Literature Review

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Effect of whole body vibration on hospitalized patients: a systematic review

Efeito da vibração de corpo inteiro no paciente hospitalizado: revisão sistemática

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ABSTRACT | INTRODUCTION: Whole Body Vibration (WBV) training was recently proposed as a training method with the potential to improve body composition and prevent osteoporosis and bone loss.[18] In recent years, some studies have shown that WBV can be a beneficial training mode in strength, physical endurance, mobility-related activities (transfer, balance, and walking) in patients with multiple sclerosis[19], type 2 diabetes[20], chronic obstructive pulmonary disease[21], and recipients of heart transplantation.[22] It becomes relevant due to the high impact on the functionality and consequently the quality of life of hospitalized patients. **OBJECTIVE:** To verify the effect of whole-body vibration in hospitalized patients. **METHODS:** Review randomized controlled clinical trials (RCT) and a pilot study in PubMed, Cochrane Library, Medline, and PEDro databases. The searches in the databases were carried out through combinations (using the "AND" and "OR" connectors) through the search strategies PICOS hospitalized patients, whole-body vibration, physiotherapy, and their respective counterparts in English: "hospitalized patients" "whole-body vibration," "physiotherapy. The PEDro scale with a cutoff point ≥5 was used to analyze the methodological quality. Eligibility criteria; included adult patients (aged ≥18 years); a randomized controlled clinical trial and pilot study design; patients who used whole-body vibration in the hospital setting. **RESULTS:** Six articles published between 2014 and 2018 were included. The therapy proved to be effective in hospitalized patients, with significance in some outcomes 6MWT- 167.9 ± 117.46m to 263.45 ±22124.13m; p<0.001 and FEV1-32.71 ±13.18% pred. for 3.71 ± 13.89%, however, there was no statistical difference in BP and HR. **CONCLUSION:** The use of whole-body vibration proved safe and viable in hospitalized patients. The 6MWT and FEV1 presented in all articles were significant. However, there was no statistical difference in BP and HR. Therefore, randomized clinical trials are needed to investigate this therapy's efficacy and adverse effects. Although positive effects have been reported, we suggest further investigations with controlled parameters and well-designed protocols on a larger scale.

KEYWORDS: Whole body vibration. Physiotherapy. Hospitalized patients.

RESUMO | INTRODUÇÃO: O treinamento com vibração de corpo inteiro (WBV, do inglês *Whole Body Vibration*) foi recentemente proposto como um método de treinamento com potencial para melhorar a composição corporal e prevenir osteoporose e perda de massa óssea.[18] Nos últimos anos, alguns estudos mostraram que o WBV pode ser um modo de treinamento benéfico na força, resistência física, atividades relacionadas à mobilidade (transferência, equilíbrio e caminhada) em pacientes com esclerose múltipla[19], diabetes tipo 2[20], doença pulmonar obstrutiva crônica[21] e receptores de transplante cardíaco.[22] Torna-se relevante em razão ao alto impacto na funcionalidade e consequentemente qualidade de vida dos pacientes hospitalizados. **OBJETIVO:** Verificar o efeito da vibração de corpo inteiro no paciente hospitalizado. **MÉTODOS:** Revisão de ensaios clínicos controlados randomizados (ECR) e estudo piloto nas bases de dados PubMed, Cochrane Library, Medline e PEDro. As pesquisas nas bases de dados foram realizadas através de combinações (utilizando os conectores "AND" e "OR") através das estratégias de pesquisa PICOS pacientes hospitalizados, vibração de corpo inteiro, fisioterapia, e seus respectivos correlatos em inglês: "*hospitalized patients*", "*whole body vibration*", "*physiotherapy*". Utilizou-se a escala PEDro com o ponto de corte ≥5 para análise da qualidade metodológica. Os critérios de elegibilidade; incluiu pacientes adultos (com idade ≥18 anos); um desenho de ensaio clínico controlado randomizado e estudo piloto; pacientes que utilizaram a vibração de corpo inteiro no âmbito hospitalar. **RESULTADOS:** Foram incluídos 6 artigos, publicados entre os anos 2014 e 2018, a terapia mostrou-se eficaz em pacientes hospitalizados, havendo significância em alguns desfechos TC6- 167,9 ± 117,46m para 263,45 ±22124,13m; p<0,001 e VEF1- 32,71 ±13,18% pred. para 3,71± 13,89%, entretanto não houve diferença estatística na PA e FC. **CONCLUSÃO:** O uso da vibração de corpo inteiro mostrou-se segura e viável em pacientes hospitalizados. O TC6 e o VEF1 apresentado em todos os artigos demonstraram significantes, entretanto não houve diferença estatística na PA e FC. Portanto, é necessário ensaios clínicos randomizados para investigar a eficácia e os efeitos adversos dessa terapia. Embora efeitos positivos tenham sido relatados, sugerimos outras investigações em maior escala com parâmetros controlados e protocolos bem elaborados.

