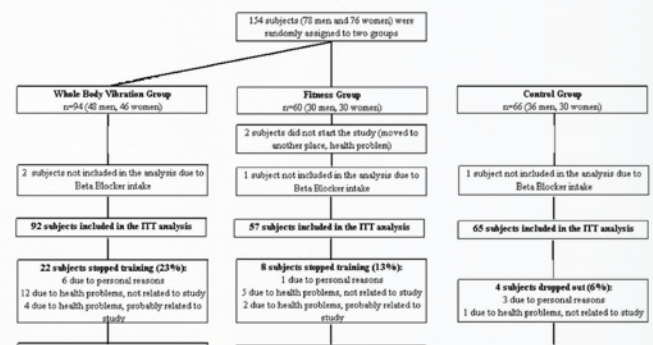
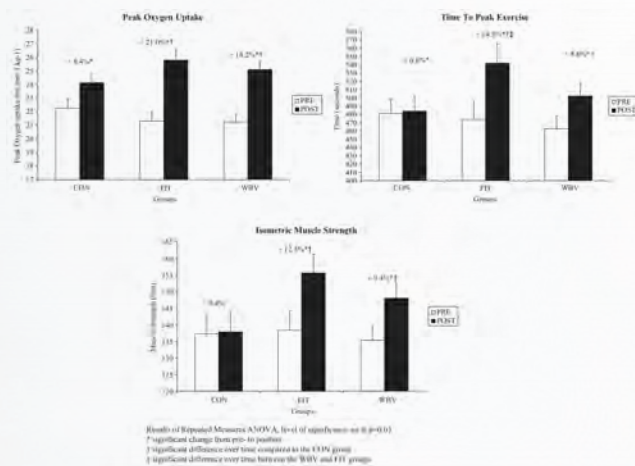
1 year of WBV training on a Power Plate led to a significant improvement in muscle strength and cardiorespiratory function in the elderly.

The improvements observed in the Power Plate group were similar to those obtained in the traditional fitness group, however the training duration of the WBV group was much lower (25 minutes versus 75 minutes in the fitness group).

WBV training appears to be an effective way to improve cardiorespiratory fitness and muscle strength in elderly community-dwelling people.



“Significant improvement in muscle strength and cardiorespiratory fitness of the elderly”





## SARCOPENIA

Elderly Population in Residential Care: Balance, Mobility, Muscular Casting, Sarcopenia, Risk of Falls

**TITLE :** The feasibility of Whole Body Vibration in institutionalised elderly persons and its influence on muscle performance, balance and mobility : a randomised, controlled trial

**AUTHORS :** BAUTMANS, Van HEES, LEMPER & METS

**LOCATION OF STUDY :** Gérontologie, Sciences de Revalidation et Physiothérapie, Université Libre de Bruxelles- Physiothérapie, Hoges School d'Anvers - Gériatrie, Hôpital Académique de l'Université Libre de Bruxelles- Fondation de Psychogériatrie, Bruxelles (Belgium) 

**PUBLICATION REFERENCE :** BMC Geriatrics Dec 2005; 5(17): p 1-8

Fatigue or lack of interest may reduce the feasibility of intensive physical exercise in nursing home residents. Low-volume exercise interventions with similar training effects might be an alternative.

The aim of this randomised controlled trial was to investigate the feasibility of Whole Body Vibration (WBV) in institutionalised elderly, and its impact on functional capacity and muscle performance.

*In nursing home residents with limited functional dependency, six weeks static WBV exercise was found to be feasible, and was beneficial for balance and mobility.*

“Rapid improvement of the balance and mobility of the elderly



## CASE STUDY

### POWER PLATE IN RETIREMENT HOMES (EHPAD)

For several years, a number retirement homes (e.g. Aix, Nice, Bordeaux) have installed Power Plate machines for use by their senior residents.

Groupe Belage is one example. Extremely satisfactory outcomes have been achieved:

- Improvement of the circulatory system
- Improvement of balance and muscle tone
- Fall prevention
- Improved independence
- Improved quality of life

Contributing factors to the success is the absence of the need for muscle loading and movement, which it feasible for most patients to achieve, as well as the fact that the sessions need only be of short duration (2 to 5 minutes).


