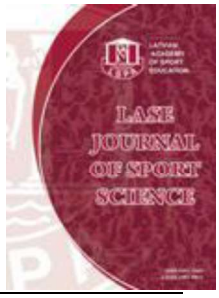
LASE Journal of Sport Science
2019 Vol 10, No. 2, Pages 63 – 68
DOI: 10.2478/ljss-2018-0026
p-ISSN: 1691-7669/e-ISSN: 1691-9912/ISO 3297
http://journal.lspa.lv/



REVIEW PAPER

CONSIDERATION OF THE DOMINANT SIDE IN APPLICATION OF LOCAL VIBROSTIMULATION

Uģis Ciematnieks, Justīne Poda

Latvian Academy of Sport Education
Adress: 333 Brīvības Street, Riga, Latvia, LV-1006
Phone +371 67799531 E-mail: ugis.ciematnieks@lspa.lv

Abstract

Local vibrostimulation (with RE-21 device) has advantage of applying it directly to the target area, therefore avoiding unnecessary vibration of other parts and tissues of human body. Our previous researches show, that parameters of local vibrostimulation (amplitude and frequency) car vary according to area and tissue affected, as well as effect to be achieved. In some sports the dominant extremity play an important role, so purpose of our study is to determine differences (if there is any) in application of local vibrostimulation parameters on dominant or non-dominant extremity - is it necessary to change parameters for dominant extremity? Study included 18-23 y.o. female subject (n=20), divided in two groups depending on application of local vibrostimulation on dominant and non-dominant lower extremity between three sets of continuous leg extension exercise, counting maximum repetitions. Study show, that there is no significant difference between stimulated dominant and non-dominant extremity, it is not necessary to apply different vibrostimulation parameters.

Keywords: *local vibrostimulation, dominant side,, lower extremity*

Introduction

Vibration has been used in sports for two main reasons – to help athlete to recover faster (this effect is often called relaxing effect) of to help athlete to increase muscle tone, to prepare muscles for upcoming activity (then it is named toning effect). Vibration has many parameters that may vary, depending of aim of vibration. In whole body vibration devices the main parameters are acceleration, down force (usually bodyweight of a athlete), amplitude of vibration (distance the platform or vibrotode travel between ending positions) and frequency of platform movements per period

of time and a amount of time of vibration application. In order to achieve a tonic or relaxing effect the parameters must change – low frequency and amplitude vibration lead to relaxing effect, but aggressive amplitude and frequency values can lead to tonic effect of human muscle.

There is two common types of vibration devices – a still platforms or devices, where whole body can be vibrated and exercises can be performed on them (Cardinale, Bosco, 2003); a portable devices, that can apply vibration locally. These devices have their purpose of application – on solid devices and platforms it is possible to carry out whole body vibration and perform an exercises on them (Rittweger, 2010) to increase human motor abilities, especially flexibility in Vladimir Nazarov's research (he called his vibration technique a biomotor stimulation) (Назаров, Спивак, 1987), maximal power for elite athletes (Issurin, Tenenbaum, 1999) and however, some researches did not show noticeable increase in strength and speed (Delecluse, Roelants, Diels, Koninckx & Verschueren, 2005). There can be also a negative vibration effect – if vibration parameters and time of vibration duration exceeds recommended, there can be possibility of vibration disease (Abercromby, Amonette, Layne, McFarlin, Hinman, & Paloski, 2007). Also, whole body vibration involves many tissues and parts of human body in vibration process even if that is not needed for training or experimental purposes. Different body tissues have their own mass and consistency, so the vibration effect will be different for each part of body because of different resonating effect of body tissues.

Local vibration devices often are used to apply vibration effect only to target location, without affecting other parts of body, also these devices are small and portable, it is possible to carry out vibration procedure in different training location (stadium, gym and other sport facilities) during training process.

Previous research show, that achieving relaxing or toning effect much depends of chosen vibration parameters (Krauksts, Ņemčenko, 2012), moreover, in case of local vibrostimulation these parameters can vary from chosen target location. Local vibration relies much on mechanical oscillations, created and amplified by vibration device (Михеев, 2007). The vibrotode oscillates specific muscle parallel to a bone – as narrow are angle of continuous oscillation wave, as more toning the vibration effect will be and on the other hand – if relaxing effect must be achieved, then oscillation waves must travel parallel to a bone with wide angle. It can be achieved with variation in frequency and amplitude of vibrotode, but these parameters will be different for each muscle and even change if it is necessary to achieve acute or chronic effect of vibration (Cardinale, Wakeling, 2005). Moreover, these parameters may vary from condition of a muscle – for

trained muscles will require more aggressive vibration parameters comparing to an untrained muscle.

There is also one parameter that cannot be measured correctly – down force of the vibrotode. If using a whole body vibration a down force will be created with a personal body weight, then applying a local vibration down force will be created by a physician, pressing down the vibrotode.

Effects of vibration can be used in some sports with general recommendation, but almost every muscle of athlete requires different vibration parameters (Krauksts, Ņemčenko, 2012), a physician needs to make notes for parameters of every athlete. Still the question is – is it possible to use the same vibration parameters on each side of body (left vs right m.bicep brachii, for example) and is it necessary to take in consideration a dominant side of body (left handed, right handed).

