Brazilian Journal of Mechanical Vibrations in Biosciences

BJMVB

Volume 1, Number 2, 2023

Brazilian Journal of Mechanical Vibrations in Biosciences

BJMVB

Vol. 1(2), 2023
Rio de Janeiro, Brazil

Brazilian Journal of Mechanical Vibrations in Biosciences

ISSN online publication: it will be requested after the second issue of the volume one.

Contact: publicacoesbjmvb@gmail.com

Instructions to prepare and to submit a manuscript – see the link https://vibmecbio.com/brazilian-journal-of-mechanical-vibrations-in-biosciences/

SUMMARY

Brazilian Journal of Mechanical Vibrations in Biosciences

Volume 1 Number 2

Abstracts of the poster presentation

108 Evaluation of the effects of systemic vibration therapy on functional capacity using the Timed Up and Go (TUG) in obese individuals: Preliminary results.
Andrade-Nascimento A., Valério-Penha A.G., Silva-Reis A., Mazini J., Jaques-Albuquerque L.A., Cardoso A.L.B.D., Porto T.A., Bernardos-Filho M. and Sá-Caputo D.C

110 A randomized double-blind study of effects acute of Whole-body vibration exercise on thermogesis in adults with obesity:preliminar results.
Reis-Silva a., Valério-Penha A.G, Andrade-Nascimento A.A, Mazini J.S., Coelho-Oliveira A.C., Cardoso A.L.B.D, Amadeu T.P., Bernanrdo-Filho M. and Sá-Caputo D.C.

112 Is there a correlation between functionality and quality of life of individuals with metabolic syndrome after intervention with systemic vibratory therapy? Preliminary results.
Coelho-Oliveira A.C., Bernardo-Filho M. and Sá-Caputo D.C

114 Effects of systemic vibratory therapy on anthropometric measurements related to cardiovascular risk in overweight and obesity pre- fragile and fragile elderly: preliminary results.
Valério-Penha A.G, Jaques-Albuquerque L.T., Moura-Fernandes M.C., Gama M.A.S., Oliveira-Silva L., Felizardo-Anchieta L.B., Oliveira L.P., Bernardo-Filho M. and Sá-Caputo D.C

116 Effects of systemic vibratory therapy on body composition and anthropometric measurements of individuals with obesity: preliminary results.
Valério-Penha A.G., Andrade-Nascimento A., Silva-Reis A., Mazini J., Coelho- Oliveira A.C., Jaques-Albuquerque L.T., Amadeu T.P., Bernardo-Filho M. and Sá- Caputo D.C

118 Effect of mechanical vibration exposure in diabetic Wistar rats on the novel object recognition task.
Cardoso A.L.B.D., Sá-Caputo D.C., Ribeiro-Carvalho A. and Bernardo-Filho M

119. Hot pain and touch-pressure response after whole- body vibration in an animal model.
Sonza A., Zaro, M.A. and Achaval M.H

121 Technological tools and innovative pedagogic resources in an online postural education program: longitudinal study for adolescents.
do Nascimento G.L., Sanada L.S. and Sonza A

123 Brown and beige adipose tissue evaluated by infrared thermography in scholars: a protocol study.
Bailich G., Lopes P.R., Freitas A.E., Sá-Caputo D., Bernardo-Filho, M., Jaques- Albuquerque L.T., Silva A.R. and Sonza A.

125 Analysis of the functional mobility of older adults during the covid-19 pandemic.
Bellini A.J., Pereira A.A.F.L., Ostroski I.M., Tavares G.M.S. and Santos G.M

127 Influence of celiac disease on bone mineral density in adult women.
Ostroski I.M., Bellini A.J., Parizotto P., Duarte L.H.C., Santos G.M.

129 Effects of whole-body vibration exercise on neuromuscular activation of acces muscles of respiration and cardiopulmonary parameters in Chronic obstructive pulmonary disease individuals: preliminary findings.
Monteiro-Oliveira B.B, Guedes-Aguiar E.O., Armstrong L.P., Souza-Santos, D., Coelho-Oliveira A.C., Bernardo-Filho M. and Sá-Caputo D.C

131 Autonomic nervous system response during systemic vibratory therapy in individua with obesity: a randomized controlled trial.
Batouli-Santos, D., Valenti V.E., Cardoso A.L.B.D., Coelho-Oliveira A.C., Reis- Silva A., Norte, C.E.; Sá-Caputo D.C. and Bernardo-Filho M

133 Effect of systemic vibration therapy on functionality in patients with chronic obstructive pulmonary disease.
Guedes-Aguiar E.O., Oliveira-Monteiro B.B., Cardoso A.L.B., Sá-Caputo D.C. and Bernardo-filho M

135 Acute effect of systemic vibratory therapy on functionality and on handgrip strength in obese individuals: preliminary results.
Mazini J.S., Jaques-Albuquerque, L.T., Valério-Penha A.G., Reis A.S., Coelho- Oliveira A.C., Andrade-Nascimento A., Amadeu T.P., Bernardo-Filho M. and Sá- Caputo D.C

137 Systematic vibration therapy as an exercise modality for children with autism: bibliographical review.
Felizardo-Anchieta L.B., Valério-Penha A.G, Bernardo-Filho M. and Sá-Caputo D.C

138 Evaluation of the effect of systemic vibrating therapy on functionality in the elderly through the timed up and go test: preliminary results.
Oliveira-Silva L., Coelho-Oliveira AC, Cardoso ALBD, Siriano GD, Valério-Penha A.G, Jaques-Albuquerque L.T., Gama M.A.S., Moura-Fernandes M.C., Oliveira L.P., Bernardo-Filho M, and Sá-Caputo D.C

139 The effects of systemic vibration therapy on functionality and muscle strength in the Elderly.
Jaques-Albuquerque, L.T., Coelho-Oliveira, A.C., Valério-Penha, A.G., Moura- Fernandes, M., Gama, M.A.S., de Oliveira, L.P., Bernardo-Filho, M. and Sá-Caputo, D.C

141 Effect of systemic vibratory therapy on sleep quality in individuals with chronic obstructive pulmonary disease by Pittsburgh sleep quality index.
Ferreira-Souza L.F., Sá-Caputo D.C. and Mario Bernardo-Filho

143 Effects of pre-post systemic vibratory therapy on sleep quality in women with knee osteoarthritis by Pittsburgh sleep quality index.
Trindade-Gusmão L.C., Ferreira-Souza L.F., Cardoso, A.L.B.D., Moura- Fernandes M.C., Melo-Lima P.1, Rocha W.S., Oliveira, L.P., Ooka N., Sá-Caputo D.C. and Bernardo-Filho M

145 Effects of the systemic vibration therapy on sleep disorders, body temperature and tone in a child with Down syndrome with renal and urinary disorders: a case-report.
Torres-Nunes, L., Costa-Borges P.P., Paineiras-Domingos, L.L., Bachur, J.A., Sá-Caputo, D.C. and Bernardo-Filho, M

147 Effects of systemic vibratory therapy on pain and on flexibility in elderly: preliminary results.
Moura-Fernandes M.C., Coelho-Oliveira A.C., Valerio-Penha A.G, Souza-Gama, M.A., Jaques-Albuquerque L.T., Silva-Oliveira L., Oliveira L.P., Bernardo-Filho M. and Sá-Caputo, D.C

149 Effects of systemic vibratory therapy on fear of falling in elderly women with knee osteoarthritis: preliminary results.
Moura-Fernandes M.C., Coelho-Oliveira A.C., Trindade-Gusmão L.C., Souza- Rocha W., Melo-Lima P., Ooka N., Mozella A.P., Oliveira L.P., Bernardo-Filho, M. and Sá-Caputo D.C

151 Effects of systemic vibratory therapy on quality of life of elderly individuals.
Souza-Gama M.A., Moura-Fernandes M.C., Coelho-Oliveira A.C, Valerio-Penha A.G.; Jaques-Albuquerque L.T, Silva-Oliveira, L., Oliveira, L.P., Bernardo-Filho, M. and Sá-Caputo, D.C

152 Effects of whole-body vibration exercise on cutaneous tissue repair in male *Wis* rats.
Alves M.A., Sá-Caputo D.C., Amadeu, T.P., Cardoso A.L.B.D. and Souza, J.B

155 Systemic vibratory therapy: alternative treatment for individuals with knee osteoarthritis: preliminary results.
Melo-Lima P., Cardoso A.L.B.D., Coelho-Oliveira A.C., Trindade- Gusmão, L.C, Moura-Fernandes M.C., Rocha, W.S., OOKA, N., Oliveira- Palmeira L., Mozella A.P., Bernardo-Filho M. and Sá-Caputo D.C

156 Does the effects of whole body vibration (WBV) contribute to the improvement of balance and gait of post-stroke patients? Literature review.
Alves-Cunha R.S., Coelho-Oliveira A.C., Sá-Caputo D.C. and Bernardo-Filho M

157 Effects of whole-body vibration on workers with low back pain: a narrative review
Alves-Cunha R.S., Souza-Rocha W., Sá-Caputo D.C. and Bernardo-Filho M

158 Reliability and measurement error of the rectus femoris muscle echo intensity obtained by ultrasound in type 2 diabetes older individuals.
Soares A.L.C., Arruda B.R., Cobas R.A. and Gomes P.S.C

159 Whole-body vibration influence on cognition (reasoning) on a group of young adults.
Duarte, M.L.M., Vasconcelos, D.A., Donadon L.V., Nick, H.C. and Neves, J.A.B

161 Immediate effects of whole-body vibration exercise on soluble TNF receptors in older adults.
Almeida H.C., Lage V.K.S., Santos J.M., Paula F.A., Santos J.N.V., Lima L.P., Coelho- Oliveira A.C., Bernardo-Filho M., Sá-Caputo D.C., Lacerda A.C.R. and Mendonça V.A

162 Effects of systemic vibratory therapy on functionality, urinary incontinence and quality of life in women with osteoarthritis of the knees aging over fifty years: preliminary findings.
Souza-Rocha, W., Moura-Fernandes, M.C, Coelho-Oliveira, A.C., Trindade- Gusmão, L.C., Melo-Lima, P., Ooka, N., Mozella, A.P., Oliveira, L.P., Bernardo- Filho, M. and Sá-Caputo, D.C

164 Effects of systemic vibratory therapy on functionality, urinary incontinence and quality of life in women with osteoarthritis of the knees aging over fifty years: preliminary findings.
Souza-Rocha, W., Moura-Fernandes, M.C, Coelho-Oliveira, A.C., Trindade- Gusmão, L.C., Melo-Lima, P., Ooka, N., Mozella, A.P., Oliveira, L.P., Bernardo- Filho, M. and Sá-Caputo, D.C

EDITORIAL

BJMVB 2023; 1(2):45-47

Editorial

Editorial: Joint Congress on Mechanical vibration and technological innovation in health (MEVITIH-2023): perspectives.

Taiar, R.[1]

[1]MATériaux et Ingénierie Mécanique (MATIM), Université de Reims Champagne Ardenne, F-51100 Reims, France; redha.taiar@univ-reims.fr;

Introduction

In this second issue of volume 1 of the Brazilian Journal of Mechanical Vibrations in Biosciences (BJMVB), the question concerning how the human body functions through the applications of the mechanical vibration and technological innovations in health was addressed. The management of human movements requires the control of different body segments which can be coordinated in multiple ways to perform a defined task. The way that the biological system functions in relation to human movement is particularly complex. Therefore, this requires a deep understanding of the interactions between physical sciences (metrology), sciences and technologies of information, and sciences of life (materials, fabrics, organs, and members). The purpose of this second issue (SI) is to specify the principles of physiology, functional anatomy, and mechanics to explore and understand biological problems by understanding the impact of the mechanical vibration and technological innovations in health. The researchers' objective for this SI was to summarize the most important parameters influencing human performance, in relation to health sciences in the lives of people from all age groups. In this second issue, the researchers were inspired by journal papers that aimed to promote the latest research in the fields of health, quality of life improvement, and sport rehabilitation, and to highlight the recent recommendations on the impact of mechanical vibration and technological innovations in health. This will help to prevent functional decline and frailty throughout the course of life. This prevention is in the form of a perspective approach via the utilization of the latest research applied in general health and it targets all stages of life. In addition, contributions to this SI aimed at prevention, improved performance, the management of diseases, modelization, simulation, quantification, and the computation of the musculoskeletal system, thus allowing researchers to quantify and improve the disparate parameters characterizing movement in different cases such as sport level, work, and patients' daily lives. The aim of this SI is to effectively combine and coordinate research and results in order to understand and improve human bodywork in medicine, in sport, and at work.

In this second issue, the contents of nine round tables that are included in the joint congress in "Mechanical vibration and technological innovation in health (MEVITIH-2023)" will permit the readers to address those questions. Herein, it is summarized the major contributions according to the subject categories. Overall, the studies showed the importance of this subject in improving the quality of life of patients' lives by expanding upon current evidence. Moreover, the studies indicated directions for future research. The articles all focus on the optimization of the musculoskeletal system and the improvement of patients' quality of life. Many fascinating, high-quality methodologies have been developed across the different articles. All the ways on the impact of the whole-body vibration (WBV) on improving the health in human beings.

In round table 1: perspectives and challenges in whole-body vibration; covered by R. Rawer (history of vibration training/therapy), J. Rittweger (Exercise as a countermeasure for deep-space missions: rationale, evidence, and perspectives), R. Taiar (Fundamentals of the applications of WBV in humans' examples and reflections), A. Sonza (pain mediation and human cutaneous mechanoreceptive afferents response after WBV.

In round table 2: Neurological approaches involving WBV; covered by MLM. Duarte (effect of WBV on cognitive tasks), A. Pin (comparison of physiotherapeutic treatment traditional kinesiotherapy and WBV in recovery of gait and balance disorders), R. Taiar (Impact of orthosis and graded sensory-motor rehabilitation on gait improvement in functional neurological disorder: perspectives on the impact of WBV protocol).

In round table 3: technologies associated with health; covered by A. Seixas (predictors of ulceration in diabetic foot patients: the role of skin temperature and plantar pressure), R. Taiar (the applications of biomechanics in the analysis of the impact of WBV effects), A. Sartorio (spinal posture and mobility of the spine and hip in obesity: novel approach), M. Das Graças Rodrigues de Araujo (contribution of the of LACIRTEM on WBV).

In round table 4: Translational research involving whole body vibration; covered by I F. Charas dos Santos (WBV in improving physical performance in dogs), T. Porto Amadeu (effects of WBV on tissue repair), N. Asad (WBV exercise on basic research and translational approaches).

In round table 5: Approaches in chronic diseases; covered by A.C. Lacerda (WBV in clinical, functional and biomarkers in chronic disease), A. Sartario (Respiratory muscle training in obese patients: integrative interventions to improve exercise tolerance), D. Da Cunha se Sa- Caputo (WBV in obese individuals: facts and perspectives).

In round table 6: Whole body vibration on bone muscle tissues; covered by P. S. Chagas Gomes (Acute and chronic effects of aging, disease, injury, resistance exercise and whole-body vibration on muscle quality: a look at muscle echo-intensity), J. A. Bachur (Approach to mechanotransduction in the joint environment and the whole-body vibration exercise in patients with osteoarthritis: a review), Liszt Palmeira de Oliveira (Functional evaluation on degenerative articular disease).

In round table 7: Systemic vibratory therapy in health promotion covered by J. Rittweger (on the importance of acceptance and feasibility for planning physical intervention studies), A. Seixas (systematic reviews and meta-analysis about WBV in musculoskeletal rehabilitation), L.L Paineiras-Domingos (Systemic vibration therapy in post-Covid respiratory symptoms: new perspectives for a multidisciplinary approach).

In round table 8: Rehabilitation with different approaches in elderly covered by V. Amaral (Immediate effects of WBV in Sarcopenic Older People), L. Palmeira de Oliveira (Risk of fractures due to the falls in elderly), D. da Cunha de Sa-Caputo (WBV as a tool for healthy aging), P. C. Handam (Viscosuplementation and strength training in patients with knee osteoarthritis).

In round table 9: Facts and challenges in systemic vibratory therapy covered by Luis Cristóvão (Laboratory results modulated by whole-body vibration), J. Rittwerger (How to Assess Adverse Events in Whole Body Vibration Studies – Proposal for a Study Protocol), M. Bernardo-Filho (Mechanobiomodulation as a possible mechanism to justify the systemic vibratory therapy).

Conclusion

This second issue of volume 1 of the BJMVB is highly actual and informative as it relates to the latest research in the field of « Mechanical vibration and technological innovation in health». Moreover, there are perspectives that the contents on this issue will allow the readers to deepen their knowledge and understanding of the complexity of the responses of the neuromusculoskeletal system to vibratory stimulus in various populations and in animal models.

Funding

This research received no external funding.

Conflicts of Interest

The author declares no conflict of interest.

References

1. Taiar R. Machado CB, Chiementin S and Bernardo-Filho M (Editors). Whole body vibrations: physical and biological effects on the human body. CRC Press, Taylor & Francis Group, New York, 2019
2. van Heuvelen MJG, Rittweger J, Judex S, Sañudo B, Seixas A, Fuermaier ABM, Tucha O, Nyakas C, Marín PJ, Taiar R, Stark C, Schoenau E, Sá-Caputo DC, Bernardo-Filho M, van der Zee EA. Reporting Guidelines for Whole-Body Vibration Studies in Humans, Animals and Cell Cultures: A Consensus Statement from an International Group of Experts. Biology (Basel). 2021 Sep 27;10(10):965. doi: 10.3390/biology10100965
3. Rittweger J (Editor). Manual of Vibration Exercise and Vibration Therapy. Springer: Cham, Switzerland, 2020
4. Sañudo B, Seixas A, Gloeckl R, Rittweger J, Rawer R, Taiar R, van der Zee EA, van Heuvelen MJG, Lacerda AC, Sartorio A, Bemben M, Cochrane D, Furness T, de Sá-Caputo D, Bernardo-Filho M. Potential Application of Whole Body Vibration Exercise For Improving The Clinical Conditions of COVID-19 Infected Individuals: A Narrative Review From the World Association of Vibration Exercise Experts (WAVex) Panel. Int J Environ Res Public Health. 2020 May 22;17(10):3650. doi: 10.3390/ijerph17103650

ORIGINAL PAPERS

BJMVB 2023; 1(2):49-59

Randomized study

Impact of the systemic vibratory therapy using two protocols on gait speed of individuals with obesity: a randomized controlled trial.

Coelho-Oliveira A.C.[1,2]*; Reis-Silva A.[2,3]; Bachur J.A.[4], Sonza A.[5], Bernardo-Filho M.[2]; Sá-Caputo D.C.[1,2]

[1]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil;

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísicae Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil;

[3]Programa de Pós-Graduação em Ciências Médicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil;

[4]Faculdades de Medicina e de Fisioterapia, Universidade de Franca, Franca, SP, Brazil.

[5]Laboratório de Desenvolvimento e Controle Postural, Programa de Pós-GraduaçãoemVCiências do Movimento Humano, Programa de Pós-Graduação em Fisioterapia, Departamento de Fisioterapia, Universidade do Estado de Santa Catarina, Florianópolis, SC, Brazil.

*Corresponding author: anacarol_coelho@hotmail.com/ anacarolcoelho26@gmail.com

Received: June 17th, 2023 / Revised: July 19, 2023 / Accepted: July 21st, 2023

Abstract

Introduction: Obesity can influence several changes in body composition, such as increased adipose tissue and alterations in fat distribution. In addition, associated with the aging process, changes are observed in muscle strength, biomechanics, and gait performance, which could increase motor effort and decrease functional independence. The main treatment for obesity consists of lifestyle changes and physical exercise. Systemic vibratory therapy (SVT) is a therapy modality that uses whole-body vibration exercise (WBVE), which can promote benefits in individuals with obesity, including those in the aging process. This study aimed to evaluate the impact of SVT in two protocols on gait speed in individuals with obesity. **Methods**: Thirty-two individuals with obesity, aged over 50 years were randomized into two groups: fixed frequency group (FFG) (n=16, 63.44 $\pm$ 10.72 years, body mass index 34.21 $\pm$ 3.86 kg/m^2), or variable frequency group (VFG) (n=16, 62.63 $\pm$ 10.17 years, body mass index 33.87 $\pm$4.76 kg/m^2). After the randomization, the individuals performed the determined protocol twice a week, for 6 weeks totaling 12 sessions. Gait speed was evaluated before and after the two interventions **protocols. Results:** The gait speed was reduced after the interventions but did not show significant differences (p>0.05) comparing before the first and after the last session of

WBVE, with the proposed parameters inboth protocols. **Conclusions:** WBVE is a viable therapy and the speed gait was maintained. No reduction in the speed of the walking speed test was observed for the proposed protocols in individuals with obesity. However, due to the sample characteristics, WBVE is a favorable resource to stimulate the regular practice of this kind of exercise, which promotes weight reduction, bone mineral density, leg muscle strength, and arterial profile improvement as mentioned in the literature and may help to promote the health of these individuals.
Keywords: systemic vibratory therapy, obesity, gait speed, whole-body vibration, aging

1. Introduction

Obesity is defined as an excessive accumulation of body fat mass, a condition with a multifactorial etiology that includes genetic, behavioral, environmental, and socioeconomic factors (1). It is related to the result of an energy balance imbalance (between consumed and expended calories) that generates a chronic positive energy balance (2). The diagnosis of obesity is commonly based on the body mass index (BMI), dividing a person's body mass by the square of their height; and individuals withresults greater than or equal to 30 (kg/m ^{2}) are considered and classified as individuals with obesity (3-5).

These clinical conditions can influence several changes in body composition, such as an increase in adipose tissue and changes in fat distribution (6). In addition, associated with the aging process, changes are observed in muscle strength, biomechanics, functionality, functional capacity, and gait performance, which could increase motor effort and decrease the functional and operational independence of these individuals (7).

In the context of functional capacity, walking is a fundamental dynamic activity for carrying out activities of daily living and is necessary for the independence of individuals (8). Gait speed has been recognized as a measure of lower limb muscle function. However, with age, the gait tends to become slow, suggesting that everyone selects the speed most compatible with their functional capabilities. Thus, a slow gait appears as a consequence of the physiological process of aging (8). The usual gait speedhas been considered a predictor of functional decline, hospitalization, hospital discharge, need for a caregiver, and mortality; in addiction, studies support that low gait speed is associated with frailty, sarcopenia, and increased risk of falls (8-10).

The main treatment for obesity consists of lifestyle changes through a balanced diet and physical exercise (11). Nevertheless, these individuals tend to have low adherence to conventional physical exercise programs, probably due to physical deconditioning, musculoskeletal pain, and lack of motivation (12). Therefore, it would be important to develop other therapeutic possibilities to better serve these individuals.

Systemic vibratory therapy (SVT) is an innovative modality of therapy, produced through a vibrating platform, usually of two models: i) vertical vibrating platform (base oscillates in an up and down movement), and ii) alternating vibrating platform (base makes a lateral movement similar to a seesaw) (13-15). The mechanical vibration produced by the vibrating platform turn-on is transmitted to the whole body of the individual and generates the exercise, which is known as whole-body vibration exercise (WBVE) (14-16). The intensity of this exercise is performed by adjusting the biomechanical parameters: (peak-to-peak displacement or amplitude in millimeters (PPD), frequency in hertz (f), and peak acceleration in multiples of Earth's gravity (g)or root mean squared acceleration (m/s^2) (17). WBVE provides a neuromuscular stimulus that has been used to improve muscle mass in diverse populations, including patients with obesity (16, 18-20). Feng Yang et al. 2017 (20) reported that vibration- based training may be a promising alternative or additional modality to active exercise- based fall prevention programs for individuals with obesity, which can be attributed to the increase in strength caused by vibration training.

A systematic review identified that vibrating devices placed on the feet or ankleswere able to improve gait parameters in elderly patients with greater baseline variability (21). Nevertheless, so far, no study has evaluated the impact of SVT on the gait speed ofolder individuals with obesity. This study aims to evaluate the impact of two whole- body vibration protocols on gait speed in individuals with obesity.

2. Materials and Methods

2.1 *Participants and Ethical Considerations*

The recruitment of the participants occurred from January 2019 to January 2021, at the *Universidade do Estado do Rio de Janeiro* (UERJ). The WBVE was performed in the *Laboratório de Vibrações Mecânicas e Práticas Integrativas* (LAVIMPI), *Policlínica Universitária Piquet Carneiro,* UERJ.

This project was approved by the Research Ethics Committee of HUPE-UERJ with the number CAAE 54981315.6.0000.5259, the registry in the Brazilian Registry of Clinical Trials (ReBEC) with the number RBR 2bghmh and UTN: U1111-1181-1177. The participants of both groups signed a consent form. Consolidated Standards of Reporting Trials (CONSORT) was used to report the steps of the interventions utilized in this study (22).

2.2 *Inclusion and Exclusion Criteria*

The inclusion criteria were individuals of both sexes, over 50 years of age, with obesity according to the classification by body mass index (BMI) $\geq$ 30 kg/m^2 (3,5).

The exclusion criteria were individuals with metallic prostheses, unable to carry out the proposed evaluations and/or interventions, infectious-contagious, neuro-degenerative, pulmonary, or other diseases that disable the performance of the protocol, and those who refuse to sign the consent.

2.3 *Study Design and Randomization*

This investigation is an intervention, longitudinal, and randomized controlled trial study with blinded analysis. In the randomization, a blinded envelope was used for the drawing of the cards with the names of the groups: fixed frequency group (FFG) or variable frequency group (VFG). After the randomization, the individuals were allocated into one of these two groups (FFG or VFG), and performed the protocols twice a week, for 6 weeks, totaling 12 sessions.

2.4 *Interventions*

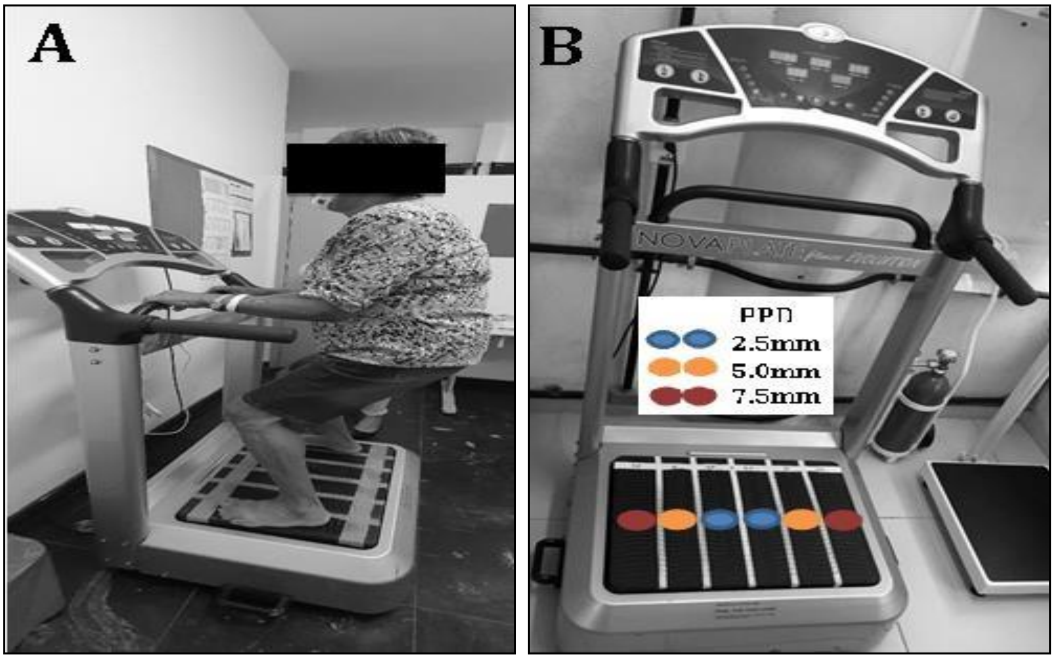
2.4.1 *Fixed Frequency Group* (FFG)

In the FFG protocol, the individuals were positioned in a squat position, barefoot and with 130° knee flexion (Figure 1A). The biomechanical parameters of the mechanical vibration were a frequency of 5 Hz in all sessions; 2.5, 5.0, and 7.5-mm peak-to-peak displacement (PPD) (Figure 1B); and individuals performed static and dynamic squats, interspersed on session days. During the intervention, the work time was 60 seconds (10 seconds of vibration and 50 seconds without vibration, totaling 1 minute), followed by 1 minute of rest in each PPD, totaling one series. From 1 to 4 weeks, the individuals performed 3 series in each session, a total time of 18 min. From 5 to 8 weeks, 4 series were performed in each session, a total time of 24 min. From 9 to 12 weeks, they performed 5 series in each session, a total time of 30 min.

2.4.2 *Variable Frequency Group* (VFG)

In the VFG protocol, the individuals were positioned in a squat position, barefoot, and with 130º knee flexion (Figure 1A). The biomechanical parameters of mechanical vibration were a frequency of 5 Hz in the first session, increasing by one Hz at each session, totaling 16 Hz in the last session; 2.5, 5.0, and 7.5 mm PPD (Figure 1B); and the individuals performed static and dynamic squats, interspersed on session days.During the intervention, the individual performed 1 minute of vibration (work time) and1 minute without vibration (rest time) was performed at each PPD, totaling one series. From 1 to 4 weeks, they performed 3 series in each session, a total time of 18 min. From 5 to 8 weeks, were performed 4 series in each session, a total time of 24 min. From 9 to 12 weeks, five series were performed in each session, with a total time of 30 min.

Figure 1. Body and foot positions at each peak-to-peak displacement.



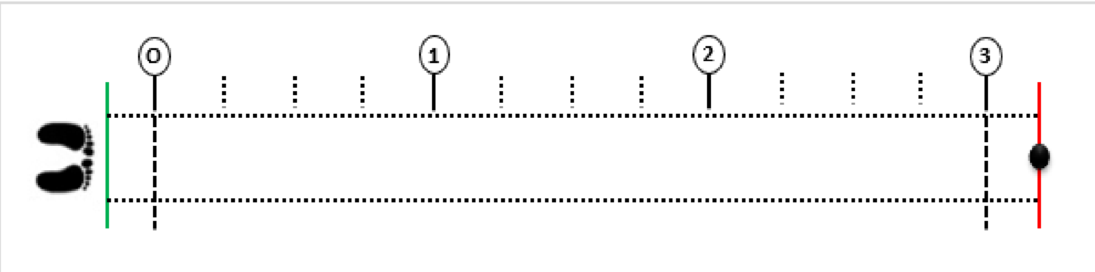
(A) Positioning adopted on the vibrating platform;
(B) Feet position and each peak-to-peak displacement (PPD).

2.5 *Measured Variable*

2.5.1 *Gait Speed Test*

In the current study, the individuals were subjected to the gait speed test (23) for functional assessment before the first and after the twelfth session. In the gait speed test (Figure 2), individuals are instructed to walk a defined distance (3 meters) with normal and usual walking speed from a specific point and to come back. A chronometer was used to measure accurately the gait time. This test was performed twice, and the score considers the smallest time of the 2 attempts: 1, more than 6.52 seconds; 2, between 4.66 and 6.52 seconds; 3, between 3.62 and 4.65 seconds; and 4, less than 3.62 seconds. If the individual was unable to perform the walk, the score is 0. A chronometer (Cronobio SW2018, Brazil) was used in the test.

Figure 2. Illustrative scheme of the gait speed test performed on a track.



The gait speed test performed before and after the two protocols with WBVE.

2.6. *Statistical Analysis*

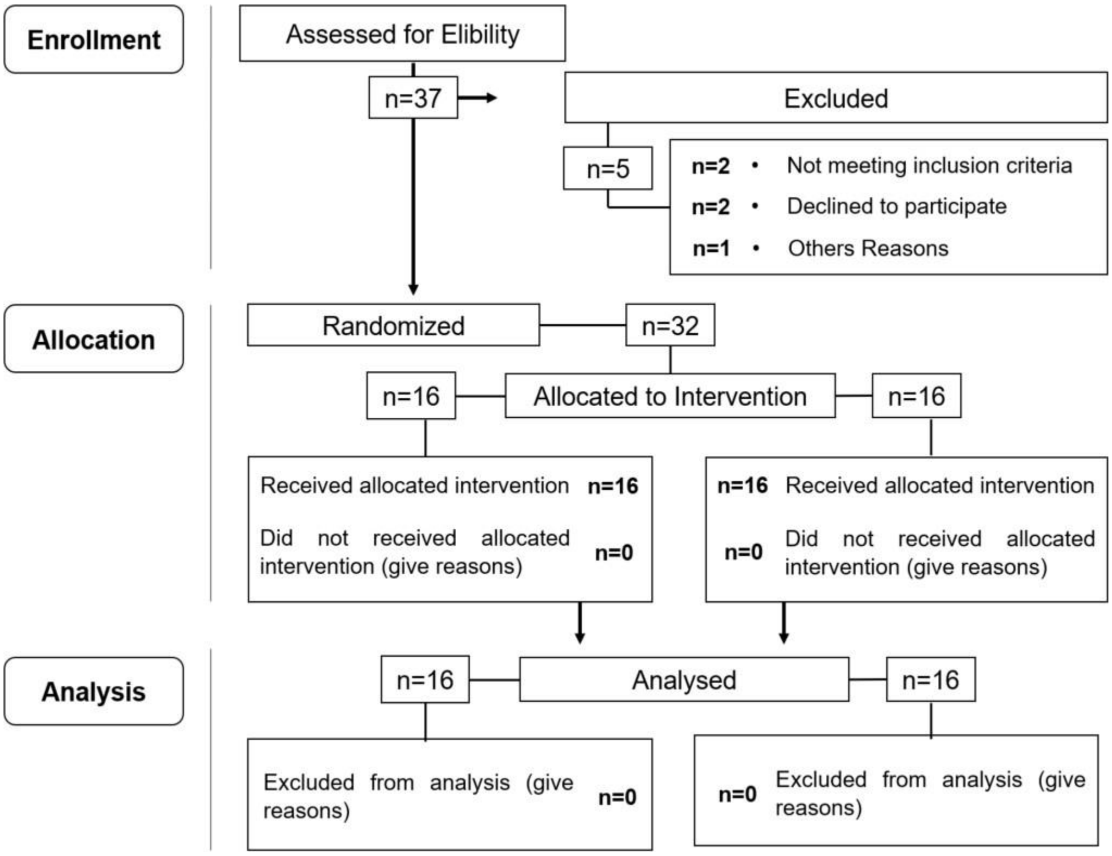
Data are given as mean and standard deviation (SD). The Shapiro-Wilk normality test was used to assess the distribution of the variable. The total time of execution of the gait speed test was presented through mean and SD. Unpaired and paired t-tests were used. The results were analyzed with the GraphPad Prism 6 program and $p \leq 0.05$ was considered statistically significant.