PALAVRAS-CHAVE: Vibração do corpo inteiro. Fisioterapia. Pacientes hospitalizados.

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Introduction

Vibration is an oscillatory mechanical stimulus, mainly characterized by its frequency and amplitude[1,2] with possible clinical application, under appropriate conditions, for performing exercises on vibrating platforms. On these platforms, individuals in orthostasis receive mechanical stimuli through their feet generated on the platform. That has been known as the EVCI[3] whole-body vibration exercise.

The EVCI is an important tool to be used in Health Sciences, and the effects of this exercise modality have been researched in healthy individuals[4,5] in the treatment of some disorders[6,7] to promote physical conditioning[8] or to prevent and manage possible clinical problems.[4,5] However, acute and chronic effects seem to be associated with these actions.[2,9]

Such therapy has been related to increased strength generation in the lower limbs due to vibration that induces tissue changes leading to the activation of muscle spindles, causing a reflex contraction to modulate the stiffness of the muscles involved. This response is known as the tonic vibration reflex. Furthermore, afferent fibers stimulated by tendon vibration appear to affect motor unit recruitment and force generation. Furthermore, EVCI seems to inhibit agonist-antagonist co-activation through inhibitory neurons, decreasing the protective forces around the joints[1,9,10], leading to a decrease in the braking force around the joints stimulated by vibration.[1] Regarding chronic effects, the mechanism involved in EVCI would be related to the responses of the neuromuscular and hormonal system.[1]

However, the extensive use of vibrations is still contrasting. Even though many studies have reported notable improvements in muscle strength after acute and chronic exposure to vibration[11-14], other authors have not found any effects.[15,16] One possible reason for these conflicting results could be the use of different protocols. In fact, several factors, such as type of application, amplitude, frequency, and time of exposure to vibrations, can have acute, residual, and chronic effects on neuromuscular performance.[17]

Whole Body Vibration (WBV) training was recently proposed as a training method with the potential to improve body composition and prevent osteoporosis and bone loss.[18] In recent years, some studies have shown that WBV may be a beneficial mode of training in strength, physical endurance, activities related to mobility (transfer, balance, and walking), and mood in patients with multiple sclerosis[19], type II diabetes[20], lung disease obstructive disease[21] and heart transplant recipients.[22] In addition, the effects of WVB on the cardiovascular system have been investigated in several published studies. The decrease in arterial stiffness after training with WBV can reduce the risk of cardiovascular disease.[23,24]

The present study is relevant due to the high impact on the functionality and consequently the quality of life of hospitalized patients due to the reduction in muscle strength due to the prolonged period of immobilization. Thus, this study aimed to verify the effects of whole-body vibration in hospitalized patients to improve the quality of life of patients, regarding the relationship between blood pressure, heart rate, forced expiratory volume in the first minute (FEV1), and the six-minute walk test, through a systematic review study.

Methods

The present study is a systematic review, in which original studies, of the randomized clinical trial and pilot study type, on the effect of whole-body vibration in hospitalized patients were included and analyzed. The systematic review protocol was submitted to PROSPERO, registration number: CRD42020201668. It was prepared following the recommendations of the Cochrane Collaboration and reported under the guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyzes (PRISMA).[25]

Data sources and research strategies

The search for articles to obtain the clinical outcome of the whole body was performed in the Public Medline (PubMed), Medline and Physical Therapy Evidence Database (PEDro), and Scientific Electronic Library Online (SciELO) databases until January 2020 of publications in the language Portuguese or English. The searches in the databases were carried out through combinations (using the "AND" and "OR" connectors) through the search strategies PICOS hospitalized patients, whole body vibration, physiotherapy, and their respective counterparts in English: "hospitalized patients" "whole body vibration," "physiotherapy." The search strategy for the PubMed databases is shown in Table 1.

