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Professional article

IMPORTANT ASPECTS ON HOW TO SET UP A VIBRATION TRAINING PROTOCOL (WBVp) FOR ATHLETES

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Luiz Paulo Silva Santos[1], Maria Lúcia Machado Duarte[2]

[1]Escola de Educação Física, Fisioterapia e Terapia ocupacional, UFMG, Brazil
[2]Escola de Engenharia Mecânica, UFMG, Brazil

Abstract. *Whole-body vibration is considered a training modality, mainly focusing on the physical and functional performances. However, the scientific community and professionals seem to underestimate some of its important aspects in order to establish a proper protocol. When used in athletes, possible incoherencies present in the cause-effect relationship may show up more than in other groups. That is the population considered in the present study. After investigating the available references, it is clear that due to the lack of methodological standard for vibration training, comparisons between the studies and their findings is difficult and sometimes conflicting. Important points observed in conventional protocols are not properly considered on vibration interventions. Moreover, it is not clear the correlation between conventional x vibration training variables and parameters. That should be the first aspect to be observed in order to get a proper vibration training methodology and testing evaluation. Therefore, a change of nomenclature is suggested from WBVT to WBVp. From now on, WBVp will mean "training protocols" whereas WBVT will mean "training interventions". To change interventions into protocols requires a systematic register of the available information (variables and parameters), what is not normally seen. So, a model spreadsheet is suggested to standardize the training process, so in a future to allow a proper protocol establishment. The suggested spreadsheet will take into consideration all necessary points, aiming the verification of the desired results. Finally, a technical terminology and methodology to be adopted during vibration training is also proposed*.

Key words: *Whole body vibration, Protocol, Performance, Spreadsheet, Variables and parameters.*

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Corresponding author: Luiz Paulo Silva Santos
Escola de Educação Física, Fisioterapia e Terapia ocupacional, UFMG, 4260, Av. Presidente Carlos Luz, 3502 - Alto Caiçaras, Belo Horizonte - MG, 31250-810, Brazil
Phone: +55 34097444 • E-mail: lzsilva11@yahoo.com.br

INTRODUCTION

Regarding physical conditioning, whole-body vibration (WBV) is being considered a way to interfere positively in the neurophysiological mechanisms, possibly contributing to the improvement of physical abilities. However, its efficacy while a training modality, mainly directed to the improvement of athletes and well-conditioned participants, still lacks sufficient methodological support, both from the theoretical, as well as the practical point of view. Such an observation may be explained, partially, by observing the difficulty of finding studies using or proposing the development of WBV protocols, as it will be shown in the following sections. In addition, the available technical information related to the adopted protocols and their efficiency and safety are generally insufficient. Furthermore, it is a clear mixture of terminology regarding the vibration stimulus (e.g., some studies treat local vibrations as if they were whole-body vibrations, as can be seen in Kurt & Pekünlü (2015)).

It should be stressed that the supposed effectiveness of the mechanical vibration while a training modality is being guided, invariably, by two aspects deserves consideration. The first one is related to the methodological inconsistencies and lack of correlation between conventional versus vibration training (VT). The second aspect is related to the tests applied during the post training period.

As the first aspect, the inconsistencies mentioned are regarding the variables used in the studies applying WBV as an improvement strategy for athletes. Such inconsistencies refer to the organization of the stimuli variables involved in VT, either when such stimuli have been used alone or when combined with conventional training (mainly resistance training) exercises. Besides, no correspondence has been seen between aspects of conventional x VT – mainly those of a neuromuscular character, both in quantitative, as well as qualitative aspects, to allow equivalence between the variables proper from these two types of training. As an example, it is appropriate to pose the following question: how could the physical stimuli provided by an opposite external mechanism [for example, the weight that would oppose a certain movement (exercise) used in conventional strength training], be "translated" into the universe of mechanical vibrations?