It has also been noted that a number of patients have returned to their usual lifestyle at their end of treatment.

## FALL PREVENTION

Elderly Population: Sarcopenia, Falls Risk

**TITLE :** A randomised controlled trial on the effects of Whole Body Vibration on muscle power in older people at risk of falling (Poster, Young Investigator Award presented at the National Osteoporosis Society, 12th conference on Osteoporosis, Edinburgh, UK)

**AUTHORS :** CORRIE, BROOKE-WAVEL, MANSFIELD, D'SOUZA, GRIFFITHS, MORRIS, ATTENBOROUGH & MASUD

**LOCATION OF STUDY :** University of Loughborough, University of Nottingham, University of Derby (UK) 

**PUBLICATION REFERENCE :** Osteoporosis Int. 2007; 18(suppl 3):S253-54

The aim of this study was to compare a standard falls prevention program with one where WBV was introduced. A randomised controlled trial of 61 elderly care home residents, including 37 women, aged 80.7 years (64-95), underwent a standard falls prevention program with the addition of a vibrating platform (Power Plate), training 3 times a week for 12 weeks.

Patient groups receiving Power Plate training reported a significant improvement in muscle strength of the leg extensors compared to the group receiving standard training (placebo group).

These results suggest that Whole Body Vibration training can play an important role in improving the prevention and risk of falls in the institutionalised elderly.




“Significant improvement in the muscular strength of the leg extensors of the elderly care home residents compared to traditional training

## SARCOPENIA

Elderly Population in Residential Care: Muscular Strength, Muscle Mass, Sarcopenia, 1 year follow-up

**TITLE :** Impact of Whole Body Vibration Training versus fitness training on muscle strength and muscle mass in older men: A 1-year randomised controlled trial

**AUTHORS :** BOGAERTS, VERSCHUEREN, DELECLUSE, CLAESSENS, COUDYZER & BOONEN

**LOCATION OF STUDY :** Université Catholique de Louvain (Belgium) 

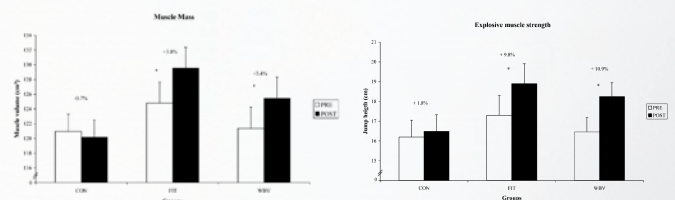
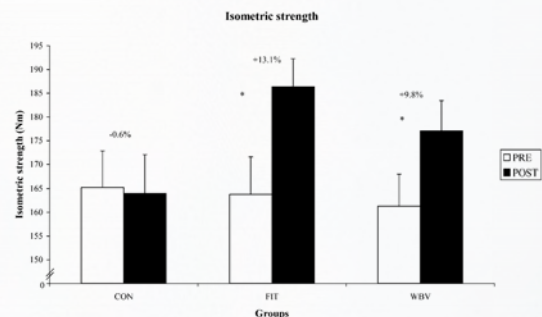
**PUBLICATION REFERENCE :** Journal of Gerontology : Medical Sciences 2007; 62A(6): p 630-635

This study investigated the effects of WBV training on isometric and explosive muscle strength and muscle mass in community-dwelling men older than 60 years. This study was carried out in 97 community-dwelling men over 60 years of age and compared a WBV, a fitness group and a control group.

WBV training is as efficient as a fitness program to increase isometric and explosive knee extension strength and muscle mass of the upper leg in community-dwelling older men. These findings suggest that WBV training has potential to prevent or reverse sarcopenia.



