

Vibrotherapy and cardiovascular health

Abstract

Cardiovascular disease (CVD) is the most prevalent cause of death in economically developed countries. This alarming situation becomes a major issue of global concern. The burden of CVD can be ameliorated by careful risk reduction and the search for viable therapeutic options. The goal of this mini review is to summarize selected studies that have examined vibrotherapy and its potential for improving cardiovascular health. Although many questions remain, presented review highlights some of the potential benefits of vibrotherapy on cardiovascular health.

Keywords: cardiovascular disease, whole body vibration, health, quality of life, intervention

Volume 2 Issue 5 - 2018

Ivan Uher

Institute of Physical Education and Sport, P J Šafárik University, Košice Slovakia

Correspondence: Ivan Uher, Institute of Physical Education and Sport, Pavol Jozef Šafárik University, Slovakia, Tel: 421 9153 16532, Email ivan.uher@upjs.sk

Received: August 03, 2018 | **Published:** September 19, 2018

Whole body vibration and cardiovascular respond

The application of new scientific knowledge on the practice of physical therapy continue to challenge our capability to scientifically test the efficacy of products designed to increase and further to improve physical performance and health. Whole body vibration (WBV) module represent, can be example of this new technology. Numerous studies provide inside of the biomechanical and physiological effects of WBV on human body. However, we are faced with more questions than answers when it comes to WBV well-grounded evidence. Our review provides the scientific basis, rationale that is necessary before incorporation of WBV into a physical therapy treatment with a valid, reliable positive declaration of success. It has been shown that mechanical oscillatory-cycloid vibration, applied to the muscle belly or tendons are able to stimulate sensory receptors. However, the effect of vibration depend on the properties of the muscle, frequency of vibration, level of pre-contraction, position of the body etc. Evidence for justification can be extrapolated from the data of¹ where after completion of 12-weeks training program, blood flow and body composition in patients with type 2 diabetes mellitus (T2DM) where analyzed. Results pointing to the conclusion that heart rate and blood flow significantly increased after WBV compare with control. Also, waist hip ratio and body fat were positively altered. Authors concluded that WBV can present effective means for incrementation of lower extremities blood flow and also lower adiposity in patient with T2DM. Other investigation² compare WBV and moist heat on lower extremity skin temperature and skin blood flow in normative older subjects. Mean skin blood flow following a 10 minutes inactive vibration coupling with moist heat exhibit marked difference in comparison to the control group, active vibration, and basic massaging heating pad. Therefore, authors claim that the combination of moist heat and passive vibration is an unexplored path that markedly elevates skin blood flow, while only modestly increasing skin temperature in the lower extremity of normative older cohorts. Moreover,³ and his colleagues attempt to assess the effectiveness of low amplitude extra luminally applied 50 Hz Localized Low Frequency Vibration (LLFV) in dissolution of 1hour old clots immersed in Heparinized Saline. Results revealed that LLFV yielded statistically superior clot dissolution (25%) in comparison to the non-vibrated control (5%) ($p < 0.0003$). Given the results of this study LLFV may hold potential

as a safe and practical adjunct to clot disruptive drug therapy in first line clearance of acute arterial thrombosis in the emergency setting. However, LLFV is not recommended in treatment of Deep Vein Thrombosis, as sudden mobilization of clot in this scenario could lead to a worsening condition. In another study⁴ was demonstrated that 3 months of WBV exposure had a plausible influence on arterial stiffness in adult men and could be considered as a complementary exercise. This is consistent with⁵ suggesting, that exercise training program that incorporates WBV, diminish arterial rigidity in postmenopausal women with pre-hypertension and hypertension. These researchers were able to demonstrate improved systemic and lower extremities arterial stiffness, favorable blood pressure and muscle strength. That on the other hand can reduce cardiovascular and disability risks in particular cohorts.

Moreover, similar to a previous investigation⁶ examined if WBV is able to enhance skin blood flow and nitric oxide (NO) blood concentration in individuals with restless legs syndrome (RLS), where data were match to comparable sample. The obtain results pointing to the conclusion that blood flow was significantly higher in RLS group compare to control. There was no improvement in NO concentration from blood drawn at the antecubital fossa, within subjects and between groups. Nevertheless, what can be gathered from this investigation is that more research should be done to elucidate if RLS subjects will react differently to WBV in different times of the day. Moreover, autonomous neural system activity should be assessed as well.

Further evidence in favor of WBV came from⁷ where authors analyzed popliteal artery mean blood velocity, peak blood velocity, arterial resting diameter and blood flow after 12-weeks of simultaneous implementation of WBV and electromyo-stimulation in patients with spinal cord injury. In addition, muscle thickness (gastrocnemius) and bone mineral density in the neck were also analyzed. We can conclude that the experimental group experience increased arterial resting diameter, blood flow, gastrocnemius muscle thickness when compare to baseline values. Authors claim that the interplay of WBV and electromyo-stimulation can be acknowledged as encouraging alternative to reverse the musculoskeletal atrophy and enhance peripheral vascular characteristics in spinal cord injury patients. Additional evidence come from⁸ where the cardiac patients were subject to 3-months, 30-minute bout of low frequency vibration. These researchers were able to demonstrate that low frequency vibration can

induce total fluid force and cyclic stretch-strain in endothelial cells and extracellular matrix which is known to promote vascular endothelial growth and stimulates the resulting responsive proteins. Moreover, cyclic stretch of coronary cells has shown to induce angiogenesis and play factor in arteriogenesis. Taking together, authors confirmed that low frequency vibration stimulates neo-coronary growth to improve clinical outcome in ischemic heart failure patients.

