

WHOLE BODY VIBRATION EXERCISE: WHAT DO YOU KNOW ABOUT THE SCIENTIFIC INTEREST?

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Abstract

Vibration is a mechanical stimulus characterised by an oscillatory motion and the main biomechanical variables that determine its intensity are the frequency and amplitude. A possible clinical application of this stimulus, in appropriated conditions, is the exercise in vibration platforms, "whole body vibration". In consequence, the scientific interest in WBV exercises can aid to increase the knowledgement on appropriate, safe and effective exercise protocols. PubMed is a service of the U.S. National Library of Medicine and the aim of this work is to identify, the scientific interest in WBV, evaluating the number of publications cited per year in the PUBMED in WBV alone and in the association with some clinical application. The searches were performed (June 2009) in the PubMed (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>). It was shown that in the last six years the scientific interest in WBV exercise has strongly increased. It is shown a high NPB with elderly and low-back pain. The current evidence indicates that platforms can generate vibrations and the WBV exercises may be an effective intervention for musculoskeletal disorders in trained and untrained, as well as in older. Moreover, the scientific community would be interest in knowing more about this kind of exercises, as it can be seen with the increase of publications in the last years. In consquence, it is necessary to pay attention with the people that are udertaken WBV exercises because to their individual reactions and due to the limited scientific information in the literature. The presence of a professional when a people is undertaken a WBV in vibration platform is desirable.

Key words: whole body vibration exercises, vibration platform, PUBMED, elderly

Resumo

Vibração é um estímulo mecânico caracterizado por um movimento oscilatório as as variáveis biomecânicas mais importantes que determina sua intensidade é a frequência e amplitude. Uma aplicação clínica possível para esse estímulo, em condições apropriadas, é o exercício em plataformas vibratórias, exercícios de corpo inteiro (ECI). Em consequência, o interesse científico in ECI pode ajudar no aumento do conhecimento de protocolos apropriados, seguros e eficazes. PubMed é um serviço da *U.S. National Library of Medicine* e o objetivo desse trabalho é identificar o interesse científico, avaliando o número de publicações (NP) citadas por ano no PUBMED em ECI sozinho e em associação com algumas aplicações clínicas. As pesquisas foram feitas (Outubro de 2009) no PubMed (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>). Foi mostrado que nos últimos seis anos o interesse científico em ECI aumentou intensamente. Um elevado NP em idoso e dor lombar. A presente evidência indica que as plataformas que possam gerar vibrações e os ECI podem ser uma intervenção efetiva para alterações músculo-esquelética em pessoas treinadas e não treinadas e em idosos. Mais ainda, a comunidade científica teria interesse em conhecer mais sobre esse tipo de exercício, como pode ser visto pelo aumento no NP nos últimos anos. Em consequência é necessario atenção com as pessoas que realizam ECI em plataformas vibratórias devido as suas reações individuais, assim como as informações científicas que ainda são limitadas. A presença de um profissional quando uma pessoa está realizando ECI em uma plataforma vibratória é desejável.

ey words: exercício de corpo inteiro, plataforma vibratória, PUBMED, idoso

Resumé

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Introduction

Vibration is a mechanical stimulus characterised by an oscillatory motion and the main biomechanical variables that determine its intensity are the frequency and amplitude (Cardinale ad Bosco, 2003, Cardinale and Wakeling, 2005). A possible clinical application of this stimulus, in appropriated conditions, is the exercise in vibration platforms. In these platforms, subjects can stand and receive mechanical stimulus via their feet, and this has been known as whole-body vibration (WBV) exercise (Rønnestad, 2009).

WBV is an important tool to be used in the field of the Health Sciences and this modality of exercise has been utilized in the treatment of some disorders (Rittweger et al, 2002, Roelants et al, 2004) or to improve the physical conditions (Delecluse et al, 2003) or for prevention and management of possible clinical problems in the human beings (Connolly et al, 2003, Rubin et al, 2004).

Some possible biological risks have been associated with vibration (Neckling et al, 2002), however, authors have reported that at controlled amplitude, frequency and time in the platforms, the mechanical stimulation of the human body is a safe and effective exercise (Rubin et al, 2003).