As the second aspect, regarding the tests applied during the post training period, important aspects of the tests used to evaluate the training should be taken into consideration. Are the parameters associated with the tests, as well as the moment they are applied (that is, the time between the beginning of the test and the end of the training period), good enough to check the nature and magnitude of the improvements promoted by the training?

Then, the present study aims to suggest the need for establishing a training protocol which can be used by the scientific community and professionals in general in order to organize and systemize the important aspects underestimated by them. With that in mind, a systematic way of reporting the training is proposed, so to enable proper comparison between the studies and their findings as, at present, such an evaluation is difficult due to the range of available approaches.

IMPORTANT ASPECTS OF THE WBV TRAINING PROTOCOL (WBVP)

For whole-body vibration to be considered as a training modality, focusing primarily on physical and functional sports performance, it is necessary to regulate a set of

protocols. This regulation should focus on the improvement of physical capabilities, also serving as a consistent reference for studies dealing with more specific contexts (sports, rehabilitation, etc.). However, such points are not seen in the available studies, as will be discussed here.

Though, before such a discussion, when one mentions VT, it should be stressed that there has been an absence to date of the WBV training protocol. That absence makes the deviate from that of the other mentioned authors. Here, it is believed that there is not yet a justification to use the term "protocol" in the VT environment, as there is not yet a set of procedures/methodological rules which would standardize the specific combinations within the whole-body VT load variables, associated or not with conventional training (such as resistance training with external weight).

So, a suggestion is made in this article to change the nomenclature from WBVT to WBVp, in order to show that the meaning is different. The former, although currently used by most authors and regarded by some as protocols (although the word protocol is not explicit), is nothing more than an intervention. That is because protocols should be understood as a standard methodology with proven efficacy, meaning much more than an intervention. That is the first point of this article.

Regarding the methodologies generally applied in studies investigating vibration effects, authors such as Wilcock, Whatman, Harris, & Keogh (2009) and Jordan, Norris, Smith, & Herzog (2005) point out the great variability of interventions used. Yet, such studies only make a systematic review of the literature, pointing to the aspects that need to be observed, without either going deep into the studies' discrepancies or discussing how these discrepancies interfere with the achieved results. On the mentioned studies, the variations are not only restricted to the specific whole-body vibration variables used on the applied stimuli (mainly frequencies and amplitudes) but also to the temporal and spatial aspects of the exercises applied on the platform (these being either static or dynamic).

Sometimes the interventions used static exercises with external load, (Pojskic et al., 2015) and Wang et al., 2014), while others used no load, (Rønnestad, Holden, Samnøy, & Paulsen, 2013). On the other hand, others applied dynamic exercises, with (Mahieu et al., 2006; Pérez-Turpin et al., 2014) or without (Gerakaki, Evangelidis, Tziortzis, & Paradisis, 2013; Cochrane & Stannard, 2005) external load. Such variety makes it difficult to understand which variable is responsible for specific changes. Furthermore, it is also important to stress that this lack of standardization makes the reproduction of such strategies difficult.

Thus, Rauch et al. (2010) suggest a practical and efficient way to organize the WBV stimuli, mainly related to the use of commercial vibration platforms. Their recommendations involve both vibration aspects, as well as those related to the individual under consideration. Some of their recommendations deserve to be highlighted in the current work as listed in the following:

Frequency (Hz) and amplitude {displacement peak-to-peak (mm) or acceleration [peak or RMS (m/s^2)]}

Here, a correction is made about the amplitude nomenclature. Although Rauch et al. (2010) tried to define a standard nomenclature, they use the word amplitude only for displacement. Amplitude should be used for any response vector, that is, displacement, velocity or acceleration when considering vibration stimulus. Therefore, such a correction has been made here.

Body position/posture over the vibration platform (e.g., knee and hip angle, standing on one or two legs, leaning on toes or heels, trunk upright or tilted forward);

Description of the exercise performed on the vibration platform (e.g., static or dynamic exercises).

