

Good Vibes

by Paul Taylor Exercise Physiologist & Sports Nutritionist

'Vibrations stimulate the body in the same way as strength or explosive training, and this stimulation can be applied in a much shorter period of time than traditional training sessions.'



Fitness trainers and enthusiasts are regularly bombarded with marketing hype about the latest 'must have' gadget that promises to enhance performance and make training more efficient, but it's pretty rare for a new piece of equipment to live up to the hype. However, a notable exception is the concept of Whole Body Vibration or Vibration Training. Vibration machines have platforms or plates that oscillate with different frequencies and amplitudes to deliver a training effect to the body part that is in direct or indirect contact with the plate.

A History of Vibration

Vibration training is actually quite an old concept. It was used by the ancient Greeks to speed recovery from injury. They achieved this by wrapping one end of a sheet of fabric around the injured body part and the other end around a flexible saw, which was manually wobbled to transmit vibrations to the injury.

The vibration effect caught up with the mechanised age when Dr John Harvey Kellogg developed a vibrating chair, platform and bar in the late 1900s, which he used to treat a wide range of conditions in his patients.

The method of vibration used today, known as Rhythmic Neuromuscular Stimulation, was developed by Professor W Biermann of the former East Germany. This technique was refined by Russian scientists, who used it very successfully on the Cosmonauts in their space program to combat the effects of zero gravity on bone and muscle mass. The Russians then found that vibration training appeared to enhance the strength, power, vertical jump ability and recovery of their athletes. They used the technology very successfully to help Russian athletes dominate the world stage during the 1970s.

The first Western coach to become interested in vibration training was the Dutchman, Guus van der Meer. He initially used it on Olympic athletes, but then discovered it also conferred many benefits to normal, healthy individuals. Quick to recognise its potential in the fitness industry, he developed the first commercial machine, known as the Power-Plate.

The Science and Physiology

The science behind vibration training is pretty straightforward. Platforms vibrate at various amplitudes (distance or height) and frequencies (vibrations per second) for a predetermined duration. The vibrations effectively generate a sense of 'hypergravity' on the affected muscles as they rapidly contract and relax in an attempt to dampen the vibrations.

In physiological terms, the vibrations stimulate afferent nerves. These are the nerve fibres that transmit impulses from the multitude of sensory receptors throughout your body to the central nervous system (CNS). In other words, the afferent nerves keep the CNS

updated about events going on inside and outside your body. The role of the CNS is to process and interpret this information in order to make decisions about what needs to be done at each moment, a process known as integration. When the CNS has decided upon a course of action, it generates a response in the muscles via motor output, and the muscles respond.

If you're standing on a vibration plate and the plate moves upwards, the sensory receptors in your leg muscles notice that the ground appears to be moving upwards. The afferent nerves in your leg collect this information from the receptors and send a message to the CNS. The CNS decides that the leg muscles must contract (along with the deep, stabilising muscles of the trunk) to counteract the movement, so it sends an electrical signal to these muscles to contract. The opposite effect happens when the plate lowers, with the muscles lengthening or relaxing.

The big advantage of vibration training over traditional forms of training lies in the fact that this all happens in a fraction of a second. If the platform is set to a frequency of 40Hz, then the leg muscles and stabilisers of the trunk will contract and relax 40 times a second! This has huge implications for the nervous system. It has been demonstrated that EMG activity in the target muscles is significantly higher with vibration than it is with voluntary contractions used in traditional resistance training. The result is a greater synchronisation of motor units, reduced antagonist muscle activity and a higher recruitment of muscle fibres, which are all desirable outcomes of a training program, especially one designed to increase muscle power.

It should also be noted that the nervous system acts very closely with the endocrine system to coordinate a training response. While the nervous system controls movement with rapid electrical impulses, the organs in the endocrine system produce hormones that are released into the blood. Vibration training has been shown to increase the release of growth hormone, the insulin-like growth factor-1 (IGF-1) and

testosterone, while reducing cortisol. As any physiologist or educated coach will tell you, growth hormone, IGF-1 and testosterone are the hormones that we need to release for our body to adapt. Cortisol, on the other hand, is the body's main glucocorticoid (released in response to long-term stress) and can be extremely destructive to the body if levels are chronically high. This illustrates the advantage of vibration training for stressed individuals.

