

Whole Body Vibration Therapy

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Introduction:

Concept of Vibration Therapy:

Vibration platform for the whole body:

The idea originated in space science: Biomechanical Stimulation (BMS) by means of whole-body vibration.

In 1856, Russian physician and inventor Gustav Zander developed a series of machines that utilized weights and pulleys to create a sense of vibration. The purpose of apparatus was therapeutic.

In 1895, Dr. Jhon Harvey Kellogg implemented vibration therapy in his health practice.

With a vibration chair he developed himself, he claimed the therapy was good for circulation and could also alleviate constipation.

During the Russian space programme, Physicians noticed that the returning astronauts suffered from loss of bone mass & bone fractures at a much earlier age than was normal.

They began to use whole body vibration device to help strengthen astronaut's bone mass & muscles.

Today NASA uses VT to help prevent muscle loss in astronauts. This is a form of bio-stimulation of the muscles that takes into account the relationship between

- muscle strength
- bone growth
- body statics
- stress and performance in both sports and everyday life

How does vibration therapy work?

Whole body Vibration

During whole-body vibration therapy, your therapist will ask you to stand, sit, or lay on a machine supported by a vibrating platform. For example, they may ask you to stand in a half-squat position with your knees bent.



Fig 1: Whole body Vibration

Three types of W-Body Vibration Platforms

Pivotal

In Pivotal vibration machines, the platform you stand on tilts around a central pivot point like a see-saw. The left and right sides alternate up and down while the centre remains fixed.

OSCILLATING Vibration (aka Triangular Oscillating, Vertical Alternate Vibration, Pivotal, Toggle)

How does the platform move? The motor drives a toggle mechanism that elevates one side of the platform, then the other side, sometimes described as a “teeter-totter” motion. Comparatively, Oscillating units have higher amplitude (up

to 10 mm or 1 cm) and lower frequency (5 – 35 Hz).

Oscillating vibration

What happens inside the body? Slow motion filming of the thigh, hip and abdominal areas show the incredible wave motion of subcutaneous fat, lending credence to the weight-loss/trimming ability of this modality. It contributes greatly to mobilization and activates the core muscles. Also great for increasing the metabolism and burning calories which aids in weight loss!

Who is this best for? It’s great for patients who suffer from lack of mobility in the lumbar and sacroiliac areas, core muscle weakness or generally have not exercised or been mobile for quite some time. It is the perfect type of vibration for the baby boomer and not-so athletic user who is interested in getting started and wants to feel better quickly.

How DC’s apply oscillating vibration: DC’s use oscillating vibration equipment for patients who are stiff, lack core strength, and want to get their bodies stimulated, start exercising, and get moving. As society in the United States becomes more aware and conscious about healthy living, DC’s have been using oscillating units in conjunction with weight-loss initiatives in their practice.

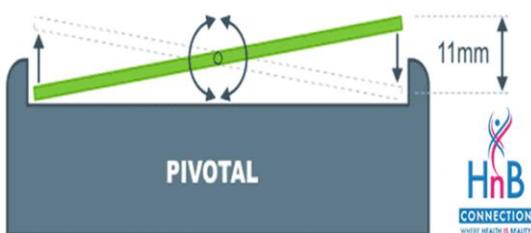


Fig 2: Pivotal Vibration

Lineal



Fig 3: Lineal Vibration

In an attempt to compete with the successful German vibration platforms, a Dutch company created a vibration machine with a new kind of platform movement called Lineal.

A Lineal vibration platform remains horizontal at all times with the entire platform moving up and down by the same amount.

Vertical vibration



Fig 4: VERTICAL Vibration (aka Tri-Planar, Vertical Uniform, Straight)

How does the platform move? The platform moves straight up and down. Vertical vibration units tend to have platform motion with lower amplitude (about 2 – 4 mm) and often achieve comfortable frequencies (between 20 – 50 Hz).

What happens inside the body? The vibration stimulus travels straight up through the body. The user’s whole body weight is being mobilized; lymphatic fluids are being circulated well.