It is important to say that the dynamic exercise information should include both the execution rhythm (a temporal relationship between the eccentric and concentric muscular contraction phases), as well as movement amplitude (distance reached by the body, or by segments/parts of it, during the concentric and eccentric phases).

In order to check if a protocol is effective or not, another important aspect on the VT worth consideration is the relationship between the stimulus and the physical tests. As it will be described next, these can be split threefold: 1) the distinction between variables x parameters; 2) the kinematic characterization of exercises applied during the physical tests, 3) the temporal lag between the end of the training and the application of the evaluation tests.

As a result, at first, the current study wishes to establish a distinction between two very similar words that have been used with mixed meaning by some authors in a training environment, that are, variables x parameters. The word variable should be applied when referring to a set of stimuli causing changes in planned training. On the other hand, the word parameter should define the elements (or, in most cases, kinematic references) used to interpret a test, that is, the characteristics used to map the desired changes.

In that context, regarding the lack of standard used on WBV interventions (WBVT) models, Jordan et al. (2005) also stress the importance of the exercises characteristics used on the evaluation test. The variables used for the training, that is, the applied stimuli (with or without WBV) and the tests parameter (based on kinematics characteristics) should be considered in association. This means that certain values should be attributed to the variable, aiming to provoke specific changes that can be adequately measured by appropriate tests. Only then will it be possible to understand the magnitude of the improvement changes, in other words, how and when a set of stimuli contributes to a certain change/adaptation. So, the more the stimuli are applied based on standardized intervention protocols, the more the test parameters will allow the understanding of the produced effects.

The last aspect is the temporal relationship between the end of the exercises and the moment the evaluation tests are applied. It is important that the effects caused by the VT are correctly evaluated. So, another question should be posed: are the parameters measured able to show the effects provoked by the applied stimuli during the training process?

Besides the recommendations given by Rauch et al. (2010), when the exercise is performed on a vibrating platform, it will require more important information. It is related to the movement being carried out. Thus, it should include the relevant information related to the mechanical vibration variables (frequency, amplitude, direction and duration), as well as those variables specific to the conventional resistance training (external weight, number of series and repetitions, relationship between the stimuli duration and rest periods). As the great majority of the studies provide incomplete information about these listed variables, as well as those necessary to evaluate the physical capabilities been improved (parameters), they mislead the correct interpretation regarding the positive benefits of the training. Such aspects are included in the Workout Sheet proposed in this article.

Rittweger (2010) stresses the need for further study in order to accept vibration as a training modality. Still, in his study no indications have been seen about the procedures to be used in order to make WBV interventions (WBVT) considered as protocol (WBVp).

Jordan et al. (2005) go a step further with the exercises diversity, calling attention to the inconsistencies regarding the time interval between the end of the vibration stimuli and the beginning of the post training test application used to evaluate the vibration effectiveness. Although their attention is on the time interval, there is no analysis on how these two moments (stimuli x test) are related to each other, what the purpose of the present work is, where one of the objectives is to show how coherent a chosen test is to the stimuli applied.

Cardinale & Wakeling (2005) also stress the importance of performing additional studies. Yet, their aim is to understand, in a more detailed way, the neurophysiological mechanisms associated to WBVp (that is, protocol, in the current nomenclature). They also see the need to identify the muscular activation level necessary to provoke positive effects over the vibration stimuli. In that direction, Jordan et al. (2005) believe that biological responses depend on both the body position and muscular contraction levels.

When dealing with studies analyzing WBV applied in well-conditioned individuals, mainly athletes, it is also convenient to verify up to what point the methodological contradictions pointed out before may influence the results, being those positive/negative or even irrelevant. Are they related to the way the stimuli have been structured (resistance training, with or without external load, and associated or not with WBV)? For that reason, the following section will discuss that in more detail in a sports environment.

WBV IN ATHLETES (GOOD OR BAD)?

This section presents the studies found related to WBVT (intervention) in athletes of different levels, as shown in Table 1. Despite the order they are presented in the table (chronological), the studies are grouped for discussion here by the topics mentioned in Section 2. The intention of the table is to provide information about all the important aspects of the studies.

