# Study on the Development of Lower Limb Strength Using XBODY Technology

**Ștefan DINU-CRISTINESCU**[1]
**Virgil TUDOR**[2]
**Răzvan-Liviu PETRE**[3]

***Abstract***

*The use of XBody technology in Romania is a widespread social phenomenon due to which millions of people benefit from its positive effects. The purpose of this study is to develop lower limb strength through EMS (Electrical Muscle Stimulation) technology using fitness exercises and XBody training equipment for the population of Bucharest and the population living around the capital city. Thus, we aim to provide these people with a healthier lifestyle by both developing their lower body muscles and getting them used to the regular practice of XBody training twice a week during their free time, under the supervision of EMS fitness specialists. Integrating people into society, into their group of friends and fellow workers is a priority for XBody experts from Bucharest, and this scientific approach wants to offer support to sedentary people. When designing the XBody programme for the development of lower limb strength, we will consider some principles and rules such as:*

*Using the Wall Test to assess lower limb strength; Analysing health status; Analysing lifestyles through medical check-ups or cardiac investigations followed by own investigations; Adapting XBody programmes to current health status, physical fitness, daily schedule, and medical history.*

*The methods used in this paper are data processing and interpretation; the comparative study of the information collected during the initial and final testing of the Wall Test applied to the participants willing to develop their lower limb strength because of XBody training. The analysis carried out led us to the conclusion that the development of lower limb strength was greatly improved through XBody technology.*

**Keywords:** XBody, fitness, training, EMS technology, Wall Test, strength, testing.

**JEL classification:** I20, I29, M31

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[1] Ștefan Dinu-Cristinescu, National University of Physical Education and Sport, stefan_dinu17@yahoo.com, Telephone: 0729.712.130

[2] Virgil Tudor, National University of Physical Education and Sport, virgiltro@yahoo.com, Telephone: 0722.740.366

[3] Răzvan-Liviu Petre, National University of Physical Education and Sport, petrerazvan2000@yahoo.com, Telephone: 0723248285

## 1. Introduction

XBody workouts were introduced as an alternative to physical training performed in a classic gym. XBody World EMS (Electrical Muscle Stimulation) technology is used as a complement to voluntary exercise for improving fitness and health in both healthy people and patients who cannot exercise due to poor condition, spinal problems or injuries (Stöllberger & Finsterer, 2019).

XBody World has an effect on the whole body, being a time-efficient, joint-friendly and highly customizable exercise technology for overweight and sedentary people who lack physical condition (Kemmler et al., 2018).

Specialists have highlighted that it is essential to create alternative or optional training technologies for the growing number of people in various age groups who are unable or unmotivated to exercise conventionally. Recent research clearly shows that an XBody programme addressing all muscle areas of the body, which is performed three times over a 14-day period with each session lasting 20 minutes, is efficient, safe, and feasible for increasing muscle mass. The application of this innovative exercise technology is a suitable option for people of different ages who want to improve their body composition and muscle strength for harmonious physical development. (Kemmler et al., 2014)

Supervised XBody training is a safe strength training method and, in combination with nutritional support, shows promising effects against muscle loss and on the physical fitness of people who engage in this programme (Schink, 2018).

## 2. Purpose of the study

Through this applied experimental and descriptive research (Epuran, 2005), we aim to achieve results that can be implemented in XBody practical activity to improve quality of life for the population of Bucharest and the population living around the capital city with the help of training sessions provided by the XBody Titan Studio, which include exercises specific to fitness, gymnastics, combat sports, athletics and movement games, all of this combined with XBody EMS technology, in order to develop lower limb muscle strength.

This scientific approach aims to offer more knowledge about the development of lower limb muscles through the revolutionary XBody Newave technology.

## 3. Material and methods

The present paper focuses on the development of lower limb strength following the voluntary participation of people in EMS training using fitness exercises (XBody Newave), but also on aspects that need to be improved in this regard.

Current XBody Newave technology alternately uses an impulse frequency set between 7 and 100 Hz and an impulse depth set between 50 and 450 μs (microseconds), allowing the simultaneous activation of 10 main muscle groups (pectoral, lumbar, latissimus dorsi, trapezius, triceps or biceps brachii, lower leg or deltoid, biceps femoris, quadriceps, gluteal and abdominal ones) by means of various stimuli that can be adjusted according to the resistance of each participant (Figure 1); this technology has a special protection system designed to partially prevent the occurrence of unpleasant reactions and is applied to the motor point of the muscle (Tudor & Crișan, 2007).


**Figure 1. XBody Newave equipment**

Briefly, the research participants were guided to an XBody station where they exercised for 20 minutes under the supervision of a certified EMS fitness instructor. The bipolar electric current was applied with an impulse width of 350 μs, intermittently with 10 seconds to perform the movement and a 4-second break at an

EMS stimulation frequency of 80 Hz using a direct impulse from the XBody Newave equipment (Hungary).

Thus, to reach an appropriate intensity for the XBody application, participants were asked to exercise at a rate of perceived exertion between "somewhat hard" and "hard" (Kemmler et al., 2014).