“Prevention and control of age-related sarcopenia






## OSTEOPOROSIS

Elderly Population: Osteogenesis, Bone Resorption

**TITLE :** Effect of Whole Body Vibration on Bone Formation and Resorption in older patients : A randomised controlled trial

**AUTHORS :** CORRIE, BROOKE-WAVEL, MANSFIELD, D'SOUZA, GRIFFITHS, MORRIS, ATTENBOROUGH & MASUD

**LOCATION OF STUDY :** University of Loughborough, University of Nottingham, University of Derby (UK) 

**PUBLICATION REFERENCE :** Osteoporosis Int. 2007; 18(suppl.3): S285 (P47A) Poster Presentation at the National Osteoporosis Society : 12th conference on Osteoporosis, Edinburgh, UK, 2007

This study looked at the impact of WBV training using Power Plate on bone turnover, markers of bone formation (osteogenesis) P1NP and markers of bone resorption (CTX) to analyze if Whole Body Vibration (WBV) training can lead to an increase in BMD (bone mineral density).

A population of 61 elderly subjects, 37 women aged 80-95 were enrolled in a 12-week fall prevention program, 3 times per week into 3 groups: 2 active and 1 control.

Preliminary results suggest that Power Plate training does not affect bone resorption but may increase osteogenesis.




“ Increased osteogenesis without any effect on bone resorption

## OSTEOARTHRITIS OF THE KNEE

Seniors, Arthritis, Knee: Physical Performance, Activities of Daily Living, Climbing Stairs, Pain, Quality of Life

**TITRE :** Does Acute Whole Body Vibration Training Improve the Physical Performances of People with Knee Osteoarthritis?

**AUTEURS :** SALMON, ROPER & TILLMAN

**LIEU DE L'ÉTUDE :** University of Florida (USA) 

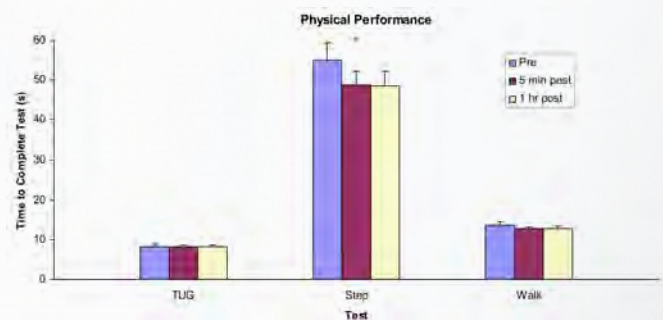
**PUBLICATION REFERENCE :** The Journal of Strength and Conditioning Research 2012, 26, p 2983-2989

The purpose of this study was to determine the effects of a single session of Whole Body Vibration training (WBVT) on the physical performance of individuals with knee osteoarthritis (OA) in 3 tests designed to simulate activities of daily living (ADLs). Assessments were carried out with 17 subjects who had symptomatic osteoarthritis of the knee and were able to follow a Power Plate training program.

WBV training on the Power Plate was well tolerated by most participants. Data showed that a single WBV session is effective in improving the ability of individuals with knee OA to perform a step test and 20-m walk test

Our findings suggest that WBVT may be an effective nonpharmacologic modality to treat some knee OA symptoms and improve ADLs.

“ Decrease in pain levels following the step-test was on average -28%, 5 minutes after application of WBV.



# POST-SURGICAL PAIN (TOTAL KNEE ARTHROPLASTY)

Seniors, Knee Arthroplasty: Early Rehabilitation, Pain

**TITLE :** Examination of the usefulness of Whole Body Vibration training for functional improvement after total knee arthroplasty

**AUTHORS :** TAKADA, SEKIYA, JU & MUNETA

**LOCATION OF STUDY :** Department of Rehabilitation, Tokyo Medical and Dental University - Department of Orthopaedic Surgery, Tokyo Medical and Dental University Hospital (Japan)



**PUBLICATION REFERENCE :** Japanese Journal of Rehabilitation JOSKAS 2013, 38: p563-567

The authors investigated the effectiveness of Whole Body Vibration (WBV) with Power Plate after total knee arthroplasty in 30 patients. The WBV group used PP five times a week on 30Hz Low amplitude before physiotherapy. the control group had physiotherapy without WBV.

A statistically significant difference was found in the level of pain experienced by the WBV group.

The administration of WBV with Power Plate in the early postoperative phase of knee arthroplasty can significant reduce pain.



