

Whole-Body Vibration Exercise as a Clinical Intervention to Counterbalance Effects of the Sedentary Behavior: Mini Review

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ABSTRACT

Sedentary Behavior (SB) is defined as the time spent engaged in sitting or lying down activities that require an energy expenditure of 1.0 or Lower Basal Metabolic Rates (METs). SB is associated with deleterious health outcomes and along with the time it has been considered a strong risk factor for cardiometabolic diseases. SB is associated with increased body mass, blood pressure, metabolic dysfunction, and chronic disease in general. SB may exacerbate the loss of muscle mass and strength, found that among healthy adults or adults with chronic pain. SB is also linked with numerous adverse mental, poor body composition, and Quality of Life (QOL). Reducing SB may be feasible through interventions that target sedentary behavior and physical activity. Considering the effects of the Whole-Body Vibration (WBV) exercise, this type of physical exercise might be an intervention to counterbalance some consequences of the SB. Considering the biological effects of the WBV exercises, this mini review aims to present scientific shreds of evidence that this kind of exercise might counterbalance some negative effects of the SB related to the pain, muscle strength and function, mental conditions, body composition, and QOL. The results suggest that WBV exercise can be a feasible and efficient exercise intervention for the management of individuals with SB. In conclusion, there are findings that WBV exercise seems a clinical intervention to counterbalance the effects of SB, because have been demonstrated potential benefits of vibration stimulus on muscular endurance improvement and pain level reduction, improvements in muscle function, body composition, QOL, and neurological conditions for individuals living with the SB.

Keywords: Sedentary behavior; Whole-body vibration; Biological effects

INTRODUCTION

Sedentary Behavior (SB) is defined as any time spent engaged in sitting, reclining, or lying down activities that require an energy expenditure of 1.5 or Lower Basal Metabolic Rates (METs). Sedentary activities are reported in various domains, such as work, leisure/entertainment, and commuting. Moreover, these activities have been categorized as non-discretionary or discretionary. Behaviors such as sitting desk-based office work, school, or while commuting *via* car or bus are nondiscretionary, whereas watching television, reading, using a computer, and playing video games are discretionary. These behaviors can also apply to those unable to stand, such as wheelchair users [1].

SB is associated with deleterious health outcomes and along with the time it has been considered a strong risk factor for cardio metabolic diseases. Various investigations have shown that the SB is associated with increased body mass and blood pressure, as well as with metabolic dysfunction with unfavorable changes in the lipid (increased plasma triglyceride levels, decreased levels of high-density lipoprotein cholesterol) and glycemic profile, and decreased insulin sensitivity [2], and chronic diseases [1]. Furthermore, regular physical activity is fundamental for preserving skeletal muscle mass, strength, and function with aging. SB may exacerbate the loss of muscle mass and strength, found that among healthy adults or adults with chronic pain such as knee Osteoarthritis (OA), individuals with

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a higher level of SB report a higher level of pain than those who are less sedentary [3].

SB is also linked with numerous adverse mental and physical health outcomes and even all-cause mortality, independent of physical activity [4]. Vainshelboim et al. [5] reported that SB was associated with compromised physiological health determinants of body composition in females and muscular strength in males. Nurnazahiah et al. [6] suggested that an increase in the time spent on moderate to vigorous physical activity was associated with improved health-related Quality Of Life (QOL) while SB was associated with poorer among breast cancer survivors. Nevertheless, physical activity is a significant modulator of the mortality risk associated with SB [1]. Reducing SB may be feasible through interventions that target sedentary behavior and physical activity. Considering the effects of the Whole-Body Vibration (WBV) exercise, this type of physical activity might be an intervention to counterbalance some consequences of the SB.

WBV exercises are useful for the management and/or prevention of undesirable conditions due to physical inactivity [7]. WBV exercise is generated when the individual is exposed to mechanical vibration produced in a Vibrating Platform (VP). The main parameters to characterize a mechanical vibration are the frequency, peak-to-peak displacement, and acceleration [8]. Several publications with various populations have reported that WBV exercise also improves muscle strength [9,10], function [9,11,12] body composition [11] QOL [11,13], parameters related to mental conditions [14], and reduces the chronic pain [9,12].

LITERATURE REVIEW

Considering the biological effects of the WBV exercises, this mini review aims to present scientific evidence that this kind of exercise might counterbalance some negative effects of the SB.