Who is this best for? This is typically the best type of vibration for stronger and more active users. It is excellent for accelerated fitness training along with building and toning muscle. It is also a great help for combating

Osteoporosis because it maximizes lymph drainage and promotes the release of osteoblast.

How DC's apply vertical vibration: DC's use vertical vibration to enhance muscle building and proprioceptive response in rehabilitation regiments once the patient is out of the acute phase. Many DC's use vertical vibration to treat osteoporosis because a weight bearing load is placed on the patient's entire skeletal structure. This type of WBV is also fantastic for lymph drainage and can be used for a pre-adjustment warm up.

Elliptical

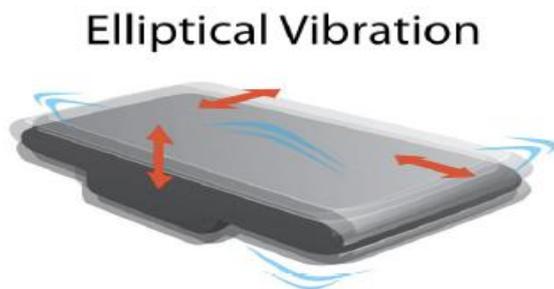


Fig 5: ELLIPTICAL Vibration (aka Low-Intensity Vertical, 3-Dimensional)

How does the platform move? In these units, the motion is created by a vertically placed motor that has uneven centrifugal plates attached to it. This produces an elliptical motion of the platform which is the mildest form of vibration out of the three types. Vibration platform often compares Elliptical vibration to be a low intensity form of Vertical vibration. Comparatively, Elliptical units have lower amplitude (2 – 4 mm) and often function at higher frequency (20 – 50 Hz).

What happens inside the body? This is the most benign form of vibration that lends itself likely to be the best modality to stimulate the proprioceptive system. This is our

innate balance system, which helps our body to orient itself in the 3-dimensional world. It stabilizes the body and gives us our sense of equilibrium.ellipticalvibration.png

Who is this best for? Elliptical Vibration works great for elderly users with balance issues and circulation problems and those who just want to increase their daily activities. Many of these users have been sedentary for a number of years and are not comfortable with the intensity of vertical or oscillating units. This is also the preferred type of unit for stroke patients or other central nervous system (CNS) issues. It is the perfect type of WBV for seniors or users under 150 lbs. body weight!

How DC's apply vertical vibration: In the practice, DC's have had great success using elliptical vibration units to enhance rehabilitation plans even when the patient is in the acute phase of an injury. Unilateral exercises can be performed to focus on a specific part of the body and the vibration stimulus accelerates rehabilitation at a phenomenal rate. DC's find that elliptical units are also fantastic for drastically improving proprioception, balance, and stability for geriatric patients.

Technical Requirements for VT Platform

Frequency: 20-50Hz

Duration: 0-120s

Pause time: 0-120s

Intensity: low – high

Repetition: 1-20

Effects of whole-body vibration therapy

Effects I

Muscles

Muscle tissue

The high frequency (30Hz) used in vibration training leads to a continuously high level of muscle tension.

Muscles can be tensed to a much greater degree using vibration training than when tensing your muscles to the maximum yourself. Vibration training thus has the effect of strengthening muscles.

While vibration training is ideal for training healthy muscles, it is just as well suited to cases in which muscles function only with difficulty, i.e. with weakened muscles, with elderly individuals or following injuries.

Vibration training is used in treating stress incontinence by improving the basic tone of pelvic muscles.

Vibration therapy is also used in flexibility training and in stretching muscles.