The sample size was calculated using the GPower ® software (Franz Faul, Universitat Kiel, Germany). Based on the study by Paineiras-Domingos et al. 2018 (23), a sample size of 28 participants was required for an error probability set at 5%, a power of 80%, with 14 participants for each group. However, we consider a 15% loss possibility; 32 participants were recruited, with 16 participants for each group. Data, when necessary, were analyzed by intention to treat.

3. Results

The flow diagram with the enrolment of the study is shown in Figure 3. It is observed that thirty-seven individuals were recruited, and five were excluded in the initial evaluation from the study because met the eligibility criteria or withdrew from participating and not realized the intervention. Consequently, 32 individuals participated in this study, FFG (n = 16) and VFG (n = 16).

Figure 3. Flow chart of this study



CONSORT flow diagram of the study.

Table 1 shows the characteristics of the volunteers. Homogeneity was observed between groups for all parameters evaluated (sex, age, height, body mass, and BMI).

Table 1. Sample characteristics

Characteristics	FFG (n=16)	VFG (n=16)	*p*-value
Sex			
F	13 (81,2%)	12 (75%)	--
M	3 (18,8%)	4 (25%)	
Age (years)	63.44 ± 10.72	62.63 ± 10.17	0.827
Height (cm)	160.81 ± 9.68	162.00 ± 7.19	0.696
Body Mass (kg)	76.89 ± 9.71	82.82 ± 10.40	0.105
BMI (kg/m²)	34.21 ± 3.86	33.87 ± 4.76	0.827

BMI, Body Mass Index. Data are presented as mean + SD.

The gait speed evaluated before and after the intervention with the two different WBVE protocols (FFG and VFG). The gait speed did not show significant differences (p>0.05) comparing baseline and the last WBVE session, with the proposed parameters, intragroup and intergroup. However, seems to have a moment effect (pre and post), when we think about the gait time, observed from the mean reduction of 0.35 seconds and 1.45 seconds in the time spent to perform the 3-meter walk, comparing the moments before and after each intervention protocol (FFG and VFG respectively), suggesting a trend towards a significant difference in test performance for the VFG

Table 2. Gait speed in baseline (before) and after the last session (12th session) of two SVT protocols in a comparison of intragroup (moments) and intergroup (groups).

Variable	**Groups**		***p*-value**	***p*-value**
Gait speed (m/s)	**FFG** (n=16)	**VFG** (n=16)	(moments)	(groups)
Baseline	1.587±0.025	1.593±0.020	0.317	0.423
After protocols	1.581±0.013	1.581±0.014	0.052	0.999

FFG, Fixed Frequency Group; VFG, Variable Frequency Group. Unpaired and paired ***t***-tests were used (groups and moments)

4. Discussion

The current findings suggest that systemic therapy through the WBVE did not promote a favorable reduction in the walking speed of the walking speed test in individuals with obesity. However, WBVE is a favorable resource to stimulate the regular practice of this kind of exercise, which promotes body weight reduction, bone mineral density, leg muscle strength, and arterial profile improvement (24, 25) and its regular practice probably may help to promote the health of these individuals.

As well as the results of the current study, Saucedo et al. 2021 used a 6-week WBVE protocol in older adults and found no change in walking speed however they used the Time Up and Go (TUG) test and 2-minute and 10-minute walk tests to evaluate the gait speed (26). In the same way, Genest et al. 2021 observed no significant decrease in TUG test time in men with osteoporosis that were training WBVE for 6 months (27). Demonstrating that the protocols used in these studies may not have been sufficient to promote a statistically significant change in this indicator of global functional capacity.

However, on the other hand, other studies with WBVE have shown that SVT can be effective in decreasing gait speed in elderly individuals. Kawanabe et al. 2007 (28) showed significant improvement in walking speed time after a 2-month intervention with WBVE associated with conventional exercises, through 10-minute walking time. Corroborating with these findings, Simão et al. 2012 (29) also showed a significant decrease in gait speed time using the 10-meter walk test after a 12-week WBVE protocol in elderly individuals with osteoarthritis. Nevertheless, this difference in the Kawanabe et al. 2007 (28) and Simão et al. 2012 (29) results, when compared to our findings, may be related to the use of different tests to assess the gait speed of the evaluated individuals, as well as tests with longer walking time. However, as the current study was carried out with individuals with obesity and aging individuals, the gait speed test used was over a short distance, simulating everyday walking.

Furthermore, the divergence between these results can be attributed to the type of protocol used, the duration of time and number of series, the number of sessions, and the periodicity of intervention, besides the acceleration or intensity of exercise. The current study used frequencies ranging from (5 to 16 Hz and PPD of 2.5 to 7.5 mm); Sauced et al. 2021 (26) (5 to 25 Hz and PPD of 1.3) and Genest et al. 2021 (27) (25.5 Hz and PPD of 1 to 3mm). But Kawanable et al (28), although they used a frequency similar (12 to 20 Hz and PPD not reported), the authors added a series of 30 minutes of conventional resistance exercises associated with the WBVE, thus providing an extra stimulus to the vibration and it probably to make a difference in the face of the results found. While Simão et al. 2012 (29) used higher frequencies throughout the study (35 to 40 and PPD 4mm).

Additionally, a score of <1.0m/s can be considered a slow gait speed (30), and the obese individuals included in this study (Table 2) had a gait speed higher than 1.0m/s, that considered normal (31). In this sense, it can be suggested that the significant improvements observed, with the increase in gait speed may also be related to the profile of populations that may already present impaired gait speed.

In this context, studies suggest that reduced walking speed, with reduced cadence and step length, indicates reduced survival when compared to individuals of the same age and with adequate walking speed (32), which was not observed in our study. Based on this assumption, although obese and aging individuals are already more likely to develop cardiovascular events, Durmurgier et al (33) observed that older with slower walking speeds are three times more likely to die from cardiovascular diseases than older who walked faster. Therefore, the findings of the present study are important for assessing the gait speed of these individuals before and after two different intervention protocols with SVT, using an easy-to-perform and useful measure to assess the effectiveness of the intervention, as well as using a tool capable of early detection of adverse health events.

This study has some limitations. Participants were limited to individuals with obesity (>50 years) who agreed to participate in the study at the time, therefore, it is not possible to generalize the findings to all individuals with obesity. Only one test was used to assess the individual's gait speed. Also, the short distance of the walking speed test selected to simulate everyday walking, might not be enough distance for the obese participants accelerate their gait, showing the true gait speed gain.

The strength of the current study is to identify a therapy strategy using WBVE that is relatively well accepted by the population and does not promote adverse effects on functional capacity. It also allowed the early observation of gait alterations, as an important prevention factor as well as a suggestive factor of possible risks. And, finally, it was able to establish the effects of the intervention, thinking of reducing mortality and future disabilities, inherent in the aging process and the presence of obesity.

Individuals with obesity aged over 50 years did not show a reduction in gait speed. But even so, the intervention with SVT was well tolerated and was an efficient strategy to maintain the walking speed after the intervention period in both used protocols. As perspectives, it would be interesting to evaluate these individuals with a larger sample, as well as to carry out a more refined analysis of the gait components; in addition, gait speed tests with longer tracks and the use of other tests capable of assessing this performance during gait for these individuals are recommended. And finally, to identify the ideal SVT protocol for these individuals.

5. Conclusion

In conclusion, the protocols proposed in this study showed that SVT through WBVE is a viable therapy and the speed gait was maintained. No reduction in the speed of the walking speed test for the proposed protocols in individuals with obesity was observed. However, due to the sample characteristics, WBVE is a favorable resource to stimulate the regular practice of this kind of exercise, which promotes weight reduction, bone mineral density, leg muscle strength, and arterial profile improvement as mentioned in the literature and may help to promote the health of these individuals. Further studies with larger and higher quality trials and longer speed walking tracks are needed to determine the factors that influence gait speed and what the ideal SVT protocol capable of promoting these improvements.

Conflicts of Interest

The author declares no conflict of interest.

Reference

1. Lin X, Li H. Obesity: Epidemiology, Pathophysiology, and Therapeutics. Frontiers in endocrinology. 2021;12:706978.
2. Esquivel MK. Energy Balance Dynamics: Exercise, Appetite, Diet, and Weight Control. American Journal of Lifestyle Medicine. 2021;15(3):220-3.
3. Organization WH. Global strategy on diet, physical activity and health. 2004.
4. Waxman A. Who Global Strategy on Diet, Physical Activity and Health. Food and Nutrition Bulletin (FNB). 2004;25(3):292-302.
5. Organization WH. A guide for population-based approaches to increasing levels of physical activity: implementation of the WHO global strategy on diet, physical activity and health. 2007.
6. Goossens GH. The metabolic phenotype in obesity: fat mass, body fat distribution, and adipose tissue function. Obesity Facts. 2017;10(3):207-15.
7. Osoba MY, Rao AK, Agrawal SK, Lalwani AK. Balance and gait in the elderly: A contemporary review. Laryngoscope Investigative Otolaryngology. 2019;4(1):143-53
8. Guedes RC, Dias RC, Neri AL, Ferriolli E, Lourenço RA, Lustosa LP. Decreased gait speed and health outcomes in older adults: Rede FIBRA's data. Fisioterapia e Pesquisa. 2019;26:304-10.
9. Komforti D, Joffe C, Magras A, Peller A, Garbe E, Garib R, et al. Does skeletal muscle morphology or functional performance better explain variance in fast gait speed in older adults? Aging clinical and experimental research. 2021;33(4):921-31.
10. Cruz-Jentoft AJ, Bahat G, Bauer J, Boirie Y, Bruyère O, Cederholm T, et al. Writing Group for the European Working Group on Sarcopenia in Older People 2 (EWGSOP2), and the Extended Group for EWGSOP2. Sarcopenia: revised European consensus on definition and diagnosis. Age and Ageing. 2019;48(1):16-31.
11. Wadden TA, Tronieri JS, Butryn ML. Lifestyle modification approaches for the treatment of obesity in adults. American Psychologist. 2020;75(2):235.
12. Celik O, Yildiz B. Obesity and physical exercise. Minerva Endocrinology (Torino). 2021;46(2):131-44.
13. Rittweger J. Vibration as an exercise modality: how it may work, and what its potential might be. European Journal of Applied Physiology. 2010;108:877-904.

14. Sá-Caputo DC, Seixas A, Taiar R, Bernardo-Filho M. Vibration Therapy for Health Promotion. Complementary Therapies: IntechOpen; 2022. p. Ch. 12.
15. Van Heuvelen MJG, Rittweger J, Judex S, Sañudo B, Seixas A, Fuermaier ABM, et al. Reporting Guidelines for Whole-Body Vibration Studies in Humans, Animals and Cell Cultures: A Consensus Statement from an International Group of Experts. Biology. 2021;10(10).
16. Sá-Caputo D, Martins-Anjos E, Seixas A, Sartorio A, Sanudo B, Sonza A, et al. Does the mechano-biomodulation vibration lead to biological responses on human beings? Series on Biomechanics. 2023;37.
17. Sá-Caputo D, Paineiras-Domingos LL, Francisca-Santos A, Dos Anjos EM, Reis AS, Neves MFT, et al. Whole-body vibration improves the functional parameters of individuals with metabolic syndrome: An exploratory study. BMC Endocrine Disorders. 2019;19:1-10.
18. Ali MS, Abd El-Aziz HG. Effect of whole-body vibration on abdominal thickness and sitting ability in children with spastic diplegia. The Journal of Taibah University Medical Sciences. 2021;16(3):379-86.
19. Colson SS, Gioda J, Da Silva F. Whole Body Vibration Training Improves Maximal Strength of the Knee Extensors, Time-to-Exhaustion and Attenuates Neuromuscular Fatigue. Sports (Basel). 2023;11(5):94.
20. Yang F, Munoz J, Han LZ, Yang F. Effects of vibration training in reducing risk of slip- related falls among young adults with obesity. Journal of biomechanics. 2017;57:87-93.
21. Aboutorabi A, Arazpour M, Bahramizadeh M, Farahmand F, Fadayevatan R. Effect of vibration on postural control and gait of elderly subjects: a systematic review. Aging clinical and experimental research. 2018;30(7):713-26.
22. Moher D, Hopewell S, Schulz KF, Montori V, Gøtzsche PC, Devereaux PJ, et al. CONSORT 2010 explanation and elaboration: updated guidelines for reporting parallel group randomised trials. British medical journal (BMJ). 2010;340:c869.
23. Paineiras-Domingos LL, da Cunha Sá-Caputo D, Reis AS, Francisca Santos A, Sousa-Gonçalves CR, Dos Anjos EM, et al. Assessment Through the Short Physical Performance Battery of the Functionality in Individuals With Metabolic Syndrome Exposed to Whole-Body Vibration Exercises. Dose-response : a publication of International Hormesis Society. 2018;16(3):1559325818794530.
24. Melo FATd, Melo GFd, Albuquerque SLd, Silva RWd, França NMd, Silva AAd, et al. Whole-Body Vibration Training Protocols In Obese Individuals: A Systematic Review. Revista Brasileira de Medicina do Esporte. 2019;25.
25. Zago M, Capodaglio P, Ferrario C, Tarabini M, Galli M. Whole-body vibration training in obese subjects: A systematic review. PloS one. 2018;13(9):e0202866.
26. Saucedo F, Chavez E, Vanderhoof H, Eggleston J. Effects of Controlled Whole-Body Vibration Training on Functional Performance Among Healthy Older Adults: A 6-Week Pilot Study. The Journal of Aging Research and Lifestyle. 2021;10:39.
27. Genest F, Lindström S, Scherer S, Schneider M, Seefried L. Feasibility of simple exercise interventions for men with osteoporosis–A prospective randomized controlled pilot study. Bone reports. 2021;15:101099.
28. Kawanabe K, Kawashima A, Sashimoto I, Takeda T, Sato Y, Iwamoto J. Effect of whole-body vibration exercise and muscle strengthening, balance, and walking exercises on walking ability in the elderly. Keio Journal of Medicine. 2007;56(1):28-33.
29. Simão AP, Avelar NC, Tossige-Gomes R, Neves CD, Mendonça VA, Miranda AS, et al. Functional performance and inflammatory cytokines after squat exercises and whole-body vibration in elderly individuals with knee osteoarthritis. Archives of Physical Medicine and Rehabilitation. 2012;93(10):1692-700.

30. Lin Y-H, Chen H-C, Hsu N-W, Chou P. Using hand grip strength to detect slow walking speed in older adults: the Yilan study. BMC Geriatrics. 2021;21(1):428.
31. Ruggero CR, Bilton TL, Teixeira LF, Ramos JLA, Alouche SR, Dias RC, et al. Gait speed correlates in a multiracial population of community-dwelling older adults living in Brazil: a cross-sectional population-based study. BMC Public Health. 2013;13(1):1-10.
32. Studenski S, Perera S, Patel K, Rosano C, Faulkner K, Inzitari M, et al. Gait speed and survival in older adults. Journal of the American Medical Association (JAMA). 2011;305(1):50- 8.
33. Dumurgier J, Elbaz A, Ducimetière P, Tavernier B, Alpérovitch A, Tzourio C. Slow walking speed and cardiovascular death in well functioning older adults: prospective cohort study. British medical journal (BMJ). 2009;339.

BJMVB 2023; 1(2):60-73

Systematic review

Local vibratory stimulation in increasing corticospinal excitability of healthy individuals: systematic review.

Alves-Pereira, T.M.[1]*, Siqueira-Brito, J.I.[1], Silva-Nascimento, L.[1], Silmar Silva- Teixeira, S.[2,3], Soares-Teles, A.[2], Orsini, M.[4], Nader, S.[5], Ribeiro, P.[6], Velasques, B.[6], Moraes- Silva, J.[7], Vale- Bastos, V.H.[3,8]

[1] Program in Biotechnology, Federal University of Delta of Parnaiba, Parnaíba, Brazil;

[2]Laboratory of Neuroscience and Techonology Innovation (NITLAB), Federal University of Delta do Parnaíba, Parnaíba, Brazil;

[3] Program in Biotechnology, Federal University of Delta of Parnaíba, Parnaiba, Brazil;

[4]Department of Medicine, University Iguaçu, Rio de Janeiro, Brazil;

[5]Masters in Neurology, Severino Sombra University, Rio de Janeiro, Brazil;

[6]Laboratory of Brain Mapping and sensorimotor integration, Federal University Rio de Janeiro, Rio de Janeiro, Brazil;

[7]Post-doctorate in Biomedical Sciences, Federal University of Delta do Parnaíba, Parnaíba, Brazil;

[8]Brain Mapping and Functionality Laboratory, Federal University of Delta do Parnaíba, Parnaíba, Brazil;

*Corresponding Author : tassiane.alves07@gmail.com / ORCID: 0000-0002-8876-7438

Received: June 17th, 2023 / Revised: August 19, 2023 / Accepted: December 21st, 2023

Abstract

Introduction: Vibratory stimulation is a therapeutic intervention that uses somatosensory inputs, activating peripheral receptors and causing a neurophysiological mechanism that activates the tonic vibration reflex and increases the firing rate of muscle spindles. These changes promote positive physiological repercussions on functional capacity and on motor impairment resulting from neurological diseases. **Aim:** The objective of this systematic review is to understand the alterations produced in the corticospinal excitability promoted by the vibratory stimulus. **Methods:** The systematic review was developed through searches in the PubMed, Scopus and Web of Science databases using the terms local vibration AND cortical excitability. Articles that presented clinical trials published in the last ten years in the English language, which used local vibratory stimulation in healthy individuals with outcomes related to corticospinal excitability, were included. The articles were evaluated for both the intended outcomes, the methodological quality with the PEDro scale and the level of evidence with the GRADE system. **Results:** Two reviewers independently selected the studies according to the criteria listed. A total of 15 articles were included where they showed an increase in corticospinal excitability through facilitation arising from afferent inputIa and intracortical motor circuits, which also showed improvements in maximum functional performance in young people and adults through neural modulations, increased proprioceptive integration and of the motor learning rate. **Conclusions**: Given the results presented, it was possible to conclude that local vibration increases corticospinal excitability in healthy individuals, which can contribute to muscular and motor performance, and can be attributed to other perspectives in pathological conditions as a therapeutic resource in neuromotor rehabilitation.

Key words: Local Vibration; Excitability cortical; Neurofunctional Rehabilitation

1. Introduction

Voluntary movement requires the integration of cortical motor areas or supraspinal motor centers, which, associated with spinal reflex circuits, have the function of controlling efferent activities in motor tasks, that is, they perform the voluntary command through the execution of muscle contraction (1,2).

Learning or developing a new motor task requires a cognitive stage that increases the level of effort to concentrate on performing the task, which leads to an increase in corticospinal excitability (3,4). This increase promotes changes at both the cortical and spinal levels, with changes in the somatosensory cortex preceding those in the primary motor cortex (5).

The somatosensory cortex receives information from peripheral receptors through sensory stimuli in order to interpret, process and store this information, in order to integrate with other brain regions and promote the individual's interaction responses with their environmental stimuli (6). There are therapeutic interventions that use resources with somatosensory inputs to promote changes in cortical excitability, which may increase or decrease it. These changes vary according to stimulus intensity, frequency, duration and duty cycle. Among these interventions are vibratory stimulation, electrical stimulation and tactile stimulation, which mainly cause changes in motor evoked potential (7).

Vibratory stimulation, specifically, is a therapeutic intervention that promotes a neurophysiological mechanism relating the activation of the tonic vibratory reflex and rapid stretching stimulation with triggering of muscle spindles that lead to the involuntary production of muscle contraction, increase corticospinal excitability and intracortical processes (8,9,10), and can be used locally, applied directly to specific muscles or tendons, or to the entire body (11,12,13,14,15)

Local vibratory stimulation has shown promising results in neurofunctional rehabilitation, including reduced spasticity (8,16,17,18,19) and ataxia (20), increased muscle strength (21), improved gait and postural control (22,23,24) and easier motor control tasks (11,13,25). Research has been developed to elucidate new responses to vibratory stimuli, mainly related to changes in corticospinal functions. In this perspective, it is relevant to seek evidence on the practice of this intervention, in order to fill gaps and favor new insights into the therapeutic repercussions of this intervention. Thus, the aim of this study is to seek scientific evidence on local vibratory stimulation in increasing corticospinal excitability in healthy individuals.

2. Materials and Methods

The study was a systematic review of the literature registered in the International Prospective Register of Systematic Reviews (PROSPERO) registration number 186680, following the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA).

2.1 *Research Protocol*

The search for articles was performed in the PubMed, Scopus and Web of Science databases, based on the PICO strategy (P-population: healthy individuals; I-Intervention local vibratory stimulation; C-Comparison: not applicable to this study; O: Outcomes corticospinal excitability), used to formulate the research's guiding question, which asks "Does local vibratory stimulation increase corticospinal excitability in healthy individuals?". The search strings created are presented in Table 1, formulated using MeSH keywords and similar terms that enable answers to the proposed research problem.

Table 1. Search strings in databases

Databases	Strings	Search within	Number results
PUBMED/Medline	local vibration AND cortical excitability [MeSH]	Article title, abstract	107
	tendon OR muscle vibration AND cortical excitability [MeSH]		96
Scopus	local vibration AND cortical excitability[MeSH]	Article title, keywords, abstract	8
	tendon AND muscle AND vibration/ AND cortical excitability[MeSH]		15
Web of science	local vibration AND cortical excitability[MeSH]	All fields	12
	tendon AND muscle AND vibration/ AND cortical excitability[MeSH]		33

2.2 *Selection Criteria*

The articles included were those that presented clinical trials published in the last ten years in the English language, which used local vibratory stimulation in healthy individuals, published from the last 10 years. Articles that used whole-body vibration or association with other therapies, duplicate articles and other study designs were excluded.

2.3 *Selection of Studies and Data Extraction*

Two independent reviewers (TMAP and JISB) selected the studies according to the criteria listed, initially by reading the title and then reading the abstracts to identify the type of study and inclusion criteria used. Disagreements between reviewers during the analysis were decided by a third reviewer (JMS). After selection, data on the profile of the participants, characteristics and protocols of the intervention, evaluated measures and results were extracted and analyzed.

2.4 *Quality Assessment*

To assess the methodological quality of the selected articles, the PEDro scale was used, which qualifies randomized controlled clinical trials following 11 criteria with scores from one to ten, with the first criterion not being scored. Studies with a score greater than or equal to six are considered to be of high quality.

2.5 *Level of Evidence*

The quality of evidence of the articles was assessed using the GRADE scale (Grading of Recommendations Assessment, Development and Evaluation). The study used the table GRADE quality assessment to assign a level of evidence and present the quality of the studies presented. The table attributes levels of evidence representing confidence in the information used in each outcome analyzed, classifying into high, moderate, low and very low defined levels according to the study outline (26,27).

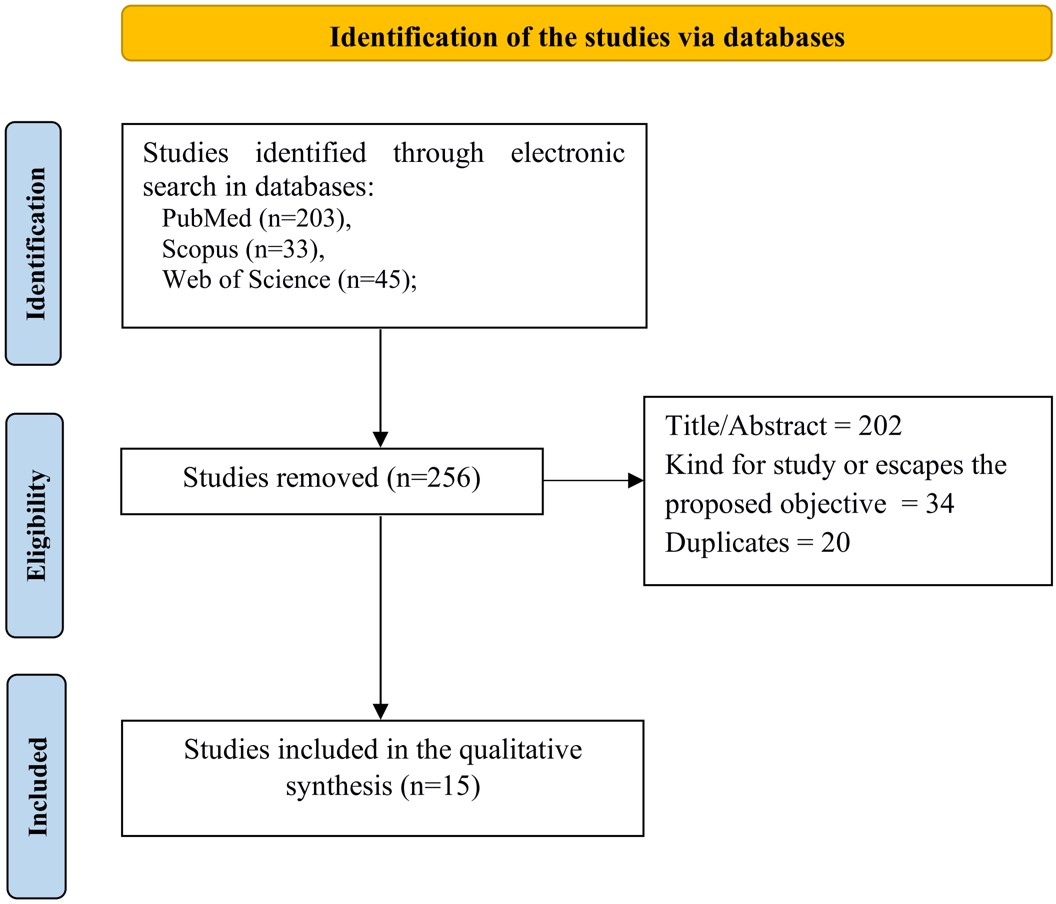
3. Results

Through the search, 271 articles were found, of which 256 were excluded using established criteria. Thus, 15 studies were included for a careful evaluation, of which met the appropriate inclusion criteria. The PRISMA flow diagram used for the study selection process is shown in Figure 1. In total, 15 articles were included with data from 270 volunteers with a mean age of 35.5 years. The details of the selected studies are listed in Table 2.

The application of vibratory stimulation was through focal devices such as Custom Made (miniature electromagnetic solenoid) (28), C-3 Tractor (29), CroSystem electromagnetic transducer (13) VB 115 (30,31,32,34,36,38,39,40)Vibralgic Model (33, 37, (Electronic Conseil, V100 Ling Dynamic Systems Electromagnetic Mechanical Stimulator (35,41).

The intervention protocol was heterogeneous with respect to the stimulated region, vibratory parameters and duration of the intervention, varying in regions such as abductor pollicis brevis (28,37,41), flexor carpi radialis muscle (13), extensor carpi radialis (39), wrist (29), tibialis anterior (30,34) rectus femoris (31,32) and in tendons: extensor pollicis brevis tendon (33), Achilles tendon (36,38,40) and flexor carpi radialis tendon (35) .

Figure 1. Study selection flowchart based on PRISMA.



The applied frequency ranged from 50 to 120 Hz with intensity from 0.2 mm to 1.5 mm or according to the individual's sensitivity threshold. The duration of the protocols varied between single sessions and sessions for up to 8 weeks, with a stimulus with a determined time of 500 milliseconds to 1 hour per intervention ((13,28,41).

The outcome evaluated in the studies were changes in corticospinal excitability as a result of local vibratory stimulation, analyzed through information arising from interpretations of the electroencephalogram (EEG)13 or single pulse Transcranial Magnetic Stimulation (TMS) (28-41), which showed an increase in Motor evoked potential and intracortical facilitation (CIF) and short interval intracortical inhibition (SICI) (13, 28-41)

Table 2. Summary of included studies presenting sample size, vibration parameters, intervention protocol, analyzed variables and results obtained in the studied population.

Author/ Sample	Vibration Parameters	Intervention Protocol	Analyzed Variables	Results
Vidakovic *et al* [28] - 11 individuals	**Frequency** - 120 Hz **Intensity** - Above individual's perception limit);	**Application location:** Upper end of finger II **Device:** Custom Made (Miniature Electromagnetic Solenoid) **Time:** 500 ms per stimulation **Action:** Rest	MEP, EMG (short thumb abductor)	Increased MEP amplitude after vibration;
Seo *et al* [29] - 46 individuals	**Frequency** - 50 Hz **Intensity** - 60% of the sensory threshold	**Application location:** left volar fist **Device:** C-3 Tractor **Time:** 25 min **Action:** Rest and movement (hand grip)	RMT, SICI, CIF, MEP TMS (short abductor of the thumb), EEG (alpha and beta power)	Changes in SICI, and in sensory motor activity both at rest and during prehension
Lopez *et al* [13] - 22 individuals	**Frequency** - 100 Hz **Intensity** - 300 lm	**Application location:** Flexor radial muscle of the carpus; **Device:** CroSystem electromagnetic transducer **Time**: n/a **Action:** Isometric contraction	EEG (alpha, beta and MRRP), EMG AND CVM, RC	Increase in alpha, suggesting increased excitability of contralateral S1-M1
Souron *et al* [30] - 44 individuals	**Frequency** - 100 Hz **Intensity** - 1 mm	**Application location:** Muscular tissue of the Right Anterior Tibialis **Device:** VB 115 **Time**: 1 hour / week (for 8 weeks) **Action:** Rest	CVM, VA, MEG, MEP TMS (anterior tibial and soleus), RC	No significant changes were observed in either leg
Souron *et al* [31] - 23 individuals	**Frequency** - 100 Hz **Intensity** - 1 mm	**Application location:** Right Femoral muscular tissue **Device:** VB 115 **Time**: n/a **Action:** Rest	CVM, VA, MEP TMS (vastus femoris and rectus femoris), EMG (vastus femoris, rectus femoris and biceps femoris) CPS, MEPT	The vibration did not change the TMS. It suggests that modulations in the CNS would be accompanied by a reduction in voluntary muscle strength
Souron *et al* [32] - 17 individuals	**Frequency** - 110 Hz **Intensity** - 1 mm	**Application location:** Right Rectus Femoral Muscle Belly **Device:** VB 115 **Tempo**: 1 hour/ week (for 4 weeks) **Action:** Rest	CVM, MEP TMS (vastus femoris and rectus femoris), EMG (vastus lateralis, rectus femoris and biceps femoris), CPS, VA	Vibration improves maximum functional performance in young people and adults through neural modulations
Bisio *et al* [33] - 30 individuals	**Frequency** - 80- 30 Hz **Intensity** - 1-5 mm	**Application location:** Short Thumb Extender Tendon **Device:** Vibralgic Model, Electronic Conseil **Time**: (1 h 30 min) **Action:** illusory movement	MEP, RC, EMG (short thumb abductor)	Responses evoked in M1 plasticity with increased excitability

(*continued on next page*)

Table 2. (continued)

Author/ Sample	Vibration Parameters	Intervention Protocol	Analyzed Variables	Results
Farabet *et al*[34] - 13 individuals	**Frequency** - 100 Hz **Intensity** - 1 mm	**Application location:** Belly of the tibialis anterior muscle **Device:** VB 115 Techno Concept **Time**: 30 min **Action:** Rest	CVM, VAtms, CPS, EMG (dorsiflexion) MEG (contralateral anterior tibial)	Increased corticospinal excitability of the lower limbs
Mancheva *et al*[35] - 15 individuals	**Frequency** - 80 Hz **Intensity** - 0.5 – 1.5 mm	**Application location:** Carpal Radial Flexor Tendon **Device:** LingDynamic Systems V100 Electromagnetic Mechanical Stimulator) **Time**: 30 min **Action:** Rest	MEP (Carpal Radial Flexor and Carpal Radial Extensor)	Changes in the facilitation of corticospinal excitability in vibrated muscles and their antagonists
Lapole *et al*[36] - 16 individuals	**Frequency** - 50 Hz **Intensity** - 1 mm	**Application location:** Achilles tendon **Device:** VB 115 techno Concept **Time**: 60 s per stimulation **Action:** Rest	MEP (Soleus), EMG (Soleus), CIF E SICI	Increased corticospinal excitability induced by soleus muscle vibration
Lapole *et al*[37] - 10 individuals	**Frequency** - 80 Hz **Intensity** - 0.8-1 mm	**Application location:** Belly of the abductor short muscle of the thumb **Device:** Vibralgic 5 Ysy Medical **Time**: (15 min) **Action:** Rest	MEP (short abductor of the thumb), SICI, CIF, M wave (Nerve stimulation), EMG (short abductor of the thumb)	Vibration increases sensorimotor integration via decreased inhibition and increased facilitation
Lapole *et al*[38] - 12 individuals	**Frequency** - 50, 80, 110Hz **Intensity** - 1 mm	**Application location:** Achilles tendon **Device:** VB 115 Techno Concept **Time**: (60 sec per series/8 series) **Action:** Rest	MEP and EMG (Soleus, medial and anterior tibial gastrocnemius)	Increased MEP of the soleus and gastrocnemius, suggesting increased corticospinal excitability due to vibration
Mancheva *et al*[39] - 19 individuals	**Frequency** - 80 Hz **Intensity** - 0.5 mm	**Application location:** Carpal Radial Extensor Muscle **Device:** VB 115, Techno Concept **Time**: (4 sec per series) **Action:** Rest	MEP (Carpal Radial Extender), MEG (Carpal Radial Extender and Flexor), CIF, SICI	Vibration is a prolongation of the effect of SICI and ICF
Lapole *et al*[40] - 12 individuals	**Frequency** - 50 Hz **Intensity** - 0.2 mm	**Application location:** Achilles tendon **Device:** VB 115, Techno Concept **Time**: (1 h) **Action:** Rest	MEP (soleus and tibialis anterior), reflexes X (tibial nerve stimulation) and wave F, EMG (soleus and tibialis anterior)	Vibration led to changes in cortical excitability that may contribute to increased muscle activation capacity

(*continued on next page*)

Table 2. (continued)

Author/ Sample	Vibration Parameters	Intervention Protocol	Analyzed Variables	Results
Rosenkrank *et al*[41] - 8 individuals	**Frequency** - 80 Hz **Intensity** - 0.2 – 0.5 mm	**Application location:** Muscular belly of the Abductor brevis or first dorsal interosseous **Device:** V100 Ling Dynamic Systems **Time**: (15 seg) **Action:** Rest	MEP (short abductor of the thumb), SICI	The vibration provided an increase in proprioceptive integration and an increase in the motor learning rate

Legend: MEP (Motor Evoked Potential); MEPT (Thoracic Motor Evoked Potential); EMG (electromyography); CIF (Afferent Facilitation); SICI (inhibition); RC (Recruitment curve); CVM (Maximum Voluntary Contraction); VAtms (voluntary cortical activation); CPS (Cortical Silence Period); M1 (primary motor cortex), S1-M1 (somatosensory cortex); RMT (Rest Motor Threshold), EEG (Electroencephalogram), TMS (Transcranial Stimulation); CNS (Central Nervous System).

