

## **ABSTRACT OF THE DOCTORAL THESIS**

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Thesis Title: **CONTRIBUTIONS TO STUDY THE EFFECTS OF  
MECHANICAL VIBRATION METHOD TO DEVELOP STRENGTH IN  
ATHLETES**

In carrying out this research started from the idea that the use of mechanical vibrations in the process of training can lead to good results. Results obtained using mechanical vibrations lead us to change the body's anatomical fizilogice athlete evidenced by improved performance athlete, getting a tonic vibration reflex growth hormone secretion, improved systemic and peripheral blood flow and state of psychological comfort co. Mechanical vibrations are classified according to their frequency as follows: low frequency vibration between 0.5 Hz and 20Hz, they are entering and vibration spreads throughout the body depending on the position of the device that generates vibrations, medium-frequency vibrations are those beginning with 20 Hz values ranging up to 1000 Hz, with maximum sensitivity to the human body around 250 Hz and high frequency vibrations are in excess of 1000 Hz. Adrian Gagea believes in tonic reflex believes, that the idea put forward by the authors for effects-based training is part of the corollary iritabilității courts involved and do not biological effects of pseudo-neuro-muscular tetany. This effect is obtained in the phenomenon of resonance, taking into account muscle mass involved in relatively high acceleration movements. Recall that acceleration is a feature of the biomechanics of a mass movement can not be real ignore. The effects of judicious use of the platform can be found in the energy metabolism, increased muscle tone (especially the difference in tone between

relaxation and maximum contraction), muscle strength increased dramatically, especially the explosive. Other beneficial effects were observed experimentally on the coordination, bone density and blood circulation. Of course there are undesirable side effects, especially when proper dosage is not respected). This refers to internal organs and delay resonance strengthen tendons, which may increase the risk of injury. The first research on the effects of using mechanical vibration to increase muscle strength were stuck towards identifying resonant frequency at which muscle contractions involved made synchronous. For this frequency range Perla quadrocipital between 38-46 Hz and depends on muscle mass and level of education. For commercial reasons, modern platform frequency and amplitude steps which broadens the scope of applications (physical therapy, fitness, bodybuilding, etc.). But reduce methodological possibilities. In fact, methodical use of these platforms is that determines the typology of effects, and establish effective dosing and iterative applications. Use of vibrating platforms to students to develop mechanical force is still a luxury, on the other hand is a risk because there are no known side effects yet. Electrode stimulation mention fashion using various forms of muscle contractions and power intensities where the effects of muscle contraction exceeded their increased mechanical properties of tendons or circulation causing accidents. By similarity, we can invoke the lack of eloquent studies support the use of mechanical vibration to the development of force, but with an acceptable risk of accidents.

In the present study is based on the following premises: it is assumed that the sample of subjects participating in the experiment is statistically homogeneous, testatîi subjects are cooperative and interest in the tasks required by protocols for measurement and control, all subjects are clinically healthy at the time of testing, assessing aerobic exercise capacity is achieved by Myo test machine, this assessment tool to measure muscle performance in short time and with high precision, using a research platform for internationally recognized professional

mechanical vibrations with frequencies of 25 , 30, 35, 50 Hz, the natural rate of progress is maintained during the experimental period.

Assumptions from which to start research were as follows: if the training of athletes is judicious use of low and medium mechanical vibration frequency will be highlighted when the results obtained by improving anaerobic power maximum explosive strength and speed of execution, the second hypothesis that if associated methodological structures of classical preparation method antrenamet sporivilor with mechanical vibration and low frequency average training time will be greater efficiency and hence higher performance will be obtained. Research subjects are athletes aged between 14 and 15 years of training are at least 5 years and the exercise capacity compared to the average team is not very varied.

Of all the methods used in the research behind the crossover method of research. Crossover study is a crossover study (referred to as a crossover trial), longitudinally applied a different variable type subiectilor. Studies crossover can be studied by observations or experiments can be controlled. In a randomized trial, subjects are randomized into groups receiving different study and different variables. When randomized repeat the same indicators are collected several times for each test. A crossover study repeatedly follow the same design in which each subject is randomly assigned to a training sequence, including at least two antrenamete (one "training" may be a standard practice). Statisticians suggest that crossovers generally have four periods can be used and a design that allows studies to be truncated to three time periods and two periods, the latter still enjoys higher efficiency (Vonesh & Chinchilla; Jones & Kenward).

Anaerobic capacity test was performed using Myotest device. This assessment tool to measure muscle performance in short time. The test can be done at home without being subject to any laboratory equipment. It is a tool for improvement, including an analysis software to optimize training time. Can

store information from one or dumb athletes, allowing comparison of results. Calculated power, strength, speed and power under speed with a three-dimensional accelerometer. Acceleration sensor can detect movement at runtime. The information obtained is transferred to the computer through a USB connection. Training on vibrating platform generates a tonic stretch reflex in all the muscles involved in the effort. During this reflex, the muscles contract and relax at very high speeds and the amount of activated fibers reach 95% of muscle fibers involved in the effort. Using vibration platform, are strongly encouraged propriospinale ways used in the production of force by isometric contraction. Mechanical vibration platform in its composition presents a framework of steel pipe, an air suspension control and integrated. Frequencies generated by the platform is 25 Hz, 30 Hz, 35 Hz, 50 Hz and duration of exercise performed on the platform is between 10 and 60 sec. Amplitude with running exercises on the platform is of two types: amplitude 5 mm high and low amplitude 2 mm.