In many sports (tennis, boxing, martial arts) dominant side can play an important role in training process and competition, so it can matter to choose the same parameters or assess a different ones.

Material and Methods

We carried out experiment in a facility of Riga Stradins University to find out variance of parameters according to dominant body side extremity stimulated. We asked a 20 female subject aged 18 – 23 and with at least 2 years of previous experience in sports or other physical activities to perform continuous leg extension exercise on pneumatic trainers HUR OY. These subjects were divided into two groups with 10 subjects in each, no other anthropometric data were taken into account, as leg extension machine is adjustable and resistance was calculated as percentage of personal bodyweight. Experiment was carried out in a same day for each group of subjects. Subjects performed 3 sets of countinuous leg extensions and local vibrostimulation on m.rectus femoris muscle group between these sets, while recovering. Only difference between groups was stimulation of dominant or non-dominant leg, both groups were experimental. During an experiment and local vibrostimulation subjects remained seated in leg extension machine.

The procedure included general and special warm up, then subject was asked to sit in a leg extension trainer, adjust resistance to 10% of personal bodyweight and execute leg extension with both legs as many repetitions as they can within a whole amplitude of leg extension movement till both extremities exhausted and was unable to perform within specified amplitude. After first set on one group of subjects we applied local vibrostimulation on dominant, other group of subjects on non-dominant extremity. Subjects were asked to adjust frequency of vibrostimulation by

themselves to achieve relaxing effect and be able to continue leg extension for additional set, frequency is adjusted by analogue potentiometer of device. Average frequency subjects chose was 50Hz. Amplitude remained unchangeable – 1.5mm. Vibrostimulation was applied on m.quadriceps femoris from distal to proximal part with repeated gliding movement without exceeding 4min of total time on single muscle group. Then all subjects repeated leg extension with same resistance and same procedure was repeated for 3 sets in total and 2 sessions of local vibrostimulation between each. We noticed that after first session of local vibrstimulation subjects were tended to raise frequency of stimulation till 55Hz in average, amplitude remains the same – 1.5mm.

Results

After a research we observed following results.

Observing results for stimulated dominant extremity there is no significant difference between extremities according to paired t-test, although the result increase in three sets for stimulated leg was significant – 4.6 repetitions, (p=0.0221). (Fig.1)

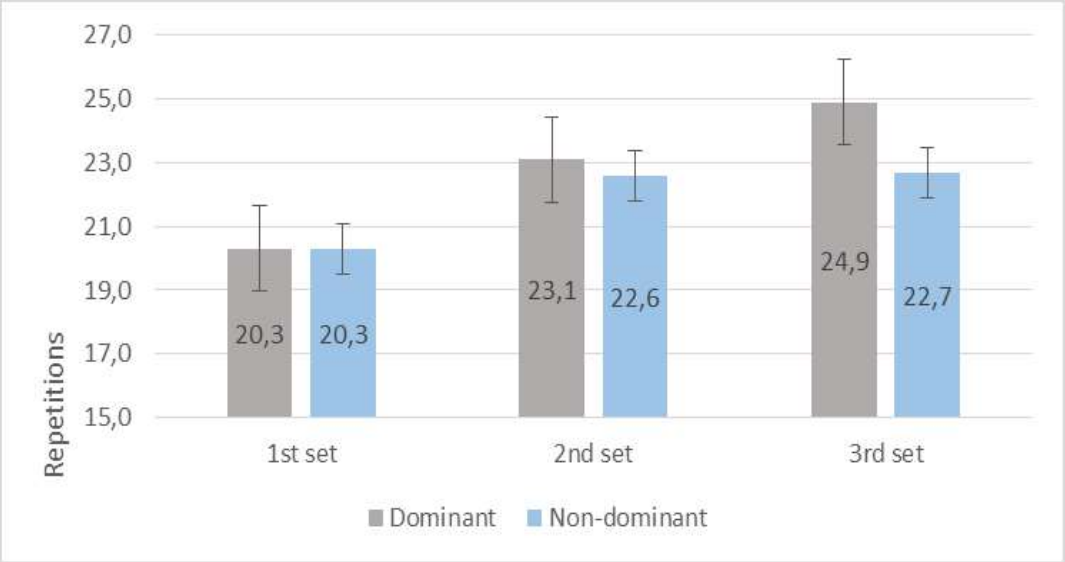


Figure 1. Maximal repetitions of continuous leg extension with stimulated dominant extremity in three sets (n=10)

With non-dominant leg stimulation we also observed confident increase in average repetitions in third set comparing to first set – 1.9 repetitions (p=0.0313), but no significant difference between extremities.