Table 1. Search strategy in PubMed databases

<<< **Complementary file 1. Database search strategy** >>>

First search - whole[All Fields] AND ("human body"[MeSH Terms] OR ("human"[All Fields] AND "body"[All Fields]) OR "human body"[All Fields] OR "body"[All Fields]) AND ("vibration"[MeSH Terms] OR "vibration"[All Fields]) AND

Second search - (whole[All Fields] AND ("human body"[MeSH Terms] OR ("human"[All Fields] AND "body"[All Fields]) OR "human body"[All Fields] OR "body"[All Fields]) AND ("critical care"[MeSH Terms] OR ("critical"[All Fields] AND "care"[All Fields]) OR "critical care"[All Fields])) AND Clinical Trial[ptyp] whole[All Fields] AND ("human body"[MeSH Terms] OR ("human"[All Fields] AND "body"[All Fields]) OR "human body"[All Fields] OR "body"[All Fields]) AND ("vibration"[MeSH Terms] OR "vibration"[All Fields]) AND hospitalized[All Fields] AND ("patients"[MeSH Terms] OR "patients"[All Fields]) (whole[All Fields] AND ("human body"[MeSH Terms] OR ("human"[All Fields] AND "body"[All Fields]) OR "human body"[All Fields] OR "body"[All Fields]) AND ("vibration"[MeSH Terms] OR "vibration"[All Fields]) AND hospitalized[All Fields] AND ("patients"[MeSH Terms] OR "patients"[All Fields])) AND Clinical Trial[ptyp]

Study selection

The selection of articles was carried out from March 2019 to January 2020, being eligible those who met the following criteria: a) included adult patients (aged ≥18 years); b) a randomized controlled clinical trial and pilot study design; c) patients who used whole-body vibration in the hospital environment. No restrictions were made regarding sex or the duration of the exercise intervention. The articles were included by checking the consistency between the title and objective of each study, followed by reading the abstracts. The main outcomes of interest in the selected articles were blood pressure, heart rate, end-expiratory volume (FEV1), 6-minute walk test.

Study eligibility assessment

For this review, controlled, randomized clinical trials and a pilot study used whole-body vibration in the hospital environment as a treatment were considered. The references of each selected article were checked to identify other potentially qualified studies. Articles that provided insufficient data and used other training outside the hospital were excluded. After reading and inclusion, the works were evaluated to construct the systematic review.

Methodological quality

The quality of the articles included was assessed using the PEDro scale. This evaluates the tests through 11 pre-established items. The first item is an additional criterion and represents the external validity (or "generalization potential" or "applicability" of the clinical trial), not being included in the total scale score. The other items analyze two aspects of the quality of the article: internal validation (items 2 to 9) and whether the article contains sufficient statistical information for the results to be interpreted (items 10 and 11). These items are qualified as "applicable" or "not applicable," generating a total score that varies between 0 and 10 points.

In order to seek rigor in the methodological quality of the selected articles, they were analyzed and classified as "high quality" when they reached a score of ≥5 points on the PEDro scale, or as "low quality" when they obtained a score of <4 on the scale mentioned above. It should be noted that the PEDro score was not used as a criterion for inclusion or exclusion of articles, but rather as an indicator of scientific evidence from the studies (Table 1).