The Research

There is a plethora of good research confirming the benefits of vibration training. However, when looking at the research, it is important to note exactly which type of machine the study was performed on, since some manufacturers use research conducted on other machines as evidence of the benefits of their own machine.

There are two main issues here – the type of vibration and the name of the plate. In terms of vibration type, the Galileo uses a tilting mechanism (one side of the plate goes down as the other side of the plate goes up), while Power-Plate and Vibrogym use vertical vibrations (the whole plate moves up and down at the same time).

Machine	Type	Frequency	Amplitude	Cost
Vibrogym	Verticle	30-50Hz	2 or 4mm	\$13,200
Power-Plate	Verticle	30-50Hz	2 or 4 mm	\$7,500 -\$16,500
Galileo Sport	Tilting	0-30Hz	0-6.4 mm	\$18,990

NB. Cost does not include GST

There has been a bit of controversy between Power-Plate and Vibrogym. The original plate was known as the Power-Plate, with naming rights and the application patent owned by an American company and the "design rights" owned by a Dutch company. A few years ago, these companies split, leaving the Americans with the name and the Dutch with the external design. So the Americans modified the original design aesthetics, maintaining an identical mechanical system, and retained the name Power-Plate. The Dutch still own the original design, but have rebranded the machine Vibrogym.

The implications of this are that any research conducted on the Power-Plate before March 2003 is applicable to the Power-Plate 'Classic', aka Vibrogym. Research after that date is easily distinguishable by name.

The studies conducted on vibration training are too exhaustive to list, but here is a summary of the benefits:

- reduced training time compared to traditional resistance training (but be aware that vibration training does not cover all muscle groups as effectively as traditional resistance training)
- increased muscle strength and power
- improved flexibility (all types of machines, but greater variety with vertical plates)
- intense stimulation and increase of neurological system (all types of machines)
- increased blood circulation (all types of machines)
- pain reduction (all types of machines)
- increased bone mineral density (all types of machines)
- increase in key hormones - growth hormone, IGF-I, testosterone, serotonin (all types of machines)
- massage applications (vertical vibration only)
- decrease in the stress hormone cortisol (all types of machines)
- increase in balance and coordination (all types of machines)
- decrease in DOMS (delayed onset muscle soreness)

Practical Applications

Depending on your training status (or that of your clients, in the case of coaches, personal trainers and health professionals), vibration training can be used in a number of ways:

- as a nervous system warm-up before traditional resistance training
- for strength and power
- rehabilitation – for back pain or recovery from muscle-wasting injuries
- prehabilitation – for improving balance in older adults to help prevent falls
- treatment of certain medical conditions, such as diabetes, hypertension or conditions involving the nervous system, such as Parkinson's disease, Fibro myalgia and MS
- improving bone mineral density
- post-exercise recovery – by dissipating lactic acid and reducing DOMS

Exercises

Most of the major muscles of the body can be worked with vibration training. The more basic exercises include squats, lunges, push-ups and tricep dips. For exercises such as squats, the Galileo has the advantage of tolerating greater loads, so more weight can be added, enhancing the training effect. On the other hand, the Power-Plate and Vibrogym have fabric handles, which can transfer some of the vibrations to the hands and arms, allowing you to work the biceps and shoulders with more variety. Both the Vibrogym and Power-Plate sit on rubber shock absorbers, which allow you to do some plyometrics, provided you don't weigh more than around 90kg. A recent product enhancement to the Power-Plate range, the PRO-5 AIRdaptive, employs adjustable pneumatic shock absorbers (think "ride control" on your SUV) that allows both greater static and explosive load to be applied in exercises on the machine.

You can do a multitude of stretches with vibration training, which has been shown to enhance flexibility. The vertical movement of the Power-Plate and Vibrogym allows for a greater variety of stretches to be performed and also allows massage to be performed by the machine, which is a pleasant extra!

Conclusion

Vibration training offers a host of benefits for a training program. Vibrations stimulate the body in the same way as strength or explosive training, and this stimulation can be applied in a much shorter period of time than traditional training sessions. These benefits apply to athletes, healthy non-athletes and people with certain medical conditions. Rather than being considered as a substitute for resistance exercise, vibration training should be viewed as a useful additional component of a comprehensive training program. It is too early to tout vibration training as a 'panacea for all', as more studies are needed to analyse chronic responses, different treatment protocols and investigate its limitations, but the future certainly looks bright for vibration training.



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