“Significant improvement in post-surgical pain in early rehabilitation after total knee arthroplasty in elderly subjects

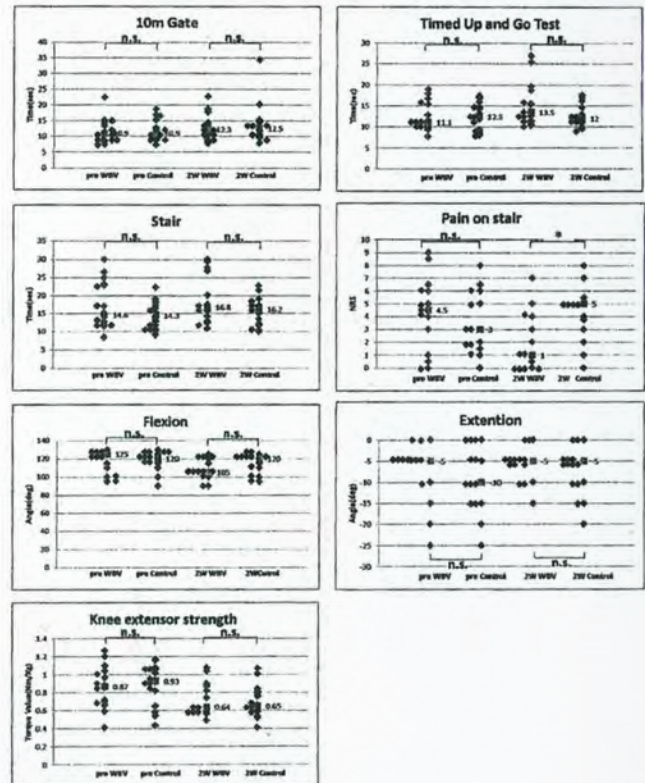


**Table 1** Characteristics of the study subjects

	Male/Female	Age(year)	Height(cm)	Weight(Kg)
WBV (n = 15)	1/14	73.6 ± 7.1	149.6 ± 6.7	59.2 ± 9.8
Control (n = 15)	3/12	73.5 ± 7.4	152.4 ± 5.7	62.2 ± 8.2

Data are expressed as means ± SD. WBV : whole body vibration

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## VIBRATION AND INFLAMMATORY MARKERS

Seniors, Elderly Population in Residential Care, Sarcopenia: Inflammatory Markers, Physical Fitness

**TITLE :** Whole Body Vibration Training Increases Physical Fitness Measures Without Alteration of Inflammatory Markers in Older Adults

**AUTHORS :** CHRISTI, COLLASO, MARQUEZ, GARATACHEA & CUEVAS

**LOCATION OF STUDY :** Institute of Biomedicine (IBIOMED), University of Leon - Faculty of Health and Sport Science, University of Zaragoza, Huesca (Spain) 

**PUBLICATION REFERENCE :** European Journal of Sport Science 2013, (DOI: 10.1080 / 17461391.2013.858370)

The aim of this study was to observe the effects of a 9-week Whole Body Vibration (WBV) training program in older adults on physical fitness measurements and markers of inflammation.

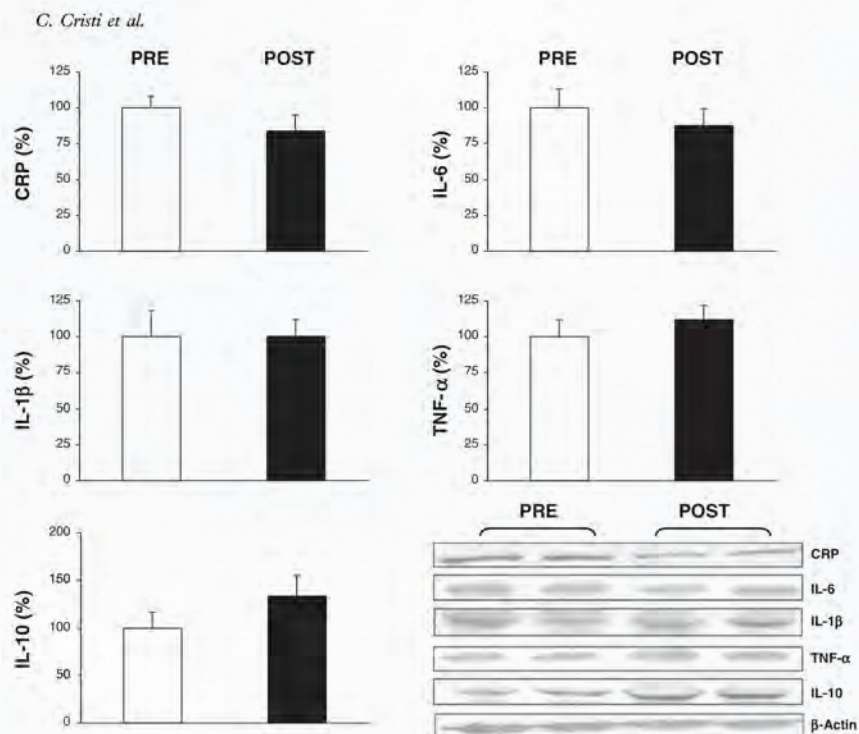
16 volunteers participated in this trial with sessions three times per week. The program consisted of lower and upper-body unloaded static and dynamic exercises.