This research used the Wall Test, which was applied before and at the end of the experiment. The participants were 57 people (49 female and 8 male) who performed this test for the assessment of their lower limb strength.

Throughout the 7 months, several XBody training programmes were developed using means specific to:

- fitness, which can be performed with the instructor during XBody training;
- gymnastics (squats, sit-ups, side arm raises, lunges, lying leg raises, etc.);
- combat sports (punches or kicks, elbow, and knee strikes) (Petre, 2011).

During training, fitness exercises were performed with the help of the following accessories: dumbbells of different sizes, gym ball, 4 kg kettlebell, elastic bands, elastic ropes with handles and stepper.

Wall Test description (Tudor, 2013)

Initial position: with the feet shoulder-width apart and the back against the wall. The back is kept against the wall and the body is slowly lowered into a squat, forming a 90-degree angle. When the foot is lifted off the ground, the timer starts, and when the foot can no longer be maintained and is back on the floor, the timer stops. The other leg is raised after a short break. The number of seconds in which the position with one leg raised is maintained represents the analysed result. An interpretation of these results can be found in the table below:

**Interpretation of the Wall Test**

**Table 1**

| Rating | Male (seconds) | Female |
|---|---|---|
| Excellent | >100 | >60 |
| Good | 75-100 | 45-60 |
| Average | 50-75 | 35-45 |
| Below average | 25-50 | 20-35 |
| Very poor | <25 | <20 |

The results were analysed using mathematical and statistical methods, and the data obtained were summarised for their statistical processing and interpretation.

The research was conducted over a 7-month period (August 2022 - February 2023) and covered several stages:

- Preparing the participant sheets
- Identifying the groups of participants for the experiment

- Assessing the participants
- Collecting raw information
- Establishing specific times for each assessment
- Analysing the results
- Drawing up conclusions.

## 4. Results

The participants included in the experimental research were selected from among the individuals who used to train at the XBody Titan Studio in Bucharest, sector 3. This studio is fully equipped with ultramodern EMS technology from Hungary, namely the XBody Newave model that was designed under the direction of experienced doctors, engineers, and physiotherapists, according to the latest developments in the technical field. The XBody Newave training equipment is especially intended for practice and meets all the requirements of functionality, quality, and technicality.

The Wall Test study was conducted on a group of 57 people who were assessed before and after the experiment, and its purpose was to develop lower limb muscles and increase times in seconds.

**Descriptive statistics results for the research participants who performed the Wall Test**

**Table 2**

| t-Test to the Wall Test | INITIAL TESTING | FINAL TESTING |
|---|---|---|
| Mean | 40,10667 | 55,64912 |
| Standard Error | 2,414165 | 2,201972 |
| Median | 36 | 53 |
| Mode | 60 | 75 |
| Standard Deviation | 18,22655 | 16,62452 |
| Sample Variance | 332,207 | 276,3747 |
| Kurtosis | -0,46876 | -0,26833 |
| Skewness | -0,2011 | 0,095735 |
| Range | 73,9 | 75 |
| Minimum | 0,1 | 21 |
| Maximum | 74 | 96 |

According to Table 2, the mean is 40.10 in initial testing and 55 in final testing, with the number 64 indicating progress in the development of lower limbs for the research participants, and this difference of 15.54 seconds is relatively important, as shown in Table 1.

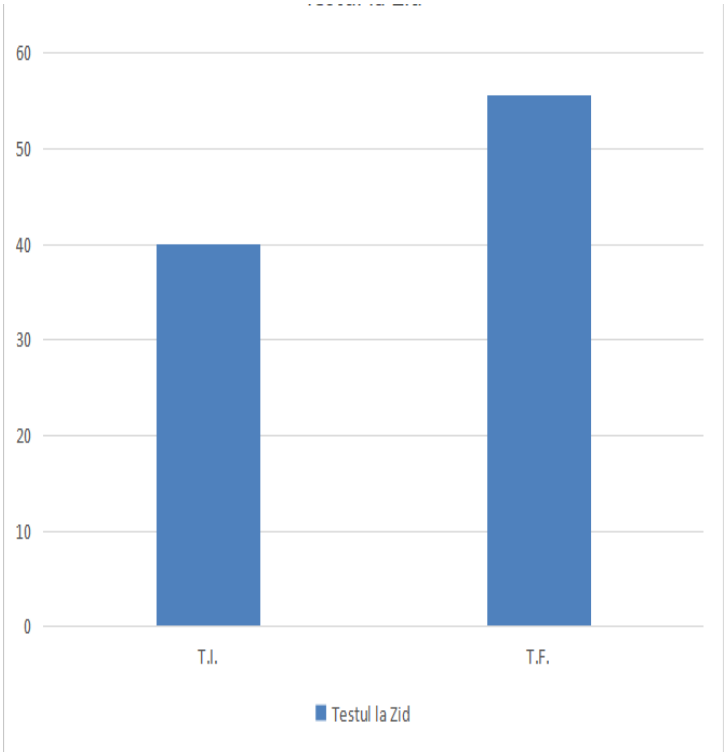


**Figure 2. Graphical representation of mean scores for the Wall Test – initial and final testing**

The standard error is 2.41 in initial testing and 2.20 in final testing, being involved in the calculation of the 95% confidence interval around the mean and the statistical inference.