Risk of bias in primary studies

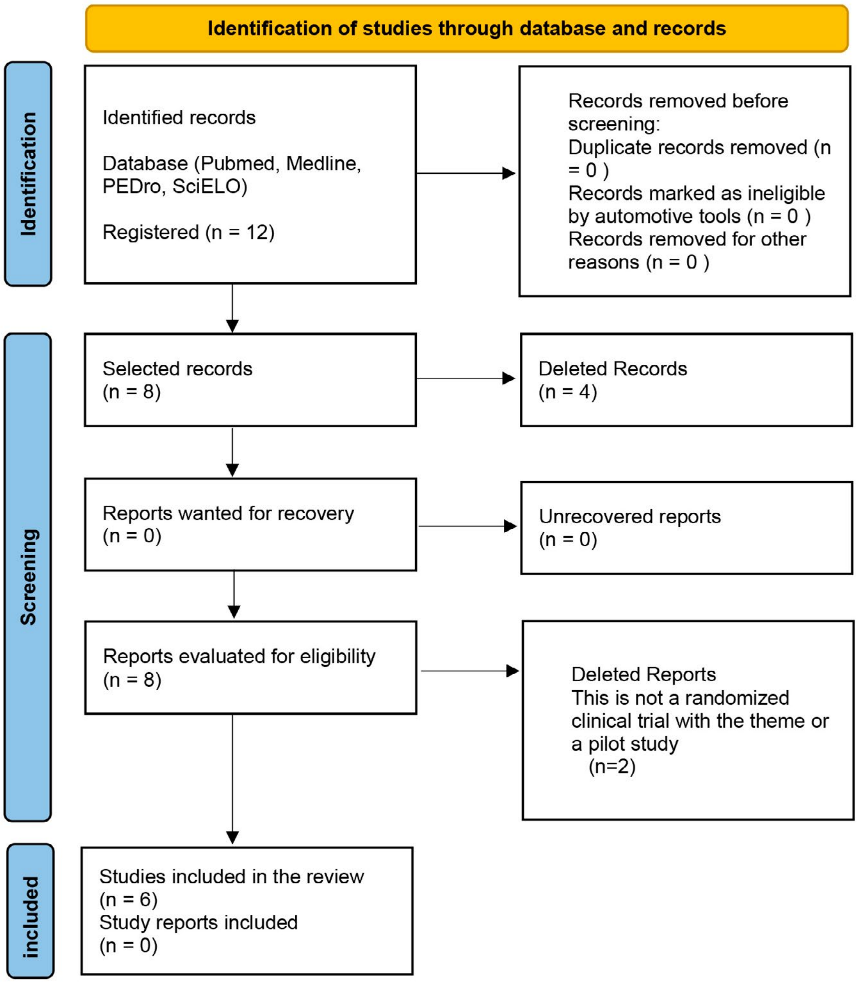
The risk of bias in the studies included in this systematic review was scored using the Review Manager version 5.4 (REVMAN - Cochrane Collaboration) software, based on domains, with the critical assessment made separately for different aspects of risk of bias of the type of study in question.[26]

Results

Description of selected studies

The initial search carried out in the PubMed databases identified 12 records. Eight were considered potentially eligible when the "filter" was applied: randomized clinical trial and pilot study; of these, two articles were excluded for inadequacy after reading the titles and abstracts. Thus, six articles met the eligibility criteria and were included for data capture. The entire search started in March 2019. Figure 1 shows the PRISMA flow diagram of the studies in this review.

Figure 1. Search and selection of studies that address whole-body vibration in hospitalized patients, according to the PRISMA-2020 methodology



Regarding the methodological quality of the articles included (Table 2), there was no study considered to be of "low quality", as they achieved a score equal to or greater than 5 on the PEDro[27] Scale.

Table 2. Methodological quality of studies using the PEDro Scale, the use of whole-body vibration in hospitalized patients, 2019

AUTHOR	1	2	3	4	5	6	7	8	9	10	11	TOTAL
Greulich et al., 2014 [28]	X	X	X	X	X		X		X	X	X	8
T. Boeselt et al., 2016 [29]	X	X	X					X	X		X	5
Brunner et al., 2016 [30]	X	X		X	X			X		X	X	6
Wollersheim et al., 2017 [31]	X			X				X	X	X	X	5
Spielmanns et al., 2017 [32]	X	X	X	X	X		X	X		X	X	8
Pahl et al., 2018[33]	X	X	X	X	X		X		X	X	X	8

Caption: 1) specification of inclusion criteria (non-scored item); 2) random allocation; 3) allocation secrecy; 4) similarity of groups in the initial or baseline phase; 5) masking of subjects; 6) therapist masking; 7) evaluator masking; 8) measurement of at least one primary outcome in 85% of allocated subjects; 9) intention-to-treat analysis; 10) comparison between groups of at least one primary outcome and 11) reporting of measures of variability and estimation of parameters for at least one primary varia

Risk of bias detail

Of the seven items described in the Cochrane Collaboration, the articles included in this review were classified as low risk of bias (Figures 2 and 3).