Training lesson structure includes three side by mechanical vibration. The preparatory included organizational aspects, details on the use of vibration platform and prepare body for exercise, the basic method of training was the use of mechanical vibrations in the training, the third followed the great return to normal body functions.

Experimental protocol included the following: choosing the place of experiment and testing, to establish two training groups during the experiment which will use mechanical vibration platform, the teacher, whose group of athletes has been used in the experiment, the been informed of the conduct of the experiment, subjects were explained and exemplified in the simple form that will collect information, recording and processing was done with Myotest device, setting tests and trials to evaluate indices and venue doriții of these samples, the sequencing of measurement iteration was set to 4 times a week.

From the research were the following conclusions of general importance. From documentary to show that vibration training platform leads with mechanical action on the muscle in a series of physiological effects. These physiological effects refer to increased hormonal secretion, improving systemic blood flow and peripheral, decreased bone demineralization leading to reduced osteoporosis by increasing bone density. Vibration training also provides toning muscles, improving joint mobility, pain relief in patients with musculoskeletal pain of different origins in particular in low back pain by decontracture effect. Benefits of this method of training is extended from the field to reshape physical rehabilitation. This technique improves muscle strength and endurance, joint movements and coordinating movements in activities or complex cinematic hypostasis. Vibration platform performed as described by stimulation of the neuromuscular training due to higher WBV compared with baseline values, by increasing and improving synchronization of motor units involved in the contraction activity. Applying mechanical vibration as well as other methods (electro) caution should be as long as side effects arising from uncontrolled uses the parameters imposed by this method can lead to unwanted side effects. This research was conducted to demonstrate that the use of mechanical vibrations in the training will improve preparation and increase the morpho-functional indicators of athletes. Experimental research was conducted on a total of 32 sportvi, divided randomly into two groups of 16 athletes (Group G1 and G2 group). Homogeneity of the two groups is large, arithmetic difference is very small, statistically insignificant, something indicated by small values of t (independent Student test) and F (ANOVA). Exposure to mechanical vibration athletes who were part of the experimental groups were not registered any case of injury and exercises performed with mechanical vibration platform were well tolerated by athletes. Following the experiment we have reached conclusions: on initial testing, dated 04/05/2010, we analyzed indicators show a group of insignificant differences between the results of experiment and control

group alleys. This is because all 32 athletes belong to the same statistical population, and their distribution in the two groups was made randomly. The only indicator with a lower homogeneity values obtained by testing athletes is Ruffier index, but most subjects showed values that indicated an average adjustment effort (levels between 5.1 and 10). Final testing, dated 17.05.2010, final test for the G1 is the first experiment the experimental group and control group G2, is also the initial test for the second experiment, the control group G1 and G2 is becoming experimental group. In this test, significant differences between the two groups were reported for the indicators: high jump in place, leg strength, jumping pliometrică, power developed in jumping and speed. The final test, experiment G1 group was significantly better than control group G2, G1 group were used for mechanical vibrations in the training. Significant differences for these three indicators are indicated by the values of T and F over tabulated values ( $t = 2.042$ ,  $F = 4.171$ ). At final testing, dated 06/28/2010, the final test for the second experiment, the G1 was the control group and experimental group G2, the final result achieved by the two groups were very close together, the statistical differences between medium is insignificant because, even if the experimental group used mechanical vibrations during training, the starting values of the control groups were higher, and in this case, the experimental group made a greater effort to overcome these results. If the final testing of 28.06.201, all starting values of the experimental group were lower than the control group, using mechanical vibrations, the results were significantly improved and the final values of the two groups were very close, with insignificant differences between them. The final test of 28.06.2011, the results revealed that the following indicators: high jump in place, leg strength, jumping pliometrică, power output in jump, speed of separation - was a significant improvement in results The experimental group obtained by judicious application of mechanical vibration. Recorded values are within normal limits for this vârstă. Rezultatele above confirm the **hypothesis number**

1, that the use of mechanical vibrations of low and medium frequencies are effective in the development of detention, the maximum power anaerobic explosive strength and speed of execution. If Ruffier index and Cooper test, even if the values are obtained at final testing to those obtained at initial testing significantly better for both groups and the control experiment, the final differences between experiment and control group are insignificant. This demonstrates that the application of mechanical vibrations is not intended primarily to improve this indicator. Growth rates in experimental groups were 5-14% higher than in control groups.

Applying a new method of training that aims mainly optimize exercise capacity, using a set of modern structures based on the judicious application of mechanical vibrations of low and medium frequency will efficiency training process. Thus, the content preparation process used to optimize exercise capacity should be oriented towards improving the morphological parameters of the athlete's perception works. Following scientific endeavor conducted found that the independent variable produces significant increases in indices of explosive force, speed of execution, the maximum anaerobic power, the prison, resulting in the preparation of athletes eficientizarea. These results confirm research **hypothesis number 2**, that if associated methodological structures of classical preparation method antrenamet sporivilor with mechanical vibration and low frequency average training time will be greater efficiency and hence higher performance will be obtained.

Research results, and systematic bibliographic material, can serve as a source for developing planning documents used by coaches, not only in the preparation of athletes. If it is considered by decision makers involved in the sport, the results are relevant, they can intervene and integrate mechanical vibration method in the preparation of athletes.

Thus, rejecting the spirit of conservation through creative work always, those interested can improve this research.