WBV significantly improved outcomes in 30 second chair stand, arm curl or chair sit and reach test. There was a significant increase in maximal voluntary isometric contractions. Muscle power values were also significantly greater after training. mRNA or protein levels for C-reactive protein, interleukin-6, interleukin-1b, tumour necrosis factor- $\alpha$  and interleukin-10 did not significantly differ from basal values.

Our data confirm the usefulness of WBV training for counteracting the loss of muscle strength associated with sarcopenia in older adults and show that WBV training could be a safe training method which induces no inflammatory effects.



“Improvement of age-related sarcopenia without secondary inflammatory effects in the older adults




## PARKINSON'S DESEASE

Parkinson's Disease, Balance, Gait, Posture, Falls Prevention

**TITLE :** Whole Body Vibration Versus Conventional Physiotherapy to Improve Balance and Gait in Parkinson's disease

**AUTHORS :** EBERSBACH, EDLER, KAUFHOLD & WISSEL

**LOCATION OF STUDY :** The Movement Disorders Clinic, Beeliz-Heilstätten (Germany) 

American Congress of Rehabilitation Medicine and the American Academy of Physical Medicine and Rehabilitation 2008) 

**PUBLICATION REFERENCE :** Archives of Physical Medicine and Rehabilitation 2008, 89, p 399-403

The objective of this study was to compare the effects of Whole Body Vibration (WBV) and conventional physiotherapy on Levodopa-resistant disturbances of balance and gait in patients with Parkinson's disease.

Subjects were randomized to receive 30 sessions (two 15-min sessions a day, 5 days a week) of either WBV on an oscillating platform or conventional balance training including exercises on a tilt board. Twenty-one subjects (10 with WBV, 11 controls) were available for follow-up 4 weeks after treatment termination.

The primary measure was Tinetti Balance Scale score. Secondary clinical ratings included stand-walk-sit test, walking velocity, Unified Parkinson's Disease Rating Scale (section III motor examination) score, performance in the pull test, and dynamic posturography.

In the WBV group, there was a statistically significant improvement in all evaluation criteria, including posturography (which was not the case for the control group treated by physiotherapy).

Equilibrium and gait improved in patients with PD receiving conventional WBV or conventional PT in the setting of a comprehensive rehabilitation program.



“Significant improvement in gait, balance and posture, all symptoms resistant to dopamine-equivalent drug therapy in patients with Parkinson's disease.

## URINARY STRESS INCONTINENCE

SEE PAGE 31

HORMONAL RESPONSES  
(STIMULATION OF THE ENDOCRINE SYSTEM)  
SEE PAGES 7/8

TYPE 2 DIABETES NON-INSULIN DEPENDENT  
SEE PAGES 26/27



## HEMIPLEGIA, CARDIOVASCULAR RISK

Seniors, Post-stroke, Hemiplegia: Arterial stiffness, Passive vibrations, Aortic Wave, PWV