The methodological quality of the articles ranged between four and eight as shown in Table 3. Five articles had high quality with scores ≥ 6. Concealed allocation, blinding and adequate follow-up were the most frequently omitted study characteristics. GRADE showed that most articles were at risk of bias due to the lack of allocation and blinding, as well as the lack of intention to treat with small samples, without comparisons between groups, also presenting indirect evidence, which was not fully related to the outcome expected (Table 4).

Table 3. Methodological quality of articles based on the PEDro scale.

Studies	1*	2	3	4	5	6	7	8	9	10	11	Total
Vidagovic *et al* *(28)*	S	N/E	N/E	S	N/E	N/E	N/E	S	N	S	S	4/10
Seo *et al* *(29)*	S	N/E	N/E	S	N/E	N/E	N/E	S	S	S	S	5/10
Lopez *et al* *(13)*	S	N/E	N/E	S	N/E	N/E	N/E	S	S	S	S	5/10
Souron *et al* *(30)*	S	S	S	S	S	N/E	N/E	S	S	S	S	8/10
Souron *et al* *(31)*	S	S	S	S	S	N/E	N/E	S	S	S	S	8/10
Souron *et al* *(32)*	S	S	S	S	S	N/E	N/E	S	S	S	S	8/10
Bisio *et al* *(33)*	S	S	S	S	S	N/E	N/E	S	S	S	S	8/10
Farabet *et al* *(34)*	S	S	S	S	S	N/E	N/E	S	S	S	S	8/10
Mancheva *et al* *(35)*	S	N	N	S	N	N/E	N/E	S	S	S	S	5/10
Lapole *et al* *(36)*	S	N	N	S	N	N/E	N/E	S	S	S	S	5/10
Lapole *et al* *(37)*	S	N	N	S	N	N/E	N/E	S	S	S	S	5/10
Lapole *et al* *(38)*	S	N	N	N	N	N/E	N/E	S	S	S	S	5/10
Mancheva *et al* *(39)*	S	N	N	S	N/E	N/E	N/E	S	S	S	S	5/10
Lapole *et al* *(40)*	S	N	N	S	N/E	N/E	N/E	S	N	S	S	4/10
Rosenkrank *et al* *(41)*	S	N/E	S	S	N/E	N/E	N/E	S	N	S	S	5/10

Legend: N/E: Not specified. Criteria: 1- specific eligibility criteria; 2- random allocation; 3- secret allocation; 4- comparison of baseline characteristics; 5- blind patients; 6- blind therapists; 7- blind evaluators; 8- description of patient follow-up; 9- intention-to-treat analysis; 10- comparison between groups; 11- measures of variability and precision; *Item 1 is not included in the total score.Legend: N/E: Not specified. Criteria: 1- specific eligibility criteria; 2- random allocation; 3- secret allocation; 4- comparison of baseline characteristics; 5- blind patients; 6- blind therapists; 7- blind evaluators; 8- description of patient follow-up; 9- intention-to-treat analysis; 10- comparison between groups; 11- measures of variability and precision; *Item 1 is not included in the total score.

Table 4. GRADE Evidence Profile

Outcome: Corticospinal excitability						
N° of participants and number of studies	**Bias Risk**	**Inconsistency**	**Indirect evidence**	**Imprecision**	**Publication Bias**	**Evidence Quality Level**
270 volunteers (15 studies)	High risk[a]	High risk[b]	Moderate risk[c]	Moderate risk[d]	Not detected[e]	AAOO Low due to risk of bias, inconsistency

Legend: aUnblinded allocation, patients, therapist, and unblinded evaluators, and lack of intent to treat.
b Heterogeneity of studies and variety of samples.
c Indirect comparison between groups
d High confidence intervals with small samples
e Not detected
Evidence Quality Level : AAAA (high risk); AAAO (moderate risk); AAOO (low risk)

4. Discussion

This study sought scientific evidence on the effect of local vibratory stimulation at corticospinal excitability in healthy individuals. Heuvelen et al, 2021 (41) published guidelines to use the mechanical vibration on Whole-Body Vibration Studies in Humans, animals and Cell Cultures, that is suggest to be utilized in investigations with local vibratory therapy (41).

Corticospinal excitability reflects on the excitation of the pathway between corticocortical motor axons and spinal motor neurons that innervate the specific muscle to produce the action, including changes in cortical and spinal evoked potentials1. Studies have revealed that the corticospinal pathway is related to feedback control of human posture, being altered according to the current state of posture, as well as being modulated by gaps in temporal feedback, in which the integration between sensorimotor information depends on signals proprioceptives to direct the correct movement (43,44).

The studies included in this review reported that local vibration was able to increase corticospinal excitability in the population studied (13, 28,29,33-40). The application of vibration to the human body is followed by activation of skin cells and specific muscle receptors, which evoke the tonic vibration reflex and provide various proprioceptive stimuli to the somatosensory and motor cortex via Ia afferent nerves. Motor evoked potential mediated by afferent input Ia and intracortical motor circuits (intracortical facilitation and short-range intracortical inhibition) resulting from vibratory stimulation, whether at rest (28, 34-40) or in muscle contraction (13, 29,33).

The effect of vibration on corticospinal excitability may reflect the activity of GABA-mediated inhibitory circuits and their function on motor control and coactivation of cortical regions (16), also demonstrating an increase in the expression of the cortical representation area associated with the vibrated muscle, in addition to allow sensory inputs to excite neural circuits and control the motor output of the stimulated muscle (46).

Studies have also observed that vibration can promote the activation of the vibrated muscle and its antagonist (35,46), as well as activate the cortical area contralateral to the stimulus (13,47). The explanation for this action may be associated with the involvement of proprioceptive information induced by vibration that occurs at the cortical level, which may activate contralateral motor cortical areas through the kinesthetic illusion in the non-vibrated muscle (46). According to Marconi et al47, although their study inhibited the cortical representation of the target muscle and excited the non-vibrated, they believed that this result may have occurred due to the particular characteristics of the protocol used, since there are studies in which they demonstrate an increase in motor evoked potentials in the vibrated muscle.

In the study carried out by Souron and his collaborators (30) applying local vibration to the muscle belly of the anterior tibialis one hour a week for 8 weeks, they could observe that there were no significant changes in corticospinal excitability when analyzing the motor evoked potential. The absence of excitability during vibration may be due to changes in afferent feedback which is known to modulate intracortical inhibition, so when the responsiveness of afferent spindles is diminished due to prolonged periods of stimulation it can lead to a relative reduction in excitability cortical (46).

Some studies did not show satisfactory outcomes regarding corticospinal excitability, however they showed changes in the central nervous system which may have been induced after intervention (31) such as improvements in maximum functional performance in young people and adults through neural modulations (32) and increased proprioceptive integration and rate of motor learning (42).

Limitations

It was not possible to perform a meta-analysis and compare the results due to the heterogeneity in the development of studies.

Strengths

New evidence on the physiological repercussions arising from local vibratory stimulation in the sensorimotor cortex by increasing the excitability of corticospinal pathways.

Facts and Perspectives

Local vibratory stimulation induces changes capable of promoting greater integration with the sensorimotor system, causing excitation of the corticospinal pathways. In this context, local vibration can provide new therapeutic alternatives and care proposals based on responses to the activation of corticospinal pathways and motor performance. It is necessary that new research is always developed, emphasizing the therapeutic efficacy of this intervention.

5. Conclusion

Given the results presented, it was possible to conclude that local vibration increases corticospinal excitability in healthy individuals, which can contribute to muscular and motor performance, and can be attributed to other perspectives in pathological conditions as a therapeutic resource in neuromotor rehabilitation.

Acknowledgements

The authors acknowledge support of the Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES).

Conflict of interest

The authors have declared no conflict of interest.

Reference

1. Kalmar JM. On task: Considerations and future directions for studies of corticospinal excitability in exercise neuroscience and related disciplines. Appl Physiol Nutr Metab. 2018;43(11):1113-1121.
2. Kim K-M, Kim J-S, Cruz-Díaz D, Ryu S, Kang M, Taube W. Changes in Spinal and Corticospinal Excitability in Patients with Chronic Ankle Instability: A Systematic Review with Meta-Analysis. Journal of Clinical Medicine. 2019; 8(7):1037.
3. Holland L., Murphy B., Passmore S., Yielder P. Time course of corticospinal excitability changes following a novel motor training task. Neurosci. Letter 2015;591:81–85.
4. Lockyer EJ, Nippard AP, Kean K, Hollohan N, Button DC, Power KE. Corticospinal Excitability to the Biceps Brachii is Not Different When Arm Cycling at a Self-Selected or Fixed Cadence. Brain Sci. 2019;9(2):41.
5. Ohashi H, Gribble PL, Ostry DJ. Somatosensory cortical excitability changes precedes those in motor cortex during human motor learning. J Neurophysiol. 2019;122(4):1397-1405.
6. Raju H, Tadi P. Neuroanatomy, Somatosensory Cortex. [Updated November 19, 2020]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021
7. Kojima S, Onishi H, Miyaguchi S, et al. Modulation of Corticospinal Excitability Depends on the Pattern of Mechanical Tactile Stimulation. Neural Plast. 2018;2018:5383514.
8. Avvantaggiato C, Casale R, Cinone N, Facciorusso S, Turitto A, Stuppiello L, et al. Localized muscle vibration in the treatment of motor impairment and spasticity in post-stroke patients: a systematic review. Eur J Phys Rehabil Med. 2021 Feb;57(1):44-60
9. Germann D, El Bouse A, Shnier J, Abdelkader N, Kazemi M. Effects of local vibration therapy on various performance parameters: a narrative literature review. J Can Chiropr Assoc. 2018;62(3):170-181.
10. Moraes Silva J, Lima FP, by Paula Júnior AR, Teixeira S, by Vale Bastos VH, by Santos RP, by Oliveira Marques C, by Conceição Barros Oliveira M, by Sousa FA, Lima MO. Assessing vibratory stimulation-induced cortical activity during a motor task--A randomized clinical study. Neurosci Lett. 2015 Nov 3;608:64-70.
11. Murillo N, Valls-Sole J, Vidal J, Opisso E, Medina J, Kumru H. Focal vibration in neurorehabilitation. Eur J Phys Rehabil Med. 2014 Apr;50(2):231-42.
12. Celletti C, Suppa A, Bianchini E, Lakin S, Toscano M, La Torre G, Di Piero V, Camerota F. Neurol Sci. 2020 Jan;41(1):11-24.
13. Lopez S, Bini F, Del Percio C, Marinozzi F, Celletti C, Suppa A, Ferri R, Staltari E, Camerota F, Babiloni C. Electroencephalographic sensorimotor rhythms are modulated in the acute phase following focal vibration in healthy subjects. Neuroscience. 2017 Jun 3;352:236-248.
14.Campos, Monique Opuszcka, and Paulo Sergio Chagas Gomes. "Effects of whole body vibration on muscle strength and power in older adults: A systematic review." Motricity 10.1 (2014): 88-106.
11. Murillo N, Valls-Sole J, Vidal J, Opisso E, Medina J, Kumru H. Focal vibration in neurorehabilitation. Eur J Phys Rehabil Med. 2014 Apr;50(2):231-42.
12. Celletti C, Suppa A, Bianchini E, Lakin S, Toscano M, La Torre G, Di Piero V, Camerota F. Neurol Sci. 2020 Jan;41(1):11-24.

13. Lopez S, Bini F, Del Percio C, Marinozzi F, Celletti C, Suppa A, Ferri R, Staltari E, Camerota F, Babiloni C. Electroencephalographic sensorimotor rhythms are modulated in the acute phase following focal vibration in healthy subjects. Neuroscience. 2017 Jun 3;352:236-248.
14. Campos, Monique Opuszcka, and Paulo Sergio Chagas Gomes. "Effects of whole body vibration on muscle strength and power in older adults: A systematic review." Motricity 10.1 (2014): 88-106.
15. Moggio L, by Sire A, Marotta N, Demeco A, Amendolia A. Vibration therapy role in neurological diseases rehabilitation: an umbrella review of systematic reviews. Disabled Rehabilitation 2021 Jul 5:1-9.
16. Seo HG, Oh BM, Leigh JH, Chun C, Park C, Kim CH. Effect of Focal Muscle Vibration on Calf Muscle Spasticity: A Proof-of-Concept Study. PM R. 2016 Nov;8(11):1083-1089.
17. Aprile I, Iacovelli C, Pecchioli C, Cruciani A, Castelli L, Germanotta M. Efficacy of focal muscle vibration in the treatment of upper limb spasticity in subjects with stroke outcomes: randomized controlled trial. J Biol Regul Homeost Agents. 2020 Sep-Oct;34(5 Suppl. 3):1-9.
18. Casale R, Damiani C, Maestri R, Fundarò C, Chimento P, Foti C. Localized 100 Hz vibration improves function and reduces upper limb spasticity: a double-blind controlled study. Eur J Phys Rehabil Med. 2014 Oct;50(5):495-504.
19. Ayvat F, Özçakar L, Ayvat E, Aksu Yıldırım S, Kılınç M. Effects of low vs. high frequency local vibration on mild-moderate muscle spasticity: Ultrasonographical and functional evaluation in patients with multiple sclerosis. Mult Scler Report Disord. 2021 Jun;51:102930.
20. Özvar GB, Ayvat E, Kılınç M. Immediate Effects of Local Vibration and Whole-body Vibration on Postural Control in Patients with Ataxia: an Assessor-Blind, Cross-over randomized trial. Cerebellum. 2021 Feb;20(1):83-91.
21. Alghadir AH, Anwer S, Zafar H, Iqbal ZA. Effect of localized vibration on muscle strength in healthy adults: a systematic review. Physiotherapy. 2018 Mar;104(1):18-24. doi: 10.1016/j.physio.2017.06.006. Epub 2017 Aug 6. PMID: 28947078.
22. Lee SW, Cho KH, Lee WH. Effect of a local vibration stimulus training program on postural sway and gait in chronic stroke patients: a randomized controlled trial. Clin Rehabilitation 2013 Oct;27(10):921-31.
23. Serio F, Minosa C, De Luca M, Conte P, Albani G, Peppe A. Focal Vibration Training (Equistasi®) to Improve Posture Stability. A Retrospective Study in Parkinson's Disease. Sensors (Basel). 2019 May 7;19(9):2101.
24. Marazzi S, Kiper P, Palmer K, Agostini M, Turolla A. Effects of vibratory stimulation on balance and gait in Parkinson's disease: a systematic review and meta-analysis. Eur J Phys Rehabil Med. 2020 Jan 14. doi: 10.23736/S1973-9087.20.06099-2. Epub ahead of print. PMID: 31939269.
25. Percival S, Sims DT, Stebbings GK. Local vibration therapy increases oxygen re-saturation rate and maintains muscle strength following exercise-induced muscle damage. J Athl Train. 2021 Aug 17.
26. GRADE – From evidence to recommendations – transparent and sensible. Available at: <https://www.gradeworkinggroup.org/>. Accessed on: 05.Apr.2021.
27. Methodological guidelines: GRADE-maual grading system of the quality of evidence and strength of recommendation for decision-making in health. Ministry of Health, Department of Science, Technology and Strategic Inputs, Department of Science and Technology. – Brasília : Ministry of Health, 2014. 72 p.

28. Vidaković, M.R., Kostović, A., Jerković, A. Using Cutaneous Receptor Vibration to Uncover the Effect of Transcranial Magnetic Stimulation (TMS) on Motor Cortical Excitability. Medical Science Monitor: International Medical Journal of Experimental and Clinical Research 2020; 26, e923166-1.
29. Seo, N.J., Lakshminarayanan, K., Lauer, A.W., Ramakrishnan, V. et al. Experimental brain research 2019;237 (3),805–816.
30. Souron, R., Farabet, A., Féasson, L., Belli,A., Millet, G Y, Lapole, T. Eight weeks of local vibration training increases dorsiflexor muscle cortical voluntary activation. Journal of Applied Physiology 2017a;122(6) 1504-1515.
31. Souron, R., Besson, T., Mcneil, C.J., Lapole, T., Millet, GY. An Acute Exposure to Muscle Vibration Decreases Knee Extensors Force Production and Modulates Associated Central Nervous System Excitability. Frontiers in human neuroscience 2017b; (11) 519.
32. Souron R, Besson T, Lapole T, Millet Gy. Neural adaptations in quadriceps muscle after 4 weeks of local vibration training in young versus older subjects. Appl Physiol Nutr Metab 2017c;43(5)427-436.
33. Bisio, A., Biggio, M., Avanzino, L., Ruggeri, P. et al. Kinaesthetic illusion shapes the cortical plasticity evoked by action observation. The Journal of Physiology 2019;597 (12):233-3245.
34. Farabet A, Souron R, Millet Gy, Lapole T. Changes in tibialis anterior corticospinal properties after acute delayed muscle vibration. Eur J Appl Physiol 2016;116(6)1197-205.
35. Mancheva, K., Rollnik, J.D., Wolf, W. et al. Vibration-induced kinesthetic illusions and corticospinal excitability changes. J Mot Behav 2016;49(3)299-305.
36. Lapole, T., Temesi, J., Arnal, P.J. Gimenez, P., Petitjean, M., Millet GY. Modulation of soleus corticospinal excitability during Achilles tendon vibration. Exp Brain Res 2015a;233(9)2655-2662.
37. Lapole, T., & Tindel, J. Acute effects of muscle vibration on sensorimotor integration. Neuroscience letters 2015b; 587, 46-50.
38. Lapole, T., Temesi, J., Gimenez, P. Petitjean, M., Millet GY. Achilles tendon vibration-induced changes in plantar flexor corticospinal excitability. Exp Brain Res 2015c; 233(2)441-448.
39. Mancheva, K., Schrader, C., Christova, L., Dengler, R. European journal of applied physiology 2014;114 (10)2073-2080.
40. Lapole, T., Deroussen, F., Pérot, C., & Petitjean, M. Acute effects of Achilles tendon vibration on soleus and tibialis anterior spinal and cortical excitability. Appl Physiol Nutr Metab 2012;37(4)657-663.
41. Van Heuvelen MJG, Rittweger J, Judex S, Sañudo B, Seixas A, Fuermaier ABM, Tucha O, Nyakas C, Marín PJ, Taiar R, Stark C, Schoenau E, Sá-Caputo DC, Bernardo-Filho M, van der Zee EA. Reporting Guidelines for Whole-Body Vibration Studies in Humans, Animals and Cell Cultures: A Consensus Statement from an International Group of Experts. Biology (Basel). 2021 Sep 27;10(10):965. doi: 10.3390/biology10100965
42. Rosenkranz, K., & Rothwell, J.C. Modulation of proprioceptive integration in the motor cortex shapes human motor learning. J. Neurosci 2012; 32 (26) 9000-9006.
43. Fujio K, Obata H, Kitamura T, Kawashima N, Nakazawa K. Corticospinal Excitability Is Modulated as a Function of Postural Perturbation Predictability. Front Hum Neurosci . 2018; 12:68.
44. Suzuki T, Suzuki M, Hamaguchi T. Corticospinal excitability is modulated by temporal feedback gaps. Neuroreport. 2018;29(18):1558-1563.
45. Smith L, Brouwer B. Effectiveness of muscle vibration in modulating corticospinal excitability. J Rehabil Res Dev. 2005 Nov-Dec;42(6):787-94.
46. Forner-Cordero A, Steyvers M, Levin O, Alaerts K, Swinnen SP. Changes in corticomotor excitability following prolonged muscle tendon vibration. Behav Brain Res.

2008 Jun 26;190(1):41-9.
47. Marconi B, Filippi GM, Koch G, Pecchioli C, Salerno S, Don R, Camerota F, Saraceni VM, Caltagirone C. Long-term effects on motor cortical excitability induced by repeated muscle vibration during contraction in healthy subjects. J Neurol Sci. 2008 Dec 15;275(1 2):51-9

PROGRAM
Mechanical Vibration and Technological Innovations in Health
(MEVITIH -2023)

Joint Congress on Mechanical Vibration and Technological Innovations in Health (MEVITIH-2023)
Chairman – Mario Bernardo-Filho, Brazil
Co-chairman –Joern Rittweger, Germany
September 13-15th 2023

The 4th Congress of the World Association on Vibration Experts (WAVex-2023)
Chairman – Mario Bernardo-Filho, Brazil
Co-chairman – Redha Taiar, France

The 2nd Congress of the Brazilian Association of Mechanical Vibration in Biosciences (VIBMECBIO-2023)
Chairman: Ana Cristina Lacerda, Brazil
Co-chairman: Alessandro Sartório, Italy

The 2nd International Congress on Technological Innovations in Health (ICTIH-2023)
Chairman: Danúbia da Cunha de Sá-Caputo, Brazil
Co-chairman: Adérito Seixas, Portugal

Program

September 13th, 2023

10:00 am- Registration

2:00 pm- 3:00 pm- Opening Ceremony

Round Table 1: Perspectives and challenges in whole-body vibration
Coordinators: Aderito Seixas, Portugal; José Alexandre Bachur, Brazil; Ana Carolina Coelho, Brazil
3:00 pm- Exercise as a Countermeasure for Deep-Space Missions: Rationale, Evidence and Perspectives – Joern Rittweger, German Aerospace Center, Germany
3:20 pm- Fundamentals of the applications of WBV in humans: examples and reflections – Redha Taiar, Université de Reims, France
3:40 pm- Pain mediation and Human Cutaneous mechanoreceptive afferents response after Whole Body Vibration – Anelise Sonza, Universidade Estadual de Santa Catarina. Brazil

Round Table 2: Neurological approaches involving whole-body vibration
Coordinators: Joern Rittweger, Germany; Danúbia da Cunha de Sá-Caputo, Brazil; Luélia Teles Jaques de Albuquerque, Brazil
4:00 pm- Effect of whole-body vibration on cognitive tasks – Maria Lúcia Machado Duarte, Universidade Federal de Minas Gerais, Brazil
4:20 pm- Impact of orthosis and graded sensory-motor rehabilitation on gait improvement in functional neurologic disorder: perspectives on the impact of WBV protocol – Redha Taiar, France
4:40 – 5:00 pm- Questions/Comments and invitation for the welcome cocktail

5:00 pm- Cocktail with Brazilian songs

September 14th, 2023

Round Table 3: Technologies associated with health
Coordinators: Joern Rittweger, Germany; Anelise Sonza, Brazil; Márcia Cristina Moura-Fernandes, Brazil
9:00 am- Predictors of ulceration in diabetic foot patients: the role of skin temperature and plantar pressure – Adérito Seixas, Escola Superior de Saúde Fernando Pessoa, Porto, Portugal
9:20 am- The applications of biomechanics in the analysis of the impact of WBV effects – Redha Taiar, Université de Reims, France
9:40 am: Spinal posture and mobility of the spine and hip in obesity: a novel approach – Alessandro Sartorio, Istituto Auxologico Italiano, Italy
10:00 am- Contributions of the *Laboratório de Cinesioterapia e Recursos Terapêuticos Manuais* (LACIRTEM) of Universidade Federal de Pernambuco on whole-body vibration – Maria das Graças Rodrigues de Araújo, Universidade Federal de Pernambuco, Pernambuco, Brazil
10:20 -10:40 am- Questions/Comments

Room A
11h20 – 11:50 am – Assembly of the *Associação Brasileira de Vibrações Mecânícas em Biociências*. VIBMECBIO Assembly

11:00 am – 12:30 pm- Coffee-break and Poster Presentation

12:30 pm – 2:00 pm – Lunch

Round Table 4: Research involving whole-body vibration
Coordinators: Adérito Seixas, Portugal; Ana Cristina Lacerda, Brazil; Ana Gabriellie Valerio Penha, Brazil
2:00 pm- Effects of Whole-body vibration on tissue repair – Thais Porto Amadeu, Universidade do Estado do Rio de Janeiro, Brazil
2:20 pm- Comparison of phisiotherapeutic treatment traditional kinesiotherapy and WBV in recovery of gait and balance disorders – Alessandro Pin, UNICERRADO, Brazil
2:40 pm – 3:00 pm- Questions/Comments

3:00 pm – 3:20 pm- Coffee-break

Round Table 5 – Approaches in chronic diseases
Coordinators: Redha Taiar, France; Vanessa Amaral, Brazil; Aline Reis Silva, Brazil
3:20 pm- Whole-body vibration in clinical, functional, and biomarkers in chronic disease, Ana Cristina Lacerda, Universidade Federal dos Vales do Jequitinhonha e Mucuri, Brazil
3:40 pm- Respiratory muscle training in obese patients: integrative interventions to improve exercise tolerance. Alessandro Sartorio, Istituto Auxologico Italiano, Italy
4:00 pm- Whole-body vibration in obese individuals: facts and perspectives. Danúbia da Cunha de Sá-Caputo, Universidade do Estado do Rio de Janeiro, Brazil
4:20 pm – 4:40 pm – Questions/Comments.

Room A
4:40 pm – 5:10 pm: The Fourth "Experts research Meeting – WAVex" – A group of research group leaders from Brazil and abroad will be discussing future scientific collaborations. Everyone is welcome.

7:00pm- Social Dinner (optional) (Oliva Restaurant – Shopping Boulevard, Vila Isabel, RJ)

September 15th, 2023

Round Table 6: Whole-body vibration on bone and muscle tissues
Coordinators: Alessandro Sartório, Italy; Paulo César Handam, Brazil; Luiza Carla Trindade Gusmão, Brazil
9:00 am- Acute and chronic effects of aging, disease, injury, resistance exercise and whole-body vibration on muscle quality: a look at muscle echo-intensity – Paulo Sergio Chagas Gomes, Universidade do Estado do Rio de Janeiro, Brazil
9:20 am- Approach to mechanotransduction in the joint environment and the whole-body vibration exercise in patients with osteoarthritis: a review – José Alexandre Bachur, Universidade de Franca, Brazil
9:40 am- Functional evaluation on degenerative articular disease – Liszt Palmeira de Oliveira, Universidade do Estado do Rio de Janeiro, Brazil
10:00 am – 10:20 am- Questions/Comments

Coffee break 10:30 am – 10:50 am

Round Table 7: Systemic vibratory therapy in health promotion
Coordinators: Aderito Seixas, Portugal; Liszt Palmeira de Oliveira, Brazil; Daniel Batouli Santos, Brazil
10:50 am- On the importance of acceptance and feasibility for planning physical intervention studies – Joern Rittweger, Germany, German Aerospace Center, Germany
11:10 am- Systematic reviews and meta-analysis about whole-body vibration in musculoskeletal rehabilitation – trends and critical appraisal – Adérito Seixas, Escola Superior de Saúde Fernando Pessoa, Portugal
11:30 am- Systemic vibratory therapy in post-Covid respiratory symptoms: new perspectives for a multidisciplinary approach – Laisa Liane Paineiras-Domingos, Universidade Federal da Bahia, Brazil
11:50 am– 12:10 pm- Questions/Comments

12:10 pm – 2:00 pm – Lunch

Round Table 8: Rehabilitation with different approaches in elderly
Coordinators: Joern Rittweger, Germany; Mario Bernardo-Filho; Rosane da Silva Rodrigues, Brazil
2:00 pm- Immediate Effects of Whole-Body Vibration in Sarcopenic Older People – Vanessa Amaral, Universidade Federal dos Vales do Jequitinhonha e Mucuri, Brazil
2:20 pm- Risk of fractures due to the falls in elderly – Liszt Palmeira de Oliveira, Universidade do Estado do Rio de Janeiro, Brazil
2:40 pm- Whole-body vibration as a tool for healthy aging – Danúbia da Cunha de Sá-Caputo, Universidade do Estado do Rio de Janeiro, Brazil
3:00 pm – Viscosuplementation and strength training in patients with knee osteoarthritis – Paulo César Handam, Universidade Federal do Rio de Janeiro, Brazil
3:20 pm – 3:40 pm – Questions/Comments

3:40 pm– 4:00 pm **Coffee break**

Round 9: Facts and challenges in systemic vibratory therapy
Coordinators: Redha Taiar, France, Danúbia de Sá-Caputo and Ana Carolina Coelho, Brazil
4:00 pm- Laboratory results modulated by whole-body vibration – Luis Cristóvão Porto, Universidade do Estado do Rio de Janeiro, Brazil
4:20 pm- How to Assess Adverse Events in Whole Body Vibration Studies – Proposal for a Study Protocol, Joern Rittweger, German Aerospace Center, Germany, Germany
4:40 pm- Mechanobiomodulation as a possible mechanism to justify the systemic vibratory therapy, Mario Bernardo-Filho, Universidade do Estado do Rio de Janeiro, Brazil
5:00 pm – 5:20 pm- Questions/Comments

5:20 pm- Closing Ceremony, announcements, awards (poster presentation).

7:00pm- Social Dinner – Barbecue (optional) (Carretão Restaurant, Copacabana, RJ)

ABSTRACTS OF THE LECTURES

Pain mediation and cutaneous mechanoreceptive afferents responses after Whole Body Vibration in humans and animal model.

Sonza, A*[1]

[1]Departamento de Fisioterapia. Laboratório de Desenvolvimento e Controle Postural (LADESCOP), CEFID, UDESC. Programa de Pós-Graduação em Fisioterapia. Programa de Pós-Graduação em Ciências do Movimento Humano, Florianópolis, SC,Brazil.

*Corresponding author: anelise.sonza@udesc.br

Cutaneous mechanoreceptive afferents are characterized by their high sensitivity and specificity to vibration, pressure, or stretch when these mechanical deformations are applied to the skin. As a consequence, when a suprathreshold vibratory stimulus occurs after extended exposure to the skin through whole-body vibration exercise (WBVE), a reversible decrement in vibratory sensitivity is expected. The nervous conduction from the mechanoreceptors travels along large diameter afferent A_{α}/A_{β} sensory fibers. Fast adapting mechanoreceptors for low-frequency vibration excites the Meissner corpuscles (30Hz) and Merkel receptors and, high-frequency vibration primarily excites the Pacinian corpuscles (200Hz) and results in a selective reduction in the sensitivity to low and high-frequency vibratory stimuli, respectively and this is called vibrotactile adaptation. Notwithstanding, if whole body vibration (WBV) affects partially the sensorial receptors, it is important to understand this relation and possible consequences. The acute effects of WBVE on vibration and touch-pressure receptors after 10min of exposition in humans, show a reversible decrement in vibratory sensitivity in a significant way. The recovery time of changes of WBVE is about 1h for touch-pressure and about 2.5h for vibration receptors. An increase in the amplitude of about 5 times for receptors sensitive at 200 Hz, and about 4 times for receptors sensitive at 30 Hz. Balance, motor task accuracy, and postural regulation in humans are related tohigh levels of sensory information and are part of the sensory feedback system. As a consequence, the exposition time should be considered regarding the population that is exposed to WBVE, such as the elderly. A study with rats submitted to a musculoskeletalchronic pain model treated 10 sessions with WBV and low-intensity exercise shows a decrease in touch-pressure sensitivity after all WBVE sessions and pain after the third session from ten applied sessions, comparing pre and post-session. In conclusion, considering the available studies in the literature, regardless of the parameter settings of the platforms, WBV seems to alter the discharge of slow and fast adapting vibration receptors and the ones responsible for touch-pressure sensation immediately after the vibration stimulation. The effects on pain perception remain unclear since differences between groups were not found for thermal sensitivity.