Figure 2. Risk of bias established by the Cochrane Collaboration[33], from the articles the use of whole body vibration in hospitalized patients, 2019

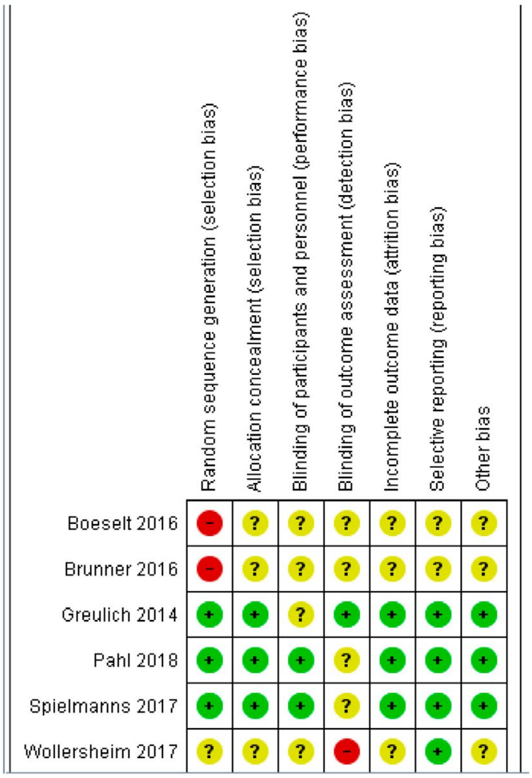
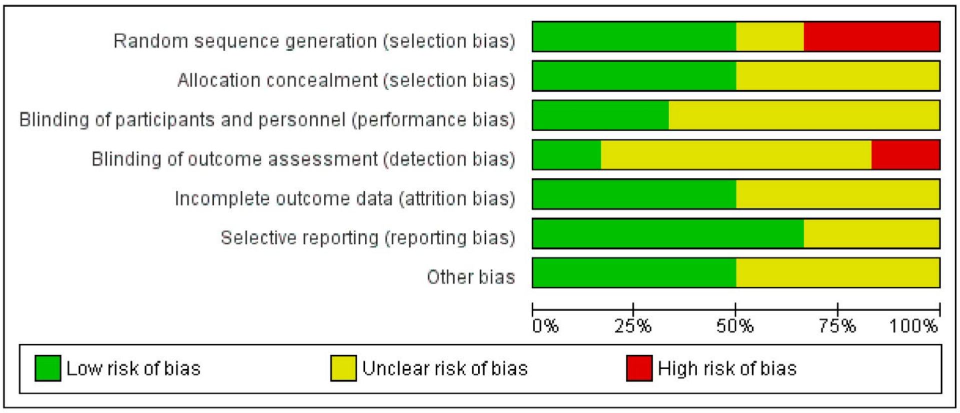


Figure 3. Summary of risk of bias established by the Cochrane Collaboration[33], from articles on the use of whole body vibration in hospitalized patients, 2019



The articles included in this systematic review had a year of publication between 2014 and 2018 (Table 3). Their sample size ranged from 10 to 50 adult individuals, randomized to the intervention group (IG) or control group (CG). The interventions lasted a maximum of 30 min, and the frequency was 2 to 5 times a week. Through the results, some outcomes considered important were divided: Blood pressure (BP), Heart Rate (HR), End expiratory volume in one second (FEV1), and 6-minute walk test (TC6).

Table 3. General characteristics of the studies included in the Systematic Review the use of whole body vibration in hospitalized patients, 2019 (to be continued)