For the great majority of the studies, the physical tests are characterized by jump, sprint and, at a smaller number, agility. The parameters (kinematics characteristics) associated with each one of these exercises when measured will reveal the occurrence of effects (positive, negative or irrelevant) when the physiological systems are activated during and/or following the training period, as will be discussed next.

One important point to stress, as also shown in section 2, that may cause interference on the observed effects, is related to the time between the end of the training (with or without WBV) and the application of the tests. In the majority of the studies, mainly the ones of a chronic nature, the evaluations of the tested variables were made just after the applied stimulus (either on the control group or the other). On the contrary, other studies researchers waited up to two days in order to evaluate the capability analyzed. So, one should take that observation into consideration when interpreting the results.

In the study by Kurt & Pekünlü (2015), all groups were tested on the hand grip. However, only the group where vibration was associated with external additional weight (30% of the corporal weight) had positive changes. The evaluation was performed one minute after the end of the stimuli. Such findings may be related to the body part in contact with the platform, that is, hands and forearms. The absence of positive effects on the other tests related to large muscle groups (mainly younger members) may be related to the number of WBV sessions used and the way the stimuli was applied. Probably one session was not enough to provoke neuromuscular changes on such body parts, although vibration

may be associated with external load. For that reason, the current study goes further. Can the training performed be considered WBV or should it be considered local vibration? Will that be more important for the negative result than the number of sessions used?

A similar argument may be used when analyzing the study of Bullock et al. (2008), where no gain was observed on the motor parameters analyzed. Maybe a higher number of series would be necessary for such improvements. The study used 3 x 60s exercises, decreasing, at the same time, the rest interval intersets, assuming that only one training session was performed. Such a procedure is traditionally used in conventional training, although not observed in studies applying WBV. As it may be observed, the study had acute characteristics, which may have influenced the obtained results.

In the study carried out by Fernandez-Rio, Terrados, Fernandez-Garcia, & Suman, (2010), gains were observed at both analyzed groups (WBV and non-WBV), certainly due to the chronic condition associated with the study (14 weeks). Though, as in the previous study, the vibration stimuli were insufficient to make the WBV group significantly overcome the control group results.

In the study by Annino et al. (2007), the group submitted to vibration had no description of the exercises used, consequently affecting the analysis of the stimuli-response relationship. Nonetheless, in their study, a more adequate and coherent organization of the stimuli variables used was observed. The description adopted includes the number of series, number of repetitions, as well as the total number of training weeks and the weekly training frequency. The positive results obtained may be attributed to the fact that the individuals composing the sample were subjected to chronic training. For that reason, the applied stimuli can be assimilated easily. The parameters evaluated for testing the performance were accomplished three days after the training period, which may have interfered with the possible acquisitions of positive responses. Nevertheless, the possible retention of the achieved effects still allowed registering changes.

The results discussed previously confirm the fact that the use of vibration stimulus with the addition of external weight to the applied exercises is growing Pojskic et al. (2015), Wang et al. (2014) and Pérez-Turpin et al. (2014). Such a practice in the majority of studies is being referred to by expressions such as “loaded WBV” and/or “unloaded WBV”. Despite such increasing use, there is a lack of standardization concerning its methodological application.

Regarding that, among the analyzed studies, Pojskic et al. (2015) apply the term “loaded WBV” to the group using vibration plus exercises with external weight, whereas Pojskic et al. (2015) and Rønnestad et al. (2013) applied such a term to WBV together with half squat exercises, without external weight. However, the same authors had previously used the term “loaded” to refer to WBV plus exercises with additional weight (Rønnestad et al., 2013). It should be stressed that the latter authors did not pay attention to whether these divergences may be the cause of the result discrepancies in their studies. Wang et al. (2014) classify the external weight as “extra load”. In their case, the intervention is associated with the static nature of exercises. Such a lack of terminology standard may make it difficult to interpret the exercise intensity associated with vibration. Therefore, another objective of the current study is to stress even more how this lack in the way the intervention is realized and reported interferes in the intended comparison among the studies.

