

WHOLE-BODY VIBRATION EXERCISE

A fitness fad or unique technology? | By Matt Rhea



few topics get me riled up like that of exercise

gimmicks and the outlandish claims made by their promoters that saturate the fitness industry. Spend a few sleepless hours watching infomercials this weekend, and you will see an endless line-up of products and programs all claiming the ability to transform anyone in any condition into a supermodel in only a few minutes a week. The fitness consumer has become (or should become) increasingly skeptical of these claims, and that will help prevent them from wasting their hard-earned money.

In recent years, a relatively new exercise technology has entered the fitness scene. At first glance, the thoughts of quack infomercials start to pop into the minds of exercise enthusiasts and consumers properly trained in skeptical spending. However, in the case of whole-body vibration (WBV) exercise, support actually exists in the form of neuromuscular physiology and scientific research regarding its use in an exercise regimen. Even though there is still much to be learned about the proper application and implementation of WBV into a well-rounded fitness routine, researchers and exercisers have already seen numerous benefits.

WHAT IS WHOLE-BODY VIBRATION EXERCISE?

In order to take advantage of the benefits of WBV, it is important to understand the concept of WBV exercise, the potential physiological mechanisms at play and what we know and don't know. WBV exercise uses controlled vibration, usually in the form of a platform or scale, to deliver gentle, consistent and safe levels of vibration into the body. Vertical oscillations result in increased acceleration of body



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weight, amplifying gravitational forces, triggering neuromuscular reflexes and altering the function of several physiological systems. First used among astronauts to reduce bone mineral loss during space flight, vibration technology has advanced considerably in the last decade, and commercial devices are now readily available. Research on WBV exercise has exploded in recent years, and we are now starting to get a better picture of what this technology can offer exercisers ranging from injury rehabilitation to athletic performance enhancement.

MUSCULAR FITNESS WBV has been shown to enhance muscular strength when used alone or in conjunction with conventional resistance training exercise. While research and reviews of this research often demonstrate conflicting results, overall trends show an expected eight to 15% increase in muscular fitness over a 12-week WBV training program.

A unique application that I have been examining in recent years with college football players is the use of WBV as a “pre-exercise” prior to the performance of a conventional resistance exercise. For instance, we have measured 10-15% increases in the amount of weight that someone can lift in the free-weight back squat if they perform 30 seconds of squats on the WBV platform prior to performing the squat. The use of WBV as added supplement or primer for other exercises is expected to enhance the effectiveness of the training program with enhanced overall fitness improvements.

WBV increases the amount of muscle tissue activated during exercise as well as the speed at which contractions occur. In our lab at AT Still University, we have consistently measured increases in muscle activity ranging from 40-60% when compared to exercises without WBV.

Pedro Marin, an adjunct faculty at AT Still University who has been working with WBV for almost 10 years, says, “I have conducted analyses of muscle activity with and without WBV and have found that increased muscle activity is a very consistent outcome when WBV is applied. I am no longer simply examining whether or not an increase occurs, because we know it does. Now I am

pin-pointing amplitudes and frequencies that will maximize that increase in muscle activity.”

Mr. Marin's research has shown that there is a relationship between the amplitude and frequency of the vibration that determines the optimal prescription. Most research shows that greatest muscle activation occurs at frequencies around 30 Hz. He also suggests that a maximum of one-minute sets are most effective due to the level of muscular fatigue that builds up.

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Numerous mechanisms have been suggested that would explain this increase in muscle activity. These include several reflexes in the neuromuscular system (tonic vibration and stretch reflexes), increased excitability of the motor nerves, increased blood flow and muscle temperature and altered hormone secretion. The tonic vibration reflex and stretch reflex mechanisms are most likely responsible for increases in muscle activity. These reflexes work to create tension in the muscles in order to avoid excessive stretching and to control the vibrations. As the muscle contracts, vibrations are dampened or controlled. Further research is being conducted to examine these mechanisms, but the end result of increased muscle activity is a consistent outcome with WBV.

FLEXIBILITY Research has consistently shown that using WBV during stretching sessions has a profound effect on increases in range of motion, both immediately and over time. Depending on the type of platform used, just about any conventional stretch can be performed with the addition of WBV to enhance the effectiveness of and condense the amount of time spent stretching. This increase in flexibility is most likely due to increased blood flow and temperature in the muscle, similar to an effective warm-up prior to exercise, and the inhibition of pain sensors that would usually trigger a muscle contraction to stop the stretch of a muscle.

RECOVERY AND REGENERATION Increases in blood flow and muscle temperature may also play an important role in speeding up nerve transmissions to the muscle fiber and clearing out lactic acid while delivering energy supplies and repair agents to the muscle. In a recent study with untrained men, we elicited high levels of muscle soreness and found that WBV in the days following a strenuous workout diminished soreness by up to 50%.

“I was very excited to see data demonstrate this decrease in muscle soreness,” remarked Kregg Lunt, MPT. The physical therapist based at Southern Utah Physical Therapy has worked to examine potential mechanisms for diminished perception of pain and sees many applications of WBV in rehabilitation and pain management. “WBV appears to block pain signals, much like applying ice or electrical stimulation. The great part about WBV is the whole-body application. It isn't targeted solely to one body part or segment, so you get a general pain inhibition.”

