

VIBRATION TRAINING: A Unique Training Tool For Anti-Aging

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Physical activity is one of the most cost-effective and innocuous tools for maintaining independence, preventing falls and maintaining wellness in older persons. However, the *Health, United States, 2006 Report* from the Centers for Disease Control and Prevention reported that less than 30 percent of the adult population in this country regularly engages in leisure-time physical activity and 39 percent participates in no leisure time physical activity at all. The picture only gets worse as we age.

Arthritis, sarcopenia (age-related muscle loss), declining metabolism, reduced mobility and a host of other age-related disabilities begin to limit our activity levels. Additionally, lack of transportation, disapproval by family members, fear of looking foolish and lack of program availability also are factors.² But what are the top reasons people give for not exercising? “I don’t have time,” followed by “I don’t have the energy,” “It’s painful, boring and inconvenient” and “I just can’t make the commitment.” It would be wonderful if there were an exercise modality that required limited time commitment; low exertion levels, and was unique, fun and accessible, even to older persons with disabilities. Enter whole-body vibration (WBV). Although this training modality may be new to us, it has a history dating back to the mid-1960s when it was used by Russian cosmonauts to reduce the impact of microgravity on their muscles and connective tissue. Since then, both the technology and the research have been growing in leaps and bounds. Today, we have a plethora of information from controlled scientific studies examining its effectiveness in addressing everything from functional performance to specific disease states. There are a number of different types of plates (vertical displacement, tri-directional displacement and central pivoting). Since results may vary by plate, this article will review only the literature on the impact of tri-dimensional/multi-planar plates.

Existing Studies With Older People

Strength and power: The literature tells us that muscle size and strength decline exponentially after the age of 55. Additionally, faster contracting muscles “die off,” decreasing our movement, speed and power (the product of force production and movement velocity). Given the fact that the WBV plate moves at very high speeds (25 to 50 Hz), the overload to the muscles incorporates both force and velocity. In fact, WBV training is now commonly referred to as acceleration training in the literature. The nature of this stimulus is reflected in the neuromuscular responses it produces. For example, Bogaerts, et al., compared improvements in muscle mass, isometric strength and explosive strength (power) due to WBV versus standard fitness training in community-dwelling men over 60 years of age.⁵ They found that WBV training was as effective as fitness training for increasing muscle mass, isometric strength and power of the knee extensors. However the WBV sessions required less than half the time (40 min. versus 90 min.) and minimal exertion compared to the fitness-training sessions. In a similar study, Roelants, et al., compared the effect of WBV to progressive resistance training in a group of 89 postmenopausal women.⁶ They reported similar gains in isometric and dynamic strength in both groups. However, only the WBV group improved in movement speed – a critical factor for independence and fall prevention.⁷ Once again, the time required for WBV was less than half that required for resistance training.

Mobility and dynamic balance: The positive impact of WBV on mobility in older individuals has been demonstrated in a number of studies. Bautmans, et al., examined the

impact of six weeks static WBV exercise on a Power Plate platform in 24 nursing home residents (15 female, nine male; mean age 77.5 ± 11.0 years). They reported significant increases in a timed up-and-go test, and in the balance score of the Tinetti gait test. More recently, Bogaerts, et al., examined the impact of 12 months of Power Plate® training on balance in 220 older individuals 60 to 80 years of age. The Power Plate training group (n=94) showed a reduced frequency of falling on a moving platform when vision was partially impaired, and improvements in the response to toes-down rotations at the ankle induced by the moving platform. The fitness group (n=60) also showed reduced fall frequency on the moving surface when vision was disturbed. Thus, whole-body vibration training may improve some aspects of postural control in community-dwelling older individuals.

These studies demonstrate that WBV can positively affect mobility, balance and proprioception, thereby improving quality of life and reducing the risk of injury in older persons.

Bone mineral density: Reductions in bone mineral density (BMD) in postmenopausal women and very old men increase the likelihood of serious injury and death following a fall. Vibration training provides a unique stimulus for increasing BMD. Both animal and human studies have shown this.¹⁰⁻¹³ For example, a study by Verschueren, et al., compared the impact of 24 weeks of resistance training or WBV on bone density in 70 women, ages 58-74. DXA scans revealed a significant increase in total hip BMD, but not in total body BMD. Additionally, there were no changes in serum markers of bone turnover for any group. Finally, a preliminary study by Corrie, et al., demonstrated that WBV can increase bone formation in 33 older patients.¹⁴ The results of these studies, though limited, are indicative of the potential for WBV to counteract bone loss due to menopause of the aging process.

Sarcopenic obesity: The combined loss of muscle tissue and increase in body fat with aging is termed *sarcopenic obesity*. As Roubenoff stated in his commentary on sarcopenic obesity, “The ‘fat frail’ have the worst of both worlds as they age – increased weakness due to sarcopenia and a need to carry greater weight due to obesity”¹⁵ (see **Figure 7**). We have already seen that WBV can positively affect lean body tissue, including muscle mass. But what about reductions in body fat? The answer to this question is addressed by Verschueren, et al., comparing WBV to resistance training.¹¹ They reported no significant changes in lean body mass due to either intervention, but a significant decrease in fat mass as a result of each.

HARBINGERS OF FUTURE SUCCESS

Flexibility: A number of studies have demonstrated the positive impact of WBV on flexibility in younger individuals. To date, no study has applied a flexibility specific flexibility program to an older population.

CONCLUSION

The above controlled studies indicate that Whole Body Vibration is an effective training tool to increase strength, power, mobility, balance, bone density and sarcopenic obesity. Additionally, there are strong findings in younger individuals indicating that flexibility, cardiovascular health and metabolic syndrome may also be improved. Given the greatly reduced time commitment, lower perceived exertion levels and rapid improvements associated with WBV, this exercise intervention constitutes a significant addition to the tools we have in our anti-aging campaign.

↑ **Dr. Signorile** has been involved in research using exercise to address independence and fall prevention for over 15 years, has over 50 refereed manuscripts and 175 national and international scientific and 200 industry presentations. He is currently a Professor of Exercise Physiology at the University of Miami and a Research Specialist at the Miami VA Medical Center Geriatrics Research Center.