Financial Support: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) – Finance code 001

Keywords: whole body vibration; post vibratory effects; cutaneous afferents; paccinian receptors; Meissner receptors; hot pain

Fundamentals of the applications of WBV in humans: examples and reflections.

Taiar, R.[1]

[1]Université de Reims Champagne-Ardenne, MATIM, 51687, Reims, France.

Objective: The aim of this presentation is to summarize the fundamental approaches of the utilization of WBV in humans at all levels of practice. It will show the interest and the latest significant results concerning this innovative method. **Main approach:** Mechanical vibration is naturally present in various cells, tissues, and organs, and it is essential to life and health. This vibratory stimulus can be added/transmitted to the whole body of the individual in daily physical activities across our lifespan, from infancy and childhood to adulthood and to the elderly. The relevance of the mechanical vibration to the promotion of the health is highlighted by the presence of mechanoreceptors at superficial and internal levels of the body. The action potential thatis generated due to the interaction of the mechanical vibration with the mechanoreceptors are responsible for various biological effects that are important to the human health and wellbeing. When the natural transmission of the mechanical vibration to the body is impaired due to the presence of a disease or because the aging, an important public heath appears. In the vibratory therapy, mechanical vibration is transmitted to the individual that is in contacting with a device that generates this vibratory stimulus. In systemic vibratory therapy (SVT), the whole-body vibration exercise is produced when the mechanical vibration that is generated in vibrating platforms, is transmitted to the body of the individual. Relevant effects of the SVT are improvements in muscular strength, bone mineral density, cognition, quality of life, and functional abilities, and reduction of the level of pain and risk of falls in several populations, from infancy to elderly. The mechanical vibration can be applied locally, in the local vibratory therapy (LVT), and the vibratory stimulus is generated in small and portable vibrators, and it is applied directly in a region of the body, over the tendon or muscle belly. Effects of the LVT have been also reported in different populations improving neuromuscular performance and functionality. A challenge is to establish the best clinical protocols of the SVT and LVT that can be used for human's improvement of neuromusculoskeletal health, aiding in rehabilitation, and in the quality of life across the life span. The comprehension about the possible use of SVT and LVT and the consequence of this exposure can aid in the development of conditions to minimize the undesirable effects in the workplace. Moreover, the costs associated with aging and a longer life expectancy have increased over the years due to chronic age-related diseases such as musculoskeletal and neurodegenerative disorders with public health consequences and the vibratory therapy that is an effective, safe, and low-cost intervention can be highly important. **Conclusion:** we described investigations aboutthe effects of the WBV and the applications aimed the prevention of diseases, increasingthe life expectancy, the promoting of health with quality of life for human's. Several approaches were focused in the aim to explore different way's concerning the utilization of the mechanical vibration and its relationship with exercise and physical activity for public health.

Effect of whole-body vibration on cognitive tasks.

Duarte M.L.M.[1,3]*, Donadon L.V.[1,3], Vasconcelos D.A.[1], Nick H.C.[1], Neves J.A.B.[2], de Araujo F.S.B.[3], Martineli S.F.[3], Costal G.Z.[1], Firmino F.G.[3], Viana P.A.X.[3]

[1]Group of Acoustics and Vibration in Human Beings (GRAVIsh). Graduation Program in Mechanical Engineering (PPGMEC), UFMG.

[2]Sociology Department, Philosophy and Human Science School (FAFICH), UFMG.

[3]Mechanical Engineering Department (DEMEC), UFMG., Belo Horizonte, MG, Brazil.

Introduction: Whole-body vibration (WBV) is present every day on people's life since every means of transport provides enough vibration to be sensed by human beings. At the beginning, most of the studies evaluated its deleterious effects. Around the early 2000, studies havechanged its focus to also evaluate its beneficial aspects. That is because it may also be applied using vibrating platforms as a form of exercise, to improve different aspects of the body, such asstrength, body mineral density, cognition, among others. **Aim**: The objective of this work is to show some studies performed by $GRAVI_{SH}$ researchers where cognition was evaluated before, during and after a session of WBV, so to confirm or not the benefits of it. These and other studies can be found at the CV-Lattes of the corresponding author, at the following address (http://lattes.cnpq.br/0076230777409819). **Methods**: To use a specific App cognitive game installed on a smartphone and/or tablet to evaluate the increase or decrease of cognitive performance. Each study had different experimental design, therefore, different sample, game, App, and objectives. However, in common, most of them used 30 Hz frequency to investigate its beneficial effects and 5 Hz to investigate its deleterious effects (Nick et al, 2019; Firmino et al, 2021, Vasconcelos, 2023) on a specific cognitive area. De Araujo (2016) used more frequencies (5, 10, 15, 30 Hz) to analyze also if there was a linear relationship between frequency and visual perception performance. One of the studies was an in loco one using a passenger car (Duarte et al, 2020). All the studies passed on the Ethics Committee of UFMG prior its performance and were evaluated both objective (using game scores) as well as subjective (using the volunteer option). **Results**: At the study investigating attention (Nick et al, 2019), the results showed decay in the game score when vibration is applied, with a tendency for recovery at the resting time after vibration is ceased. Tablet is a better media to use than smartphones for playing cognitive games under WBV. The results at 30 Hz where better than 5 Hz and females tend to perform better than males. Similar results were obtained in the in loco study by Duarte et al (2020) investigating focus. At the study investigating logic (Firmino et al, 2021) the results show that the frequency of 5Hz may be related to reduced performance for long exposure times, whereas 30Hz has positive effects on logic as the exposure time increase, being the positive and negative aspects also reflected on comfort and concentration. De Araujo (2016) showed that there is no linear relationship between frequency and visual perception performance. Vasconcelos (2023) applied all 5 and 30 Hz with 2 different amplitudes to each group of volunteers in different orders. However, their effects tended to cancel each other. **Conclusions**: All the studies confirmed the beneficial effects of the 30 Hz and the deleterious effects of the 5 Hz frequency. However, they must be applied individually, as the simultaneous application may cancel each other effects.

Financial Support: This study was financed in part by the Coordenação de Aperfeiçoamentode Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001, in the form of scholarshipto some students that developed some of the studies.

Acknowledgements: To all students that performed the studies (listed as co-authors) and the professors that helped with the experiments and analysis (also listed). Also, to all the volunteers who took part of the experiments and to the companies Rosetta Stone Inc (provider of the Fit Brains App) and Synaptikon GmbH (provider of the NeuroNation App), Apps used for the evaluation of the effects.

Keywords: Whole-Body Vibration, App, Cognition.

Impact of orthosis and graded sensory-motor rehabilitation on gait improvement in functional neurologic disorder: perspectives on the impact ofWBV protocol.

Taiar, R.[1]

[1]Université de Reims Champagne-Ardenne, MATIM, 51687, Reims, France.

Introduction : The chronic pain centralization phenomena following peripheral pain can cause a nociplastic inadaptation as in functional neurologic disorder. These disorders are polymorphic, they are evoked in the absence of systematized neurological deficits or in a context of psychic trauma or in case of fluctuation of the disorders during the daytime and/or of an unusual walk without physio-pathological explanation. The clinical presentation is not consistent with a precise anatomical or physiological deficiency. If organic etiology is lacking, the interest of supplementing a deficient body segment with an orthotic treatment could favour a sensory-motor reintegration of the body. This single case study describes the benefit of orthotics in a patient with a functional neurologic disorder. **Results and discussion:** Mrs X is 51 years old, has had several spinal surgeries, and was followed for psychiatric comorbidities with a suicide attempt history. Proximal and distal motor deficits of the left lower limb were noted, responsible for an unusual walking not explain by deficiencies. Complementary exams were considered normal (brain and spinal cord imaging and electroneuromyographic study). A pelvic-crural-foot orthesis associated with rehabilitation (8 weeks in hospital with a relay to the community PT rehab) allowed a clear improvement of all the parameters evaluated by Quantitative Walking Analysis. Weaning from technical aids was achieved, and we also noted a decrease in the intensity of pain, a disappearance of anxious and depressive symptoms compared to the initial levels, and a clear improvement in subjective quality of life.**Conclusion:** The analysis of this clinical case shows that a graduated sensory-motor management associated with the orthosis as well as a physical rehabilitation allows to improve a functional walking disorder (see the videos). The next step of this study will be to compare the impact of the orthosis and a whole body vibration program's on the patients daily life. The idea will be to decrease the cost of the utilisation of the expensive device of the orthosis and to expolore others benefit ways covered by the benefit of the WBV methods.

Keywords: orthosis, sensory-motor rehabilitation, quality of life, functional neurologic disorder.

The applications of biomechanics in the analysis of the impact of WBV effects.

Taiar, R.[1]

[1]Université de Reims Champagne-Ardenne, MATIM, 51687, Reims, France.

Objective: Our current biomechanical approach is to modelize the impact of vibration on the human body in order to simulate and study his consequences on human's. The first step is to study the vibration through the results obtained by the patients quantified gait analysis, and then to modelize his impact on the musculoskeletal impairments. In this study, we present our preliminary work. **Main approach:** Biomechanics study the complexity of human body through behavior and performance in daily life with therespect of the musculoskeletal behavior and his optimization. This discipline seems essential in today's world and considerably promising for the future. Indeed, the concepts,methods, and analytical techniques that we use to characterize human mechanics represent major economical stakes. The development is necessarily inscribed in a vision of interactions between the physical sciences (metrology, complex mechanical and electronicsystems), information sciences and technologies, and life sciences (materials, tissues, organs and limbs). The ambition of the research work carried out in biomechanics is to improve the performance of high-level athletes, the comfort and quality of life of patients and to minimize stress on joints in real field or laboratory situations. Biomechanics is subdivided into kinematic and kinetic analysis. Kinematics is concerned with the analysis of motion (e.g. to determine the forces applied to a joint from the inverse dynamics) while kinetics studies the forces that cause or result from it (e.g. the reaction of the ground when walking). Different models can be considered ranging from the human body representedby its center of gravity to the model integrating both motor control and musculoskeletal modeling of the human body. The complexity of the model required aims to replace the complicated visible with the simpler invisible depends on the aims of the analysis but also on the nature of the approach: kinematic or kinetic. With current medical techniques (Scanner, MRI and X-ray) and recent computer modelling, many technical and scientific advances are now possible in biomechanics. The aim is to modelize mathematically and simulate the mechanical behaviour of the human body under the application of various constraints. While it correlated with cases of declared pathologies considering the behavioral control with prevention objective. The simulation will make it possible to predict the appearance of pathologies that may slow down the stability or progression of human mechanics in all fields combined. The recommendations will be applicable to optimize human mechanics. It is important to note that the mathematical modeling in Life Sciences or Medical Sciences is hardly developed. This modeling involves applying physical laws to analyze both human and animal movements and to quantify and analyze the discriminating parameters of movement. Given its very complex approach, "skeletal" modelling consists of representing the body by a certain number of segments (often considered indeformable to simplify calculations). **Conclusion:** The interest of this modelling lies in the possibility of combining and coordinating research. With results in an efficient way in innovative projects towards CAD- simulation- rapid prototyping.Applications will be in medicine (e.g., development of new orthotics) and in sport (sports clothing).

The effect of obesity on spinal posture and mobility: our preliminary results and perspectives.

Sartorio, A.[1]*, Bayartai, M.B.[2,3], Luomajoki, H.[3], Tringali, G.[1], De Micheli, R.[1], Grugni, G[1,4], Abbruzzese, L.[1,5]

[1]Istituto Auxologico Italiano, IRCCS, Laboratorio Sperimentale Ricerche Auxo- endocrinologiche, Milan and Piancavallo-Verbania, Italy;

[2]Department of Physical and Occupational Therapy, School of Nursing, Mongolian National University of Medical Sciences, Ulaanbaatar, Mongolia;

[3]Institute of Physiotherapy, School of Health Professions, Zurich University of Applied Sciences, ZHAW, Winterthur, Switzerland;

[4]Istituto Auxologico Italiano, IRCCS, Divisione di Auxologia, Piancavallo-Verbania, Italy; [5]Istituto Auxologico Italiano, IRCCS, Divisione Disturbi Alimentari e della Nutrizione, Piancavallo-Verbania, Italy.

Introduction: the influence of obesity on human motion, particularly spinal kinematics/movements, although crucial to daily activities and the management of spinal conditions, has been understudied so far. **Aim:** the aim of our studies was to explore the association of obesity with spinal posture and mobility, commonly associated with musculo-skeletal problems, in children/ adolescents/ adults with essential obesity and in patients with Prader-Willi syndrome, a rare genetic disorder characterized by morbid obesity. **Methods:** a non-invasive, radiation-free, reliable, computer-aided skin-surface device, the Idiag M360 (Idiag, Fehraltorf, Switzerland), was used to measure the spinal parameters. **Results:** children and adolescents with obesity (no. 109, mean age±SD: 15.2±2.0 yrs; BMI: 35.7±5.7 kg/m^2) had greater thoracic kyphosis [difference between groups (Δ)=13.0°, 95% CI 10.1°-15.8°, p<0.0001] and thoracic extension (Δ=6.5°, 95% CI 2.9°-11.6°, p=0.005), as well as smaller mobility in thoracic flexion (Δ=5.0°, 95% CI 1.2°-8.8°, p=0.01), thoracic lateral flexion (Δ=17.7°, 95% CI 11.6°-23.8°, p<0.0001), lumbar flexion (Δ=12.1°, 95% CI 8.7°-15.5°, p<0.0001), lumbar extension (Δ=7.1°, 95% CI 3.1°-12.2°, p=0.003) and lumbar lateral flexion (Δ=9.1°, 95% CI 5.5°-12.8°, p<0.0001) compared to age-matchednormal-weight peers (no. 90, mean age±SD: 13.9±3.4 yrs; BMI: 20.1±2.4 kg/m^2) Adults with obesity (no. 71, mean age±SD: 47.8±15.2 yrs; BMI: 43.6±6.6 kg/m^2) hadgreater thoracic kyphosis [difference between groups (Δ)=6.1°, 95% CI 3.3°-8.9°, *p*<0.0001] and thoracic lateral flexion (Δ=14.5°, 95% CI 5.1°-23.8°, *p*=0.002), as wellas smaller thoracic flexion (Δ=3.5°, 95% CI 0.2°-6.9°, *p*=0.03), thoracic extension(Δ=4.1°, 95% CI 1.1°-7.1°, *p*=0.008), lumbar flexion (Δ=10.4°, 95% CI 7.7°-13.5°, *p*<0.0001), lumbar extension (Δ=4.8°, 95% CI 2.2°-7.4°, *p*=0.0003) and lumbar lateral flexion (Δ=12.8°, 95% CI 9.8°-15.7°, *p*=< 0.0001) compared to age-matched subjects with normal weight (no. 142, mean age±SD: 45.3±13.8 yrs; BMI: 21.1±1.1 kg/m^2). Adults with Prader-Willi syndrome (no. 34, mean age±SD: 35.9±11.2 yrs; BMI: 37.6±8.7kg/m^2) had greater thoracic kyphosis [difference between groups (Δ)=9.6°, 95% CI 3.3° to 15.6°, p=0.001], less lumbar lordosis (Δ=-6.5°, 95% CI -12.7° to -0.3°, p=0.03) as well as smaller lumbar and hip mobility than those recorded in age-matched subjects with normal weight (no. 37, mean age±SD: 39.4±10.5 yrs; BMI: 21.1±1.3 kg/m^2). Although the characteristics of the spine in patients with Prader-Will syndrome appear to be similar to those found in adults with essential obesity, Prader Willi syndrome was found to influence lumbar movements more than thoracic mobility. **Conclusions:** although the reliability of Idiag M360 for spinal posture and mobility measurements is reported to be fair

to high, X-ray examination obviously remains the gold standard for assessing spinal deformities. Furthermore, all the results obtained withthis instrument obviously require to be carefully interpreted by a physiotherapist and/ora clinician. These results provide relevant information about the characteristics of the spine in patients with essential and syndromic obesity to be taken into careful consideration in the management of spinal conditions. Furthermore, these findings highlight the importance of considering the musculo-skeletal assessment of spinal postures and approaches targeting spinal and hip flexibility in adults with different forms of obesity.

Financial support: supported by the Italian Ministry of Health - ricerca corrente

Keywords: obesity: Prader-Willi syndrome; spinal posture; musculo-skeletal assessment; mobility; adapted physical activity

Effects of whole-body vibration on tissue repair.

Amadeu, T.P.[1]

[1]Universidade do Estado do Rio de Janeiro (UERJ), Rio de Janeiro, RJ, Brasil.

Introduction: Cutaneous wound healing is a biological process that involves molecular, biochemical and cellular events. However, in some cases, healing can be compromised, resulting in slower wound healing or do not heal properly.This problem represents a significant challenge for public health. Several therapies have been studied with the aim of accelerating process of abnormal wound tissue repair. Many of these therapeutic strategies have unwanted side effects or contradictory results, limiting their use. Physical exercise is considered an important factor that influences the healing process. Whole-body vibration (WBV) is an alternative therapy that has gained attention for its potential benefits in different situations, although its effects on cutaneous healing are not well elucidated. **Aim:** The objective of this lecture is to provide a comprehensive overview of the main effects of WBV on the healing of cutaneous wounds in human pathological conditions and in different animal models. **Results:** Researches has shown encouraging results, indicating that WBV can accelerate the healing process, improve scar quality and reduce associated complications. Additionally, it is important to consider that each case is unique and it is essential to individually assess the benefits and risks of WBV as a therapy to healing process. **Conclusion:** In summary, data presented on WBV have shown promising therapeutic strategies for accelerating wound healing mainly in murine experimental models. However, further studies are needed to confirm these results, elucidate the mechanisms involved and establish appropriate protocols for the application of WBV as a therapy for cutaneous wound healing.

Financial Support: The studies were supported by *Conselho Nacional de desenvolvimento Científico e Tecnológico* — CNPq.

Keywords: Wound healing; Skin; Whole-body Vibration.

Comparison of physiotherapeutic treatment traditional kinesiotherapy and WVB in recovery of gait and balancedisorders.

Pin, A.S.[1]

[1]Curso de Fisioterapia – Centro Universitário de Goiatuba – UNICERRADO – GO.

Introduction: the restoration of the health conditions of people affected by neuromotor injuries is essential for the recovery of their physical capacity and quality of life. Kinesiotherapy is an old and traditional resource of physiotherapy used for the recovery of neuromotor conditions. Whole Body Vibration (WBV), on the other hand, is a relatively recent resource, based on mechanical vibrations, which has been showing interesting results in several human health disorders, including neuromusculoskeletal ones. **Aim:** to compare the results of physiotherapeutic treatments performed withkinesiotherapy and WBV applied together and separately, to verify the efficiency in the recovery of balance and gait of people with neurofunctional impairments. **Method:** the state of the art of traditional kinesiotherapy in the intervention of people with balance and posture disorders today was researched, being compared with the use of WBV in similar situations; as well as the union of the two modalities could result in the treatment. Concomitantly, a study carried out with people with neuromotor disorders of balance and posture aged 60 years and over of both genders is being conducted to determine whether a physiotherapeutic method makes the clinical improvement more evident or even the combination of the two. After 15 treatment sessions in 3 groups (Kinesiotherapy, WBV and combined therapy), balance and posture assessments preand post intervention will be tabulated and statistically compared to verify the most efficient intervention in the studied group. **Results:** with regard to the state of the art of therapeutic modalities, it is observed that WBV shows interesting results in reducing therisk of falls, controlling muscle tone and improving the activation of postural muscles, in addition to being a therapy that can be quickly applied; however, it does not present a significant difference with traditional kinesiotherapy (considering stretching, posture and strengthening exercises) in balance gains – both are equivalent in results. However, research indicates that the combination of the two modalities enhances the final results. With the field research in progress, it is expected to verify the reproduction, or not, of the functional improvement in both modalities, to verify if one in particular is more advantageous than the other; because it is believed that the combination of therapieswill be more efficient than the individual use in the end. **Conclusion:** evidence shows that WBV has a general efficiency equivalent to that of traditional Kinesiotherapy in gaining balance and posture, with the advantage of short application time and very low risk for patients with associated diseases. However, the combined use enhances the functional gains in those who receive the therapy. It is expected to confirm with thefield research now carried out.

Keywords: Gait. Posture. WBV. Kinesiotherapy

Whole-body vibration in clinical, functional, and biomarkers in fibromyalgia syndrome.

Lacerda, A.C.R[1]*, Santos, J.M.[2], Ribeiro, V.G.C.[3], Mendonça, V.A.[4]

[1]Departamento de Fisioterapia. FCBS, UFVJM, Diamantina, MG, Brazil. lacerda.acr@ufvjm.edu.br

[2]Programa de Pós Graduação Multicêntrico em Ciências Fisiológicas (PPGMCF), FCBS, UFVJM, Diamantina, MG, Brazil. jousielle@hotmail.com

[3]Programa de Pós Graduação Multicêntrico em Ciências Fisiológicas (PPGMCF), FCBS, UFVJM, Diamantina, MG, Brazil. vafisio.ribeiro@gmail.com

[4]Departamento de Fisioterapia. FCBS, UFVJM, Diamantina, MG, Brazil. vaafisio@hotmail.com

*Corresponding author

Introduction: The fibromyalgia syndrome (FMS) is characterized by chronic pain, clinical, functional, and quality of life impairments. Yet, evidence points to a chronic systemic inflammatory state with modifications in blood plasma biomarkers, e.g., irisin and brain-derived neurotrophic factor (BDNF). Along with this, a marked increase in oxidative stress parameters leads to an imbalance between oxidant and antioxidant factors, enhancing the production of reactive oxygen and nitrogen species (RONS) and cell lysis. Although earlier research by our team has shown that whole body vibration exercise (WBVE) has an immediate effect on redox status parameters, BDNF, and irisin plasma levels in FMS patients, still has a gap in the efficacy of cumulative WBVE sessions, or whole body vibration training (WBVT).
Objective: To investigate the efficacy of whole-body vibration training on redox status parameters, BDNF and irisin plasma levels, clinical and functional outcomes in FMS.
Methods: Randomized and controlled clinical trial study. Forty women with FMS were randomized into two groups. An intervention group (IG), who received WBVT for 6 weeks, or a control group (CG) who received no intervention. The outcomes at baseline and follow-up in both groups included quality of life (generic health-related questionnaire (SF-36)), pain intensity (visual analog scale (VAS)), depression screening (Beck Depression Inventory (BDI)), sleep quality (Pittsburgh Sleep Quality Index (PSQI)), BDNF, irisin, catalase (CAT), reactive substances with thiobarbituric acid (TBARS) plasma levels, muscle strength (sit-to-stand test (STS)), aerobic capacity (6-minute walk test (6MWT)), fibromyalgia impact questionnaire (FIQ), visceral adipose tissue (VAT).
Results: The results showed an interaction effect (time and groups) after the WBVT compared to no intervention. Thus, the main findings (IG compared to CG) were increased BDNF (p=0.045), irisin ($p = 0.01$), CAT ($p = 0.02$) plasma levels, number of repetitions in the STS (p=0.011), and walking distance in the 6MWT (p=0.010). Moreover, IG reduced the scores of the FIQ (p=0.001), PSQI (p=0.001), BDI (p=0.017), pain intensity assessed by VAS (p=0.008), TBARS ($p = 0.02$) plasma level, and VAT ($p = 0.01$). **Conclusion:** WBVT is efficient because it improves the inflammatory profile and redox status while simultaneously increasing lower limb muscle strength, aerobic capacity, clinical symptoms, and quality of life in FMS women.

Financial Support: FAPEMIG, CNPq, CAPES.

Keywords: Chronic Disease, Oxidative Stress, Irisin, Vibrating Platform, Brain-derived neurotrophic Factor, Pain.

Respiratory muscle training in obese adolescents: integrative interventions to improve exercise tolerance.

Sartorio, A.[1]*, Tringali, G.[1], De Micheli, R.[1], Salvadego D.[1]

[1]Istituto Auxologico Italiano, IRCCS, Laboratorio Sperimentale Ricerche Auxo- endocrinologiche, Milan and Piancavallo-Verbania, Italy.

Introduction: obesity has profound effects on respiratory function, even in the absence of primary parenchymal lung or restrictive chest wall diseases. Respiratory dysfunctions observed in patients with obesity are characterized by impaired breathing mechanics, decreased respiratory system compliance, increased small airway resistance, and alterations in both breathing pattern and respiratory drive. Overall, these alterations can cause increased work of breathing and O2 cost of breathing and increased metabolic requirements at rest and during exercise, and concur to determine exertional dyspnea and early respiratory muscle fatigue during exercise. Moreover, these alterations are frequently associated with respiratory muscle weakness, which may exacerbate the cascade of negative effects on the integrative response to exercise and ultimately the capacity to accomplish exercise and daily-life physical activities. To date, the effectiveness of respiratory muscle endurance training in patients with obesity (i.e. reduced sensation of breathlessness during exercise, lower perception of breath effort, and lower respiratory muscle burden) still require to be confirmed, mainly in younger subjects with this clinical condition. **Aim**: the purpose of this study was to determine whether a novel approach of interval training targeted to the respiratory muscles (RMIT; normocapnic hyperpnea with resistance) in addition to a multidisciplinary in-hospital body weight reduction program (BWRP) was able to improve the integrative response to exercise in young patients with obesity. **Methods:** Nine male patients (mean$\pm$SD: 17.9$\pm$4.9 yrs; weight: 113.8$\pm$16.3 kg) underwent 12 sessions of RMIT and eight age-andsex-matched patients underwent 12 sessions of a sham protocol (CTRL) during the same 3-week BWRP. Before and after the interventions the patients performed an incremental and a heavy-intensity constant work-rate (CWR>GET) cycling exercise to voluntary exhaustion. **Results:** Body mass decreased by ~4.0 kg after both RMIT(p=0.0001) and CTRL (p=0.0002). Peak pulmonary O2 uptake (VO2) increased after RMIT (p=0.02) and CTRL (p=0.0007). During CWR>GET at ISO-time, VO2 (p=0.0007), pulmonary ventilation (p=0.01), heart rate (p=0.02), perceived respiratory discomfort (RPER; p=0.03), and leg effort (p=0.0003) decreased after RMIT; only RPER (p=0.03) decreased after CTRL. Time to exhaustion increased after RMIT (p=0.0003) but not after CTRL. **Conclusions:** in a group of young patients with obesity, a 3-week supervised program of interval training for the respiratory muscles (normocapnic hyperpnea with inspiratory and expiratory resistances), administered during a multidisciplinary BWRP, decreased the cardiorespiratory burden, the overall metabolic cost of exercise and the perceived effort during constant work-rate cycling above the gas-exchange threshold, and globally was well tolerated. These responses were associated with a marked increase in the duration of the exercise. These findings demonstrate the need and feasibility to include specific programs of respiratory muscle training within the current interventions of body mass reduction and health care of patients with obesity, both in the hospital and at home. Indeed, respiratory muscle training may represent a key strategy to help patients with obesity, and other patients affected by cardiopulmonary dysfunctions and/or profound muscle weakness, to overcome the perception of breathlessness and the respiratory limitations that frequentlyinduce them to interrupt/ reduce/ avoid whole-body exercise programs.

Financial support: this study is supported by the Italian Ministry of Health - ricerca corrente.

Keywords: respiratory training; exercise tolerance; adolescents; obesity

Whole-body vibration in obese individuals:facts and perspectives.

Sá-Caputo, D.C.[1] , Bernardo-Filho M.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas; Instituto de Biologia Roberto Alcantara Gomes and Policlínica Universitária Piquet Carneiro; Universidade do Estado do Rio de Janeiro

*Corresponding author: dradanubia@gmail.com

Introduction: Obesity is favored by genetic and behavioral factors and has high prevalence, mortality and morbidity. It is characterized as a challenge for public health around the world as it is a risk factor for several pathological situations, such as cancer, type 2 diabetes mellitus (T2DM) and cardiovascular diseases. Social isolation (a strategy for managing the Coronavirus disease - COVID-19 pandemic) also favored its development as a result of physical inactivity, anxiety and stress. The metabolic risk related to fat accumulation is dependent on its distribution and, in this context, central obesity is very worrying. Visceral fat is metabolically more active than subcutaneousfat, being strongly correlated with insulin resistance and metabolic dysfunctions, promoting an increased risk of morbidity and mortality due to atherosclerotic disease. Another factor to be considered is low-intensity chronic systemic inflammation characterized by an increase in the plasma concentration of inflammatory cytokines, such as interleukin-6 (IL-6) and tumor necrosis factor (TNF-alpha), secreted by adipocytes and the liver. These cytokines are signaling proteins that act like hormones, activating the immune response, which triggers a chronic state of inflammation in obeseindividuals. Studies report the role of the autonomic nervous system (ANS) in regulating the inflammatory response, possibly relating it to the vagus nerve. However, the role of the ANS in the inflammatory and anti-inflammatory response is still not fullyunderstood. Physical exercise (PE) has been used as a strategy to improve body composition and reduce cardiometabolic risk in obesity, however, obese individuals generally have sedentary behavior and difficulties in adhering to this practice on a regular basis (mostly because of physical comorbidities, musculoskeletal discomfort and lack of motivation). In this context, it is important to study different types of PE, such as whole-body vibration exercise (WBVE), which benefits this population and have good adherence. The muscle activation promoted during WBVE can be justified asthe result of a reflex contraction, known as the tonic vibration reflex. It has been suggested that WBVE could induce effects in the central nervous system that would lead to responses from the endocrine system. Modulations in the hypothalamic- pituitary-adrenal axis would lead to changes in plasma concentrations of hormonal and non-hormonal biomarkers. The action of vibratory stimulus receptors that would promote local and systemic effects as a result of biostimulation has been described. WBVE can also induce an excitatory tonic effect in the muscles exposed to MV and a consequent increase in proprioception. Studies with obese individuals have used different protocols (type of VP, biomechanical parameters, positioning and sessiontime**).** However, they have not yet identified the most appropriate protocol for these individuals so far. On the other hand, benefits related to body composition, biochemical and functional parameters, related to quality of life and quality of sleep in individuals with obesity who underwent WBVE have been described.

Keywords: Mechanical vibration; whole-body vibration exercise; systemic vibratory therapy; obesity; physical exercise

Financial support: FAPERJ and CNPq.

Approach to mechanotransduction in the joint environment and the whole-body vibration exercise in patients with osteoarthritis: a review.

Bachur, J.A.[1], Bachur, C.A.K.[1], Bernardo-Filho, M.[2], Sá-Caputo, D.[2]

[1]Universidade de Franca - Unifran, Franca-SP, Brazil.

[2]Universidade do Estado do Rio de Janeiro – UERJ, Rio de Janeiro-RJ, Brazil.

Tensegrity, or tensional integrity, is the designation given in 1948 by Kenneth Snelson and Buckminster Fuller to the state of stability resulting from the continuous network relationship of tensioned structural members and other compression-resistant elements, in such a way that the external load on this structure be evenly distributed in the various dimensions, depending on the level of pre-existing tension or "pre-stress" of the structure, which reduces its risk of buckling. Commonly made up of prestressed and geodesic structures, the self-stability of tensegrity systems is provided by the level of prestress and morphofunctional structural triangulation. Biotensegrity refers to the tensegrity of the human body structured as a network of tensional interconnectivity between its different organic elements from the microscopic to the macroscopic level, considering the different hierarchical and multimodal levels of body tensegrity. How can be observed in the structural set of compression-resistant bones interconnected by tensioned muscle-tendinous and capsule-ligamentous structures, resulting in a continuously stable network both statically and dynamically. As well as the relationship between the contractility of respiratory musclesand its repercussions on the dynamics of the alveoli and the protein structures of the basement membrane through the activity of cytoskeletal filaments. Cellular biotensigrity, structured in the connectivity between the Focal AdhesionComplex (FAC) and: transmembrane integrins, cytoskeletal filaments, microfilaments and microtubules, intermediate filaments extending to the cell nucleus and mechanosensitive ion channels (Piezo 1, Piezo 2 and others), provides the appropriate conditions for the occurrence of the phenomenon of mechanotransduction, which is the transduction of mechanical signals into a cellular environment followed by the performance of biochemical activities fundamental to biological activities, in healthy or pathological conditions. As observed in cartilage homeostasis resulting from the responsive activity of protein synthesis and secretion by the cells, through the transduction of extracellular signals relating to the physicochemical state of the pericellular matrix, to the FAC and its intracellular surroundings, including the cell nucleus. where the synthesis of collagenfibers begins. This fact corroborates the proposition that the integrity of articular cartilage is directly influenced by the intensity and frequency of mechanical load, whichinterferes with the regulation of chondrocytic metabolism, and may even trigger osteoarthritis or, in the maintenance or structural restoration of cartilage. Among the different preventive and/or therapeutic physical stimulation strategies, Whole Body Mechanical Vibration (WBV) exercise presents a real potential application to improve dose-response effects and counteract age-related and/or disease- related deterioration of multiple organs. degenerative diseases, such as osteoarthritis, probably through secretion mechanisms of potential key mediators involved in physiological adaptations. As it was possible to observe that WBV is a therapeutic strategy for people with knee osteoarthritis, since both high and low frequency WBV triggered beneficial effects in reducing pain intensity, improving physical function and increased shape of the knee extensor muscles of patients studied in different randomizedclinical studies. The use of translational research is necessary to highlight specificities of the intervention protocol,

considering the parameters of amplitude, frequency, duration/frequency and the method of application of WBV, and the respective effects based on individualities at the molecular, physiological, environmental and behavior of different subjects with a certain disease, such as Osteoarthritis. In an experimental study carried out with the aim of evaluating whether low frequency and low magnitude of vibrations could interfere with the chondrogenic differentiation potential of mesenchymal stem cells derived from human adipose tissue with simultaneous inhibition of their adipogenic properties, it was observed that under the influence of a 35Hz mechanical signal, there is the formation of more effective and stable cartilaginous tissue, due to greater secretion of Bone Morphogenetic Protein 2and Type II Collagen, and low concentration of Type I Collagen. Suggesting that the application of low vibrations frequency and low magnitude coupled with stem cell therapy may be a promising tool in cartilage regeneration. This suggestion positively supports the proposition that WBV or Vibration Therapy (VT) presents itself as a therapeutic element with a high capacity for mechanobiomodulation of biological responses. Although further in-depth studies on the molecular pathways of mechanotransduction in chondrocytes may provide new information on the pathogenesis of osteoarthritis and also on the different therapeutic approaches for this disease, the therapeutic viability of WBV in Osteoarthritis, as an element of mechanobiomodulator of biological responses induced by mechanotransduction in a body tensegrity system, becomes something highly effective, through the appropriate parameterization of the vibratory mechanical signal.