Vibration plate triggers reflexes

Subconscious → Reflexes cannot be controlled

Increased recruitment of muscle fibres:

Vibration Plate: 90-100%

Normal: 60-70%

High performance sports: 80-90%

Example: Muscle Atrophy

(MS, Confinement to bed, Incontinency)

Tendon / Connectivity Tissue

Intermittent stretching results in manipulation of tendons, fascia and connective tissue. Areas of soft tissue absorb the vibration frequency alternately, causing friction between tissue areas and hence the loosening of any adhesion. Through an improved blood supply to soft tissue, muscles

and joint capsules relax. This represents an important step in overcoming limitations of joint movement and ultimately in increasing mobility

Tissues taking on vibrations alternatively

Friction of different tissues against each other

→ releasing tissue adhesences

Improved blood circulation

Effects II

Blood Vessels

- Improved mobility of blood vessels
- Improved circulation
- Improved metabolic function
- Improved removal of metabolic waste
→ Faster rregeneration
- Example: Intermittent Claudication

Hormons

Vibration training stimulates the body to produce a higher level of hormones such as testosterone (responsible for growth).

It results in enhanced secretion of neurotransmitters (i.e. substances transporting information to nerves) such as serotonin (elevates mood), which results in an improved general feeling of wellbeing.

Vibration training reduces cortisol levels (associated with stress).

- VT influences the hormonal system positively
- Increased distribution of growth-hormons
- Increase of testosterone
- Increased production of neurotrophin
- Decreased production of cortisol

Effects III**Capsule & Joints**

- Balance (Vestibular system)
- **proprioception**, the process by which the body can vary muscle contraction in immediate response to incoming information regarding external forces
- Improved neuro muscular connection
- Example: High performance sports

Nerves /Neuro Transmitters:

Muscular contraction has its origin, among other factors, as a reflex in the nervous system. In addition, positive effects have been reported in cases of partial paralysis as a result of nerve pathways being mobilized and sensitized

- Activation of Spinal reflexes
- „Tuning “of the Nervous system via mobilisation / sensitisation
- Increased number of Neurotransmitters (Dopamine / Serotonin)
→ Increase neuromuscular connections
- Example: M. Parkinson

Effects IV**Bones & Cartilage**

Vibration training increases bone density. Muscle tone is restored through vibration, while blood circulation is put back on track. Vibrations directly stimulate bone tissue, resulting in the production of new bone tissue.

- Bones follow the same rules as muscles
- Speed of deformation strengthens the bones
→ Build-up of bones
- Example: Osteoporosis

Intermittent pressure stimulates cartilage to function in an optimum manner by pumping through cartilage joint fluid, the substance that nourishes joints. In this way, vibration training contributes to regeneration of cartilage.

- Intermittent pressure improves cartilage function
→ Increased synovial fluids surrounding cartilage (Improved nutrition)

Skin

Vibration training results in the production of hormones, such as the growth hormone, that causes fatty tissues to shrink, and at the same time connective tissues are reinforced. Vibration of the skin causes increased production of keratin – an important substance making up the skin. In combination with other effects, including reduction of cellulite and strengthening of muscles, the overall result is a tighter skin.

- combination muscle, blood circulation, improved lymphatic transport, connective tissue causes a tightening of the skin

Vibration training as a complement

- VT causes mechanical vibrations which are transferred to the body
- VT is a new and modern form of training because of its positive effects on different systems of the body
- Used as warm-up, Strength training, Coordination training, Balance training, Regeneration, Cool-down
- Excellent alternative to all sports

Vibration training in therapy

Absolute contra-indications:

- Cardiac pace maker
- Pregnancy
- Cemented joint implants
- Relative Contra-indications:
- Therapist needs to decide whether VT is indicated or not

Vibration training in sports

Whole body vibration is a boon for every fitness studio.

Everybody training with it becomes enthusiastic about the large variety of ways it may be used.

Accounts are settled easily using the programmable protocol.

Vibration training affects nearly 100% of all muscle fibres.

Maximum strength and continued muscle power substantially improve.

By way of comparison, using conventional exercising methods untrained individuals reach 40-50 % of muscles fibres and top athletes as much as 70 %. Simultaneous stimulation of receptors throughout the body improves intramuscular and intramuscular coordination.

This results in an improved sense of balance and a shorter ability to react. For this reason, vibration training is implemented within the entire gamut of sports, from high-level competitive athletics to leisure time and rehabilitative sports.

While there are no negative side-effects and little effort is required, in a very short time it substantially improves the body 's ability to perform.