BALANCE AND COORDINATION Research has demonstrated that WBV can increase balance among elderly people and individuals recovering from ACL surgery. Increasing balance is an effective way to decrease the risk of falling among older adults. Combined with the increases in muscular fitness, WBV may be an effective fitness tool for the elderly and rehab patients.

BONE DENSITY Another valuable benefit of WBV for elderly populations is a bone mineral density increase. As the platform vibrates, it creates upward acceleration and an increase in gravitational forces experienced by the skeletal system. These forces result in added stress on the bones and a stimulation of bone formation. Peak bone density generally occurs during the mid- to late 20s. Following peak formation, bone mineral density gradually declines throughout life span. It is important to maximize bone formation, especially among young women. WBV can serve as a valuable tool for such a cause. ➤

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PRESCRIPTION GUIDELINES Perhaps the vaguest aspect of WBV is the correct dose of training. We have spent 30 years trying to figure out the correct amount of work in traditional resistance training to elicit desired gains in health and fitness. With WBV just recently gaining the attention of exercise scientists, it may take some time to fully answer this question. However, as we compare WBV to conventional exercises, we are beginning to gain an understanding of how the body responds to each.

I compared sets of the back squat (free weights at 75% of 1 RM) to squats on the iTonic WBV platform at different amplitudes, frequencies and durations among avid exercisers and found that 45 seconds WBV (35 Hz, 4 mm) resulted in the same fatigue patterns as one set of squats. Other published protocols have ranged from 30 seconds to four-minute sets on the platform, each demonstrating some effectiveness for increasing health and fitness. Using this standard of 45 seconds will enable us to begin to apply the correct amount of WBV during exercise.

As with any form of exercise, potential contraindications exist that should be kept in mind. For WBV, it is suggested that individuals with the following conditions not participate in this form of exercise until research can determine its safety and effectiveness:

- ✓ Acute thrombosis
- ✓ Serious cardiovascular disease
- ✓ Pacemakers and defibrillators
- ✓ Recent surgery
- ✓ Joint implants
- ✓ Acute hernia, discopathy or spondylolysis
- ✓ Severe diabetes
- ✓ Epilepsy
- ✓ Retinal conditions
- ✓ Recently placed metal pins
- ✓ Recent infections
- ✓ Severe migraines
- ✓ Tumors
- ✓ Pulmonary embolism
- ✓ Gallstones, kidney, bladder stones
- ✓ Neoplastic disease of the spine
- ✓ Poor somatosensory receptor sensitivity on the plantar surfaces of the feet

MISLEADING CLAIMS AND OVER-PROMOTION

Despite benefits, some promoters of WBV platforms have, at times, crossed from legitimate discussion of applications to exercise quackery. In an effort to sell more devices, some companies have begun to promote WBV as a virtual cure-all and holding the capability of producing an extreme make-over in fitness and appearance. Just as important as understanding what WBV will do is the knowledge of what it won't do.

American consumers are captivated by weight loss, and based on the latest figures on obesity, justifiably so. It seems that the easiest way to sell something in the fitness industry is to claim that a product will cause fat to melt or, in this case, shake away. While WBV will increase blood flow and muscle activity, this impact on caloric expenditure is so slight that claims of rapid, dramatic weight loss are either fraudulent or a result of dieting and other exercise being performed. WBV should not be expected to result in large amounts of weight loss.

I was quite impressed in 2007 when I met with FreeMotion Fitness regarding the launch of their iTonic WBV platform. Jeremy Strom, Director of Education for FreeMotion Fitness, commented,

"Initially, we had information in our literature regarding the ability of WBV to reduce body fat; however, as we examined the lack of potential mechanisms to back that claim as well as the lack of strong evidence for it, we felt that it was best to remove that statement. It is very important that we do our best to accurately promote our products." This is the kind of integrity that we all hope to see in a fitness industry starved for accurate and correct information.

The degree to which whole-body vibration exercise will increase fitness has also been exaggerated by some proponents of this technology. Consistent results in research demonstrate a small to moderate effect on fitness. Increases in strength of 50% in three weeks are not plausible, though they have been promoted by some. The measured degree of improvement is significant, especially for athletes and individuals who have been exercising consistently for a long period of time. The improvements among individuals just beginning a training program will exceed those of seasoned exercisers but should not be expected to rapidly make-over a "couch potato."

Unlike many of the exercise gimmicks that enter the market each year, WBV exercise has been shown to be effective. It represents a very unique training mode that is capable of eliciting numerous desirable fitness outcomes. While much research is needed to clarify the appropriate applications of WBV as an exercise tool, scientific evidence and professional applications have demonstrated its effectiveness. Incorporating WBV into training regimens can result in benefits to exercisers ranging from novices to elite athletes, whether it is for increased fitness development, enhanced recovery and regeneration or to stimulate greater improvements in flexibility.

Matt Rhea completed a PhD at Arizona State University, where he studied exercise and wellness with an emphasis in sports and occupational performance enhancement. He is currently the director of the Human Movement Master's degree program at AT Still University. For more information, contact Matt at humanmovement@atsu.edu. ●