Author, year	Participants (N - GI/GC)	Intervention	Evaluated Outcomes	Results	Conclusion
Greulich et al, 2014[28]	40- 20/20	GI= Mobilization + breathing exercises + passive muscle movements + 3x2 min/day of vibrating platform. CG= 5 min of mobilization + 5 min of sudden movements + 10 min of breathing exercises. Physical therapy consisted of bedside mobilization, respiratory therapy, and passive muscle movements.	TC6 VEF1 SGRQ CAT	FEV1 increased significantly between the two groups. There was no significant difference. The 6MWT showed a significant improvement in the intervention group but not in the control group. The difference between the two groups was significant for the SGRQ.	Therapy in exacerbations did not cause any adverse events, induced clinically significant benefits to exercise capacity and quality of life.
T. Boeselt, 2016[29]	24- 12/12	Supine position device attached to the foot of the bed to transmit sufficient load to the lower limbs of the patient in a 25º inclined bed GI= It was performed in 2 stages, vibrating footplate, training was performed without shoes for 3 min with a frequency of 24HZ and medium intensity. After 1 min of rest, whole-body vibration with a vibrating dumbbell was added in the second stage. GC= Full body vibration in DD+ full-body vibration with a vibrating dumbbell.	PA FC SpO_2	There was a significant increase in blood oxygen saturation (SpO2) in the second period (between the first and second minute) ($p = 0.006$). For WBVD, significant differences were found only for SatO2 and diastolic blood pressure in the first period (between the initial value and the first minute) ($p = 0.003$). Exemplary use of electromyography (EMG) in a healthy subject showed significantly increased electrical activity of the quadriceps femoris muscle (vastus lateralis) during training.	It showed no obvious harm to the patient. WBV and WBVD therapy should be considered for use during treatment in the ICU. More prospective randomized studies are needed to assess the potential beneficial effects of WBV and WBV therapy on rehabilitation in ICU patients.

Table 3. General characteristics of the studies included in the Systematic Review the use of whole body vibration in hospitalized patients, 2019 (continuation)

Author, year	Participants (N - GI/GC)	Intervention	Evaluated Outcomes	Results	Conclusion
Brunner, 2016[30]	10	It began on the first day after discharge from the ICU and was maintained until transfer to a rehabilitation center. Performed under the supervision of a respiratory therapist for five weeks, 10 min a day with frequency up to 10 Hz GI = 10 min of whole body vibration.	TC6 VEF1 maximum workload peak flow VC SF-36	All outcomes were improved, but those that showed significant improvement were: 6MWT, CV, maximum workload, and SF-36 questionnaire. Among the eight measured aspects of health, only the "general medical health" scale showed a significant improvement after completing the training program.	WBV is safe and has not caused any adverse events. However, WBV training cannot be considered for all patients after intervention because there are several barriers to starting this therapy. Among them, the inability for physical training, especially due to critical illness polyneuropathy after a long ICU stay, has to be mentioned. Also, some patients subjectively feel very weak or anxious about this type of therapy.
Wollersheim 2017[31]	19	Passive physiotherapy single session whole body vibration sessions for 15 min, using 2 devices, one with 26 Hz synchronous vibration nine times for the frequency of 1 min and the other with alternating lateral vibration 24 Hz three times for 3 min GI= Mobilization for 6 min, whole body vibration lasting 15 min.	PA SpO_2 intracranial pressure Energy Metabolism PH	Vital signs and hemodynamic parameters were stable, with minimal changes resulting from the intervention. However, they were not considered significant.	WBV is safe and feasible in critically ill patients. Our results support the principle that WBV stimulates muscle and improves muscle metabolism, and therefore may have the potential to prevent and/or treat muscle weakness in critically ill patients.
Spielmanns 2017[32]	27- 14/13	GI= Lateral vibration 15 min, warm-up 5 min, training was performed for 3x2 min (2 min of rest between them with a frequency of 6-10 HZ and mean peak-to-peak displacement of 4-6 mm the first four weeks. Intervals could sit or walk individually; exercise duration and vibration frequency were progressively increased over time Training 2x a week for 30 min for three months. CG= Sessions for 30 minutes of relaxation and respiratory re-education combined with calisthenic exercises.	TC6 SGRQ CAT	Low-intensity WBV increased the 6MWT by 105(45.5-133.5)m (P=0.001), the improvement between groups was significantly greater (P=0.001) compared to the calisthenic treatment group. The SGRQ did not reach significance. However, the difference between the COPD test score groups was significantly higher (P=0.02) in favor of the calisthenic training group.	A low-volume WBV program resulted in significant and clinically relevant improvements in exercise capacity compared to calisthenic exercises in subjects with mild to severe COPD.