**TITLE :** Acute Passive Vibration Reduces Arterial Stiffness and Aortic Wave Reflection in Stroke Survivors

**AUTHORS :** KOUTNIK, WONG, KALFON, MADZIMA & FIGUEROA

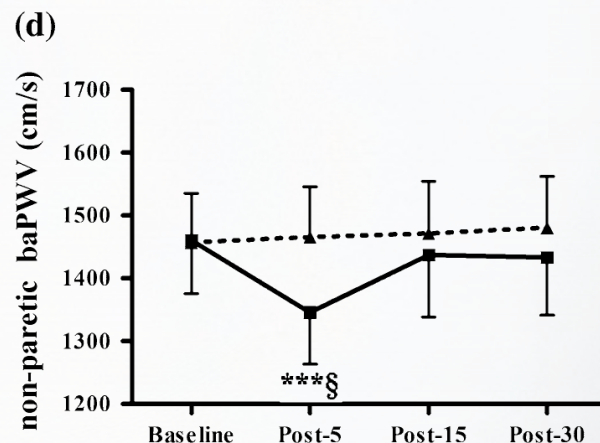
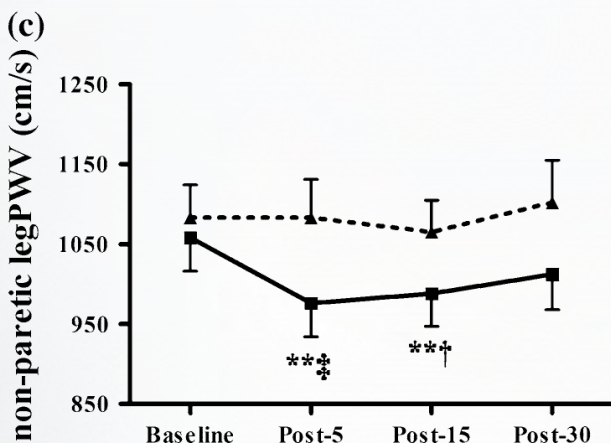
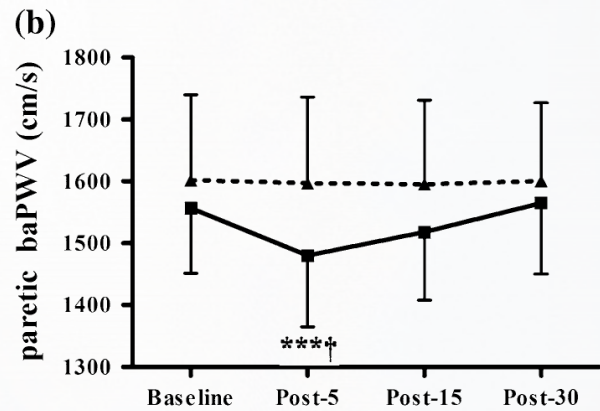
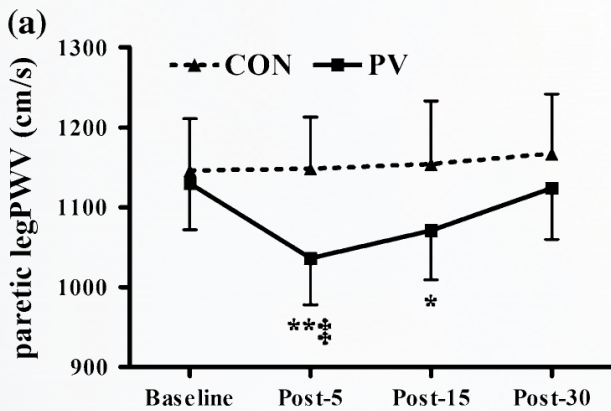
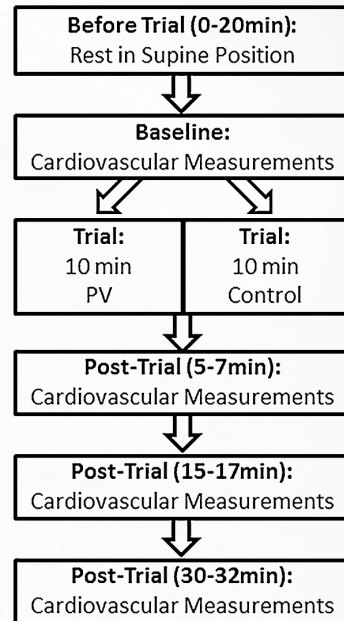
**LOCATION OF STUDY :** Department of Nutrition, Food and Exercise Sciences, The Florida State University, Tallahassee, FL (USA) 