The mechanical system used in WBV has vibrating plates producing sinusoidal vibrations and the exercises are performed by oscillating plates in some devices of machines, as for example with alternative vertical displacements on the left and right side of a fulcrum or whole plate oscillating uniformly up and down ().

The vibrations used in the clinical protocols described using platform, the WBV exercises can have frequencies from 5 up to 60 Hz) and amplitudes from 1 mm up to 10 mm and the possible combinations of these parameters permit to reach various mechanical conditions to be used ().

In consequence, the scientific interest in WBV exercises can aid to increase the knowledgement on appropriate, safe and effective exercise protocols (Rubin et al, 2003) to be used clinically. The interest of the scientific community in a specific subject can be evaluated by the analysis of the number and quality of published papers. The publication of a paper is as important as the results of the research itself, and is worthwhile (i) to validate the obtained results and conclusions, (ii) to reach the targeted audience, (iii) to stimulate the discussion of a subject, (iv) to introduce new methodologies and (v) to aid to develop safe and effective experimental protocols to be used in clinical and basic research (Santos-Filho et al, 2004, Santos-Filho et al, 2005).

PubMed is a service of the U.S. National Library of Medicine that includes over 18 million citations from MEDLINE and other life science journals for biomedical articles back to 1948. PubMed, which is used as a suitable tool in various publications, includes links to full text articles and other related resources as well as this databank system has been used as a tool in various publications (PubMed (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>)).

The aim of this work is to identify, the scientific interest in WBV, evaluating the number of publications cited per year in the PUBMED in WBV alone and in the association with some clinical

application. Moreover, the acquisition of these information could be useful to develop safe and effective clinical protocols using WBV.

Methodology

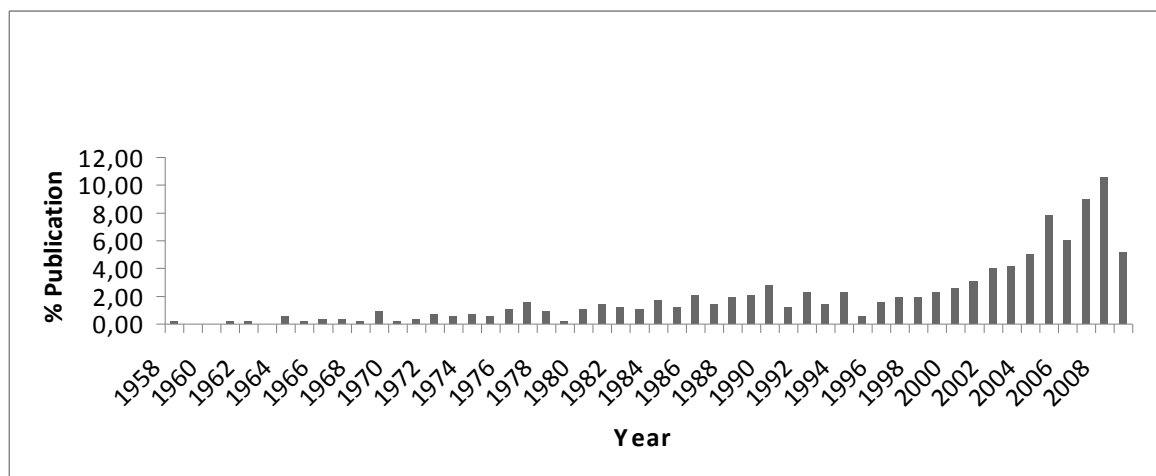
The searches were performed (June 2009) in the PubMed (<http://www.ncbi.nlm.nih.gov/entrez/query.fcgi>) and all the publications were considered in this study.

A search using only the term “whole body vibration” was done to verify number of publication (NPB) in this subject in each year. The percentage of publications per each year (% NPB/year) was determined dividing the NPB in each year by the total of publications in the period that was considered.

A search using the term “whole body vibration” associated with gender, (male or female), or osteoporosis or osteopenia or cystic fibrosis or postmenopausal or elderly or sarcopenia or Parkinson´s disease or osteoarthritis or low-back pain was done, too. The NPB in each association was determined. An interest factor in a subject (IFS) was also calculated by dividing the NPB in a specific association by the NPB in WBV.

Results

Figure 1 shows the percentage of publications per year found in the PubMed when the search was with term whole body vibration alone. It was shown that in the last six years the scientific interest in this subject has strongly increased.



