

Vibration Training and Performance

Can vibration training enhance Sports Performance?

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Although vibration training has been around for 40 years, the potential benefits for sportsmen and women have only recently begun to be properly researched. John Shepherd takes a look at the latest thinking on this training methodology and in particular, examines the role that vibration training may play in enhancing speed, power and flexibility in sport performance

The concept of vibration training was originally developed by Russian scientists as part of their space programme and in particular, the desire to keep their cosmonauts in space in the best physical condition as possible for the longest period of time. The USSR (as it was then) actually held numerous endurance records in this respect.

Vibration training requires the use of specially designed machines that vibrate at specific frequencies (normally between 30 and 50Hz). The most popular type of vibration machines are 'platform-based', which allow the user to perform a variety of exercises while standing, or placing their hands on the vibrating plate to perform upper body exercises, such as triceps dips. Other items of vibration equipment include dumbbells and breathing devices.

Physiology of vibration training

Although there remains uncertainty about the precise magnitude of the benefits of vibration training, there's no doubt that it does produce *profound physiological effects* in the body:

- Vibration training can recruit nearly 100% of a muscle's fibres. This contrasts with the 40%-60% recruitment normally associated with other *resistance training* activities. Vibration training achieves these high recruitment levels by creating an almost continuous stretch/reflex in muscles. This is known as a tonic stretch/reflex and means that while undergoing vibration training, muscles are contracting at incredibly high frequencies, which also subjects them to considerable forces. These vibrational forces are believed to be highly advantageous for the enhancement of *fast-twitch muscle fibre* (more later);
- Vibration training stimulates muscular blood flow, which can speed up *recovery* from workouts and rehabilitation from injury. Increased blood flow will bring restorative nutrients to muscles cells and clear out damaged tissue faster;

- The tonic stretch/reflex produced by vibration training can interact with the muscle's own contraction frequencies. Fast-twitch muscle for example, contracts (twitches) at a rate of 30-70 times a second when stimulated by, for example, heavy load weight training and speed training. By duplicating these frequencies with vibration training, these fibres can be worked even harder – i.e. greater fibre recruitment – without the need for a huge 'mental' input from the athlete.

Recent research into vibration training

An increasing body of research exists on the merits of vibration training for both athletes and the recreational fitness trainer. The former has looked at the effects of this training method on increasing power, strength and flexibility, while the latter has examined whether vibration training can be as effective as resistance and even CV training methods for improving body composition.

A team of Italian researchers considered the effects of whole-body vibration training on various measures in female competitive athletes (1). Whole-body vibration requires the athlete to stand on the vibration machine plate for designated time spans and/or perform reps of designated exercises, with or without added resistance.

The athletes were split between a vibration group (13 athletes) who trained three times a week for eight weeks and a *control* group (11 athletes). At the end of this period they were tested on: countermovement jump, leg extension strength, horizontal leg press, and flexibility (sit and reach test). The researchers discovered that the vibration group displayed a significant improvement in leg extension strength, countermovement jump performance and flexibility. There were no significant changes in the tested abilities of the controls. The team qualified their findings by indicating that the optimal frequency, amplitude (movement of the vibration platform), and G-forces need to be identified when using vibration training in order to maximize its effects.

Researchers from the Universities of Aberdeen and North Dakota discovered that a 30Hz protocol with 10mm amplitude and 60 seconds on/60 seconds off of vibration training exercise elicited the most significant muscle fibre recruitment in the vastus lateralis (thigh muscle) as measured by *EMG*(2). Higher frequencies did not elicit a significantly superior response. The athletes – in this case elite female volleyball players – stood on the platform in a squat position, with their knees at a 100-degree angle.

A team from Belgium considered whole-body vibration on knee extension strength and speed of movement and countermovement jump performance in older women aged 58-74 over a 24-week period (3). Interestingly, this particular study included a resistance training group as well as a control group.

Both the vibration group and the resistance group trained three times a week. The former performed unloaded static and dynamic knee extension exercises on a vibration platform, while the latter trained their quadriceps (knee extensors) by performing dynamic leg press and leg extension exercises, increasing from low (20 repetitions maximum – RM)) to high (8RM) resistance. The control group did not participate in any training.

Tests were performed before training commenced, at 12 weeks and at the end of the study. Leg extension strength was measured isometrically and dynamically, as was speed of movement of knee extension using an external resistance equivalent to 1%, 20%, 40%, and 60% of isometric maximum. Countermovement jump performance was determined using a contact mat, which measured jump height and force generation.

The results showed that isometric and dynamic knee extensor strength increased significantly in the vibration group and the resistance group after 24 weeks of training. Crucially, the training effects were not significantly different between the groups. Speed of movement of knee extension significantly increased at low resistance (1% or 20% of isometric maximum) in the vibration group only.

These findings led the researchers to conclude that vibration training is, ‘...a suitable training method and is as efficient as conventional resistance training when improving knee extension strength and speed of movement and countermovement jump performance in older women.’ Crucially they also argued that it was the vibration and not the performance of unloaded exercises on the vibration machine that resulted in enhanced physical performance.

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References

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