On the importance of acceptance and feasibility for planning physical intervention studies.

Rittweger, J[1,2]

[1]Institute of Aerospace Medicine, German Aerospace Center (DLR), 51147 Cologne, Germany.

[2]Department of Pediatrics and Adolescent Medicine, University of Cologne, D50931 Cologne, Germany.

Physical interventions, such as exercise training, are often recommended as effective low-cost options for many health care applications. However, it is often the case that those who could mostly benefit from physical exercises are not able or not willing to engage in strenuous activity. This could be for a variety of reasons, which are not limited to personality traits only, but which may also encompass physiological and pathophysiological effects. Clearly, acceptance is, in practical terms, as important for a successful therapy as its effectiveness.

Another question that has to be asked is about the feasibility of physical interventions. For example, resistive training is recommended as gold standard for patients with sarcopenia. However, only few geriatric centers and nursing homes have the space and equipment to accommodate resistive training therapy. Moreover, most older people are unexperienced with weight training, or suffer from disorders that hamper the ability to practice actively.

The existing literature on physical interventions is almost exclusively dedicated on effectiveness, and very limited evidence has been published regarding acceptance and feasibility. That is lamentable, because this knowledge gap precludes potentially useful interventions from being rolled out. Moreover, exercise approaches that contain passive elements, such as vibration exercise or electromuscular stimulation, may have greater acceptance and feasibility than strenuous other types of exercises.

Therefore, future studies should close this important knowledge gap. Traditional quantitative research methods, such as questionnaires, are straightforward to use for a systematic assessment of acceptance and feasibility in physical intervention studies. However, that approach would be limited to those categories of information that had been considered a priori by the researchers. This approach should therefore be complemented by a qualitative approach, e.g. with structured interviews. That approach has ability to a posteriori define new categories of information. Whilst the primary approach seems straightforward to assess the potential need for enhancing acceptance and feasibility, the secondary approach can identify ways by which such enhancements can be achieved.

Systemic vibratory therapy in post-covid respiratory symptoms: new perspectives for a multidisciplinary approach.

Paineiras-Domingos, L.L.[1,2]*, Costa, I.O.[3], Torres-Nunes, L.[4]

[1]Departamento de Fisioterapia, Instituto Multidisciplinar de Reabilitação e Saúde, Universidade Federal da Bahia (UFBA), Rua Padre Feijó, nº 312 (Casas 47 e 49), Canela, 40.110-170, Salvador, BA, Brasil.

[2]Programa de Pós-Graduação em Medicina e Saúde, Universidade Federal da Bahia (UFBA), Rua Doutor Augusto Viana, S/n, Canela, 40110-060, Salvador, BA, Brasil,

[3]Programa de Pós-Graduação em Processos Interativos de Órgãos e Sistemas, Universidade Federal da Bahia (UFBA), Avenida Reitor Miguel Calmon s/n - Vale do Canela, 4º andar (Sala 404), 40.110-902 Salvador, BA, Brasil.

[4]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Av. Marechal Rondon, 381
- São Francisco Xavier - 20950-003, Rio de Janeiro, RJ Brasil.

*Corresponding author: laisanit@gmail.com

Introduction: Type 2 severe acute respiratory syndrome caused by coronavirus infection (SARS-CoV-2) has become the most well-known pandemic infectious viral disease in the present century. Long COVID or post-acute sequelae of COVID-19 is an often debilitating illness that occurs in at least 10% of SARS-CoV-2 infections. Addictionaly, other symptoms have been identified with impacts on multiple organ systems like fatigue, amnesia, concentration difculties, insomnia or other sleep disturbance and depression refleting at a poor quality of life. **Aim:** this integrative review intends to establish strategies pointed out by the literature, including the systemic vibratory therapy (SVT), for the management of respiratory and other symptoms that add up to cause poor quality of life in post-COVID individuals. **Methods:** Different databases were consulted (PubMed, Scielo, Scopus, PEDro, Embase) between January and July 2023, considering: first, evidence (clinical trials, observational studies and systematic reviews with or without meta-analysis) describing the most prevalent respiratory and other associated symptoms; and secondarily, recommendations on the use of SVT as a therapeutic tool to manage these symptoms along with other therapeutic approaches. **Results:** There is no evidence or specific SVT protocol for the management of post-COVID respiratory dysfunctions. Meanwhile,considering that the management of the most prevalent respiratory complications in post-COVID individuals is directed at the respiratory capacity, dyspnea associated with the performance of activities of daily living, the SVT can be inserted into the rehabilitation program of these individuals as a new perspectives for a multidisciplinary approach. Anxiety, fatigue and tiredness have also been frequently reported by these individuals. Sleep disturbances as part of the post-COVID syndrome were reported, appearing independent of a mood disorder (anxiety and depression). There is also a greater manifestation of these symptoms in individuals with chronic non-communicable diseases such as chronic obstructive pulmonary disease, systemic arterial hypertension,

metabolic syndrome, obesity, fibromyalgia and cancer, diagnosed before the pandemic caused by Covid-19. And the literature already offers effective and safe results for the execution of this modality in these different clinical conditions. **Conclusion:** It ispossible to adjust SVT protocols to the management of post-COVID respiratory complications, considering it to be an adaptable and strongly recommended therapeutic modality, especially for individuals with chronic non-communicable diseases associatedwith SARS-COV-2 infection. Better management of other symptoms manifested by individuals in the context of COVID-19, such as sleep disorders, should be done with a multidisciplinary approach, favoring a better quality of life.

Financial Support: none.

Keywords: long COVID, Coronavirus Infections, respiratory symptoms, chronic non-communicable diseases, whole body vibration, sysematic vibratory therapy.

Immediate Effects of Whole- Body Vibration in Sarcopenic Older People.

Mendonça, V.A.[1]

[1]Universidade Federal dos Vales do Jequitinhonha e Mucuri (UFVJM), Diamantina, MinasGerais, Brasil.

*Corresponding author: vaafisio@hotmail.com

Introduction: Sarcopenia is a disease, ICD-10 (International Code of Diseases), characterized by the progressive loss of muscle mass, strength, and function that occurs with aging. Sarcopenia is considered a significant health concern, as it can lead to various adverse outcomes, such as falls, fractures, physical disability, increased mortality risk, and higherhealthcare costs. Physical exercise, nutrition, hormone replacement, and lifestyle interventions are among the forms of treatment for sarcopenia. Whole-body vibration (WBV) exercises have recently been introduced as a nonpharmacological therapeutic strategy for sarcopenic older people. **Aim:** The studies aim to evaluate the effect of stimulation of a WBV exercise session onhemodynamic and inflammatory parameters in sarcopenic older people. **Methods**: These are randomized controlled studies, with elderly Brazilians living in the community, who were randomly divided into a non-sarcopenic group (NSG) and a sarcopenic group (SG). The experiment was divided into two situations: intervention protocol (squat with vibration) and control protocol (squat without vibration). Participants were randomly allocated to one of the protocols and, after a one-week washout period, underwent the other intervention. The local Ethics Committee approved the studies, identification No. 74422817.1.0000.5108. Heart rate (HR), peak heart rate (peak HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), double product (DP), mean arterial pressure (MAP), and subjective perception of effort (SPE), were assessed at baseline, during, and after a single WBV session. Plasma soluble TNF receptors were determined by ELISA and collected before and soon after the execution of each protocol. **Results:** The results demonstrated that the addition of WBV promoted greater variations in hemodynamic variables compared to the squatting exercise alone. However, both groups had the same behavior, proving that it is a safe procedure for individuals with sarcopenia. The MAP values were similar at baseline between groups; however, in the NSG there was a significant increase during and immediately after the squatting with WBV intervention ($p < 0.05$). After the WBV exercise, there was an increase in sTNFR2 levels in the NSG ($p<0.01$; $d= -0.69$ (-1.30; -0.08) and in the SG ($p <0.01$, $d = -0.95$ (-1.57; -0.32). **Conclusion:** In conclusion, the findings suggest that a single acute session of WBV can inducessafe changes in hemodynamic parameters and a modulation of sTNFr2 levels with more magnitude in sarcopenic older people.

Financial Support: The studies were supported by the Fundação de Amparo à Pesquisa do Estado de Minas Gerais (FAPEMIG APQ-01328-18), Conselho Nacional de Desenvolvimento Científico e Tecnológico—CNPq (CNPq-426952/2018-9), and the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (Capes).

Keywords: Sarcopenia; Older people; Whole-Body Vibration; Physical Exercise; Hemodynamic responses; Plasma Soluble TNF receptors.

Whole-body vibration as a tool for healthy aging.

Sá-Caputo, D.C.[1], Bernardo-Filho, M.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas; Instituto de Biologia Roberto Alcantara Gomes and Policlínica Universitária Piquet Carneiro; Universidade do Estado do Rio de Janeiro.

*Corresponding author: dradanubia@gmail.com

Introduction: Aging is marked by a decrease in functional capacities, which are influenced by physiological, genetic, psychological and social changes. Aging can occurnaturally and gradually, without the presence of other associated diseases, known as senescence, or be influenced by diseases or dysfunctions, known as senility**.** The aging process comes along with many factors that can impair the health of the elderly. Amongthese factors, chronic noncommunicable diseases and external causes (such as falls and accidents) stand out, being considered important causes of morbidity and mortality.Falls affect up to 32% of seniors aged 65 to 74 years and 51% of seniors over 85 years. Falls, although preventable, are considered very common among the elderly population, and may signal the beginning of a frailty process or even an acute illness. Associated with falls is the social, economic and psychological cost, in addition to medical complications, with a possible outcome of compromising the independence of this elderly person, favoring hospitalization and/or institutionalization. Approximately onein three individuals over the age of 65 suffer a fall event and of these, one in twenty suffers a fracture or requires hospitalization. Considering individuals aged 80 or older, 40% fall each year. Among the risk factors associated with falls are: a) advanced age(80 years old and over); women; previous history of falls; immobility; low physical fitness; reduced muscle strength of the lower limbs and handgrip; reduced balance; reduction in walking speed; cognitive damage; Parkinson's disease; sedatives, hypnotics, anxiolytics and polypharmacy. Unsafe environments can also increase the likelihood of falling, causing individuals to slip, trip, misstep, misstep and bump, compromising balance and favoring a fall. Associated with the factors described, the more vulnerable and fragile the elderly, the more susceptible they are to environmental risks. Sarcopenia, which is the generalized and progressive loss of strength and skeletal muscle mass with aging and even in healthy individuals, favors frailty in the elderly. Frailty, in turn, represents a physiological vulnerability of the elderly, resulting from thedeterioration of biological homeostasis and the body's ability to adapt to new stressful situations, which includes recent weight loss, especially lean body mass, fatigue, frequent falls, muscle weakness, reduction walking speed and reduced physical activity. Fall prevention is related to the regular practice of exercises and balance training. Considering that aging can generate limitations and increase the risk of falls, physical exercise has been a strategy used to minimize and delay the declines observed during this process, maintaining functional capacity and quality of life in satisfactory conditions. However, the elderly population often has difficulty adhering to conventional exercise protocols. In this context, offering new intervention possibilitiesas a preventive strategy for falls in the elderly is highly desirable. Among the new exercise possibilities we have the whole body vibration exercise (WBVE). For the WBVE to be performed correctly and safely, it is necessary that the patient is positioned correctly and that adjustments are made in the biomechanical parameters (frequency, amplitude and peak acceleration) according to the clinical conditions of each patient. The exposure time, rest time, total time as well as the periodicity of the sessions must also be established according to the intended objective. The WBVE has been described as an exercise that is easy to perform, low cost, safe and with good adherence. There is scientific evidence for the use of WBVE in the elderly referring benefits i) in reducing the rate of falls, ii) in static and dynamic balance, iii) in the prevention of osteoporosis in women, iv) in muscle strength, v) in mood, in autonomic nervous system, cognitive function, brain functions, vi) functionality in frail elderly people, vii) peripheral blood flow, viii) muscle performance in women with knee osteoarthritis, ixi) decrease in pain level, x) in knee function (neuromuscular function, flexibility, muscle power and strength), xi) in the reduction of inflammatory biomarkers and xii) in the reduction of systolic blood pressure and mean arterial pressure, without significant change in diastolic blood pressure.

Keywords: Mechanical vibration, whole-body vibration exercise, systemic vibratory therapy; elderly; physical exercise

Financial support: FAPERJ, CNPq and Instituto UNIMED RIO

Viscosupplementation and strength training in knee osteoarthritis

Hamdan, P.C[1,2]

[1]Department of Traumatology and Orthopedics, Faculty of Medicine of Universidade Fedral do Rio de Janeiro – DTO-FM-UFRJ;

[2]Orthopedics, Rheumatology and Physiatrics Center, Strength Training Center, Rio de Janeiro, RJ, Brazil.

*Corresponding author: hamdanacademico@yahoo.com.br

Introduction: viscosupplementation and strength training are proposed interventions in the treatment of knee osteoarthritis. **Objective:** to describe the isokinetic response in women with knee osteoarthritis who underwent both interventions. **Methods:** a double-blind, randomized clinical trial involving thirty women diagnosed with grade II and III bilateral knee osteoarthritis using the radiological criteria of Kellgren & Lawrence. The subjects were randomized into three groups of ten patients each: one group was submitted to viscosupplementation and strength training (VST), another was submitted to strength training (ST) only, and a third to viscosupplementation (VS) only. All evaluations followed the study phases defined as pre-procedure (PRE); after 48 hours of VS (POS-VS); after 12 weeks of training (POS T); and after eight weeks of detraining (POS D). Intra-articular knee infiltrations were performed with a single dose of Hylan GF-20 and isokinetic dynamometry to determine the maximum torque in knee extension and flexion. Pain was measured by the visual analogue scale (VAS). **Results:** the interventions promoted improvements in the isokinetic response in all three groups and in both muscle groups, with advantage for the extensor group. A significant difference was noticed in the isokinetic response of the trained groups when compared only to the viscosupplemented group ($p<0.005$), and the VST group showed better isokinetic response compared to the ST group. **Conclusion:** combined treatment with viscosupplementation and strength training, and treatment with strength training only, presented better results in terms of isokinetic response and pain reduction than viscosupplementation alone.

Key words: Strength training; Viscosupplementation; Osteoarthritis, knee

Financial support: Research fully funded by the author.

How to Assess Adverse Events in Whole Body Vibration Studies – Proposal for a Study Protocol.

Rittweger, J[1,2]

[1]Institute of Aerospace Medicine, German Aerospace Center (DLR), 51147 Cologne, Germany.

[2]Department of Pediatrics and Adolescent Medicine, University of Cologne, D50931 Cologne, Germany.

Vibration exercise and vibration therapy are nowadays being routinely used in sports and medicine. Benefits have been documented in many fields, ranging from pediatric rehabilitation to usage in geriatric departments. However, relatively little attention has been given to possible adverse events.

A frequent finding after vibration exercise is a stocking-like rash at the lower extremities that occurs after whole body vibration on vibrating platforms. The phenomenon disappears after a few minutes, is deemed as harmless, and its occurrence is limited to the first few vibration sessions. However, some potentially more harmful adverse events have been reported in literature that are related to the eye and the kidney.

A huge body of evidence exists in occupational medicine. Thus, occupational exposure on vibrating platforms (e.g. in mining or in the oil industry), with vibrating seats (e.g. in trucks) or with vibrating power tools (e.g. riveting hammers) is very well documented to be causative of lower back pain and of vibration white finger disease. Accordingly, ISO norms 2631 and 5349 are being used world-wide in order to mitigate the occupational vibration risks.

Although usage of vibration for therapy and exercise is usually well below the critical values defined by the ISO-norms and thus suae, it is still possible that problems may arise in vulnerablepopulations, such as children, older people, or patients after chemotherapy.

It is therefore proposed to prospectively monitor the occurrence and non-occurrence in a multi-center study. A central register is envisioned that will systematically assess exposures of all registered studies, and it is suggested participating centers assess possible side effects in a standardized, pro-active fashion.

Would be mechano-biomodulation a possible mechanism to justify the systemic vibratory therapy?

Bernardo-Filho, M.[1], Sá-Caputo, D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Instituto de Biologia Roberto Alcantara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro

*Corresponding author: bernardofilhom@gmail.com

Introduction: Living beings are exposed to a variety of chemical and physical stressors, and some might trigger physiological responses if their energies are absorbed. Among the physical stimuli, there are temperature, ionizing and non-ionizing radiation, pressure, and mechanical vibration (MV). The human body has specific sensory receptors that are responsible for detecting and sending information about the stimulus to the central nervous system. Consideringthe MV, specialized cutaneous sensors found in the skin, muscles, and joints, called mechanoreceptors, are capable to detect mechanical stimuli (including touch, pressure, tension, or MV). In addition to the cutaneous receptors, the body also has also internal sensors for MV, including the mechanosensitive ion channels Piezo1 and Piezo2 that are present in various internal tissues of mammals. Furthermore, physiological processes can generate internal MV, or MV may enter into the human body from the environment outside. Normally, MV is present in our lives, and it is generated in our bodies in various situations. MV is associated with various physiological events, such as the beats of the heart, the shortening, and stretching of muscle fibers, the pulsatile movement of the digestive and vessels of the vascular system, the vibrational energy of electrons in a chemical bond or the vibration of molecules in the cellular metabolism. From the environment, in some activities, such as walking, playing, dancing, or running, when the feet contact the floor, MV is generated, and it is easily perceived. Moreover, when an individual is in a vehicle in displacement, such as in a car, bus, train, or boat, MV is transmitted to them. The same occurs in some occupational activities and in systemic vibratory therapy (SVT). In the SVT, MV produced in a vibrating platform is transmitted to the body of the individual, and whole-body vibration exercise is generated. The interaction of the MV with the mechanoreceptors may lead to action potentials, the mechano-transduction, referred to as mechanobio-transduction. Due to the mechanobio-transduction, the concentration of hormones and nonhormone molecules would be altered. These molecules might be considered signaling molecules that are altered and would justify the mechano-biomodulation in the SVT. So, theMV may act through direct mechanical perturbation or modulation of the tissue perfusion, but, it may also develop fluctuations in hormones capable of modulating the tissue, as physiological responses of the endocrine system. Moreover, mechanobio-transduction would be to aid the comprehension of the effects of the SVT, such as (i) the improvement of muscle strength and potency, sleep quality, peripheral blood circulation, flexibility, functionality, balance, postural control, quality of life, body composition; (ii) the reduction of the pain level, the muscle fatigue,the risk of falls and (iii) the increase of muscle fiber recruitment and bone mineral density. Conclusion: It is possible to conclude that it may be relevant to consider that the addition of MVto the body would be the trigger for organic functions to take place and for the person to live with physical and mental health. The knowledge of mechano-biomodulation would be relevant for understanding the mechanisms that underline the biological responses to the whole-body vibration exercise used in systemic vibration therapy, which has great potential as a therapeutic intervention.

Financial support: FAPERJ and CNPq

Keywords: Mechanical vibration, whole-body vibration exrcise, systemic vibratory therapy.

ABSTRACTS OF THE POSTER PRESENTATION

Evaluation of the effects of systemic vibration therapy on functional capacity using the Timed Up and Go (TUG) in obese individuals: Preliminary results.

Andrade-Nascimento, A.[1], Valério-Penha, A.G.[1], Silva-Reis, A.[1], Mazini, J.[1], Jaques-Albuquerque, L.A.[1], Andrade-Araujo, V.M.[1], Cardoso, A.L.B.D.[1], Porto, T.A.[1], Bernardos-Filho, M.[2], Sá-Caputo, D.C.[2]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[2]Departamento de especialidades cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Corresponding author: alessandra.andrade.nick@gmail.com

Introduction: Obesity is a chronic and highly complex condition defined by the excessive accumulation of adipose tissue in the body, obesity is harmful to health, and is considered multifactorial with behavioral, psychosocial and genetic components. A sedentary lifestyle is seen as a main pillar for the emergence of overweight, occurring when the individual fails to have a regular practice of physical exercise and, as a consequence, the appearance of an imbalance between consumed and expended calories, providing an increase in body fat mass. Analogously, obesity is associated withloss of functional capacity, due to low muscle mass, related to reduced physical activity and excessive consumption of a hypercaloric diet. The Timed Up and Go (TUG) test isa safe and time-efficient way to assess overall functional mobility, can assess theindividual at risk of declining health, and to measure treatment progress towards improved function and of quality of life. In this context, systemic vibration therapy (TVS) has been studied in this population because it is a tool with good adherence, low cost and easy operation. **Aim:** To evaluate the effects of systemic vibration therapy on the functional capacity of individuals with obesity using the Timed Up and Go Tug. **Methods:** Randomized, interventional study with blinded analysis, CAAE 30649620.1.0000.5259. Individuals aged between 18 and 59 years of both sexes were eligible to participate in the study, divided, after randomization, into the PVA and CG groups, who performed the 130 squat protocol (measured with a goniometer). The TUG Test was performed before the interventions and after 12 SVT sessions. The frequency used was 30Hz, with peak-to-peak displacement from 2.5mm to 5mm (1 min of work and 1 min of rest). Data were analyzed using GraphPad Prism 6.0, Student's t-test was performed for independent samples, data were expressed as mean ± standard deviation. **Results:** Eighteen individuals (GC, n= 10; PVA, n= 8), both genders, aged 42.8 ± 6.7 years, CG group; 41.1± 9.7 years PVA group, showing a heterogeneous sample. Initially, before the interventions, height 161.3±6.9 in cm in the CG group, 169.3±9.6 in cm in the PVA group; body mass 93.2±10.3 in kg; BMI 35.8±3.0 in kg/m² CG group, body mass 95.5±10.8 in kg, BMI 34.1± 3.1 in kg/m² PVA group. Regarding the results of the TUG-TEST group GC 9.8±0.9 s before the interventions; in the PVA group 9.8±1.3 s. After 12 intervention sessions on a vibrating platform, the results of the TUG-TEST group GC 9.2±1.3 s; PVA group 9.6±1.5 s. **Conclusion:** Therefore, after analyzing the preliminary data, we can see that there were no significant changes in the population studied in relation to the TUG-TEST, however this study is not concluded and there may be changes in the samples in relation to the number of individuals, the adjusted parameters and adherence to the

protocol. corresponding author.

Keywords: Obesity, Whole-body vibration, Timed Up and Go Tug. Functionality.

Acknowledgment: The authors are thankful to Conselho Nacional de Pesquisa e Desenvolvimento (CNPq), Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ), Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—Brazil (CAPES)—Finance Code 001, Universidade do Estado do Rio de Janeiro (UERJ).

A randomized double-blind study of effects acute of whole-body vibration exercise on thermogenesis in adults with obesity: preliminary results.

Reis-Silva, A.[1,2*], Valério-Penha, A.G.[2,3], Andrade-Nascimento, A.A.[2], Mazini, J.S.[2], Coelho-Oliveira, A.C.[2,3], Cardoso, ALBD[2], Amadeu, T.P.[1,3], Bernardo-Filho, M.[2], Sá-Caputo D.C.[2]

[1]Programa de Pós-Graduação em Ciências Médicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[3]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

*Corresponding author: fisio.alinereis@hotmail.com

Introduction: Obesity is a condition characterized by excess body fat that can harm an individual's health. It is usually defined as body mass index (BMI ≥ 30kg/m²), but other parameters such as waist circumference and accumulation of adipose tissue can also be considered. Adipose tissue can be classified into white, beige, and brown adipose tissue. The metabolic benefits of brown adipose tissue (BAT) are well known, therefore, increasing BAT content and/or activity is a proposed therapeutic approach to combat obesity and metabolic diseases. Physical exercise is an energy-consuming activity that likely activates lipid metabolism and, like cold stress, can promote thermogenesis and the browning of white adipose tissue. However, these obese individuals may have mobility difficulties, joint pain, muscle weakness, and low physical fitness, tending to a sedentary lifestyle with low adherence to conventional physical exercise programs. In this context, it is necessary to explore other possibilities of exercises that can motivate these individuals. Systemic vibration therapy that promotes whole-body vibration exercise (WBVE) via a vibrating platform that is considered a type of physical exercise. WBVE has good adherence among special populations, including individuals withobesity, due to the low perception of effort, short training period, and ease of execution of the series. WBVE is graded using biomechanical parameters such as peak-to-peak displacement (PPD) in mm and frequency (f) in Hz and exercise intensity can be given by $2 \times \pi^2 \times f^2 \times$ PPD in m/s^{-2}. **Aim:** To evaluate the acute effects of WBVE on a side- alternating vibrating platform (SAVP) and on a vertical vibrating platform (VVP) in the thermogenesis of obese individuals, through the analysis of infrared thermographyimages of the right supraclavicular region. **Methods:** Interventional, randomized, double-blind study at LAVIMPI/UERJ - CAAE 30649620.1.0000. 5259. Individuals (n=40; F= 26; M= 14) diagnosed with obesity based on BMI≥ 30kg/m² have been included in three groups: the control group (CG), the SAVP group, and the VVP group. Participants with functional disabilities or serious illnesses that made it impossible to carry out the proposed protocol were excluded from the study. An acute protocol was performed with 1 session of WBVE: i) static squat, ii) 30 minutes (1 minute of work and 1 minute of rest), iii) frequency of 30 Hz, and iv) PPD of 2.5 mm on SAVP, VVP (same protocol) and CG (no vibration). Infrared thermography of the right supraclavicular area was performed before the session and immediately after the WBVE
session. Data were analyzed with appropriate statistical tests using the software GraphPad

Prism 6.0. **Results:** Data analyzed for absolute temperature before and after intervention by infrared thermography show mean and standard deviation and *p*-value, respectively: control group (34.32 ± 0.76 / 33.96 ± 0.94) p= 0.103; SAVP (34.14 ± 0.99/ 33.7 ± 1.07) *p*= 0.040 and VVP (34.21 ± 0.57/33.48 ± 1.06) *p*= 0. 017. **Conclusion:** The current study demonstrated that acute session of WBVE, can significantly modify the temperature of the sub clavicular area in individuals with obesity regardless of the type of vibrating platform used.

Keywords: systemic vibratory therapy, adipose tissue, physical exercise, mechanical vibration.

Funding: CAPES: CNPq, FAPERJ.

Is there a correlation between functionality and quality of life of individuals with metabolic syndrome after intervention with systemic vibratory therapy? Preliminary results.

Coelho-Oliveira, A.C.[1,2]*, Bernardo-Filho, M.[2], Sá-Caputo, D.C.[1,2]

[1]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Universidadedo Estado do Rio de Janeiro, Rio de Janeiro, 20950-003, Brazil.

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Piquet Carneiro, Universidade do Estado do Rio de Janeiro, 20950-003, Rio de Janeiro, Brazil.

*Autor correspondente: anacarol_coelho@hotmail.com

Introduction: Metabolic syndrome (MSy) is a major worldwide public health issue and is defined as a cluster of cardiovascular risk factors, the underlying causes include overweight and obesity, physical inactivity, genetic factors, and aging, collaborating to reduce functional performance, stress and consequently, quality of life related to impaired health. In this context, these individuals have low motivation and adherence to perform physical exercises. And thinking about it, systemic vibratory therapy (SVT) generates whole-body vibration exercise that can be an exercise alternative for this population, mainly because it is easy to perform, efficient, and of quick duration. **Aim**: This is a randomized, interventional, and longitudinal study, with blinded analyzes. To verify if there is a relationship between functionality through the total score of the Short Physical Performance Battery (SPPB) and the total score of the assessment of quality of life with the World Health Organization Quality of Life (WHOQOL-Bref) questionnaireafter two different intervention protocols with SVT in MSy individuals. **Methods**: Twenty MSy individuals were randomized into two groups with Fixed Frequency (FF) protocols (n=10, 53.2±8.6 years; 31.7±2.4 BMI) and Variable Frequency (VF) (n=10, 53.9±9.4 years; 33.23± 3.7 BMI). A side-to-side alternating vibrating platform wasused. The parameters used were 5 to 16 Hz (frequency), 2.5, 5.0 and 7.5 mm (peak-to- peak displacement), 1 minute of work time and 1 minute of rest. This protocol was performed in squat static and dynamic position, per 6 weeks, twice a week. The overall score of functionality and quality of life were evaluated before the first session and afterthe last SVT session. The significant difference will be considering $p<0.05$. **Results:** No significant difference was observed in the correlation of delta (after-before) when comparing functionality and quality of life with both intervention protocols FF ($p= 0.167$, r= -0.472, R= 0.223) and VF (p= 0.186, r = -0.455, R= 0.207) with SVT in individuals with MSy. However, it is important to consider in both groups the participant's scores in the baseline were homogeneous to functionality ($p=0.638$) and quality of life ($p=0.422$). The functionality involves three components (balance, gait, and strength), already the quality of life involves different domains (physical, psychological, social, and environment), and can happened different interpretations by participants, which can influence the absence of results. **Conclusion:** Considering the small number of individuals in the sample, so far, the results suggest that the SVT protocols', with whole-body vibration exercise interventions, do not were sufficient to interfere and present one linear relation between the functionality and quality of life of these MSy individuals. More studies with larger sample sizes are needed to meet and understand better the results.

Keywords: metabolic syndrome, mechanical vibration, function, quality of life.

Trial register: CAAE 19826413.8.0000.5259 and RBR-2bghmo.

Funding: FAPERJ, CNPq, CAPES – Finance code 001.

Effects of systemic vibratory therapy on anthropometric measurements related to cardiovascular risk in overweight and obesity pre-fragile and fragile elderly: preliminary results.

Valério-Penha, A.G.[1,2]*, Jaques-Albuquerque, L.T.[1], [1]Moura-Fernandes, M.C., Gama, M.A.S.[1], Oliveira-Silva, L.[1], Felizardo-Anchieta, L.B.[1], Oliveira, L.P.[3], Bernardo-Filho, M.[1], [1]Sá-Caputo D.C.[1,2,3]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[2]Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidadedo Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[3]Departamento de especialidades cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

*Corresponding author: anagabriellie.vpenha@gmail.com

Introduction: Obesity increases the risk of cardiovascular events and the increase in the average age of the population also contributes to triggering these risks. Although obesity is considered a triggering factor for these diseases, visceral obesity enhances these health problems. In view of these issues, several anthropometric indicators are associated with the assessment of cardiometabolic diseases, mainly Waist Circumference (WC), Waist-Hip Ratio (WHIR), Conicity Index (CI) and Waist-Height Ratio (WHER). The WC cutoff points are 80 cm for women and 94 cm for men, WHIR
0.90 for men and 0.85 for women, CI ≥ 1.18 for women and ≥ 1.25 for men, and WHER 0.5 to 0.59 (elevated central adiposity) and 0.6 or more (high central adiposity) in both sexes. Systemic vibratory therapy (SVT) has been incorporated into the management of this population, it happens when the mechanical vibration (MV) generated at the base of a connected vibrating platform (VP) is transmitted to the individual's body, generating the whole body vibration exercise (WBVE), which is pointed out as a safe and easy-to-perform exercise. **Aim:** To evaluate the effects of systemic vibration therapy on anthropometric measures related to cardiovascular risk in overweight and obese pre-frail and frail elderly. **Materials and Methods:** Longitudinal clinical study, CAAE 68385022.9.0000.5259. Individuals aged ≥ 60 years, both sexes, pre-frail or frail, were included. The SVT protocol occurred standing (SVT-Sta) or sitting (SVT-Sit). Bioimpedance equipment was used to assess WHR and body mass, a stadiometer to measure height and a non-flexible measuring tape to measure the other anthropometric measurements before and after the SVT protocol. The individuals were exposed from 5 to 14 Hz, peak-to-peak displacement from 2.5 to 7.5 mm, peak acceleration from 0.12 to 2.95 g, in three series (1 min of work and 1 min of rest) totaling 18 min, for 20 sessions. **Results:** Sixteen elderly people (ages of 69.06 ± 6.31 years old; 31.88 ± 3.78 kg/m² of body mass index (BMI) and 3.81 ± 1.32 of frailty) participated in the study. With regard to WC SVT-Sta, the results were 100.92 ± 8.91 before and 98.85 ± 12.28 after, in the WC SVT-Sit group they were 102.56 ± 14.07 before and 100.43 ± 9 .22 later. As for WHIR SVT-Sta it was 0.93 ± 0.12 before and 0.94 ± 0.10 after, in the WHIR SVT-Sitgroup it was 0.95 ± 0.04 before and 0.98 ± 0.075 after. CI SVT-Sta values were 1.29 ± 0.12 before and 1.29 ± 0.07 after, in the CI SVT-Sit group they were 1.29 ± 0.12 beforeand 1.28 ± 0, 07 later. In the variable WHER SVT-Sit they were 0.62 ± 0.04 before and 0.61

± 0.06 after, in the WHER SVT-Sit group they were 0.65 ± 0.09 before and 0.63 ± 0.05 after. **Conclusion:** There was no difference in the evaluated parameters, however,the results are preliminary.