Table 3. General characteristics of the studies included in the Systematic Review the use of whole body vibration in hospitalized patients, 2019 (conclusion)

Author, year	Participants (N - GI/GC)	Intervention	Evaluated Outcomes	Results	Conclusion
Pahl et al., 2018[33]	11-6/5	3 sessions per week lasting 20 min GI set of two to four different exercises (static and dynamic squats, heel lift and a combination of both), each exercise lasted from 30 to 60s, with rest for 30 to 60s between exercises and 60 to 120s between sets in the range of frequency 18-25HZ and amplitude 3.5-4mm CG performed aerobic exercises on an ergometric bicycle for 20 min, patients who could not support had an individual interval with rest periods for each exercise session.	PA FC heel height TUG.	Patients in the intervention group reduced the time needed to perform the TUG test (-1.3s, 95% CI-2.53-0.7, p=0.027), while the control group showed no change (-1.1 s.95% CI-6.4 -1, p= 0.138). The WBV significantly increased the height of the jump (2.3 cm, 95% CI 0.1-4.4 p=0.028), they did not observe changes in arterial or HR post-exercise compared to pre-exercise and post-intervention in relation to pre-intervention.	Our results also suggest that WBV can improve mobility and jump height in these patients. Such factors may be associated with greater autonomy and a better survival prognosis. Thus, we recommend the implementation of WBV as an alternative training method for aerobic exercise training during intensive chemotherapy to maintain the functional status of patients.

Caption: BP: Blood pressure; HR: Heart rate; WBV: Whole body vibration; 6MWT: 6-minute walk test; FEV1: Forced Expiratory Volume in First Second; SGRQ: Hospital Saint George Respiratory Disease Questionnaire; CAT: COPD assessment test; ICU: Intensive Care Unit; VC: Tidal volume; WBVD: Whole Body Vibration with Dumbbell; SF-36: Quality of Life Questionnaire; SpO2: Blood oxygen saturation; PH: Potential of hydrogen.

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Blood Pressure (BP)

When evaluating BP, three of the six articles brought outcomes on whole-body vibration therapy. Pahl et al.[33] reported that blood pressure in patients hospitalized during chemotherapy was almost unchanged by WBV or post-exercise compared to pre-exercise and post-intervention compared to pre-intervention. Systolic pressure in the pre-exercise GC-120(115-130) GI 128 (110-145) is presented; post-exercise GC-110 (105-125) GI-110(100-123); pre-intervention GC-114 (112-127) GI-118 (112-137); post-intervention GC-119 (111-136) GI 118 (113-135); diastolic pre-exercise GC-80(60-85) GI 80 (70-90); post-exercise GC-75 (70-90) GI-70(70-80); pre-intervention GC-76 (71-82) GI-79 (68-86); post-intervention GC-77 (71-84) GI 78 (73-83).

Corroborating the previous study, Wollersheim et al.[31] demonstrated that the diastolic blood pressure increased during the period of Physiotherapy compared to the baseline p=0.014, which did not occur during the WBV, the systolic pressure did not differ significantly from the baseline in any of the intervention times.

In contrast, the study Boeselt et al.[29] used predominantly pulmonary and cardiac patients hospitalized in the intensive care unit, showed that there was a slight and transient increase in diastolic blood pressure in the first period (between the initial value and the first minute) of the intervention WBVD GC 0.33 (4.25).

Heart Rate (HR)

Regarding HR, two of the six articles analyzed the outcome. In their study, Boeselt et al.[29] demonstrated a slight reversible increase in HR in a matter of minutes (P=0.011) during WBV in patients admitted to the ICU. No changes remained after the completion of the intervention. The initial increase in HR was lower in patients than controls, which may be due to the influence of drugs that lower HR and blood pressure, such as β-blockers and angiotensin-converting enzyme (ACE) inhibitors. For both drugs, an influence on HR variability.[35] However, the study by Pahl et al.[33] did not observe any change in the groups in the post-exercise heart rate values compared to pre-exercise and post-intervention compared to pre-intervention.

Forced Expiratory Volume in the First Second (FEV1)

Regarding FEV1 two studies analyzed the outcome. Grelich et al.[28] demonstrated that during the time interval between admission and hospital discharge of patients with COPD exacerbation, FEV1 increased significantly in both control groups: 37.9 ±17.41% to 43.23 ±22.8% p = 0.03; intervention 32.71 ± 13.18% to 3.71 ± 13.89% p=0.04). Corroborating the study, Brunner et.al 201630 demonstrated that FEV1 was slightly improved in lung transplant patients, but with no statistically significant difference (before WVB: 1.78±0.14 L; after: 2.04±0.18; p=0.26).