- Improved coordination (central/peripheral NS)
 - Improved learning situation
- Increased recruitment of muscle fibres (Intramuscular coordination)
 - Increased strength
- Frequency of training: 3 / week
 - Eventually combined with strength training (super compensation)
- Warm-up prior to endurance training
 - Immediate ideal effects (increased efficiency)

Application area**Medical Area**

In the world of medicine, the biomechanical aspects of vibration training and vibration therapy are used for

treatment and prevention of a number of disorders and injuries. Vibration therapy using whole body vibration therapy platform plays a significant role in particular for rehabilitation following accidents or serious injuries and in revitalising the elderly.

Vibration therapy is also used successfully for chronic joint and tendon diseases. Experts confirm their good experience with biomechanical stimulation and its positive effects.

- physical therapists, rehab clinics

Professional Area

- sports consultants, sports clubs, training centers, golf clubs, tennis clubs

Fitness Area

- fitness studios, wellness hotels

Application fields**Medical application**

Incontinence, osteoporosis, MS, rehabilitation following injuries, treatment of pain and stiffness

Professional application

Effective exercising method for both hobby and serious athletes, stretches, extends and smooth muscles, increasing explosive strength, strength training

Fitness application

Improving coordination and movement ability eases tension

Wellness and beauty

The use of whole-body vibration platform in the area of wellness and beauty care represents an optimum supplement to many treatments.

In addition, it is easy to operate and may be implemented flexibly.

Given only little space it is possible to offer an entirely new treatment method e.g. for cellulite.

Vibration training improves blood circulation in connective tissue as well as functioning of the lymph system. Performing specific exercises supports elimination of toxic substances and reduces cellulite deposits.

Positive effects can be seen and felt even after a few 9 training sessions.

As a result of activating the entire muscles, calorie consumption increases and fat metabolism in the body is stimulated; this has positive effects on all of the body's "problem zones".

Personal Use

Regular, effective training with whole body vibration platform improves the general physical condition and strengthens muscles and bones.

Only little space is required and a user-friendly menu or training is provided to the users. A basic training session can be completed in just 20 minutes. When used in combination with endurance sports, or in order to improve the entire musculoskeletal system.

Whole body Vibration therapy in Osteoporosis

Use of the whole-body vibration for Osteoporosis: Vibration training stimulates the production of a higher bone density because of the strongly increased muscle activity.

The following exercises are suggestions based upon the experiences of users.

Settings in FREE TRAINING:

Hz 25, intensity low, time 40 sec., pause 40 sec., repetitions 9

After regular training of 2-3 weeks the settings can be increased to:

Hz 28, intensity low, time 60 sec., pause 60 sec., repetitions

1. Bend one leg,

Standing on the plate.

Push hips forward.

Change legs.

2. Feet hip wide,

Standing on the toes.

Knees slightly bent, not in

Front of the toes.

Pull abdomen up

3. Stand with slightly bended knees on the vibration platform

Push hips forward.

Create tension and release.

4. Stand wide on the plate.

Lift the heels altering.

Upper body is static

5. Put one leg on the vibration platform.

Pull the straps in a right angle. Palm is showing up.

Long straight spine. Abdomen is pulled in and up.

Change legs

6. Stand in lunge on the vibration platform.

Upper body is lowered slightly

With straight spine. Straight arms,

Thumbs showing to the ceiling.

Change sides

Various Positions on the vibration platform for Geriatric population and youngsters.

Vibration therapy for the young and old

Not just for athletes or those concerned about fitness, vibration therapy exercises have powerful effects on muscle power.

As we age, our muscle power reduces making us less stable on our feet therefore increasing the risk of falls. With its very low stress on the cardiovascular system, vibration therapy is a great way for elderly patients to improve their balance and mobility.