When evaluating the mentioned training sessions, positive results were obtained in two of the studies, Pojskic et al. (2015) and Rønnestad et al. (2013). While in the latter study only 1x 30s stimulus were sufficient to produce gains on the 20m ice sprint, in the former 5x 60s series, having a 30s rest period between the series were necessary in order

to have positive gain recorded by the applied tests. Nevertheless, it is important to mention that both studies lack information about the weekly training frequency, as well as the number of weeks used, although in the latter study more detailed information regarding the adopted parameters is presented. In Rønnestad et al. (2013), which used ice sprint to evaluate possible changes, is it coherent to use dynamic exercises to monitor possible positive changes provoked by static exercises?

In the study by Wang et al. (2014) the objective was to verify the possible positive responses when using WBV training together with 75% of the body weight added as external weight. Three groups were analyzed: a) WBVT with external weight; b) only WBVT; c) only conventional strength training (with external weight). It is important to emphasize that the variables used in this study (number of series, duration of each series, resting period and external weight) make the way the vibration stimulus is applied close to the way it is normally used in conventional training, mainly when applied to neuromuscular adaptations. The study by Pérez-Turpin et al. (2014), on the other hand, shows some differences when compared to the study by Wang et al. (2014). In the WBV group, an increase in the training session duration, in terms of 4 exercises, each one composed of 4x 30s is observed. Such a strategy is equivalent to the directives of conventional training, where the load training has to increase in order to provoke performance gains (Verkhoshanski & Siff, 2009). In the former, 6 weeks of training were used, where there was an increase of 60s for each repetition after the first three weeks. Although both studies have established methodologies approaching conventional resistance training, analyzing them, it is not possible to confirm that such a procedure was applied intentionally or not, to verify the effectiveness of the two training methodologies when using similar approaches.

However, some studies did not observe positive results for the WBV group. An example is the study by Kavanaugh et al. (2014), performed over 12 weeks, 2 training sessions (with a 32-day interval), with total duration of 60s each day. Such a study did not report the necessary variables generally used on the resistance conventional training, such as the number of series and repetitions (Jones, Parker, & Cortes, 2011), as well as the weekly frequency. The absence of positive effects may be attributed to two other factors: the lack of additional external weight associated with the exercise, and to the static character of the exercise used during the training. In addition, running tests, applied twice on each of the trained days, did not reveal improvement in the ability to develop speed running.

In that respect, another study without positive effects when evaluated by the used tests (power, muscular, flexibility and velocity) was the one by Gerakaki et al. (2013). There, the WBV group used two dynamic exercises with 90s total duration. Despite the stimulus being bigger for each exercise, in contrast to the study by Kavanaugh et al. (2014), it is in fact a study of acute nature.

SUGGESTIONS

Considering the lack of the standards related to recognized establishment of protocols leading positive adaptation, this section is devoted to that, as well as to questions related to the physical tests applied after the training.

Table 1 presents some topics that need to be observed in order to improve the capabilities by means of vibration intervention (WBVT) to be measured in a more adequate way (WBVp), then, in the direction of a protocol establishment. At this point, a generalization about the

training will be made, that is valid both for athletes (the main focus of this article), as well as for the population using such an intervention in general. Instead of referring to the training as a WBVT, the authors here will refer to VT only, as all the aspects considered in Table 1 are also valid when using local vibration intervention, despite the latter not commonly being seen in studies.