**PUBLICATION REFERENCE :** European Journal of Applied Physiology 2014; 114: p 105-111

Impaired leg arterial stiffness (pulse wave velocity, PWV) and vasodilatory function are found after stroke. Acute passive vibration (PV) decreases leg PWV (legPWV) and pressure wave reflection (aortic augmentation index, aAIx) in healthy men. Our objective was to evaluate the effects of acute PV at 25Hz and 2mm amplitude on aAIx and PWV in the paretic and non-paretic sides in stroke survivors.

Acute PV applied to the legs of stroke survivors reduces systemic arterial stiffness and aortic wave reflection due to a reduction in leg arterial stiffness, which last longer in the non-paretic than in the paretic leg.

“Decreased arterial stiffness and reflection of the aortic wave in subjects who have suffered a stroke



## COGNITIVE DISORDERS, ALZHEIMER'S

Seniors, Elderly population: Alzheimers, Dementia, Neurodegenerative Illness, Cognitive Disorder, Fall Risk, Aging, Physical Activity, Quality of Life

**TITLE :** Is Whole Body Vibration a viable option for individuals with Alzheimer's Disease ?

**AUTHORS :** DA CUNHA SA-CAPUTO, RONIKEILE, DA COSTA, PACHECO-LIMA, KUTTER, COSTA-CAVALCANTI, MANTILLA-GIEHL, NUNE PAIVA, DE PAOLI, PRESTA, MARIN & BERNARDO-FILHO

**LOCATION OF STUDY :** Laboratory Medicine and Forensic Technology, Rio de Janeiro State University (Brazil), Laboratory of Physiology, European University Miguel de Cervantes, Valladolid (Spain)



**PUBLICATION REFERENCE :** Public Health Research 2014; 4(4): p 136-143

Besides the cognitive limitations, individuals with Alzheimer's disease (AD) have posture and gait disturbances and risk of falls. Researchers have reported that appropriate physical activity can enhance cognitive function and attenuates age-related deterioration of the brain structure.

PA has been considered a non pharmacologic intervention to manage the AD patient. This literature review was undertaken to weigh up the potential reported benefits to this population group.

It is suggested to include Whole Body Vibration (WBV) exercise in the management of the AD patients. The reviewers concluded that WBV could be a relevant, viable, safe and inexpensive strategic option of physical activity for individuals with AD.

“ Relevant strategic option by improving cognitive, posture, gait and fall risk in Alzheimer's patients



## POWER PLATE SCIENTIFIC COMMITTEE

The French Power Plate Scientific Committee is composed of medical specialists. The objective of this committee is the development of medical research and knowledge in preventive medicine, diseases of aging, physical and sports medicine and rehabilitation related to Power Plate and Whole Body Vibration.

The committee is composed of:

Dr. Catherine Bailleu - Chairperson -  
Medical Specialist in Clinical Research and Regulatory Issues

Dr. Philippe Blanchemaison - Angiology / Phlebology-  
Author of numerous medical books

Dr. Michel Gaillaud - Sports Medicine Physician - Former  
Chief Medical Officer of Olympique de Marseille (Football)





EXTENDED SEVERE FATIGUE  
SEE PAGE 19


SKIN MASSAGE (TOUCH, RELAXATION, HEALING)  
PAGES 4/5

STRENGTHENING SPINAL MUSCULAR  
DYSTROPHY

12 months of WBV, 30 Hz + 0.3 g, Spinal Muscle Mass, (+ 7,2%)