Funding: We thank FAPERJ, CNPq, CAPES and Instituto UNIMED for financial support.

Keywords: Vibrating Platform, Obesity, Anthropometric Measurements, Whole Body Vibration Exercise.

Effects of systemic vibratory therapy on body composition and anthropometric measurements of individuals with obesity: preliminary results.

Valério-Penha, A.G.[1,2]*, Andrade-Nascimento, A.[1], Silva-Reis, A.[1], Mazini, J.[1], Coelho-Oliveira, A.C.[1], Jaques-Albuquerque, L.T.[1], Amadeu, T.P.[3], Bernardo-Filho, M.[1], Sá-Caputo D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[2]Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidadedo Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[3]Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

*Corresponding author: anagabriellie.vpenha@gmail.com

Introduction: Obesity is characterized by excess or accumulation of body fat deposited in different parts of the body. New modalities have been incorporated in the management of this population, such as systemic vibratory therapy (SVT) which occurs when mechanical vibration (MV) generated at the base of a vibrating platform (VP) connected is transmitted to the individual's body generating the exercise whole body vibration (EWBV). **Aim:** To evaluate the effects of SVT on body composition and anthropometric measurements of obese individuals. **Materials and Methods**: Randomized, double-blind, interventional, longitudinal study, CAAE 30649620.1.0000.5259. Adult individuals (ages of 18 to 59 years old of both sexes) with body mass index (BMI) ≥ 30kg/m² were included. Randomized into two groups: control (CG) and alternating vibrating platform (SVTG-AVP). The CG performed the same protocol as the TVS group, but the PV was turned off. The SVTG-AVP is using 30Hz and 2.5mm of peak-to-peak displacement. Participants perform series of 1 minute of static squat followed by 1 minute of rest, with 15 repetitions, totaling 30 minutes of session, twice a week for 6 weeks. Bioimpedance and a non-flexible tape measure were used to assess body composition before and after the exercise protocol. **Results:** The study included 14 adults (9 women and 5 men), with 7 individuals in each group, (40.71 ± 10.71 years old and 34.67 ± 3.12 kg/m² of BMI). In the CG, the results regarding lean mass (LM) were 50.00 ± 10.18 kg before and 50.17 ± 9.47 kg after, the fat-free mass (FFM) were 53.02 ± 10.88 kg before and 53.24 ± 10.10 kg after. The results of neck circumference (NC) were 39.18 ± 3.40 cm before and 38.82 ± 3.71 cm after, waist circumference (WC) were 104.42 ± 10.04 cm before and 106, 11 ± 11.12 cm after, hip circumference (HC) was 117.78 ± 5.52 cm before and 118.35 ± 5.55 cm after, and waist-hip ratio (WHR) was 1.00 ± 0 .06 cm before and 0.99 ± 0.06 cm after. In SVTG- AVP the results regarding LM were 57.14 ± 15.34 kg before and 55.65 ± 15.47 after, FFM were 60.64 ± 16.16 kg before and 59.04 ± 16.33 kg later. The results of NC were 39.5 ± 4.67 cm before and 40.84 ± 4.76 cm after, for WC they were 107.9 ± 10.98 cm before and 109.70 ± 12.13 cm after, for HC were 117.80 ± 3.24 cm before and 119.19 ± 5.65 cm after and the WHR were 1.01 ± 0.05 cm before and 1.04 ± 0.07 cm after. The LM p-value was 0.7055, FFM was 0.6623, NC was 0.4102, WC was 0.2858, HC was 0.4306 and WHR was 0.3559 in the CG. In GTVS-PVA the p-value of LM was 0.0865

and in FFM it was 0.0903, in NC it was 0.1413, in WC in 0.8687, in HC in 0.6214 and in WHR in 0 ,1076. **Conclusion:** There was no difference in the evaluated parameters, however, the results are preliminary.

Funding: We would like to thank *Fundação de Amparo à Pesquisa do Estado do Riode Janeiro (FAPERJ), CNPq* and CAPES for their financial support.

Keywords: Vibrating Platform, Obesity, Body Composition, Whole Body Vibration Exercise.

Effect of mechanical vibration exposure in diabetic *Wistar* rats on the novel object recognition task.

Cardoso, A.L.B.D.[1]*, Sá-Caputo, D.C.[1], Ribeiro-Carvalho, A.[2], Bernardo-Filho, M.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Instituto de Biologia RobertoAlcântara Gomes, Policlínica Américo Piquet Carneiro, Universidade Estadual do Rio de Janeiro, RJ, Brazil.

[2]Departamento de Ciências, Faculdade de Formação de Professores, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

*Correspondence author: andreluisdionizio@hotmail.com

Introduction: Diabetes mellitus (DM) is a metabolic disease characterized by elevated levels of blood glucose. DM has several effects, including cognitive impairment. Some interventions, as exercise, might enhance cognitive function. In turn, exercise based on the use of vibration stimulus in which subjects are exposed to mechanical vibration (MV) generated by a vibrating platform have also reported cognitive improvement in both human and small animals. Therefore, the evaluation from MV effects in cognitive impairment related DM has been proposed. **Aim:** The objective of this study was to evaluate effects of MV exposure in alloxan- induced diabetic rats on the novel object recognition (NOR) test. **Methods:** Eighteen male Wistar rats (250-350g, 2-3 months) were allocated into two groups, diabetic control (DM, n = 9)and diabetic rats exposed to MV (DM+VBR, n = 9). For diabetes induction, alloxan monohydrate (170 mg/ kg) diluted in saline (NaCl 0.9%) was used. Glucose was measured in a sample of blood collected from the tail with a glucometer and the rats were considered diabetic with glucose above 200 mg/dl. The DM+VBR group was exposed to MV (frequency - 50 Hz; amplitude - 0.78 mm) at 4 bouts of 30s, separated by 1-min rest period in each session, performed for 5weeks. In the last week, the attention for a novel object (NOR test) in a familiar environment was tested in an open box. Objects were made of acrylic with hemisphere- cylindrical shape (object A) or hexagonal (object B). The test started 3 hours after the vibration exercise. The protocol was approved by the ethics committee of the Rio de Janeiro State University (number CEUA / IBRAG / UERJ / 006/2019). The t-test for independent samples was used to compare the groups by using the software GraphPad Prism 5.0. Results were expressed as mean ± SEM and difference was considered at p-value<0.05. **Results:** After 5weeks of the interventions no statistical difference was found when compared the NOR test between the animals of DM group (51.44 s ± 10.82 [total object exploration time]; 51.73 ± 11.84 [recognition index]) and DM+VBR group (54.44 s ± 7.18 [total object exploration time]; 44.89 ± 9.19 [recognition index]), p-value = 0.8203 (exploration, DM x DM+VBR), p-value = 0.6550 (recognition, DM x DM+VBR). **Conclusion:** It can be concluded that cumulative exposure to MV was not able to promote cognitive enhancement of alloxan-induced diabetic rats in NOR test, at least with the parameters used in the intervention.

Financial Support: FAPERJ and CAPES.

Keywords: mechanical vibration, diabetes, recognition, alloxan, animals.

Hot pain and touch-pressure response after whole-body vibration in an animal model.

Sonza, A.[1*], Zaro, M.A.[2], Achaval, M.H.[3]

[1]Departamento de Fisioterapia. Laboratório de Desenvolvimento e Controle Postural (LADESCOP), CEFID, Universidade do Estado de Santa Catarina (UDESC). Programade Pós-Graduação em Fisioterapia. Programa de Pós-Graduação em Ciências do Movimento Humano, Florianópolis, SC, Brazil.

[2]Programa de Pós graduação em Informática na Educação, Universidade Federal do RioGrande do Sul (UFRGS)

[3]Programa de Pós-Graduação em Neurociências, Universidade Federal do Rio Grandedo Sul. *In memoriam.*

*Corresponding author: anelise.sonza@udesc.br

Introduction: Several studies show that whole-body vibration exercise (WBVE) changes mechanoreceptive afferents for fast-adapting mechanoreceptors for 200 and 30 Hz and pressure sensation immediately after the exercise and a few hours later, however, pain mediation is uncertain. **Aim:** The goal of this study was to question the effects of WBVE in a chronic pain model after WBVE sessions. **Methods:** This was an interventional longitudinal study where male *Wistar* rats (±180 g, 12 weeks old) were submitted into 3 groups, control saline sedentary (SS), control chronic pain sedentary (PS), and chronic pain subjected to the WBVE (VP). The chronic pain model was a muscular and non-inflammatory pain model applied in the left gastrocnemius muscle, with long-lasting, widespread mechanical hyperalgesia production. The vibrating platform was set to a frequency of 42 Hz with 2 mm peak-to-peak displacement, $g \approx 7$, in a spiral mode (TBS100A, Total Image Fitness, Canada) for 5min (sessions 1-5) and 10min (sessions 6-10). Mechanical sensitivity was measured with a calibrated pressure meter (Electronic von Frey EFF 301, Insight, Brazil). For pain and thermal sensitivity, each animal was individually placed on a hot plate (set at 52 ± 0.5°C) for a maximum of20 s, or until it displayed a nocifensive reaction of either hind-paw. This study was approved by the Ethics Committee for the use of Animals from UFRGS under protocol number 2012-062 and followed the Arouca Brazilian law (1179/2008) to the animal´s care. The sample size of 12 animals per group was calculated through the software nQuery Advisor 3.0 (with $P \leq 0.05$ and a power of 90%). SPSS version 20.0 software was used for statistical analyses. Shapiro-Wilk's test was used to test the normal distribution of the changes in sensitivity to the control group. Two-way repeated measures ANOVA was used to compare the pre- and post-condition on the same group, due to the parametric nature of the data. Two-factor mixed ANOVA compared the delta (difference between pre- and post-condition of each animal) between groups over time (during the 10 days of data collection). **Results:** No significant differences for all comparisons were found between before and after "training" for the left paw during the 10 days in the SS and PS, ($P > 0.05$). A significant loss of sensation after 5 or 10 min vibration exercise was found for mechanical sensitivity in the tested places of the left paw (between "before" and "after" treatment, for VP. The left paw showed significantlydecreased touch pressure sensitivity ($P < 0.01$) directly after VP. A significant change inthermal perception 40 min after WBVE intervention was found after the third session in VP, however, the difference between all groups by time, pre- and post-treatment showed no significant results ($P > 0.05$). **Conclusion:** In *Wistar* rats subjected to a chronic pain model and WBVE, the afferent discharges from touch-pressure mechanoreceptors were influenced after all sessions with WBV. Sensitivity to thermal stimulation was impaired after the third WBV session, disturbing large-diameter

fibers; however, the thermal sensitivity decrease after WBV was not confirmed since no differences were found between groups.

Financial Support: *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* - Brazil (CAPES) – Finance code 001

Keywords: whole-body vibration; post vibratory effects; cutaneous afferents; large diameter fibers; thermal sensitivity; pain.

Technological tools and innovative pedagogic resources in an online postural education program: longitudinal study for adolescents.

do Nascimento, G.L.[1,3], Sanada, L.S.[1,2], Sonza, A. [1,2,3*]

[1]Laboratory of Development and Postural Control (LADESCOP), Universidade do Estado de Santa Catarina, Centro de Ciências da Saúde e do Esporte (UDESC/CEFID), Rua Pascoal Simone, 358- Coqueiros, Florianópolis, SC, 88080-350, Brazil.

[2]Post-graduate Program in Physiotherapy, Universidade do Estado de Santa Catarina, Centro de Ciências da Saúde e do Esporte (UDESC/CEFID), Rua Pascoal Simone, 358- Coqueiros, Florianópolis, SC, 88080-350, Brazil.

[3]Post-graduate Program in Human Movement Sciences Universidade do Estado de Santa Catarina, Centro de Ciências da Saúde e do Esporte (UDESC/CEFID), Rua Pascoal Simone, 358- Coqueiros, Florianópolis, SC, 88080-350, Brazil.

*Corresponding author: anelise.sonza@udesc.br

Introduction: Postural Education programs involving students, teachers, and family members to improve posture and postural habits should provide integrated knowledge acquisition and improve the quality of life. **Aim**: To evaluate the effects of technological tools in an Online Postural Education Program on theoretical knowledge on posture and education in health, dynamic posture, and physical self-perception of elementary adolescents from a public school in Southern Brazil. **Method:** This Online Postural Education Program was a longitudinal interventional study with pre- and post-intervention evaluations and a quantitative and qualitative approach. This study was approved by the Ethics Committee on Research Involving Human Beings of the Universidade do Estado de Santa Catarina (CAAE: 46019921.3.0000.0118). The sample comprised adolescents, teachers, and parents from the participating school. The program was conducted over five weeks, encompassing five remote and synchronous meetings (one evaluation, one reassessment, and three interventions, once a week, lasting 120 minutes for each class) and interactive educational intervention and physical exercises. Data collection and application of interventions were performed through the digital platform Google® Meet (Google, United States). Anamnesis and the Theoretical Knowledge Questionnaire were applied through the online form of Google® Forms (Google, United States) and analysis of dynamic postures. Questionnaires elaborated by the researchers were applied to teachers and parents through the digital platform. The students held games with questions related postural education using the Interactive Presentation Software Mentimeter® (Mentimeter, Sweden). After each theoretical meeting, physical exercise practices were performed focusing on important musculoskeletal structures to maintain proper postures. A website was developed on the platform Google® Sites (Google, United States), in which digital teaching materials, animated folders with orientations and demonstrations of the exercises to be performed at home during the week. These educational materials were developed using the software Genially® (Genially WEB SL, Spain), and the digital design platform Canva®(Canva Pty Ltd, Australia). An online course about postural education was offered to the Teachers, lasting 120 minutes, through the platform Google® Meet. The paired student t-test and Wilcoxon test were applied to compare the quantitative variables, McNemar and Wilcoxon tests for nominal and ordinal categorical variables. **Results:** Fifty-four schoolchildren aged between 11–16 years participated of the study, and a significant improvement in the theoretical knowledge (7.02±2.34 vs. 12.94±3.18, p<0.001), dynamic postures of tying shoelaces, lifting and dropping objects to the ground, carrying backpacks (*p*<0.001), and physical self-perception (10.11 ± 18.82 vs. 29.04 ± 14.90, *p*< 0.001) were found. Teachers and parents expressed satisfaction and learning with the program. **Conclusions:** The Online Postural Education Program provided a significant improvement in theoretical knowledge about posture and postural education, dynamic posture and physical self-perception of the participating adolescents. The interventions associated with using technology provided students witha teaching-learning for participants. This study can contribute to health promotion and prevention of inadequate postural habits and their consequences.

This study was supported in part by the Coordination for the Improvement of Higher Education Personnel – Brazil (CAPES) – Finance Code 001.

Keywords: Posture; adolescents; postural education; technology.

Brown and beige adipose tissue evaluated by infrared thermography in scholars: a protocol study.

Bailich, G[1]., Lopes, P.R.[1], Freitas, A.E.[1], Sá-Caputo, D.[2], Bernardo-Filho, M.[2], Jaques-Albuquerque, L.T.[2], Silva, A.R.[2], 1,3 Sonza, A.[1,3*]

[1]Laboratório de Desenvolvimento e Controle Postural - LADESCOP. Programa de Pós-Graduação em Ciências do Movimento Humano - PPGCMH, Centro de Ciências da Saúde e do Esporte - CEFID, Universidade do Estado de Santa Catarina-UDESC.

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas—LAVIMPI. Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro - UERJ

[3]Departamento de Fisioterapia. Programa de Pós-graduação em Fisioterapia PPGFT- CEFID-UDESC.

*Corresponding author: anelise.sonza@udesc.br

Introduction: Childhood obesity is appointed as a nutritional disease with the world's highest growth, classified as a pandemic, with difficult intervention, because the environment is becoming more obesogenic. Therefore, it becomes interesting to investigate the fatty tissue in children with different nutritional conditions using infrared tomography. **Aim**: To describe a protocol study to evaluate brown and beige adipose tissue from the supraclavicular and abdominal area by infrared thermography and also to measure body anthropometry and blood pressure in scholars with different nutritional states, verifying the protocol's viability and application time. **Methods:** This is a cross-sectional observational protocol study, with a quantitative approach, involving children aged from six to twelve years old, in different nutritional states, enrolled in public and private schools in southern Brazil. An intentional non-probabilistic sample was used. The protocol was approved by the Ethics Committee for Research Involving Human Beings (CEPSH) from *Universidade do Estado de Santa Catarina* (UDESC) with protocol number 55671522.9.0000.0118. The body mass will be measured on a digital scale (Segma®, Brazil) and the height through a stadiometer (Sanny®, Caprice, Brazil). Measurements of arm, neck, waist and hip circumferences will be performed using an inextensible measuring tape (Sanny®, model TR4013, Brazil). Blood pressure will be assessed using a sphygmomanometer (Premium, aneroid model, Germany) and stethoscope (Littmann® Classic III™, United States). The evaluation of the brown and beige adipose tissue is going to be obtained by infrared thermography, utilizing acompact thermography camera (FLIR C3-X, USA) with a thermal image sensor (-20 on 300°C) from images of 128x96 (11.288 pixels) and a camera with a resolution of 5 megapixels. The camera will be positioned at 1.5 meters of distance from the evaluated child, fixed to a tripod to obtain images from the supraclavicular, infraclavicular, supraumbilical and infraumbilical areas. Evaluated areas must be uncovered 20 minutes before obtaining the image, without any interference in the area of interest; participants were instructed not to drink thermogenic drinks on the day of the assessment and not to perform physical activities. The room will be dark and will have a controlled temperature of 21 (±1)°C, monitored by a digital thermohigrometer (J Prolab, Brazil), with a sensitivity of 0.1°C. For evaluation of the skin temperature of the regions of interest (ROI) the software FLIR Thermal Studio, Standard, will be used. For data

normality analysis, the Kolmogorov-Smirnov test will be used; Pearson or Spearman correlation and Student's or Man-Whitney's test for comparison between variables with a significance of $p \leq 0.05$. **Results:** Fifteen children with a median age of 9.0(8.0-11.0) years were evaluated for familiarization with the protocol and verification of the average collection time, which was 50 (±5.0) minutes. **Conclusion:** The protocol study has showed viability, with feasible application time. Considering that there is a lack of published studies with the use of thermography in children for evaluating beige and brown adipose tissue, this study can contribute as a new tool to evaluating children with different nutritional states.

Keywords: childhood obesity, infrared thermography, adipose tissue.

Analysis of the functional mobility of older adults during the covid-19 pandemic.

Bellini, A.J.[1*], Pereira, A.A.F.L.[1], Ostroski, I.M.[1], Tavares, G.M.S.[2], Santos, G.M.[1]

[1]Posture and Balance Laboratory / Physiotherapy Course / Master's Program in Physiotherapy / Health and Sport Sciences Center/University of the State of Santa Catarina (UDESC)/Florianópolis / Santa Catarina/Brazil.

[2]Physiotherapy Course / Federal University of Pampa (UNIPAMPA)/ Rio Grande do Sul/ Brazil.

*Corresponding author: angibellini@hotmail.com

Introduction: Corona Virus disease (COVID-19) or Severe Acute Respiratory Syndrome (SARS-Cov-2) has spread rapidly since December 2019, becoming a worldwide public health problem. To contain the spread of the virus, the World Health Organization has strongly recommended the practice of social isolation. It is believed that isolation may have reduced daily activities, contributing to weight gain and obesity in older adults, which, even without association with other comorbidities, were considered factors that increased the chances of hospitalization, intensive care unit (ICU) and death from COVID-19. Given this context, it is believed that functional mobility could be negatively affected. **Objective:** To compare functional mobility between older adults, obese and non-obese, during the COVID-19 pandemic. **Methods:** One hundred (100) older adults, between 60 and 80 years old, were divided into two groups based on the calculation of the body mass index (BMI): obese (O) (BMI >30 kg/m^2) and non-obese (NO) (up to 29.9 kg/m^2). In addition, they were classified as fallers (those who had 2 or more falls in the last year) and non-fallers (those who did nothave a fall episode). After anthropometry, the older adults were evaluated for functional mobility, using the BTS-G-Walk Inertial Sensor (Bioengineering Corp -USA), performing the Timed Up and Go Test (TUGT). The best performance (lowest total time) of the three attempts performed was considered. To perform the TUGT, the inertial sensor was fixed at the height of the second lumbar vertebra by a belt. The cut- off point used to predict falls for the Brazilian population was 12.47 seconds. To compare O and NO in terms of functionality, the Mann-Whtiney U test was applied. The significance level adopted was 5% ($p<0.05$). **Results:** The mean age of the evaluated older adults (n=100); 74 women and 26 men, was 67.98 (SD=5.40) years. Theresults showed an average BMI of 28.09 kg/m^2 (SD= 4.74); of the 100 evaluated seniors, 28 were obese and 72 were non-obese. The mean TUGT was 6.29 seconds (SD=0.89). Of the 12 considered fallers, that is, who fell twice or more in the last year, 8 were obese. A significant difference was evidenced when comparing functional mobility between obese older adults (median=6.47) and non-obese older adults (median=5.99), $p= 0.025$. Obese seniors showed longer execution time of the TUGT, that is, less functional mobility. **Conclusion:** Our results showed that obese older adults have less functional mobility when compared to non-obese. The condition of obesity may have contributed to the increase in the TUGT execution time, suggesting a greater risk of falls for obese older adults during the COVID-19 pandemic. Long-term preventive strategies can help reduce the severity of COVID-19 illness, taking into account that overweight and obesity are modifiable risk factors.

Keywords: Accidentals falls. COVID-19; Older Adults; Functionality.

Financing: Coordination for the Improvement of Higher Education Personnel(CAPES), National Council for Scientific and Technological Development (CNPq). FAPESC through grant term 2021tr995.

Influence of celiac disease on bone mineral density in adult women.

Ostroski, I.M.[1*], Bellini, A.J.[2], Parizotto, P.[3], Duarte, L.H.C.[4], Santos, G.M.[5]

[1]Master's Degree Student in Physiotherapy (PPGFt) / Posture and Balance Laboratory (LAPEQ) / Center for Health and Sports Sciences (CEFID)/ Santa Catarina University State (UDESC)/ Florianópolis / Santa Catarina (SC) / Brasil.

[2]Master in Sciences of Human Movement – PPGCMH / Posture and Balance Laboratory (LAPEQ) / Center for Health and Sports Sciences (CEFID)/ Santa Catarina University State (UDESC)/ Florianópolis / Santa Catarina (SC) /Brasil.

[3]PhD Student in Sciences of Human Movement – PPGCMH / Posture and Balance Laboratory (LAPEQ) / Center for Health and Sports Sciences (CEFID)/ Santa Catarina University State (UDESC)/ Florianópolis / Santa Catarina (SC) / Brasil.

[4]Master's Degree Student in Sciences of Human Movement – PPGCMH / Posture and Balance Laboratory (LAPEQ) / Center for Health and Sports Sciences (CEFID)/ Santa Catarina University State (UDESC)/ Florianópolis / Santa Catarina (SC) / Brasil.

[5]Professor in Physiotherapy Departmen. Research Coordinator Posture and Balance Laboratory (LAPEQ) / Center for Health and Sports Sciences (CEFID)/ Santa Catarina University State (UDESC)/ Florianópolis / Santa Catarina (SC) / Brasil.

*Corresponding author: isisostroski@hotmail.com

Introduction: Celiac Disease (CD) is a systemic immune-mediated disorder triggered by the ingestion of gluten and related prolamins causing damage to the lining of the small intestine. This can lead to poor absorption of nutrients, including calcium and vitamin D, which are essential for bone health. Studies have shown that CD can have a negative impact on bone mineral density (BMD), especially in adult women, an important indicator of bone strength and risk of fractures. However, the literature is conflicting with the effectiveness of gluten-free diet (GFD) in BMD, which may be particularly significant for women, who are already at greater risk of osteoporosis and fractures compared to men. Therefore, regular monitoring of BMD and the adoption of measures beyond the GFD are important to maintain bone health, seeking to reduce the risk of fractures and other complications associated with CD. **Aim:** The aim of the studyis monitoring the BMD of adult women with CD. **Method:** Cross-sectional, descriptive,comparative study of a quantitative nature. Participated in the study 52 adult women, divided into two groups: with celiac disease (GDC), confirmed by a medical diagnosis (biopsy and/or positive serology for CD); and without CD (GC). Women, aged between 18 and 56 years were included. The GDC was submitted to the Celiac Dietary Adherence Test (CDAT) questionnaire to assess adherence to the GFD. BMD and T *score* were evaluated in the lumbar spine, between vertebra lumbar 1 and vertebra lumbar 4 (L1-L4), evaluated by dual-energy X-ray absorptiometry (DXA), *GE® Lunar Prodigy Advance*. The participants were positioned with the lower limbs on a foam block, in 60/90° of hip flexion, with the upper limbs apart along the body. The laser beam was pointed, through the mobile arm of the device, 5 centimeters below the umbilicus and in the midline, initiating the assessment of BMD. To verify the difference in BMD means between groups, the independent test was used with a significance level of 5%. **Results:** Of the 52

women evaluated, 26 (50%) had CD and 26 (50%) didn't. The groups were homogeneous in age, body mass and height. The mean age of GDC was 29.7 years (±9.8) and 30 years (±10.7) in GC. In GDC 18 women (69.32%)presented adherence to GFD and 8 women (30.76%) presented worst adherence. The GDC presented BMD and T-score mean BMD and T-score lumbar spine (L1-L4) was: BMD 1.2 ± 0.1; T *score*: -0.2 ± 1.1, in GC the mean was: BMD: 1.2 ± 0.1; T *score*: -0.1± 0.9. The comparative result showed no significant difference between the groups: $p = 0.897$ for BMD and $p = 0.665$ for T-score, both groups presented BMD values considered within normal limits. **Conclusion:** There was no difference in BMD between adult women with and without CD, probably due to adherence to the GFD by women with CD, implying normal BMD.

Acknowledgments: We would like to thank the: Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES), Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) and Fundação de Amparo à Pesquisa e Inovação do Estado de Santa Catarina – FAPESC (2021TR995) for supporting this research.

Keywords: Celiac Disease, Bone density, dual-energy X-ray absorptiometry.

Effects of whole-body vibration exercise on neuromuscular activation of accessory muscles of respiration and cardiopulmonary parameters in Chronic obstructive pulmonary disease individuals: preliminary findings.

Monteiro-Oliveira, B.B.[1,2], Guedes-Aguiar, E.O.[1,3], Armstrong, L.P.[1,2], Souza-Santos, D.[1,4], Coelho-Oliveira, A.C.[1,2], Bernardo-Filho, M.[1], Sá-Caputo, D.C.[1]

[1] Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Américo Piquet Carneiro. Universidade de Estado do Rio de Janeiro, Rio de Janeiro, RJ,Brazil.

[2] Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Faculdade de Ciências Médicas. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[3] Programa de Pós-Graduação em Ciências Médicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro 20551-030, Brazil.

[4] Programa de Pós-Graduação Mestrado Profissional em Saúde, Medicina Laboratorial e Tecnologia Forense. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil.

*Corresponding author: bessa.oliveira@gmail.com

BACKGROUND: According to the World Health Organization (WHO), smoking is considered a chronic disease caused by nicotine dependence. Smoking is classified in the International Statistical Classification of Diseases and Related Health Problems (ICD-10) with the alphanumeric identifier code – F17. Prolonged consumption of cigarettes and/or tobacco products can lead to irreversible lung damage. Chronic obstructive pulmonary disease (COPD) is a preventable, common and treatable disease and is characterized by air limitation due to alveolar changes that result in persistent respiratory symptoms. The tobacco epidemic is a major cause of death, disease and impoverishment. Respiratory symptoms are dyspnea, one of the most debilitating, coughing, discharge and the most common non-respiratory symptoms are loss of musclemass, weakness, reduced mobility. Whole-body vibration exercise (WBVE) is an intervention capable of reducing the extra-pulmonary symptoms of COPD individual and is considered safe as it does not exacerbate cardiopulmonary parameters. METHODS: This is a six-week longitudinal clinical trial. COPD Individual were allocated by convenience into one of 5 groups [Control (GC), Sitting Group Once a Week (GS1), Sitting Group Twice a Week (GS2), Standing Group Once a Week (GP1) and Standing Group 2 x in the week (GP2)]. The parameters used were frequency 25 Hz, amplitude 2.5mm, rest time 1 minute, work time 1 minute and 5 bouts. The neuromuscular activation of the accessory muscles of respiration and the diaphragm was assessed by surface electromyography (sEMG), the cardiovascular parameters were assessed by the measurement of heart and respiratory rate and diastolic, systolic and mean arterial pressure. The muscular strength of the respiratory muscles was evaluated by manovacuometry and the sensation of dyspnea and tiredness was evaluated by the modified Borg scale. The data were analyzed with appropriate statistical tests using the Graph Prism software. Ethics Committee: agreement number: CAAE

49219115.3.0000.5259 and ReBEC under number RBR-72dqtm. **Results**: Preliminary results indicate that WBV does not activate accessory muscles of respiration. An analysis of the sEMG graph was performed and noise was observed indicating inactivity of the sternocleidomastoid (SCOM) and external intercostal muscles and there were no significant differences in cardiovascular parameters and respiratory muscle strength ($p > 0.05$). **Discussion**: Physical exercise is a non-pharmacological strategy recommended within a pulmonary rehabilitation program. WBVE is an indicated intervention because it does not exacerbate dyspnea and does not activate the accessory muscles of respiration, therefore, there is no increase in the work of breathing and can help to reduce the fear of dyspnea that COPD individuals have when performing physical exercise. **Conclusion:** Preliminary results have shown that WBVE does not activate the accessory muscles of respiration and no significant changes were found in respiratory muscle strength and cardiopulmonary parameters and may be a safe intervention for this population.

Financial Support: *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (CAPES), *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (CNPQ) and *Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro* (FAPERJ).

Keywords: surface electromyography; whole body vibration, COPD, accessory muscles of breathing, dyspnea.

Autonomic nervous system response during systemic vibratory therapy in individuals with obesity: a randomized controlled trial.

Batouli-Santos, D. [1,2*], Valenti, V.E.[3], Cardoso, A.L.B.D.[2], Coelho-Oliveira, A.C.[1,2], Reis-Silva, A.[1,2]; Norte, C.E.[4]; Sá-Caputo, D.C.[1,2]; Bernardo-Filho, M.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ 20950-003, Brazil.

[2]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Faculdade de Ciências, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ 20550-900, Brazil.

[3]Departamento de Fonoaudiologia, Universidade Estadual Paulista, Marília, SP 17525- 900, Brazil.

[4]Programa de Pós-Graduação em Psicologia Social, Instituto de Psicologia, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ 20550-900, Brazil.

*Corresponding author: danielbatouli@gmail.com

Introduction: Obesity is a disease with high prevalence worldwide and it is associated with chronic inflammation and autonomic nervous system imbalance, which predisposes to cardiovascular disease. Heart rate variability (HRV) analysis is a safe andnon-invasive method for assessing cardiac autonomic function. Systemic vibratory therapy (SVT) has been studied as an intervention to improve HRV. **Aim:** The objectivewas to investigate the autonomic nervous system (ANS) response during SVT, through the analysis of heart rate variability (HRV) in individuals with obesity. **Methods:**Twenty-six individuals with obesity (19 women, 7 men), divided in two groups: control group (n=13) and SVT group (n=13), were exposed to a single session of side alternating vibrating platform (SVT), with peak-to-peak displacement of 2.5 mm and 30Hz of frequency. The individuals were positioned standing on the vibrating platform (VP), barefoot, with 130º knee flexion, in a semi-squatting position and remained in thisposition in all active periods of the protocol. The protocol consisted of 9 bouts of 1 minute of vibration followed by 1 minute of rest, totaling 18 minutes of intervention. The control group performed the same protocol, however, with the VP turned off and a vibrating device attached to it, simulating vibration. HRV measurements were taken in orthostatic position (rest), and during SVT. The RMSSD index was analyzed. The protocol was approved by Research Ethics Committee and registered on *Plataforma Brasil* under number 30649620.1.0000.5259. The t-test for independent samples was used to compare the groups by using the software GraphPad Prism 5.0. Results were expressed as mean ± SD and difference was considered at *p*-value<0.05. **Results:** Anthropometric analysis indicated no difference between the groups in age (CON – 48.85 ± 15 years old / SVT – 54 ± 9.98 years old / *p*-value = 0,156), body mass (CON –97.51 ± 27.5 kg/ SVT – 102.53 ± 19.13 kg / *p*-value = 0,297), height (CON – 161.33 ± 8.52 cm / SVT – 163.7 ± 9.25 cm / *p*-value = 0,252), BMI (CON – 37.24 ± 8.44 / SVT – 38.12 ± 5.83 kg/m^2 / *p*-value = 0,379). After a single session of SVT, there was no statistical difference when comparing the RMSSD of individuals in the control group (20.18 ± 18.35 ms [orthostatic]; 15.61 ± 19.04 ms [during intervention]) and SVT group(11.64 ± 6.08 ms [orthostatic]; 13.06 ± 11.19 ms [during intervention]), *p*-value = 0.067 (orthostatic, CON vs SVT), *p*-value = 0.341 (during intervention, CON vs SVT). **Conclusion:** The parameters used in this SVT protocol did not acutely alter the

parasympathetic activity compared to the control group. SVT is a safe intervention for individuals with obesity. More studies analyzing different biomechanical parameters are important to add more knowledge on this topic.