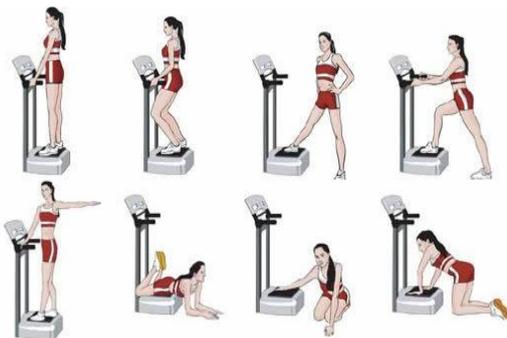


Fig 6: Various Positions on the vibration platform for Geriatric population and youngsters Positioning on whole body vibration platform.



Fig 7 Position: Golfers elbow



Fig 8 Position: Calf stretch



Fig 9 Position: Il adductor stretch



Fig 10: Position: Calf relaxing

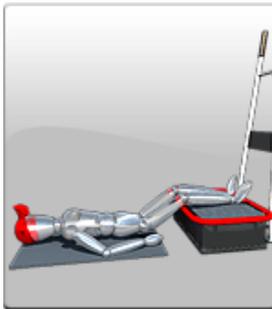


Fig 11: Position: Spinal stretch



Fig 12: Position: Hamstring stretch



Fig 13: Position: lateral stretch



Fig 14: Position: Pectoral stretch

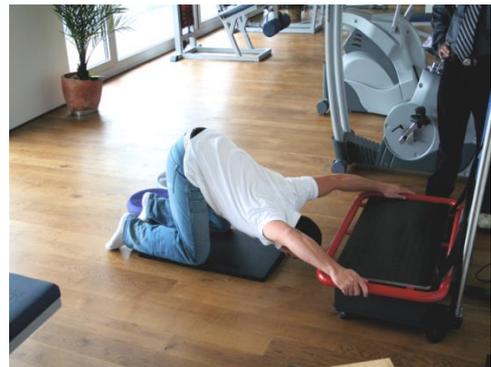


Fig 15: Position: Bridging



Fig 15: Position: Core strengthening



Fig 16: Position: Cat & Camel



Some of the additional exercises that can be done by using additional accessories:

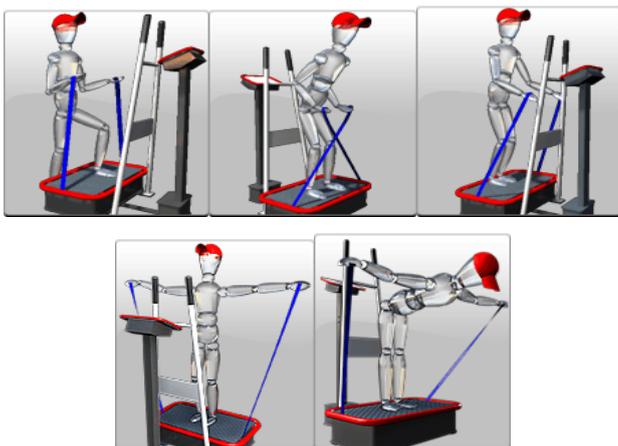


Fig 17: Using Thera Band



Fig 18: Using Balance board and cushion

Further exercises can be designed in accordance to the need of the client.

Before prescribing the exercises, a detailed assessment should be taken.

References

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4440196/>
<https://pubmed.ncbi.nlm.nih.gov/29548300/>
<https://www.healthline.com/health/vibration-therapy>
[https://www.practicalpainmanagement.com/treatments/rehabilitation/whole-body-vibration-potential-benefits-management-pain-physical-function#:~:text=Whole%20body%20vibration%20\(WBV\)%20is,mechanics%2C%20and%20quality%20of%20life.](https://www.practicalpainmanagement.com/treatments/rehabilitation/whole-body-vibration-potential-benefits-management-pain-physical-function#:~:text=Whole%20body%20vibration%20(WBV)%20is,mechanics%2C%20and%20quality%20of%20life.)

Picture from Dr Andreas clinic

<https://www.hindawi.com/journals/ecam/2019/8436325/>
<https://www.backinmotion.com.au/services/vibration-therapy/how-does-whole-body-vibration-therapy-work>