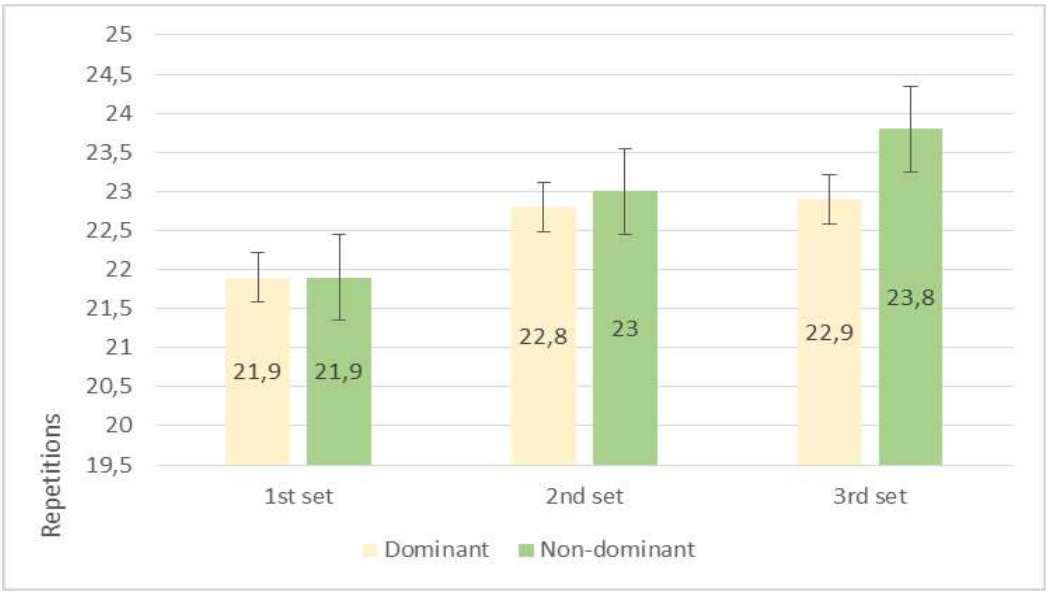


Figure 2. Maximal repetitions of continuous leg extension with stimulated non-dominant extremity in three sets (n=10)

Discussion

There must be taken into consideration fact, that different local vibrostimulation machines provide different results, making contradictions of application of local vibrostimulation (Issurin, 2005). Since LASE are provided with RE-21 local vibrostimulation machine, we researched effect of local vibrostimulation on strength and speed dynamics, permanent effect of local vibrostimulation and changes of muscle biomechanical parameters after local vibostimulation (Ciematnieks, 2011), we was questioned about parameter changes in dominant extremity, in practical application of local vibrostimulation some athletes experienced muscle spasms in dominant side after local vibrostimulation. In research no spasms were observed and there was no significant difference in maximal repetitions in dominant and non-dominant extremity.

Comparing repetitions of stimulated dominant (24.9±2) and repetitions of stimulated non-dominant extremity (23.8±2) there was not significant difference.

Conclusions

Based on the results of the study we can conclude that there is no need for physician to take into consideration dominant and non-dominant extremity for small groups of athletes. Still, there must be a individual approach of each athlete and each muscle even, so vibrostimulation records must be carried out to apply proper dynamics of frequency and amplitude of vibrostimulation. If there is possibility, then each athlete may be allowed to adjust frequency of vibrostimulation to acquire relaxing effect.

As research shows, vibrostimulation still allows relaxing muscles between sets of repetitions, so it can be used in competitions and training process, where continious strength endurance must be maintained.

References

1. Abercromby, A., Amonette, W., Layne, C., McFarlin, B., Hinman, M. & Paloski, W. (2007). Vibration exposure and biodynamic responses during whole-body vibration training. *Medicine & Science in Sports & Exercise*. Oct;39 (10), 2007. P. 1794-800
2. Cardinale, M. & Bosco, C. (2003). The use of vibration as an exercise intervention. *Exercise and Sport Science Reviews*, Vol 31, No. 1, p. 3-7.
3. Cardinale, M. & Wakeling, J. (2005). Whole body vibration exercise: are vibrations good for you? *British Journal of Sports Medicine* 39, p. 585.
4. Ciematnieks, U. (2011). Lokālās vibrostimulācijas ietekme uz spēka izpausmēm. *Promocijas darba kopsavilkums.* Rīga, LSPA.
5. Delecluse, C., Roelants, M., Diels, R., Koninckx, E. & Verschueren, S. (2005). Effects of whole body vibration training on muscle strength and sprint performance in sprint-trained athletes. *International Journal of Sports Medicine.* Oct, 26 (8), p. 662-8.
6. Issurin, V. (2005). Vibrations and their applications in sport. *Journal of Sports Medicine and Physical Fitness,* 45, p. 324-36.
7. Issurin, V. & Tenenbaum, G. (1999). Acute and residual effects of vibratory stimulation on explosive strength in elite and amateur athletes. *Journal of Sports Sciences.* March, 17 (3), p. 177-82.
8. Krauksts, V. & Ņemčenko, A. (2012). *Lokālā vibrostimulācija kā treniņu līdzeklis sportā.* Monogrāfija, 1. daļa. Rīga, Drukātava.
9. Rittweger, J. (2010). Vibration as an exercise modality: how it may work, and what its potential might be. *European Journal of Applied Physiology.* March, 108 (5), p.877-904.

Submitted: October 16, 2019
Accepted: December 20, 2019