Six-minute walk test (6MWT)

When evaluating the exercise capacity through the 6MWT, Greulich et al.[28] explained that the main outcome measure was the difference between the 6-minute walk test groups (day of discharge-day of admission). In this mentioned study, the 6MWT significantly increased in the WBV, but not in the control group (WBV: 167.9 ± 117.46m for 263.45 ±22124.13m; p<0.001 and CON: 203.79 ± 126.11m for 198.67 ±101.37 m, p=0.001, and p=0.001. The difference between the delta of both groups was significant (control 6.13±81.65m vs. WBV 95.55±76.29m; p=0.007).

Brunner et al.[30] presented the significance of their results in the 6MWT after completing the program (before:132.3 ± 31.2 m; after: 255.5±43.3m; p<0.05), the gain in the 6MWT was 132.2 ±20.0m.

Spielmanns et al.[32] observed that the WBV group managed to increase the 6MWT by 105 (45.5-133.5) m (P=0.001), the improvement between the groups was significantly greater (P=0.001) compared to the calisthenic training (15[-3 to 21]m, P=0.10).

Discussion

The present systematic review found that using whole-body vibration has shown significant improvement concerning the functional part with 6MWT and pulmonary with FEV1, with a similar effect on other outcomes. However, it did not show statistical significance in HR and BP, being surely applicable in hospitalized patients.

According to the 6MWT and FEV1 outcomes, one study demonstrated that in COPD patients, the 6-minute walk test distance (MWD6) progressively decreases over time, the 6MWT contributes to the complete assessment of patients affected by the disease[36-38]. This test can be applied to patients with advanced heart failure who are being evaluated for heart transplantation. Other studies have shown that the 6MWT is valid and reproducible in patients with heart failure, evidence that the test is a reliable means of assessing functional capacity in such patients.[39,40] Researchers have also associated poorer performance on the walk test in COPD patients with low FEV1 values, dynamic hyperinflation, worse disease prognosis (higher rates of exacerbations), and mortality in these individuals.[36,41,42]

In the outcomes that did not have statistical significance HR and BP, an experiment conducted by Robbins et al.[43] showed a significant increase in blood flow velocity without significant changes in heart rate, blood pressure, or peripheral skin temperature. The increase in muscle blood volume and blood flow velocity after vibratory exercise was mainly attributed to vibrations in reducing blood viscosity and increasing its velocity through the arteries.[44] These results are similar to those found in the study by Boeselt et al.[29], which demonstrated a slight increase in HR. These findings indicate that WBV may represent a mild form of exercise for the cardiovascular system.[2]

The articles Boeselt et al.[29] and Wollersheim et al.[31] presented a high risk of bias, making it necessary to present detailed information about the method used, compromising the study's feasibility. If these biases are not dealt with properly, they can have negative repercussions, from the wrong decision-making in health to incorporating new treatments and technologies at the national level that could cause more harm than good.[45]

Notably, whole body vibration therapy was well tolerated by patients surveyed in the studies. However, data on the platform's protocols and their effects need further investigation. In addition, larger studies are needed to define the optimal intensity and duration of whole-body vibration and investigate its possible long-term effects.

Conclusion

The use of whole-body vibration proved safe and viable in hospitalized patients. The 6MWT and FEV1 presented in all articles were significant. However, there was no statistical difference in BP and HR. Therefore, randomized clinical trials are needed to investigate this therapy's efficacy and adverse effects. Although positive effects have been reported, we suggest further investigations with controlled parameters and well-designed protocols on a larger scale.

Authors' contributions

Lima AS participated in the conception, design, search, and statistical analysis of research data, interpretation of results, and scientific article writing. Silva CMS participated as advisor, researcher, and reviewer, statistical analysis of research data, interpretation of results. Oliveira ACC participated as a researcher, conception, design, search writing of the scientific article.

Conflicts of interest

No financial, legal, or political conflicts involving third parties (government, corporations and private foundations, etc.) have been declared for any aspect of the submitted work (including, but not limited to grants and funding, advisory board participation, study design, preparation of the manuscript, statistical analysis, etc.).

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