Keywords: Exercise. Whole-body vibration. Autonomic nervous system. Heart rate variability.

Financial Support: This research was supported by the *Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq), Fundação Carlos Chagas Filho de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ)* and *Coordenação de aperfeiçoamento de Pessoal de Nível Superior (CAPES)* under grant 001.

Effect of systemic vibration therapy on functionality inpatients with chronic obstructive pulmonary disease.

Guedes-Aguiar, E.O.[1], Oliveira-Monteiro, B.B.[2], Cardoso, A.L.B.D[3], Sá-Caputo, D.C.[3], Bernardo-Filho, M.[3].

[1]Programa de Pós-Graduação em Ciências Médicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil.

[2]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Faculdade de Ciências Médicas. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brazil.

[3]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Instituto de Biologia Roberto Alcântara Gomes, Policlínica Universitária Piquet Carneiro, Universidade Estadual do Rio de Janeiro, RJ, Brazil.

*Corresponding author: ellianeguedes@gmail.com

Introduction: According to the American Thoracic Society and the European-Respiratory Society, chronic obstructive pulmonary disease (COPD) is the third leading cause of mortality worldwide. A commonly observed comorbidity in patients withsevere COPD is cachexia, which can lead to loss of skeletal muscle mass and weakness, resulting from muscular sedentary lifestyle. The loss of muscular strength is a result of numerous hospitalizations and this causes an increase in the symptomatology, as well reduced exercise tolerance and poor quality of life. As people with COPD have intolerance physical exercise (PE) these activities need to be in accordance with the limitations of these patients. The PE is an important recommended PR strategy for the treatment of patients with COPD. In this context it appears that the Systemic Vibration Therapy (SVT) may be considered as a type of PE. The SVT is produced when the individual is in contact with the base of the vibratory platform turned on. The SVT induce muscle contractions through the involuntary reflex, it can be useful to amelioratethe effects of treatment of patients with COPD. Thus, the SVT may be an option in the management of patients with COPD, used as PE. **Aim**: To analyze the effect of Systemic Vibration Therapy on Sit and stand test five times (STST 5x) in patients with Chronic Obstructive Pulmonary Disease (COPD). **Methods**: Twenty-seven COPD patients underwent STST 5x test sitting in an armless chair. Each participant was instructed to cross their arms over their chest and sit with their back against the upright backrest of the chair. The raters required the patients to stand and sit five times "as quickly as possible" without physical assistance. The parameters used in alternating vibrating platform, were frequency 25 Hz, amplitude 2.5mm, rest time 1 minute, work time 1 minute. Ethics Committee: agreement number: CAAE 49219115.3.0000.5259 and ReBEC under number RBR- 72dqtm. WBVE. **Results:**After 6 weeks were assessed the execution time of the STST 5x of 27 patients. No significant difference was found, before and after the EVCI protocol respectively, performed by GC [1.4 ± 0.37 vs 1.29 ± 0.48 (p=0,2759) and 22.67 ± 8.3 vs 21.37 ± 7.27 (p=0,3798)], by GS1 [1.38 ± 0.74 vs 1.63 ± 0.91 (p=0,2793) and 26.95 ± 12.92 vs 1.63 ± 0.91 (p=0,2515)], by GS2 [1.33 ± 0.51 vs 1.33 ± 0.81 (p=0,5000) and 21.21 ± 4.8 vs 22.65 ± 6.22 (p=0,3324)], by GP1 [1.43 ± 0.78 vs 1.14 ± 0.37 (p=0,2017) and 20.99 ± 6.39 vs24.47 ± 7.40 sec. (p=0,1820)] and by GP2 [1.57 ± 0.79 vs 1.29 ± 0.49 (p=0,2150) and 19.39 ± 5.91 vs 19.65 ± 4.06 (p=0,4636)]. **Conclusion:** No significant difference was found, however further investigations are required, with a larger sample,to

explore the clinical implications of STST 5x results.

Keywords: Whole-body vibration, functionality, chronic obstructive pulmonarydisease, systemic vibration therapy, pulmonary rehabilitation.

Acute effect of systemic vibratory therapy on functionality and on handgrip strength in obese individuals: preliminary results.

Mazini, J.S.[1,*], Jaques-Albuquerque, L.T.[1], Valério-Penha, A.G.[1,2], Reis A.S.[1,3], Coelho-Oliveira, A.C.[1,2], Andrade-Nascimento, A.[1], Amadeu, T.P.[2], Bernardo-Filho, M.[1,2,3], Sá-Caputo, D.C.[1,2,3]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas - LAVIMPI, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro 20950-003, RJ, Brasil.

[2]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 20950-003, Brazil.

[3]Programa de Pós-Graduação em Ciências Médicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro 20551-030, RJ, Brazil.

*Correspondence author: mazinijennyfer@gmail.com

Introduction: Obesity is characterized by the accumulation of body mass associated with a sedentary lifestyle, affecting the functionality and autonomy of the obese individuals. In this context, the practice of physical exercise is recommended for this population. One modality of physical exercise is the whole-body vibration exercise (WBVE) that is produced in an individual exposed to mechanical vibration generated in a vibrating platform (VP) in the systemic vibratory therapy (SVT). WBVE is considered safe, low cost, easy to perform and has good adherence for individuals with obesity. **Aim:** To evaluate the acute effect of SVT on functionality and on handgrip strength in individuals with obesity. **Methods:** Randomized clinical trial, interventionist, transversal, CAEE 30649620.1.0000.5259Participants between 18 at 60 years, both sexes, Body mass index (BMI) ≥ 30kg/m² were included and allocated in the groups: i) side alternating VP SVT (SVT-A); ii) vertical SVT (SVT-T); and iii) control group- SVT-C (VP off). Positioning: 130º knees flexion). Frequency 30Hz, peak-to-peak displacement: 2.5, 5.0 and 7.5 mm. 1-minute session with vibration, and 1-minute rest (no vibration), by 15 times, totaling 30 minutes. The functionality was evaluated with the Short Physical Performance Battery (SPPB) score total, through balance, gait speed, and lower limb muscle strength. The isometric muscle strength was assessed through the Laffayete handgrip dynamometer. The measures were performed before and after the session of WBVE. The Graph Pad Prism 5.0 was used for statistical analysis, being considered significant $p \leq 0.05$. **Results:** Twenty-seven adults participated in the study (SVT-A, n =9; SVT-T, n=9; SVT-C, n=9) with 41.7± 9.94 years old, 163.9 ± 8.3 centimeters, 94.6 ± 13.3 kg body mass, and 35.1± 3.8 kg/m2 BMI, and both sexes. The score total of SPPB in SVT-A group was 11.4 ± 1.0 before and 11.7± 0.4 after the intervention. SVT-T was 10.6 ± 2.0 before and 11,3 ± 1.6 after the intervention; in the SVT-C group was 11.6 ± 0.5 before and 11.8 ± 0.3 after the intervention. No significant differences were observed, in within-group values *(p=0.0653),* between-groups*(p=0.2522),* and interaction *(p= 0.9567).* Regard the handgrip (HG) right was 42.01 ± 14.2 kgf in SVT-A group before and 39.2 ± 13.4 kgf after the intervention. In relation toHG SM was 36.2 ± 11.6 kgf in SVT-A group before intervention and 34.9 ± 10.4 kgf after intervention. In relation to right HG was 30.1 ± 7.8 kgf in SVT-T group before and
30.5 ± 7.4 kgf after the intervention. In relation to left HG was 30.5 ± 8.0 kgf in SVT-T group before intervention and 29.1 ± 7.5 kgf after intervention. In relation to right HG

was 34.8 ± 15.9 before and 35 ± 17.1 kgf after the intervention. In relation to left HG was 33.5 ± 10.8 kgf in SVT-C group before and 32.4 ± 14.6 kgf after intervention. In general, no significant differences were observed in the right HG, with values within- groups (*p=0.2493)*, between–groups (*p=0.2682)*, and interaction (*p=0.0852)*. Also, no significant differences were observed in the left HG, with values in within-groups *(p=0.0689),* between-groups *(p=0.5616)*, and interaction *(p=0.9353)*. **Conclusion**: In conclusion, the preliminary findings suggest that the SVT, with only one session did not alter the functionality and strength of individuals with obesity. More studies with larger sample sizes are needed to understand better the results.

Fuding: *FAPERJ, CAPES* and *CNPq*.

Keywords: Obese; SPPB; Mechanical vibration; Muscle performance.

Systematic vibration therapy as an exercise modality for children with autism: bibliographical review.

Felizardo-Anchieta, L.B.[1], Valério-Penha, A.G.[1], Bernardo-Filho, M.[1], Sá-Caputo, D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Corresponding author: larissaberto.felizardo@gmail.com

Introduction: Autism, refers to a broad range of conditions the core features of autism include atypical development in socialization, communication and behavior such as stereotyped. **Aim:** The objective of this work was report the effects of whole body vibration exposure on young children with autism. **Methods:** The databases PubMed, PEDro, Scopus, Periodicos libraries were accessed to find publications about the use of vibration therapy in autism individuals. The descriptors vibrating therapy, whole-body vibration, systemic vibration therapy, autism, early infantile autism, autistic disorders were used in English and the equivalent words in Portuguese. The searches were performed on July 2023. Inclusion and exclusion criteria were defined to select the publications related to the aim the narrative review. **Results:** Only one article reached the inclusion criteria where it covered the effects of whole-body vibration on stereotypy of young children with autism. The results revealed that whole body vibration reduced stereotypic breathing, stereotypy vocalization in all children tested. However, some forms of stereotypy were not influenced such as bodyrocking and for one child simply standing on the vibration platform with it turned off reduced stereotypy. **Conclusion:** Brief whole-body vibration was not able to uniformly decrease the rates of all types of stereotypies. Specifically, rates of some stereotypy decreased while others were unchanged. From a practical perspective, whole body vibration was easy to implement in the intensive early behavioral intervention clinic and no negative side effects were observed. However, further studies are necessary to confirm the findings described in the current review.

Keywords: Autism, Whole-Body Vibration, Physiotherapy. Vibratory Platform. Motor development.

Evaluation of the effect of systemic vibrating therapy on functionality in the elderly through the timed up and go test: preliminary results.

Oliveira-Silva, L.*[1], Coelho-Oliveira, A.C.[1], Cardoso, A.L.B.D.[1], Siriano, G.D.[1], Valério-Penha, A.G[1], Jaques-Albuquerque, L.T.[1], Gama, M.A.S.[1], Moura-Fernandes, M.C.[1], Oliveira, L.P.[2], Bernardo-Filho, M,[1], Sá-Caputo, D.C.[1].

[1]Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro,RJ, Brazil.

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Policlínica Piquet Carneiro, UERJ, Rio de Janeiro, RJ, Brazil.

*Corresponding author: larissaoliver20151@gmail.com

Introduction: According to the World Health Organization (WHO), the elderly people represents approximately 13.5% of the world population. The aging process is associated with a loss of functionality that reduces mobility and functional balance, resulting an increase in the risk of falls. Physical exercise promotes multiple beneficial effects to the individual, indicating to be effective in reducing the risk of falls in the elderly. In this context, systemic vibratory therapy (SVT), that produces whole-body vibration exercise (WBVE) in individuals that are exposed to mechanical vibrations provided by a vibrating platform (VP), could be useful to elderly individuals due to the safety and facility to be performed. **Aim:** To evaluate effects of SVT on functionality in the elderly individuals through the timed up and go test (TUG Test). **Methods:** This is an interventional longitudinal study, CAAE number 30649620.1.0000.52.59.Individuals aged 60 years or older were eligible for participation and performed the standing (SVT-P) or sitting (SVT-S) protocol. The study included 24 individuals (SVT- P, n=12 and SVT-S, n=12) aged 68.3 ± 6.1 years, height 152.8 ± 28.1 cm, 70.7 ± 16.06 kg of body mass and 28.9 ± 5.6 kg/m² body mass index (BMI) for both sexes. SVT protocol consisted of a frequency of 5 Hz, in three series of 6 minutes (1 min of work and 1 min of rest), totaling 18 min of intervention. For each series, the peak-to-peak displacement was: 2.5; 5.0 and 7.5 mm. Peak acceleration was from 0.12 to 2.95 g. There were 20 sessions, twice a week, for 10 weeks. The TUG test is an important tool for assessing functional mobility, whose performance is related to balance, gait and functional capacity of the elderly. This test was applied before the 1st session and after the 20th SVT session. The Graph Pad Prism 5.0 was used for statistical analysis, data were presented as mean and standard deviation, and differences were considered with p-value≤0.05. **Results:** Regarding the results, in the SVT-S group, TUG-test was 15.2 ± 9.6 s before the intervention and 13.03 ± 3.1 s after the last session. In the SVT-P group,it was 11.2 ± 2.3 s before SVT and 9.9 ± 1.8 s after. No differences were observed in thesitting group (p-value=0.8311) and standing (p-value=0.1617). **Conclusion:** After 10 weeks**,** the SVT did not contribute to significant alterations for the time to perform the TUG test. It is suggested more studies are needed to better understand the effects ofSVT on the risk of falls in this population.

Fuding: *FAPERJ, Instituto UNIMED, CAPES* and *CNPq*.

Keywords: Elderly; Mechanical vibration; TUG-Test; Risk of falls; Functionality.

The effects of systemic vibration therapy on functionality and muscle strength in the Elderly.

Jaques-Albuquerque, L.T.[1*], Coelho-Oliveira, A.C.[1], Valério-Penha, A.G.[1,2], Moura-Fernandes, M.[1], Gama, M.A.S.[1], de Oliveira, L.P.[3], Bernardo-Filho, M.[1] and Sá-Caputo, D.C.[1,2].

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes e Policlínica Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[2]Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidadedo Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brazil.

[3]Departamento de especialidades cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Corresponding author: lueliaa19@gmail.com

Introduction: Aging can favor changes in organic functions, favoring limitations and reduced functionality. Physical exercise contributes to the improvement of these functions and systemic vibration therapy (SVT) has been used in this population because it is safe and has good adherence. The A Short Physical Performance Battery (SPPB) comprises a battery of tests to assess functional capacity. Handgrip dynamometry (HD) is used for functional assessment and muscle strength in the elderly. **Aim:** to evaluate the functionality and muscle strength promoted by systemic vibratory therapy in the elderly. **Material and methods**: Cross-sectional clinical study, CAAE nº 68385022.9.0000.5259. Individuals aged 60 years or older were eligible for participation and performed the standing (SVT-Sta) or sitting (SVT-Sit) protocol, according to clinical and functional evaluation. SPPB and dynamometry were evaluated before SVT and after the 20th SVT session. Subjects were exposed to 5 Hz, peak-to- peak displacement: 2.5; 5.0 and 7.5 mm, peak acceleration: 0.12 to 2.95 g, in threeseries (1 min of work and 1 min of rest) totaling 18 min. Graph Pad Prism 5.0 was used for statistical analyses, considering p≤0.05. **Results:** We evaluated 27 elderly people in the SPPB (SVT-Sta, n=14 and SVT-Sit, n=13) and 25 elderly people in the DPP (SVT- Sta, n=13 and SVT-Sit, n=12) with 68, 3 ± 6.1 years old, 152.8 ± 28.1 cm in height,70.7 ± 16.06 kg body mass and 28.9 ± 5.6 BMI of both sexes. And with a frailty scoreof 3.7 ± 1.2. Regarding the SPPB score in the TVS-S group at balance, it was 3.4 + 0.6 before and 3.6 + 0.4 after the 20th session, p-value of 0.5313. At walking speed of 2.6 + 1.1 before and 2.7 + 0.9 after the 20th session, p-value of 0.9844. In the sit-to-stand test, 1.2 + 0.7 before and 1.9 + 1.3 after the 20th session, p-value of 0.0938. The total score was 7.3 + 1.7 before and 8.3 + 2.3 after the 20th session, p-value of 0.1431. Regarding the score in the SVT-Sta group at balance, it was 3.8 + 0.3 before and 3.7 + 0.4 after the20th session, with a p-value of > 0.9999. At walking speed of 3 + 1.1 before and 3.5 + 0.5 after 20 sessions, p-value of 0.2188. In the sit-to-stand test, 2.2 + 1.1 before and 2.2 + 1.1 after the 20th session, p-value of 0.7656. In the total score of 9.1 + 1.7 before and 9.6 + 1.2 after the 20th session, p-value of 0.489. Regarding the DPP in the right upper limb (UL) in the SVT-Sta group it was 27.1 + 6.3 before and 25.6 + 6.7 after the 20th session, p-value of 0.293 and in the left UL of 27.8 + 6.1 and 25.7 + 7.3 after the 20th session, p-value of 0.2563. In relation to the right MS in the SVT-Sit group it was 19 + 7.3 before and 19.1 + 6.5 after the 20th session, p-value of 0.7646 and in the left 18.8 + 6, 4 before SVT and 17.6 + 4.9 after the 20th session, p-value of 0.4819. **Conclusion:** Based on the preliminary results obtained, there was no difference in muscle strength and functional capacity assessment through the SPPB, considering the acute effect of 20SVT sessions.

Fuding: *FAPERJ, Instituto UNIMED, CAPES* and *CNPq*.

Keywords: Systemic vibration therapy; Physical exercise; functionality, muscle strength, SPPB, dynamometry.

Effect of systemic vibratory therapy on sleep quality in individuals with chronic obstructive pulmonary disease by Pittsburgh sleep quality index.

Ferreira-Souza, L.F.[1,2*], Trindade-Gusmão, L.C.[1,2], Sá-Caputo, D.C.[1,2,3], Bernardo-Filho, M[1].

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas - LAVIMPI, Departamentode Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro 20950-003, RJ, Brasil.

[2]Programa de Pós-graduação em Saúde, Medicina Laboratorial e Tecnologia Forense, Universidade do Estado do Rio de Janeiro, Rio de Janeiro 20950-003, RJ, Brasil.

[3]Programa de Pós-Graduação em Ciências Médicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro 20551-030, RJ, Brazil.

*Corresponding author: lumadaragu@gmail.com

Introduction: According to the World Health Organization, chronic obstructive pulmonary disease (COPD) is expected to become the third leading cause by 2030. COPD is characterized by persistent respiratory symptoms and airflow limitation from the lumen of the lower airways (chronic bronchitis and pulmonary emphysema) caused by prolonged exposure to noxious particles or gases. The main signs and symptoms are chronic cough, dyspnea, wheezing, and expectoration, accompanied by poor sleep. A regular exercise program can attenuate symptoms of sleep, respiratory mechanics, and lung ventilation performance. Systemic vibratory therapy (SVT) is a safe and easy-to- perform intervention that produces whole-body vibration exercise when mechanical vibration generated in a vibrating platform (VP) is transmitted to an individual. The hypothesis is that there will be an improvement in the sleep quality of COPD individuals after the SVT. **Aims:** To assess the effects of the SVT on sleep quality usingthe Pittsburgh Sleep Quality Index (PSQI). **Methods:** An open, randomized, longitudinal, and blinded clinical study involving 24 COPD individuals recruited in the *Departamento de Pneumologia* of *Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro.* The individuals were allocated into three groups: (i) the group in a standing position on the VP (STG); (ii) the group in the sitting position in a chair in front of the VP with the feet on the base of the VP (SITG); and (iii) the control group (CG). The sample size was calculated with G-Power. Eight individuals for each group were defined with a 95% confidence interval. Voluntary individuals of both sexes, aged between 40 and 60 years, and diagnosed with COPD by the Global Initiative for Chronic Obstructive Lung Disease were included. The individuals were exposed to the mechanical vibration of the VP (Novaplate fitness evolution), which presents a side-alternating displacement of the base. The SVT was six weeks of intervention, with two sessions of five sets per week, interspersed with a one-minute work and a one-minute rest time. The frequency used was 25 Hz, with peak-to- peak displacement at the base of the VP of 2.5 mm. The PSQI was used before and afteran intervention to assess sleep quality, considering good sleep with a score ≤ 5. The results were stored in an Excel spreadsheet and were compared using a Student t-test with $p \leq 0.05$ significance. **Results:** According evaluation to the PSQI and the statisticalanalysis by the paired Student's t-test, the following values were observed for each group: STG (pre) 7.88 ± 2.95, STG (post) 4.75 ± 7.64, (p-value = 0.03), SITG (pre) 7.00 ± 1.97, SITG (post) 5.13 ± 1.24, (p-value = 0.01), CG (pre) 8.75 ± 2.87, CG (post) 9.13 ± 3.41, (p-value = 0.53).

According to the PSQI, significant differences were observed due to the SVT, given the improvement in sleep quality in the SITG and STG groups, with a $p \leq 0.05$. **Conclusion:** This study demonstrates that patients with sleep disorders presented less intense symptoms when submitted to SVT. Future research with different parameters should be carried out. Study approved by the Pedro Ernesto University Hospital Research Ethics Committee, registered under number CAAE: 30649620.1.0000.5259, and by the Brazilian Registry of Clinical Trials (ReBEC) under number RBR-72dqtm. The patients signed the Informed Consent Form after a verbal explanation and before any study procedure.

Financial support: *Fundação de Amparo à Pesquisa do Estado do Rio de Janeiro (FAPERJ),* by the *Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq),* and by the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* - Brazil *(CAPES)* – Finance Code 001.

Keywords: Sleep quality. self-evaluation. Systemic Vibration Therapy. COPD. PSQI.

Effects of pre-post systemic vibratory therapy on sleep quality in women with knee osteoarthritis by Pittsburgh sleep quality index.

Trindade-Gusmão, L.C.*[1,2], Ferreira-Souza, L.F.[1,2], Cardoso, A.L.B.D.[1,3], Moura-Fernandes, M.C.[1,3], Melo-Lima, P.[1,3], Rocha, W.S.[1], Oliveira, L.P.[5], Ooka, N.[5], Sá-Caputo, D.C.[1,2,3], Bernardo-Filho, M.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica eBiometria. Instituto de Biologia Roberto Alcântara Gomes, Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, 20950-003, Rio de Janeiro, RJ, Brasil.

[2]Programa de Pós-graduação em Saúde Medicina Laboratorial e Tecnologia Forense, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 20950-003, RJ, Brasil.

[3]Programa de Pós-graduação em Ciências Médicas, Universidade do Estado do Rio de Janeiro, 20950-003, Rio de Janeiro, RJ, Brasil.

[4] Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidade do Estado do Rio de Janeiro, 20950-003, Rio de Janeiro, RJ.

[5]Departamento de Especialidades Cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, 2550-170, Brasil.

*Corresponding author: luizagusmao.fisio@gmail.com

Introduction: Knee Osteoarthritis (KOA) is the most common type of arthritis. It is characterized by progressive degeneration of the articular cartilage, sclerosis of the subchondral bone and presence of marginal osteophytes. Symptoms such as sleep disturbances discomfort at night and chronic pain are associated with the osteoarthritis. Studies suggest positive effects of exercise on sleep quality in individuals that presented reduced by Pittsburgh Sleep Quality Index (PSQI) score. In turn, a practical approach for individuals with KOA know as systemic vibratory therapy (SVT), a procedure which subjects are submitted to mechanical vibrations through a vibrating platform (VP), is proposed as an intervention to improve sleep quality. The hypothesis is to consider a sleep quality improvement in individuals with KOA after performing SVT. **Aim:** The study purpose was to evaluate effects of SVT on sleep quality in women with KOA using the PSQI. **Methods**: Longitudinal clinical trial, interventional study, involving a single group of nine women, recruited from the *Departamento de Traumatologia e Ortopedia of Hospital Universitário Pedro Ernesto,* Rio de Janeiro State University, diagnosed with KOA age above 67 years, height (cm) 156.7 or more, with median body mass (BM) (kg) scores of 89.88 and Body Mass Index (BMI kg /m^2) 35.62, was exposed to SVT using a side-alternating VP. The individuals performed three bouts of three minutes working time, resting one minute between interventions, twice sets a week, for 5-weeks. The frequency was progressive (from 5 up to 14 Hz) with peak-to-peak displacement at the base of the VP of 2.5, 5.0 and 7.5 mm. The PSQI was used before and after intervention to assess the sleep quality, considering goodsleep quality with a score ≤ 5. The results were stored in the Excel spreadsheet and were compared using a Student t-test with a significant $p \leq 0.05$. **Results:** According to the evaluations by PSQI and the statistical analysis by the paired Student's t-test the following values were observed: PSQI pre-intervention was 8.55 (2.40); PSQI post was 7.66 (4.17), (p-value=0.39). In agreement to the PSQI no significant difference was observed. **Conclusion**: No significant difference was observed due to the

cumulative effects of the SVT intervention on sleep quality in women KOA. Further additional studies are requested. The project was approved by the Research Ethics Committee of HUPE, State University of Rio de Janeiro - UERJ (CAAE 19826413.8.0000.5259) and registered in the Brazilian Registry of Clinical Trials - REBEC (RBR-7dfwct).

Financial Support: FAPERJ and CAPES.

Keywords: sleep quality; systemic vibratory therapy; osteoarthritis; knee; vibration therapy.

Effects of the systemic vibration therapy on sleep disorders, body temperature and tone in a child with Down syndrome with renal and urinary disorders: a case-report.

Torres-Nunes, L.[1,2*], Costa-Borges, P.P.[1], Paineiras-Domingos, L.L.[1,3], Bachur, J.A.[4], Sá-Caputo, D.C.[1,2], Bernardo-Filho, M.[1]

[1]Laboratory of Mechanical Vibrations and Integrative Practices, Department of Biophysics and Biometrics, Roberto Alcântara Gomes Institute of Biology and Piquet Carneiro University Polyclinic, State University of Rio de Janeiro, Rio de Janeiro20950-003, Brazil.

[2]Program of Postgraduate Degree in Clinical and Experimental Pathophysiology, State University of Rio de Janeiro, Rio de Janeiro 20550-170, Brazil.

[3]Department of Physiotherapy, Multidisciplinary Institute of Rehabilitation andHealth, Federal University of Bahia, Salvador 40110-909, Brazil 4 Department of Physiotherapy, University of Franca, Franca 14404-600, Brazil.

*Correspondence author: ltnmamae@gmail.com

Background: Down syndrome (DS), the most common genetic disease worldwide. The health and developmental problems of people with DS are complex and are associated with many biopsychosocial problems of childhood to adulthood. Children with DS are at increased risk of multiorgan comorbidities, including renal and/or urinary disorders. In addition, they also have disturbances in sleep, temperature, and muscle and jointtone. Physical activity (PA) seems to be effective in minimizing some of these alterations, and systemic vibration therapy (SVT) may be an option for PA for children with DS because it is considered a safe modality, easy to perform and of short duration. **Aim**: The aim is to study the effects of the SVT on sleep disorders, body temperature and tone in a child with DS with renal and urinary disorders. **Methods**: The subject is a 7-year-old boy, with free type DS, with renal disorders, who underwent bilateral clearance of the posterior urethral valve and uses a diaper to sleep due to urinary disorders. He undergoes periodic follow-up with a urologist and was released to perform any type of exercise and physical activity, including SVT. Their legal guardian signed the Free and Informed Assent form and responded before the SVT intervention and 15 days after the SVT intervention to two questionnaires about sleep disorders in children, the Reimão and Lefevre Child Sleep Questionnaire and the Sleep Disorders Scale for Children. The temperature was measured by infrared thermography of the anterior region of the neck, before and 15 min after the SVT intervention with a FLIR Systems camera, E40, Wilsonville, OR, USA; the camera was placed at 1 m between the camera and the cricoid cartilage of the child and the child was positioned in a sitting position with support in the head region so that could maintain a satisfactory cervical extension for capturing the images. Tone was assessed before and after the SVT intervention, through muscle palpation and passive joint movements. Parameters used during SVT were 2.5 mm peak-to-peak displacement, 5 Hz frequency, 1 time/week, each session consists of 5 sets (30 seconds/vibration, 1 minute/rest) used the position sitting on the vibrating platform with feet flat on the floor and hands on knees. **Results**: There was improvement in sleep patterns and muscle and joint tone. He stopped urinating and snoring during sleep, showed decreased movement in bed and hyperhidrosis during sleep and daytime sleepiness. In muscle tone, there was a slight alteration of the hypotonic pattern in the bilateral deltoid muscle, in joint tone a change in elbow extension, dorsiflexion, and plantar flexion. Their central, maximum and minimum temperature remained increased after 15 minutes of the SVT intervention, corroborating what the literature says. **Conclusion**: It is possible to suggest that the acute effect of SVT has physiological effects that can benefit sleep quality, muscle tone and joint tone in children with DS.

Keyword: Down Syndrome, Sleep, Urinary disorders.

Effects of systemic vibratory therapy on pain and on flexibility in elderly: preliminary results.

Moura-Fernandes, M.C. [1,2], Coelho-Oliveira, A.C. [1,3], Valerio-Penha, A.G[3], Souza-Gama, M.A.[1], Jaques-Albuquerque, L.T.[1], Silva-Oliveira, L.[1], Oliveira, L.P.[4], Bernardo-Filho, M.[1] , Sá-Caputo, D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[2]Programa de Pós-Graduação em Ciências Médicas. Faculdade de Ciências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[3]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental. Faculdade deCiências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[4]Departamento de Especialidades Cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Correspondence author: marciafernandesfisio@hotmail.com

Introduction: Aging and sedentary lifestyle can favor the appearance of musculoskeletal diseases, pain and consequent decrease in functionality. Muscle flexibility influences the mobility, and should be considered in rehabilitation programs. Exercise and life style changes have been suggested to reduce these symptoms. However, elderly, due to several factors, have difficulty for adhering to an exercise program. The Systemic vibratory therapy (SVT), generated whole-body vibration exercise when indivdiual are exposure to mechanical vibration produced in vibrating platform. The SVT is a safe intervention with positive results in healthy individuals or with clinical conditions. **Aim:** To evaluate the effects of the SVT on pain and on flexibility in elderly individuals. **Methods:** This is a longitudinal clinical study, approved by the CAAE Ethics Committee nº 30649620.1.0000.52.59, where elderly individuals were included in the Systemic Vibratory Therapy Group - Stand Position (SVTG-sta) or the Systemic Vibration Therapy Group - Sitting Position (SVT-sit). They were allocated in the groups according to the frailty score by Phenotype Fried *etal*. The study included twenty-seven elderly (SVT-sta, n=14 and SVT-sit, n=13), of bothgenders, aged 68.3 ± 6.1 years, height 152.8 ± 28.1 cm, body mass 70.7 ± 16.06 kg and with body mass index (BMI) 28.9 ± 5.6 kg/m2 and frailty score by Phenotype Fried *etal* 3.7 ± 1.2. The subjects were exposed to 20 sessions, with progressive frequency from 5 to 14 Hz, peak-to-peak displacement: 2.5, 5.0 and 7.5 mm, peak acceleration: 0.12 to 2.95 g, in three series (1 min of work and 1 min of rest), and in the first 10 sessions the total time was 18 minutes and in the last 10 sessions it was 24 minutes. The pain of these individuals was analyzed using the Numerical Rating Scale (NRS) for pain, and the functionality was analyzed with the anterior trunk flexion (ATF) in the initial and final evaluations. Graph Pad Prism 5.0 was used for statistical analyses, considering $p \leq 0.05$. **Results:** There were no significant differences ($p > 0.05$) regarding the pain (NRS for pain - SVT-STA= p=0.8594 and SVT-Sit= p= 0.2617). However, significatives diferences were found in the ATF the both groups (ATF SVT-Sta= p= 0.0386 and SVT-Sti= 0.0102). **Conclusion:** The preliminary results of this study demonstrate that 20 sessions of SVT did improved with the flexibility in the elderly individuals avaluated the both groups.

Funding: CAPES, CNPq, FAPERJ and Instituto UNIMED.

Keywords: pain; flexibility; mechanical vibration; exercise; eldery.

Effects of systemic vibratory therapy on fear of falling in elderly women with knee osteoarthritis: preliminary results.