Table 1 Important aspects to be observed in VT

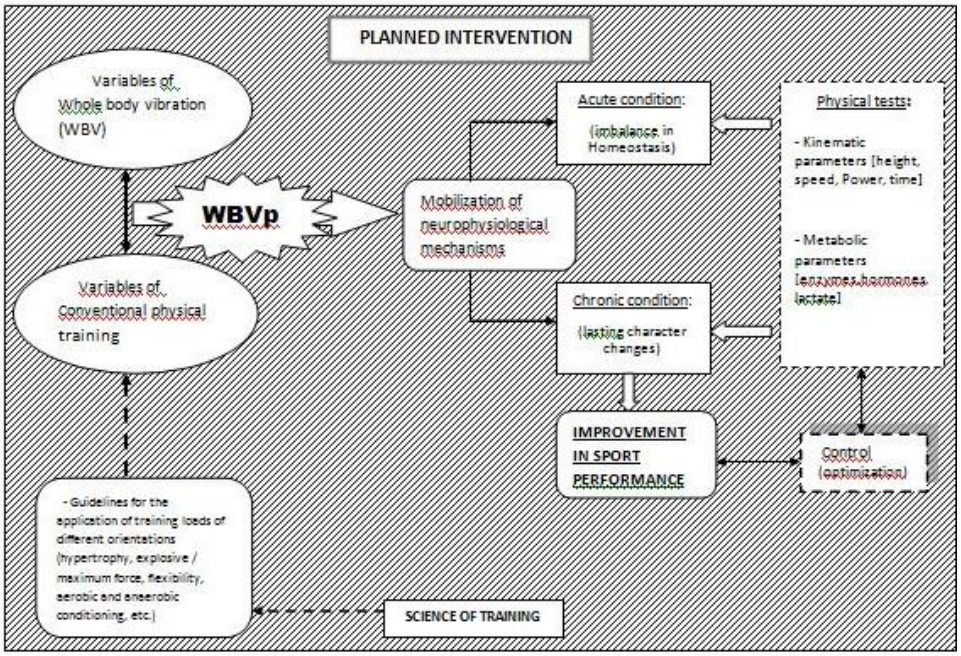
Stages	Points to be questioned
Stimulus	Why is it necessary to use vibration training? (e.g., to manipulate the training intensity or volume, etc.). What do you want to improve when using vibration training? (e.g., some local area, the body as a whole, etc.). What are the neurophysiological mechanisms recruited by means of certain vibration stimulus configuration designed in order to answer to the previous questions? What is the right time to introduce the vibration training? Regarding the conventional exercises (e.g., concomitant with, before or after those); Regarding the periodization training (e.g., in case of athletes: training session, macrocycle, mesocycle, microcycle (Issurin, 2008); Considering the differences between conventional x vibration training and based on the knowledge of the former, it is important to know the following for vibration training: ▪ How long is it necessary to wait until positive results are observed? ▪ How long do the results last?
Tests	Which are the parameters to be measured? Are the parameters measured capable to record the changes induced by the applied stimulus? When do the tests need to be applied after the training (or a single exercise) so as to capture the generated effects (either positive or negative); that is, ▪ What is the right time to apply the tests? ▪ What are the tests to be applied when considered chronic and acute training?

Considering the points mentioned in Table 1, some further questions can be posed, as presented in Table 2, in order to complete the establishment of a VT protocol.

Table 2 Further questions about the VT

Confrontation Points
The capture responses magnitude x the tests application moment.
The neurophysiological effects x the negative or irrelevant results.
The addition of external weight to the vibration training x vibration training alone.
The analyzed parameters during the tests x the type of the exercise (static or dynamic) used during the vibration training.

So, in order to design a vibration training protocol, considering the points presented both in Table 1 and Table 2, Fig. 1 presents a flowchart representation of the possible relationships between the variables to be included in a structured training WBVp (whole-body vibration protocol) and its relationship with the evaluation tests to measure the produced effects.



Legend: WBVp - Whole Body Vibration protocol

Fig. 1 Flowchart representation summarizing the important aspects and relationships involved in the organization of a Whole-body vibration protocol (WBVt)

In summary, the flowchart refers to the relationships and aspects/processes between a simple intervention model (which would be nothing more than a set of stimuli composed only by mechanical vibration or by combining the latter with some kind of conventional training) and the establishment of mechanical vibration protocols, intended for the maintenance or increase of the athletic performance.