**TITLE :** Low-level, high frequency mechanical signals enhance musculoskeletal development of young women with low BMD

**AUTHORS :** GILSANZ, WREN, SANCHEZ, DOREY, JUDEX & RUBIN

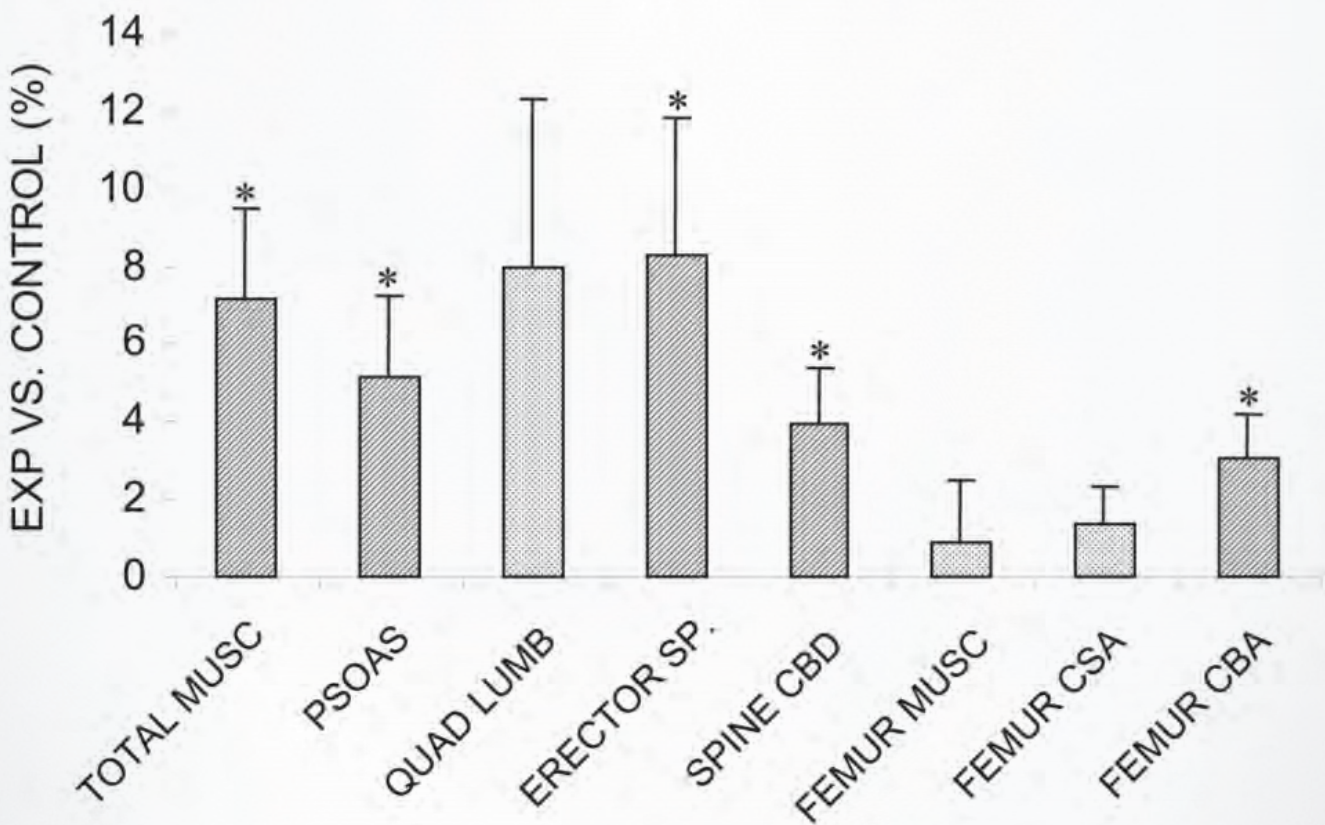
**LOCATION OF STUDY :** Children's Hospital of Los Angeles, University of Southern California, Keck School of Medicine, Los Angeles, CA (USA) 

(Study sponsored by the Department of the US Army)

**PUBLICATION REFERENCE :** Journal of Bone & Mineral Research 2006, 21, p 1464-1474

The potential for brief Whole Body Vibration (WBV) sessions to improve the development of the musculoskeletal system was evaluated in 48 young women. 12 months of this non-invasive mechanical treatment using WBV, for at least 2 minutes each day, increased the bone and muscle mass of the axial skeleton and the lower limbs compared to the control group which did not receive WBV. In particular, an increase of the spinal musculature of 7.2% was observed.

“7.2% increase in spinal muscle mass



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