At last research was conducted and⁹ examined exercise programs with and without WBV in the patients with stroke. Based on this review insufficient evidence was found to support clinical use of WBV in enhancing body function, structure and participation after stroke. However, the limitation of this study was that a broad approach was used, with stroke as an inclusion criterion for this review. Also, we have to take into consideration the heterogeneity of patient groups, type, frequency, amplitude, peak acceleration, and treatment duration of WBV parameter that may influence the presented finding.

Application of vibrotherapy

In the last decade the strategy of acute and chronic pain management has changed from analgesics and surgical treatment to laser, magnetic and electro-stimulation therapy. Proponents of WBV claim that vibrotherapy can be used for number of health issues for example: tiredness and heaviness of legs, improvement of lymphatic drainage and sports massage, pain in lower extremities, spasticity, painful back disorders, postural and locomotion problems, lack of spinal stability, as a preventive measure for bed sores, muscle strains and post-traumatic recuperation. Also, for problems with metabolism, irritable bowel syndrome, overweight, obesity, limitation of mobility in the trunk area, removing waste products of metabolism from the organism, for improvement of skin firmness and elasticity, vibrotherapy can be also used for symptoms of overwork, exhaustion, issues related to emotional state e.g. (nervousness, anxiety, irritability, feeling discomfort and tiredness). Problems with memory and concentration, it can be applied for individuals suffering from insomnia, ADHD, ADD, psychomotor hyperexcitability as well as in regeneration and relaxation etc. Above stated evidence comes from the review of numerous studies related to vibrotherapy. We are aware that there are skeptics of WBV asserting that this is just another intense and widely shared enthusiasm for health, while other critics cite it as a not demonstrated by evidence or argument as true or existing, made by manufacturers who are hoping to cash in on consumer appeal for new remedy for today's health care problems. Based on my own experience with the WBV and knowing a set of moral principles of one of the vibrotherapy company (Vitberg+) from Poland. I can conclude that vibrotherapy has its validation even though the exact mechanism is yet to be further examined or inspected closely and thoroughly.

Conclusion

Presented investigations demonstrate convincing evidence. Even though various populations which may benefit from whole body vibration have been defined, there appear to be some subgroups

which emerge to benefit more from WBV than others. Muscle tissue is responsible for maintaining posture, locomotion, movement of internal organs. However, viewing muscle tissue as an organ of the immune system has become quite untouched. It is possible that beside improvements in muscle characteristics, WBV enhance immune functions, immune response in injured muscle tissue. This may be another reason for even closer look at WBV and its potential as a circulation system and immune system serve the same yet complementary purpose. Last but not list WBV also points to the psychological effect. However, at the very end, we can conclude that low frequency vibration is simple to apply, does not rely on expensive imaging equipment and a high medical expertise requirement to implement the therapy. However, for the future more research is needed to clarify number of factors that may approximate and explain connection between WBV and cardiovascular health.

Acknowledgements

None.

Conflict of interest

Author declares that there is no conflict of interest.

References

1. Sañudo B1, Alfonso RR, Del Pozo CB. Whole body vibration training improves leg blood flow and adiposity in patients with type 2 diabetes mellitus. *Eur J Appl Physiol.* 2013;113(9):2245–2252.
2. Lohman EB, Sackiriyas KS, Bains GS. A comparison of whole body vibration and moist heat on lower extremity skin temperature and skin blood flow in healthy older individuals. *Med Sci Monit.* 2012;18(7):CR415–CR424.
3. Hoffmann A, H Gill. Externally applied Vibration at 50 Hz facilitates dissolution of blood clots In -Vitro. *Am J Biomed Sci.* 2012;4(4):274–284.
4. Liang Lai Ch, H Yu Chen, S Yu Tseng, et al. Effect of whole-body vibration for 3 months on arterial stiffness in middle-aged and elderly. *J Clinical Intervention in Aging.* 2014;9:821–828.
5. Figueroa A, Kalfon R, Takudzwa A, et al. Whole-body vibration exercise training reduces arterial stiffness in postmenopausal women with prehypertension and hypertension. *J North Am Menopause Sci.* 2013;21(2):131–136.
6. Mitchell UH, Johnson PK. Vibration and skin blood flow changes in subjects with restless legs syndrome. *J of Parkinsonism and Restless Legs Syndrome.* 2014;4:9–16.
7. Menéndez H, Ferrero C, Hernández MJ. Chronic effects of simultaneous electromyostimulation and vibration on leg blood flow in spinal cord injury. *International Spinal Cord Society.* 2016:1–7.
8. Hoffmann A, H Gill. Can a Vibratory Back Massage Induce Neo-Coronary Growth? A blinded, randomized controlled Pilot study protocol. *J Clin Exp Cardiol.* 2016:6–8.
9. Liao LR, Huang M, Lam FHM, et al. Effects of whole-body vibration therapy on body functions and structures, activity, and participation posts-stroke: a systematic review. *Phys Ther.* 2014;94(9):1232–1251.