Once the changes can be tracked conveniently (by means of physical tests) and correlated to the variables used on the formatted stimulus, the training can be corrected, insofar as they approach the proposed objectives or not - until it reaches the point where the repeated confirmation of their effectiveness results in the formation of recognized intervention models.

To facilitate the establishment of a WBV as a training protocol (WBVp), first, it is necessary to standardize the terminology used in the VT. For that, from now on, the following exercises terms will have the following meaning:

- Loaded: half-squat without external weight;
- Extra Load: half-squat with external weight;
- Unloaded: upright body without external weight.

Considering that the exercise can be performed both in a static as well as dynamic manner, the words static and dynamic should precede the above terminology; for example, “static loaded”, “dynamic extra loaded”, etc.

Vibration Training Spreadsheet (VTS)

With that in mind, the present work suggests the adoption of a model spreadsheet to be used to register and control the WBVp (since it is proposed here as a structured protocol). That is referred to, from now on, as "Vibration Training Spreadsheet (VTS)", by means of which the variables can be registered at the time the training is established. In another point of the VTS, the parameters to be used to evaluate the produced effects are informed. Such parameters have to be in consonance with the physical capabilities which need to be improved, evaluating the nature and the magnitude of the reactions provoked by the applied stimulus. Such a strategy will allow the stimulus-response relationship to be monitored, to enable the establishment of an association between the effects produced and the variables measured.

Therefore, Table 3 and Table 4 present a model VTS to be used when thinking about the Whole-body Vibration Protocol (WBVp).

Table 3 Vibration training spreadsheet (VTS) model.

		DAILY WORKOUT SHEET				
		Characteristics of stimulus				
		Variables		**SET Ø**	**SET 1**	**SET N**
				Ex.1	Ex.2	Ex.3	Ex.N
WBVt	**Mechanical Vibration Variables**	Frequency					
		Amplitude					
		Direction					
		Type of vibration (WBV or local)					
		Duration of vibration	series				
			repetition				
CONVENTIONAL TRAINING	**Kinematic variables**	Amplitude of movement					
		Pace of execution [concentric/eccentric muscular contraction phases]					
		Duration of stimulus	series				
			repetition				
	Structural variables	Sets					
		Repetitions					
		Rest duration	series				
			repetition				
		External weight					
		Weekly frequency					
		Total of weeks					

Table 4 Vibration training spreadsheet (VTS) model.

		PHYSICAL TESTS			
		Test 1	**Test 2**	**Test 3**	**Test N**
Time of test application (after the end of exercises - minutes):					
Mechanical parameters	Jump (height, № jumps)				
	Strength (force x time, 1RM)				
	Sprint (time, speed)				
	N				
Physiological parameters	Lactate (mmol/l)				
	Heart Rate (% of maximum)				
	N				

In the future, the VTS can be improved so as to include graphical representation of the results, by means of which it will be possible to demonstrate the behavior of any parameters over a certain period of time; at a certain moment of the training process, in the case of athletes.

As a result, those models can now be called "training protocols" (WBVp). Each protocol in turn would be able to incite positive adaptations in specific physical capabilities, which, in case of athletes, would be located conveniently in singular moments inside their preparation process.

Table 4 shows, in fact, an example of a VT sheet which can be used to structure the training sessions. In the present study, each "set" makes reference to a physical ability (maximum/explosive force, aerobic resistance, flexibility, power, etc.) to be worked in a given training session. Besides, it will be represented by a group of exercises, each one being represented by the conjunction between conventional and/or VT. For an illustration, the present study suggests the following correlations: setØ = maximum force; set1 = aerobic resistance, set2 = flexibility, set3 = balance; set4 = power, set5 = anaerobic resistance, set6 = explosive force …, setN.