WBV and chronic pain

Effects of the WBV exercise are recognized in reducing the chronic pain level in individuals with different clinical conditions, such as patellofemoral pain, metabolic syndrome, and fibromyalgia [9,12]. These studies suggest positive findings on pain level with two devices of the vibrating platform (alternating or vertical) and WBV exercise interventions with different protocols [9,12]. The response to this type of exercise has also important implications for the health of individuals with OA, since BS has been associated with decreased physical functions over time, and physical exercise has been recommended as an of the most effective treatments for OA symptoms [15]. As pain is present in individuals with SB, it is expected that WBV exercise would be and useful intervention to these individuals.

WBV and muscle strength

The WBV promotes generates significant gains in muscle strength and improves endurance in various chronic diseases, as patellofemoral pain [12], metabolic syndrome [9], chronic kidney disease [16], and multiple sclerosis [17], also including healthy individuals [10]. Its use is technically easy and shows positive

and fast results, being one more modality to the therapeutic arsenal that can improve strength and performance. In this context engaging in regular physical activity and avoiding SB are important for healthy aging with benefits including the mitigation of disability and mortality.

WBV and muscle function

Excess time spent in sedentary activities may intensify functional losses. The individuals used to spending long hours in this situation are more susceptible to decline the functional capacity, and it increases the vulnerability of this population, and especially the risk of dependence. This occurs since the high time spent in activities in a sitting or lying position interferes directly with the work of large muscles, responsible for maintaining the standing posture [4]. In this sense, the WBV led to pronounce improvements in functionality parameters in different populations, such as Type II Diabetes Mellitus (T2DM) [11], patellofemoral pain [12], and metabolic syndrome [9]. Then, WBV exercise might be an important alternative to be offered to individuals with SB.

WBV and mental conditions

The WBV exercise seems to improve parameters related to the different disorders that affect neurological conditions, with results of these exercise in neurocognition in healthy subjects [14], Lam [18] in mild or moderate dementia, and Kim [19] in women with senile dementia. There is increasing evidence that the overall level of SB is associated with worse mental or psychological outcomes [15]. WBV treatment is relatively inexpensive and easy to apply and might therefore be of potential relevance for clinical use in different mental conditions [14,18,19], including people with SB.

WBV and body composition

Domingues-Muñoz et al, [11], analyzed the effects of WBV exercise on body composition in people with T2DM. WBV was shown to be beneficial for reducing the fat mass in people with T2DM. The reviewed effects of WBV exercise on children and adolescents with Down syndrome. It was observed that this kind of exercise improves muscle strength, body mass density, body composition, and balance of children and adolescents with Down syndrome. In this context, it is expected that WBV exercise might improve the body composition in individuals with SB.

WBV and quality of life

Jamal et al. [20] determined the efficacy of WBV exercise on pain, neuropathy disability score, balance, proprioception, and QOL in patients with painful Diabetic Peripheral Neuropathy (PDPN). It was concluded that WBV improves sensory sensations like pain and vibration perception, neuropathy disability score, balance measures, and health related QOL in PDPN. The effect of WBV exercise on the QOL was studied in individuals with Metabolic Syndrome (MSy) individuals. It was verified that WBV exercise promotes improvements in the QOL of MSy individuals [13]. Considering that the QOL of people

with SB is poor, probably WBV exercise would be useful to these individuals.

STRENGTH

The strength of this short review is related to the suggestion of WBV exercise as physical activity to reduce the time spent on sedentary activities throughout life. It can be considered an important preventive action to promote independence and QOL, delaying functional decline and allowing greater autonomy for individuals with SB. However, future studies are still needed, such as randomized clinical trials, with elaborated protocols, considering the clinical condition related to the SB.

CONCLUSION

In these findings, the WBV exercise is seen as a clinical intervention to counterbalance the effects of SB, because its demonstrated potential benefits of vibration stimulus on muscular endurance improvement and pain level reduction, improvements in muscle function, body composition, QOL, and neurological conditions for individuals living with the SB. The results suggest that WBV exercise can be a feasible and efficient exercise intervention for the management of this population.

LIMITATIONS

A limitation of this study is related to be a short review. In consequence, only some relevant scientific evidences are shown involving the use of WBV exercise as an intervention to the management of clinical disorders due to the SB.

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