There are 557 publications with the term “whole body vibration” in the PUBMED. Table 1 shows the first publication using this term was in 1958. Moreover, if it is considered to each five year since 1958, it is possible to see that the percentage of publications per year found in the PubMed increase progressively up to 1988-1992. There is a decrease in 1993-1997, but after this period, a strong increase is found. Furthermore, the percentage of publication is concentrated since 2003 up to 2009 with almost 50% of all the publications.

The table 2 shows the number of publications found in the PubMed and the interest factor in whole body vibration associated with gender (male or female) (humans) The NPB is higher with male than with female.

Table 1: The percentage of publications in

Ano	NP	%P
1958-1962	2	0,52
1963-1967	8	1,38
1968-1972	13	2,25
1973-1977	25	4,33
1978-1982	27	4,67
1983-1987	43	7,44
1988-1992	59	10,21
1993-1997	44	7,61
1998-2002	80	13,84
2003-2007	185	32,01
2008-2009	91	15,74

Table 2- publications found in PUBMED considering whole body vibration and the gender.

Humans	Male	Female
450	271	136
%PT	60,22	30,22

The table III shows the number of publications found in the PubMed and the interest factor in whole body vibration associated with some possible clinical conditions treated with WBV and the application of this technique in elderly. It is shown a high number of publications, as well as an important interest factor with elderly and low-back pain.

Table III- publications found in PUBMED considering whole body vibration and some diseases and elderly.

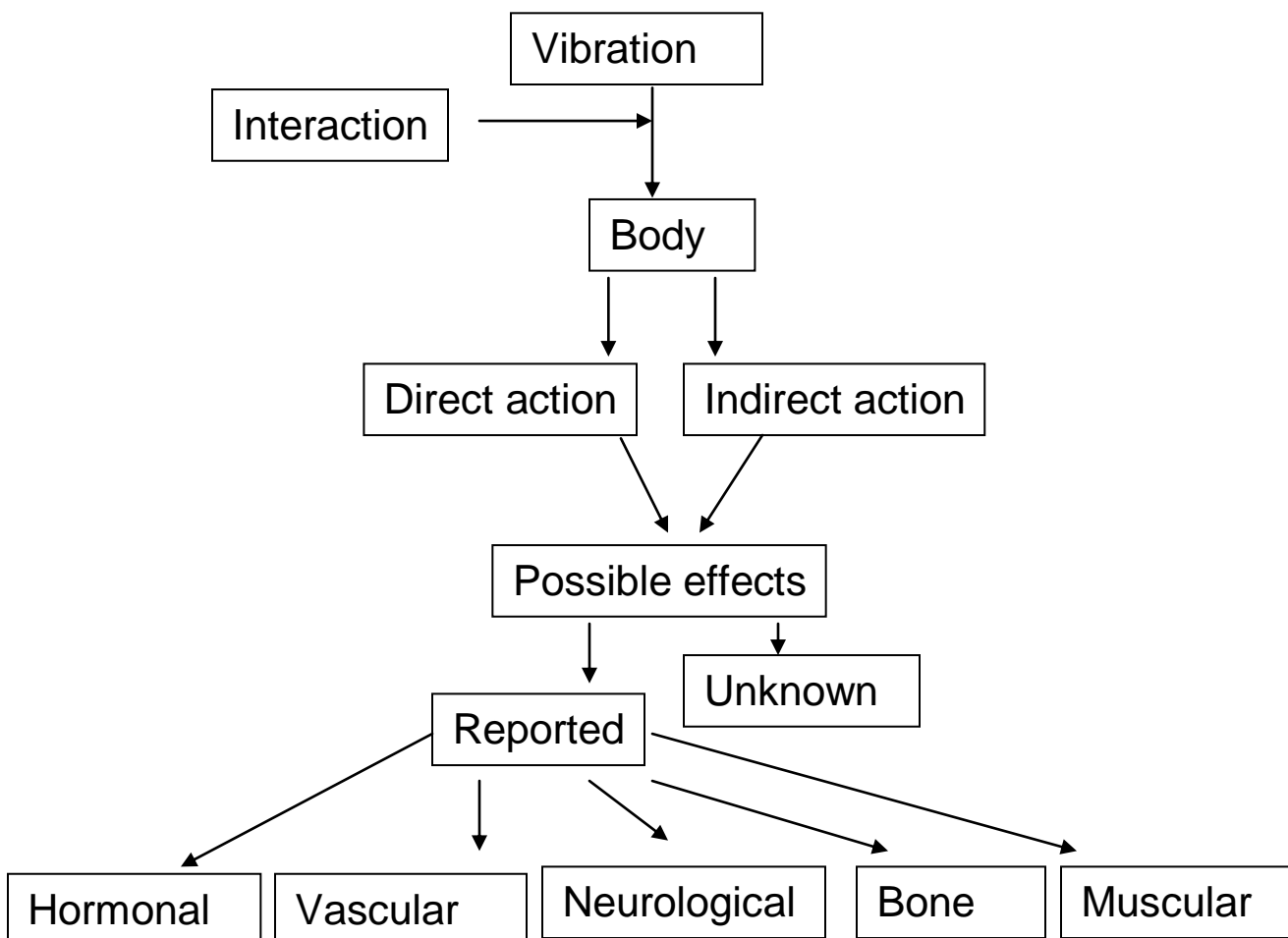
	NP	%P
osteoporosis	14	2,53
cistic fibrosis	2	0,36
Postmenopausal	9	1,63
Fibromyalgia	3	0,54
Elderly	119	21,52
Sarcopenia	9	1,63
Osteopenia	11	1,99
Parkinson's disease	5	0,90
Osteoarthritis	3	0,54
Low-back pain	77	13,92