Table 4 illustrates the above idea when the objective is to improve the physical abilities refereed in sets Ø, 1 and 2. It refers to a daily training, though, without excluding longer periods of time, such as weeks, months or even years, making the necessary modifications.

One important point stressed in this article is that after each session, or a specific number of training sessions, appropriate tests (formed by physiological and/or mechanical parameters) aiming to verify the efficacy of the session may be applied. This way, the intention is that the VTS will help the establishment of the cause-effect relationship verification.

CONCLUSIONS

It was observed on the analyzed studies that neither protocols, nor intervention models were present by means of which it is possible to distinguish any form of standardization regarding organization of vibration stimuli. Those stimuli are sometimes used on their own, sometimes combined with conventional training exercises, with or without external weight.

The great majority of the studies proposes only the analysis of possible positive effects from whole-body vibration. Besides, there are remarkable differences within the dynamic nature of the movements composing the majority of the evaluation tests applied (jump, sprint and agility) and the exercises used during the training process (the majority of which are composed by half-squat exercises performed in a static manner).

Another important observation from this work is the lack of standardization regarding the temporal relationship between the beginning of the test which composed the physical evaluation and the end of the exercises application. That was both for acute nature studies, as well as for studies with more chronic condition.

It is worth mentioning that inconsistencies were found regarding the use of some terminology used at WBV interventions, illustrated by the variety of definitions for terms such as “loaded” and “unloaded”.

Assuming that the highlighted points play a role not only in the structure of the stimulus, but also in the evaluation of its effectiveness, due attention is necessary so as to avoid either the lack of the training efficiency, as well as to not jeopardize the reproduction of the methodology used.

Therefore, this article aims to determine the first step in a training or evaluation protocol, by establishing the necessity of a major systematization of such points. So, a suggestion is made here regarding a Vibration Training Spreadsheet (VTS) so to allow the correct reporting of the variables/parameters used and the organization of these points. That can be used, and later on improved, by the scientific community and professionals related to the use of WBV in general.

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VAŽNI ASPEKTI USPOSTAVLJANJA PROTOKOLA ZA VIBRACIONI TRENING (VBVp) ZA SPORTISTE

Vibracije čitavog tela smatraju se modalitetom treninga, koje se uglavnom tiču fizičke i funkcionalne performanse. Međutim, čini da naučna zajednica i stručnjaci podcjenjuju neke od važnih aspekata u cilju uspostavljanja odgovarajućeg protokola. Kada se koriste kod sportista, eventualne neusklađenosti prisutne u uzročno-posledičnom odnosu mogu se pojaviti više nego u drugim segmentima populacije. To je populacija koja se razmatra u ovom istraživanju. Posle istraživanja dostupnih referenci, jasno je da zbog nedostatka metodološkog standarda za vibracioni trening, upoređivanje rezultata istraživanja teško, a ponekad i dovodi do protivurečnosti. Važne stavke koje se primećuju u konvencionalnim protokolima ne uzimaju se u obzir prilikom vibracionog treninga. Štaviše, nije jasno da li postoji korelacija između konvencionalnih varijabli i parametara vibracionog treninga. To bi trebalo da bude prvi aspekt koji treba posmatrati kako bi dobili odgovarajuću metodologiju vibracionog treninga i procenu testiranja. Zbog toga je predložena promena nomenklature od VBVT-a u VBVp-a. Od sada će VBVp značiti "protokol obuke" dok će VBVT značiti "intervencije za obuku". Promena intervencije u protokole zahteva sistemski registar raspoloživih informacija (varijable i parametre), što se obično ne vidi. Dakle, predložen je tabelarni prikaz za standardizaciju procesa obuke, tako da u je u budućnosti omogućeno pravilno uspostavljanje protokola. Predložena tabela će uzeti u obzir sve neophodne tačke, sa ciljem provere željenih rezultata. Na kraju, predložena je i tehnička terminologija i metodologija koja se usvaja tokom vibracionog treninga.

Ključne reči: *vibracije celog tela, protokol, performanse, tabela, varijable i parametri.*