Moura-Fernandes, M.C.[1,2], Coelho-Oliveira, A.C.[1,3], Trindade-Gusmão, L.C.[4], Souza-Rocha, W.[1], Melo-Lima, P.[3], Ooka, N.[5], Mozella, A.P.[5], Oliveira, L.P.[5], Bernardo-Filho, M.[1], Sá-Caputo, D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[2] Programa de Pós-Graduação em Ciências Médicas. Faculdade de Ciências Médicas.Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[3]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental. Faculdade deCiências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[4]Programa de Pós-Graduação em Saúde, Medicina Laboratorial e Tecnologia Forense. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil.

[5]Departamento de Especialidades Cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Correspondence author: marciafernandesfisio@hotmail.com

Introduction: Knee osteoarthritis (KOA) is one of the orthopedic disorders that most affects the elderly in the world. Also in KOA, fear of falling has a multifactorial approach and may be associated with functional decline, decreased balance, level of pain and depression. Physical exercises is strongly recommended for the managementof KOA individuals. However, these individuals, due to pain, are unable to adhere to an exercise program. Systemic vibratory therapy (SVT), that uses whole-body vibration exercise, could be important to reduce the pain level and to improve the functionality of individuals with different clinical conditions. **Aim:** To evaluate the effect of SVT on fear of falling in elderly individuals with KOA. **Methods:** This is a randomized, longitudinal, single-blind clinical trial, approved by the Ethics Committee in Research involving Human Beings CAAE nº198 26413.8.0000.5259, registered in the Brazilian Clinical Trials Registry (ReBEC nº RBR 738wng). All participants were informed about all stages of the investigation and signed an Informed Consent Form before starting anyprocedure. Fifteen elderly women with primary KOA were allocated to the SVT group (GSVT), n = 8 (Ahlbäck right degree 1= 50%, Ahlbäck right 2=12.5%, Ahlbäck right 5= 12.5%, Without Ahlbäck right=25%, Ahlbäck left degree 1= 75%, Ahlbäck left degree 2= 12.5%, Ahlbäck left degree 5=12.5%, Ahlbäck bilateral= 75%, Ahlbäck unilateral= 25%, Age= 63.25±6.67, Stature= 1.58±0.05, Body mass= 92.44±12.21 and body mass index (BMI)= 37.21±5.63) and in the SHAM group (GSHAM), n = 7 (Ahlbäck right degree 1= 57%, Ahlbäck right 4=28%, , Without Ahlbäck right=15%, Ahlbäck left degree 1= 57%, Ahlbäck left degree 3= 14,3%, Ahlbäck left degree 4=14.33%, Without Ahlbäck left= 14.3%, Ahlbäck bilateral= 86%, Ahlbäck unilateral= 14%, Age= 65.57±6.80, Estature= 1.54±0.03, Body mass= 76.97±15.08 and BMI= 32.37±6.42). The GSTV performed ten sessions of SVT on a side alternating vibrating platform (VP), with a progressive frequency of 5 to 14 Hz, peak-to-peak displacement of 2.5, 5.0 and 7.5 mm, in three series,

with 3 minutes of work, 1 minute rest, 2 times a week, for 4 weeks. The same position was used in GSHAM, however the VP was turned off and customized. Fear of falling was assessed using the Falls Efficacy Scale- International (FES-I) at baseline and final assessment. The data were analyzed with appropriate statistical tests using the Graph Prism software and considering $p<0.05$. **Results:** No significant differences ($p>0.05$) were found regarding the fear of falling (FES-I= $p= 0.6125$). **Conclusion:** The preliminary results of this study demonstrate that 10 sessions of SVT did not interfere with the fear of falling in elderly women.

Funding: FAPERJ, CAPES and CNPq.

Keywords: knee osteoarthritis; functionality; fear of falling; mechanical vibration; exercise.

Effects of systemic vibratory therapy on quality of life of elderly individuals.

Souza-Gama, M.A.[1], Moura-Fernandes, M.C.[1,2], Coelho-Oliveira, A.C [1,3], Valerio-Penha, A.G.[3], Jaques-Albuquerque, L.T[1], Silva-Oliveira, L.[1], Oliveira, L.P.[4], Bernardo-Filho, M.[1], Sá-Caputo, D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[2]Programa de Pós-Graduação em Ciências Médicas. Faculdade de Ciências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[3]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental. Faculdade deCiências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[4]Departamento de Especialidades Cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Corresponding author: drmarcogamafisioperito@gmail.com

Introduction: The aging is closely associated with physiological changes in several systems that can lead to functional decline and consequent frailty of an individual. Falls in elderly are widely reported and can result in damage to the musculoskeletal system, long-term hospitalizations, social withdrawal that can have a direct influence on the quality of life. Exercise is recommended for the prevention and or treatment of various diseases. Systemic vibratory therapy (SVT), that generates whole-body vibration exercise (WBVE) in an individual that is exposure to mechanical vibration produced in vibrating platform (VP), has been suggested as a clinical intervention. SVT has potential benefits for reducing pain, improving the functionality, and functional capacityof elderly individuals. **Aim:** To evaluate effects of SVT on quality of life in elderly individual. **Methods:** This study included 27 elderly (Sistemic Vibratory Therapy - Stand Position (SVT-Sta), n=14 and Sistemic Vibratory Therapy - Siting Position (SVT-Sit), n=13) aged 68.3 ± 6.1 years, height 152.8 ± 28.1 cm, 70.7 ± 16 .06 kg of body mass and with 28.9 ± 5.6 Kg/m² of body mass index (BMI), of both sexes, with a score through the Phenotype of Fried *et al* 3.7 ± 1.2 and performed 20 TVS sessions ona side alternating VP with progressive frequency from 5 to 14 Hz, peak-to-peak displacement of 2.5, 5.0 and 7.5 mm, in three series, with 3 minutes of work, 1 minute rest, 2 times a week. The quality of life was assessed using the Short Form Health Survey 36 (SF-36) at baseline and final assessment. Graph Pad Prism 5.0 was used for statistical analyses, considering $p \leq 0.05$. **Results:** Significant differences ($p > 0.05$) were found regarding the quality of life both groups (SVT-Sta (p=0,04) and SVT-Sit (p=0,009). **Conclusion:** The results of this study demonstrate that 20 sessions of SVT were able to improve the quality of life in both groups (SVTG-Sta and SVTG-Sit).

Funding: FAPERJ, CAPES, CNPq, Instituto Unimed.

Keywords: quality of life; elderly; whole body vibration; exercices.

Effects of whole-body vibration exercise on cutaneous tissue repair in male *WISTAR* rats.

Alves, M.A.[1], Sá-Caputo, D.C.[2], Amadeu, T.P.[1], Cardoso, A.L.B.D.[2], Souza, J.B.[4]

[1]Laboratório de Imunopatologia, Faculdade de Ciências Médicas, UERJ.

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Policlínica Universitária Piquet Carneiro e Instituto de Biologia Roberto Alcântara Gomes, UERJ.

[4]Faculdade de Ciências Médicas, UERJ.

*Correspondence author: Matteus007@gmail.com

Introduction: The skin is subject to various types of injuries that can lead to cell death and tissue loss. Tissue repair is a complex process characterized by the inflammatory, proliferative, and remodeling phases. Due to intrinsic and extrinsic factors, this process can be affected, leading to fibrosis formation or the cessation of the healing process. Venous and diabetic ulcers are examples of wounds with difficulty in healing. Physical exercise practices are related to the improvement of tissue repair process, but individuals may have difficulty in mobility, thus unable to perform physical exercises. Whole-body vibration exercise has been gaining prominence in the field of alternative treatments as it has been associated with various benefits for the human body. Being a viable alternative for patients with limited mobility, vibration appears to be an alternative for the healing process in individuals with chronic injuries. Few studies have related the effects of whole-body vibration to wound healing, necessitating the use of experimental models for better understanding. **Aim:** To investigate the effects of whole-body vibration exercise on cutaneous tissue repair in male Wistar rats compared to sham control animals that didnot receive vibration intervention. Investigation performed by analyzing wound contraction, re-epithelialization, distribution of inflammatory cells, organization and distribution of collagen fibers, myofibroblastic differentiation, and angiogenesis. **Methods:** The study, approved by opinion 008/2021, used 9 male Wistar rats, aged two months, divided into Sham and Vibration groups. The Vibration group received vibration intervention on a vertical displacement platform for 15 days, with 4 days ofrest. During this period, the wounds on the dorsum were photographed and monitored through drawings on the day of injury (d0), 7 (d7), and 15 (d15). On d15, the animals were sacrificed, and the wound with adjacent healthy skin was collected. The samples were fixed in formalin, processed, and embedded in paraffin. The sections were stained with hematoxylin and eosin (HE), Gomori's Trichrome, and Picrosirius Red. Immunohistochemical staining for smooth muscle alpha-actin expression was also performed. **Results:** The data obtained from macroscopic analysis evaluating wound area and re-epithelialization showed no significant difference (p-value of 0.0952 and 0.2778, respectively). Microscopic evaluations demonstrated similar tissue structure between the groups and low density of inflammatory cells in HE staining. Collagen fibers were observed parallel to the surface with thick fibers and green staining in Gomori staining and reddish-yellow staining in Picrosirius Red staining in both groups. Immunohistochemistry revealed a possible influence on increased angiogenesis, with widely distributed vessels in the dermis, higher concentration at the wound edges, along with highly concentrated myofibroblasts at the edges of the wounds in animals that underwent the vibration procedure. **Conclusion:** The preliminary results indicate or suggest positive effectson cutaneous wound healing in rats; however, further analysis needs to be performed to determine the mechanisms involved.

Financial Support: *Conselho Nacional de Desenvolvimento Científico e Tecnológico* – CNPQ.

Keywords: Wound Healing, Skin, Vibratory Platform, Vibration, Rats.

Systemic vibratory therapy: alternative treatment for individuals with knee osteoarthritis: preliminary results.

Melo-Lima, P.*[1,2], Cardoso, A.L.B.D.[2], Coelho-Oliveira, A.C.[1,2], Trindade-Gusmão, L.C[2,3], Moura-Fernandes, M.C.[2,4], Rocha, W.S.[2], OOKA, N.[5], Oliveira- Palmeira, L.[5], Mozella A.P.[5], Bernardo-Filho, M.[2], Sá-Caputo, D.C.[1,2]

[1]Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 20950-003, Brasil.).

[2]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísicae Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, 20950-003, Rio de Janeiro, Brasil.

[3]Programa de Pós-graduação em Saúde Medicina Laboratorial e Tecnologia Forense, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, 20950-003, RJ, Brasil.

[4]Programa de Pós-graduação em Ciências Médicas, Universidade do Estado do Rio deJaneiro, 20950-003, Rio de Janeiro, RJ, Brasil.

[5]Departamento de Especialidades Cirúrgicas, Faculdade de Ciências Médicas Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, 2550-170, Brasil.

*Corresponding author: philipemelo18@hotmail.com

Introduction: Knee osteoarthritis (KOA) is a chronic disease characterized by pain, instability, stiffness, crepitus and decreased range of motion, reducing the individual's functionality. In this context, these individuals have difficulty in adhering to physical exercise. Considering this information, systemic vibratory therapy (SVT) may be a positive intervention for this population. **Aim:** To analyze effects of SVT on the functionality of KOA individuals with the Short Physical Performance Battery (SPPB). **Methods:** This is a randomized, interventional, longitudinal study with blind analyses. Eighteen individuals with KOA were randomized into two groups, SVT Group (GSVT, n=10 59.8+8.0 years; 96.61 Kg ± 21.9 body mass; 1.60 m ± 0.1 height; 37.98 Kg/m² ± 9.1 body mass index) and Sham Group (GS, n=8 63.5 ± 8.7 years; 78.81 kg ± 15.4 body mass; 1.57 m ± 0.1 height; 31.56 Kg/m² ± 5.8 body mass index). A side alternating vibrating platform (VP) was used, with frequency 5 to 14 Hz, 2.5, 5.0, 7.5mm (peak-to- peak displacement), 3 minutes of work and 1 minute of rest. This protocol was performed with the individual sitting in an ergonomic chair, with hands on knees in a static position with feet on the base of the VP, for five weeks, twice a week. The SPPB was applied before the first and after the last intervention of SVT to assess the individual's functionality. GraphPad Prism 6.0 was used, and the t-Student test was performed for independent samples, the data were expressed as mean ± standard deviation. **Results:** No significant difference was observed in the functionality of individuals between the GS groups (3.87 ± 0.3 Balance Test Score; 3.37 ± 0.7 Gait Speed Test Score; 2.37 ± 1.4 Five-Times Sit-To-Stand Score) and SVT group (3.9 ± 0.3 Balance Test Score; 3 ± 0.9 Gait Speed Test Score; 1.7 ± 1 Five-Times sit-To-Stand Test Score) after the protocol. *p*-value= 0.43 (Balance), *p*-value= 0.18 (Gait Speed Test), *p*-value= 0.13 (Five-Times sit-To-Stand Test). **Conclusion:** The prelimary resultssuggest that the SVT did not interfere in the functionality of individuals with KOA. More studies with larger samples are needed to better know and understand the results.

Trial register: CAAE 19826413.8.0000.5259

Funding: FAPERJ, CNPq, CAPES – Finance code 001.

Keywords: Knee Osteoarthritis, mechanical vibration, function, "Short Physical Performance Battery".

Does the effects of whole body vibration (WBV) contribute to the improvement of balance and gait of post-stroke patients? Literature review.

Alves-Cunha, R.S.[1,3]; Coelho-Oliveira, A.C.[1,2]; Sá-Caputo, D.C.[1,2,3]; Bernardo-Filho, M.[3]

[1]Programa de Mestrado Profissional em Saúde, Medicina Laboratorial e Tecnologia Forense. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil.

[2]Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidade do Estado do Rio de Janeiro. Rio de Janeiro, Brasil.

[3]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísicae Biometria, Instituto de Biologia Roberto Alcantara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil.

*Correspondence author: rosane66rj@hotmail.com

Introduction: Stroke is the second leading cause of death worldwide. According to World Health Organization (WHO) one in four individuals will have a stroke during their lifetime. Among the measures to be adopted, health education, such as not smoking, not consuming alcoholic beverages, maintaining the ideal weight, keeping blood pressure under control, drinking plenty of water, among other measures, are fundamental for the prevention of stroke. After hospital discharge, during the period of physical rehabilitation, many individuals have motor sequelae, including balance and gait development. In this context, whole-body vibration (WBV) has been an eligible therapy by many reference centers around the world, as a tool used in the rehabilitation of post-stroke patients. **Aim:** To verify if WBV contributes to the improvement of balance and gait in post-stroke patients. **Methods:** Searches were carried out in three databases: PubMed, Physiotherapy Evidence Database (PEDro), Scopus, on April 26th 202, which included non-randomized clinical trials in english that evaluated the effects of WBV on balance, gait and rehabilitation in adults with a clinical diagnosis of stroke. Studies with another primary diagnosis, as well os abstracts published in congresses andbooks, were excluded. Several reference rehabilitation centers for people with stroke sequelae in the world were included. **Results:** Searches were carried out in the databases, being eligible for the study, fifteen articles that met the inclusion criteria, namely: WBV, gait, balance, post-stroke; rehabilitation **Conclusion:** The application of the WBV suggests that gait and balance performance can be improved in post-stroke patients.

Funding: CNPq, FAPERJ, CAPES.

Keywords: Whole Body Vibration; Stroke; Balance; March; Rehabilitation.

Effects of whole-body vibration on workers with low back pain: a narrative review.

Alves-Cunha, R.S.[1,3], Souza-Rocha, W.[3], Sá-Caputo, D.C.[1,2,3], Bernardo-Filho, M.[3]

[1]Programa de Mestrado Profissional em Saúde, Medicina Laboratorial e Tecnologia Forense. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil.

[2]Programa de Pós-graduação em Fisiopatologia Clínica e Experimental, Universidadedo Estado do Rio de Janeiro. Rio de Janeiro, Brasil.

[3]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísicae Biometria, Instituto de Biologia Roberto Alcantara Gomes e Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Brasil.

*Correspondence author: rosane66rj@hotmail.comORCID: https://orcid.org/0000-0003-2227859

Introduction: Low back pain (LBP) is the main cause of disability worldwide, being the condition that causes a greater number of people to need rehabilitation. Worldwide, in 2020, LBP affected 619 million people. Being the highest prevalence globally among musculoskeletal conditions. It is estimated that the number of cases will increase to 843 million cases by 2050, a fact driven by population expansion and aging. Nonspecific LBP is the most common presentation, accounting for approximately 90% of cases. Most of the symptoms disappear without intervention. However, a portion of the population requires non-surgical clinical interventions and there are some cases inwhich surgery is indicated. LBP, despite a series of interventions to reduce its impact, has been a major public health problem, bringing harm to individuals, employers and society. **Aim:** To estimate the effect of whole-body vibration exercise on workers with chronic low back pain. **Methods:** Database searches were performed on the following platforms: Pubmed, Scopus, MEDLINE, Physiotherapy Evidence Database (PEDro), on July 29, 2023, including randomized clinical trials in English that evaluated the effects of whole-body vibration (WBV) as physical activity aimed at reducing chronic low back pain in individuals at their workplace. **Results:** Searches were carried out in databases, following inclusion and exclusion criteria, being for inclusion: complete texts; English language; that bring the theme according to the question elaborated for research; following the keywords. For deletion: Texts in languages other than English; closed for complete reading; that did not address the topic. In the end, ten studies were eligible. **Conclusion:** Participating in workplace fitness programs can improve health- related fitness and reduce risky behaviors. Whole-body vibration exercise can provide more benefits than classic exercises. In addition to being carried out in protocols that do not require a prolonged approach, which can increase adherence to programs. And according to studies, WBV training appears to be an effective, safe and appropriate intervention for employees with chronic low back pain.

Funding: CNPq, FAPERJ, CAPES.

Keywords: Whole Body Vibration; Back Pain; Musculo-skeletal; Workplace; Exercise.

Reliability and measurement error of the rectus femoris muscle echo intensity obtained by ultrasoundin type 2 diabetes older individuals.

Soares, A.L.C.[1], Arruda, B.R.[1], Cobas, R.A.[2], Gomes, P.S.C.[1*]

[1]Laboratório Crossbridges, Programa de Pós-Graduação em Ciências do Exercício e doEsporte, Instituto de Educação Física e Desportos, Universidade do Estado do Rio de Janeiro, Rio de Janeiro - RJ, Brasil.

[2]Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio deJaneiro - RJ, Brasil.

*Corresponding author: paulo.gomes@uerj.br

Introduction: Muscle echo intensity is a non-invasive investigation identifying intramuscular fat and fibrous tissue by analyzing an ultrasound image with 256 gray scales. This variable can potentially accompany muscle quality in training studies associated with mechanical vibration, blood flow restriction, electro stimulation, among others, in populations with some comorbidity, athletes, and persons recovering from muscle injury. However, there is a need to determine the quality of the measurement so that possible changes related to the interventions can be attributed to the treatments and not to the error resulting from the measurement. **Aim:** To determine the intra- and inter-rater reliability and measurement error of the rectus femoris muscle echo intensity obtained by ultrasound in type 2 diabetes older individuals. **Methods:** The study included 37 older individuals (19 women) with type 2 diabetes, aged 75 ± 7 years, and abody mass index of 26.2 ± 7.4 kg/m^2. Images were collected using an ultrasound scanner in B-mode, with a 4 cm linear transducer, 8 cm depth, 10 MHz frequency, and 80 dB gain. The probe was positioned at the midpoint between the iliac spine and the upper edge of the patella and transversal to the rectus femoris muscle. The histogram function in polygonal mode analyzed the echo intensity measurement using a Java- based open-source image processing program developed at the National Institutes of Health (ImageJ, version 1.50f). **Results:** The intraclass correlation coefficient, typical error of measurement, and coefficient of variation were, respectively, 0.98 [CI: 0.96-0.99], 2.7 a.u., and 0.8% for intra-rater comparison and ranged from 0.98 to 0.99 [CI: 0.96-0.99], 1.1 to 2.7 a.u., and 0.6 to 0.8% for inter-rater comparison. **Conclusion:** The echo intensity of the rectus femoris data showed reliable results and low measurement errors for intra- and inter-rater comparisons. Thus, this measure may be used to monitor future studies with interventions for assessing muscle quality in type 2 diabetes older individuals. Future studies, though, need to analyze how minor modifications in muscle quality can be observed with this technique.

Keywords: Quadriceps muscle; Reproducibility; Ultrasonography

Whole-body vibration influence on cognition (reasoning) on a group of young adults.

Duarte, M.L.M.[1*], Vasconcelos, D.A.[1], Donadon L.V.[1],Nick, H.C.[1], Neves, J.A.B[2].

[1]GRAVIsh: Group of Acoustics and Vibration in Human Beings, Graduation Program in Mechanical Engineering (PPGMEC), UFMG, MG, Brazil.

[2]P Sociology Department; Philosophy and Human Science School (FAFICH), UFMG, MG, Brazil.

UFMG – Universidade Federal de Minas Gerais, Av. Antônio Carlos, 6627 – Pampulha, Campus Universitário, 31270-901, Belo Horizonte/MG, Brazil.

*Corresponding author: mlmduarte@ufmg.br

Introduction: Whole-Body Vibration (WBV) is present in everyday life, since everyone uses at least one means of transport to go out and about (car, bus, train, etc). Besides it may be possible that the same person works using equipment that transmits mechanical vibration to the whole body, like agricultural machines (e.g., tractors), industrial machines (e.g., forklift trucks), buses, trains, cars, etc. It is found in the literature that 5Hz frequency may be deleterious for cognition (Firmino et al, 2021; de Araújo, 2016; Nick et al, 2019), since it is the one that has the highest seat-to-head transmissibility (STHT) (Rakheja, 2010). On the other hand, 30Hz frequency has been used to improve cognition (Fuermaier et al, 2014a, 2014b; Regterschot et al, 2014; de Araújo, 2016; Nick et al, 2019). The current study used these two frequencies alongside two different levels of mechanical vibration, 0.5 and 1.2m/s^2 regarding as being low andhigh levels of amplitudes, respectively (Zamanian, et al, 2014), ending up in 4 different orders of vibration exposure, so to check their influence. It was used also no vibration atthe beginning and at the end of the tests to be a control parameter and to study the residual effects, respectively. **Aim**: The objective of the study was to verify the influence of frequency, amplitude, gender, and moment of exposure on the cognitive ability of reasoning in a group of young adults. Moreover, to determine the eventual residual effects of the mechanical vibration parameters on cognition (reasoning) and to investigated possible influences of a learning effect regarding the cognitive game by changing the order of vibration exposure. **Methods**: Forty volunteers (28 men and 12 women) were tested on a homemade vibrating platform. For that, they played a game part of a cognitive training App (NeuroNation, 2022), called Solitaire. The commercial App was developed to test 4 different areas of human cognition: attention, velocity, memory, and reasoning; the last being the objective of this study. The reasoning was defined by the App as the capacity to take conclusions from information. The App uses points, precision, and reaction time as a scoring system for individual performance evaluation. The 40 volunteers were divided into 4 groups of 10 (7 men and 3 women in each), but everyone was exposed to all vibrating parameters. Only the order of exposurechanged among the groups. In total, the experiment was composed of six stages. The first and last were control ones with null values of vibration from the vibrating platform.The 4 vibration stages were in among those in their respective order for each group. Two statistical analyses were performed to analyze the results, one descriptive, with the use of graphs, and another multilevel. The research was approved by the university ethics committee under the number CAAE:15856519.4.00005149. **Results**: The results showed very little difference in performance between men and women, regarding vibration parameters and the stage of exposure. The most prominent effect could be attributed to a learning effect that was found in the multilevel analysis as the most significant factor. **Conclusions**: One possible explanation for the findings is that since the volunteers were exposed to all frequencies,

their effects canceled each other. To confirm that, the study has to be repeated with only one frequency at a time per group and is ongoing.

Acknowledgment: The authors would like to thank Synaptikon GmbH for the use of the NeuroNation App. Also, to CAPES for the scholarship of both Daniel A. Vasconcellos e Herbert C. Nick. Last, but not least, to all volunteers that took part in the research.

Keywords: Whole-body Vibration. Cognition. Reasoning

Immediate effects of whole-body vibration exercise onsoluble TNF receptors in older adults.

Almeida, H.C.[1], Lage, V.K.S.[2], Santos, J.M.[1], Paula, F.A.[1], Santos, J.N.V.[2], Lima, L.P.[1],Coelho-Oliveira, A.C.[3], Bernardo-Filho, M.[3], Sá-Caputo, D.C.[3], Lacerda, A.C.R.[1,2], Mendonça, V.A.[1,2*]

[1]Programa de Pós-Graduação Multicêntrico em Ciências Fisiológicas, UFVJM,Diamantina, MG, Brasil.

[2]Programa de Pós-Graduação em Ciências da Saúde, UFVJM, Diamantina, MG,Brasil.

[3]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental, UERJ, RJ,Brasil.

*Corresponding author: vaafisio@hotmail.com

Introduction: The aging process triggers a low-grade chronic inflammation, known as "Inflammaging", causing increased production and release of cytokines, especially tumor necrosis factor alpha (TNF-α) and its receptors (sTNFr1 and sTNFr2). sTNFr1 is directly related to pro-inflammatory and apoptotic effects and sTNFr2 to immunoregulatory and anti-inflammatory functions. Studies demonstrate the central role of physical exercise in promoting healthy aging, as it has a positive influence on theinflammatory profile. Whole-body vibration exercise (WBVE) is a non-invasive intervention that has been shown to have potential benefits for older adults, including improvements in muscle strength, balance, and bone density. **Objective**: The aim of thisstudy was to evaluate the immediate impact of the WBVE action on inflammatory parameters in older adults. **Methods**: The study included 22 elderly men and women over 65 years of age, who were cross randomized into two groups. An intervention group (squat with WBVE), which received the acute stimulus of WBV and a control group (squat without WBVE) that did not receive the intervention. Blood was collected to assess TNF receptors at baseline and shortly after the exercise sessions. The study was approved by the Research Ethics Committee under number 2.282.653. Data were analyzed using the Statistical Package for the Social Sciences (SPSS, version 22.0, IBM®, Chicago, IL, USA) and presented as mean, 95% confidence interval (95% CI). Comparisons between groups were performed using the unpaired t test or the Mann-Whitney test, and the confidence interval used was 5%. **Results:** The absolute values of sTNFr1 decreased when only squatting was performed (-27.8, p=0.538) and increased with the addition of WBVE (+4.29, p=0.620). sTNFr2 also decreased with squatting (- 19.8, p=0.949), but increased significantly with the addition of WBVE (+375,0, p=0.002). **Conclusions**: Performing the squat without WBVE did not significantlyimpact the inflammatory profile of the older adults. When WBV was added to the squat,there was a significant increase in sTNFr2, which is associated with inflammatory homeostasis and has an anti-inflammatory profile. This result indicates a possible potential of WBVE in modulating parameters associated with "Inflammaging".

Financial Support: FAPEMIG, CNPq and CAPES.

Keywords: Whole Body Vibration, Aging, Inflammation, sTNFr1, sTNFr2.

Effects of systemic vibratory therapy on functionality, urinary incontinence and quality of life in women with osteoarthritis of the knees aging over fifty years old: preliminary findings.

Souza-Rocha, W.[1], Moura-Fernandes, M.C. [1,2], Coelho-Oliveira, A.C. [1,3], Trindade-Gusmão, L.C. [4], Melo-Lima, P.[3], Ooka, N,[5], Mozella, A.P.[5], Oliveira, L.P.[5], Bernardo-Filho, M.[1], Sá-Caputo, D.C.[1]

[1]Laboratório de Vibrações Mecânicas e Práticas Integrativas, Departamento de Biofísica e Biometria, Instituto de Biologia Roberto Alcântara Gomes and Policlínica Universitária Piquet Carneiro, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[2]Programa de Pós-Graduação em Ciências Médicas. Faculdade de Ciências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[3]Programa de Pós-Graduação em Fisiopatologia Clínica e Experimental. Faculdade deCiências Médicas. Universidade do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

[4]Programa de Pós-Graduação em Saúde, Medicina Laboratorial e Tecnologia Forense. Universidade do Estado do Rio de Janeiro, Rio de Janeiro, Rio de Janeiro, Brazil.

[5]Departamento de Especialidades Cirúrgicas, Faculdade de Ciências Médicas, Universidade do Estado do Rio de Janeiro, Rio de Janeiro, RJ, Brasil.

*Corresponding author: waleska.edfisio@gmail.com

Introduction: Knee osteoarthritis (KOA) is a disease that involves the entire joint and affected patients may develop complaints of severe joint pain, slow gait and impaired balance. Obesity is a risk factor for the worsening of symptoms in individuals with KOA and may be a facilitating factor for the onset of urinary incontinence and worsening of quality of life scores. Exercise is recommended to KOA individuals. Whole-body vibration exercise (WBVE), that is produced in the systemic vibratory therapy (SVT) may be a management strategy to management of KOA individuals. **Aim:** To evaluate effects of SVT on functionality, urinary incontinence and quality of life in women with KOA aging over fifty years **Methods:** Longitudinal study, with blinded analyses, with an interventionist method design, where women(n=6, age= 67.33±5.65 years old, stature= 1.55±0.06m, body mass = 87.20±5.63 kg, body mass index= 36.32±3.76 kg/m2) with KOA performed SVT on a side alternating vibrating platform, with progressive frequency of 5 to 14 Hz, peak-to-peak displacement of 2.5, 5.0 and 7.5 mm, in three series, with 3 minutes of work, 1 minute rest, 2 times a week. The presence of urinary incontinence and quality of life was assessed using the International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF) and functionality was assessed using Short Physical Performance Battery (SPPB) at baselineand at the final assessment. **Results:** There were no significant differences ($p>0.05$) regarding the evaluated parameters (ICIQ-SF - Frequency = $p=0.174$, Gravity= $p= 0.051$ and Quality of life= $p= 0.099$) and SPPB (Balance= $p= 0.695$, Walking speed= $p=0.690$ and Sit and stand test= $p= 0.5336$) were found. **Conclusion:** The preliminary results indicate that that 10 sessions of SVT did not interfere with the functionality,urinary incontinency, and quality of KOA individuals.

Funding: FAPERJ, CAPES and CNPq.

Keywords: knee osteoarthritis; urinary incontinence; functionality; quality of life; whole-body vibration exercise.

The influence of whole-body vibration in the cognitive tasks and visual performance: an experimental study.

Nick, H.C[1]., de Araújo, F.S.B.[2], Duarte, M.L.M.[1,2*]

[1,2]GRAVIsh: Group of Acoustics and Vibration in Human Beings

[2]Graduation Program in Mechanical Engineering (PPGMEC), UFMG, MG, Brazil.

[3]Mechanical Engineering Department (DEMEC), UFMG, MG, Brazil.

UFMG: Universidade Federal de Minas Gerais, Av. Antônio Carlos, 6627 – Pampulha, Campus Universitário, 31270-901, Belo Horizonte/MG, Brazil.

*Corresponding author: mlmduarte@ufmg.br

Introduction: Whole-body vibration (WBV) can affect individuals both psychologically and physically, which in turn can interfere with their focus, dexterity, visual perception, and performance (GRETHER, 1971). These effects can be positive or negative, depending on the characteristics of the vibration (JIAO, et al., 2004); (BOLB, MUHAMMAD, GIBB, 2010). Therefore, a deeper investigation of the variables involved is of paramount importance (PORTALE AGENTI FISICI, 2017). **Aim:** This study's first aim was to try to find the relationship between exposure frequency to WBV and performance or sensation in humans. The second aim was to try to identify the worst and best frequencies that influence the cognitive behavior of attention and visual perception skills over time. **Methods:** Two experiments were carried out, using 20 volunteers in total, extracting data from general subjective sensations and objective measures through numerical results for the performance of the game. The peak acceleration was kept constant at 0.7 m/s² and the frequency varied. In the first experiment, frequencies of 5, 10, 15, and 30 Hz and a stationary condition at 0 Hz for control were used. Thereby the objective was to determine the best and worst frequency in relation to the tested skill. In the second experiment, the best and worst frequencies obtained in the first experiment were used to analyze the cognitive behavior of attention skills and visual perception over time. This original study was approved by the University's Ethics Committee under the number CAAE No.55602816.4.0000.5149. **Results:** The findings for the first experiment, statistically, showed no significant difference in the objective results between the requencies. In the subjective analysis, 90% of the volunteers indicated the frequency of 30 Hz as the best and 5 Hz as the worst. Despite the short time span, the volunteers concluded in their subjective analysis that the 30 Hz frequency had fewer degrading effects on game performance for the visual perception and attention task compared to the 5 Hz frequency over time. **Conclusion:** The volunteers' trend regarding the mean results was perceived to have the best scores and accuracy at 30 Hz, and the best reaction time at 15 Hz. At 10 Hz, the worst scores and reaction time were obtained, and at 5 Hz the worst accuracy. Moreover, when analyzing the subjective results and comparing the results of the volunteers to himself, there is clear evidence that the higher the frequency the better, despite there being no linear relationship between frequency and objective measures. In the second experiment, it was studied the effect of the 5 Hz and 30 Hz frequency over time and the results also gave small evidence that the 30 Hz frequency was better than 5 Hz, mainly in terms of accuracy. However, despite the short time interval, the volunteers concluded in their subjective analysis that 30 Hz frequency had fewer degrading effects than 5 Hz

frequency over time.

Financial Support: The authors thank Dr. Conny Lin for partnering with the company that allowed the use of the Fit Brains App for free during the research.

Keywords: Whole-Body Vibration (WBV); Cognition; Visual performance; Attention.