Discussion

In the WBV exercises are used mechanical stimulus that are transferred for the body of the subjects when they are stood in vibration platforms via their feet (Rønnestad, 2009). However, these stimulus can also be transferred to subjects when they are sat on the platform or with the support of of their arms. In these cases, the stimulus could be transferred only for a part of the body and we are suggesting the term segmental body vibration (SBV) exercises to these situations.

Many studies have been conducted with the aim of understanding the acute (Rittweger et al, 2000) and chronic responses to WBV training (Roelants et al, 2004, Verschueren et al, 2004). Besides the the parameters used in the WBV, the clinical characteristics of the patient must also be considered to the protocol utilized might be safe and a successful treatment could be achieved. WBV exercises have been shown to cause clear metabolic responses similar to other forms of exercises. In Figure 2 are suggested some possible biological actions in different systems due to direct and/or indirect actions due to the WBV exercises that have been published. Moreover, probably, there are some actions that are unknown and they have not reported yet.

Figure 2: Vibration and possible biological effects



WBV exercises have been shown to acutely enhance strength and power capabilities in well trained people (Rønnestad, 2004). Moreover sedentary, injured, and elderly people with impaired muscle activation capabilities may also be benefit (Roelants et al, 2004a, Roelants et al, 2004b) and in this case the results seem to be more encouraging.

Chronic studies seem to provide more supportive evidence for the possibility of using WBV exercises in various, but our results indicated that the elderly (Table 1) could be aided with this technique and scientific information are available. About 25% of the all the publications in WBV are with elderly. Moreover, the elevated IF obtained with WBV and osteoporosis and osteopenia indicate the importance of this clinical procedure.

The current technology/methods using WBV exercises in platforms produce important improvements in performance in well trained athletes and physically active young subjects. Moreover, this technology may be of benefit to the elderly or in rehabilitation programmes, as little effort is required and there is no complicated technique to be learned. These considerations could justify the increase of the publications found in the PUBMED in the different years and a strong increase in the last years (Figure 1 and Table 1). It is also observed that the variability in vibration protocols, in time of the procedure, the frequency and the amplitude, used by different investigators may be an relevant reason for some inconsistent results that have been reported. Furthermore, as these knowledge are relatively new, it is important to consider to take careful with the reactions of some patients and to establish secure conditions, as to stay near of the individual is under the platform.

CONCLUSIONS

The current evidence indicates that platforms can generate vibrations and the WBV exercises may be an effective intervention for musculoskeletal disorders in trained and untrained, as well as in older. Moreover, the scientific community would be interested in knowing more about this kind of exercises, as it can be seen with their increase of publications in the last years. In consequence, it is necessary to pay attention with the people that are undertaken WBV exercises because to their individual reactions and due to the limited scientific information in the literature.

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