The median, as a value of the series, is 36 in initial testing and 53 in final testing, so half of the observations have higher values and the other half have lower (or equal) values.

Table 2 reveals that the module has the value 60 in initial testing and 75 in final testing, representing the value with the highest frequency in the series.

The standard deviation is 18.25 in initial testing and 16.62 in final testing, indicating the average squared deviation from the mean scores of the variable.

Kurtosis is -0.46 in initial testing and -0.26 in final testing, meaning that, if flatness is < -1, the distribution is leptokurtic.

Skewness is -0.20 in initial testing, which shows an asymmetry to the right, and 0.09 in final testing, which indicates an approximately symmetrical symmetry (Table 2).

The variation is 332.20 in initial testing and 276.36 in final testing (Table 2), therefore the research participants can be considered heterogeneous.

**Results regarding the application of t-Test to the Wall Test**

**Table 3**

| **t-Test: Paired Two Sample for Means** | | |
|---|---|---|
| **t-Test to the Wall Test** | | |
| | Variable 1 | Variable 2 |
| Mean | 40,10666667 | 55,64912 |
| Variance | 332,2070333 | 276,3747 |
| Observations | 57 | 57 |
| Pearson Correlation | 0,923193048 | |
| Hypothesized Mean Difference | 0 | |
| d f | 56 | |
| t Stat | -16,7440416 | |
| P(T<=t) one-tail | 9,15324E-24 | |
| t Critical one-tail | 1,672522304 | |
| P(T<=t) two-tail | 1,83065E-23 | |
| t Critical two-tail | 2,003240704 | |

In terms of dispersion of the samples, the score is 332.20 in initial testing and 276.34 in final testing (Table 3), so it can be hypothesised that dispersions can significantly change.

The volume of the two variables is 57 people for variable 1 and variable 2, respectively.

Pearson's Correlation Coefficient has the value 0.92 (Table 3), meaning a very high correlation and a very close relationship between variable 1 and variable 2.

Hypothesised Mean Difference is the value with which we compare the difference between the means of the two variables. Since we aimed to test the equality of means (Table 3), the mean differences had to be compared with 0.

In Table 3, df (56) is the number of degrees of freedom of the t-distribution (t Statistic); it refers to the number of observations minus 1.

T Stat is -16.74 (Table 3), being the calculated value of our statistic test, which theoretically comes from the t Student distribution with df (previously reported degrees of freedom).

P(T<=t) one-tail is the one-dimensional critical probability that has the value 9.15 (Table 3), indicating the likelihood for a t Student test with degrees of freedom (df) to exceed our calculated value. If this value is lower than the set significance threshold, then the null hypothesis can be rejected in favour of the alternative hypothesis. The value 9.15 shown in Table 3 is higher than the usual $\alpha$ values, so the null hypothesis cannot be rejected.

T Critical one-tail (with the value 1.67 in Table 3) represents the one-dimensional critical value for the significance threshold $\alpha = 0.05$ (being specified in the Excel program when entering the data). Because the calculated t value is higher than the critical value in the table, H0 is rejected in favour of the

alternative hypothesis H1: $\mu 1 > \mu 2$, which is not the case in our research where $-16.74 < 1.67$.

The two-tailed critical probability (P(T<=t) two-tail) indicates the likelihood for a t Student variable with degrees of freedom (df) to exceed, in absolute value, the determined value. In other words, there is a probability for the difference between people's means to be farther from 0 than the observed difference.

The value 1.83 shown in Table 3 is higher than all the usual $\alpha$ values, meaning that the null hypothesis cannot be rejected.

The two-dimensional critical value (t Critical two-tail) for the significance threshold is $\alpha = 0.05$ (specified in the Excel program). The calculated t value (-16.74) is lower, in absolute value, than this critical value, so H0 is not rejected in favour of the alternative hypothesis. For our research, $|t| = |-16.74| = -16.74 < 2.00$, therefore the null hypothesis is not rejected.

## Conclusions

Following the data analysis, we have concluded that XBody workouts and the way of organising and conducting the Wall Test have positive feedback for people using XBody Newave technology.

According to specialised studies, the use of XBody EMS technology is an effective strategy and a good alternative for prevention, rehabilitation, and training. After a surgically healed injury or just an injury, the XBody EMS method contributes to fighting muscle atrophy and keeping muscle groups fit.

Our study has revealed that the XBody Newave equipment seems to be effective in improving the activities of contemporary fitness centres. Due to the reduced number of hours spent in a classic fitness gym, XBody EMS technology is preferred by the modern person, for whom time is extremely valuable.

The present study also highlights that the joint efforts provided during XBody workouts have improved lower limb strength, leading to better physical fitness.

XBody Titan training sessions managed to increase the lower limb strength of our participants in the direction desired by them, redefining the assessment of the physical status of their bodies.

We can state that overall physical condition has improved due to the development of physical fitness and its components.

In conclusion, the analysis carried out indicates that the development of lower limb strength has greatly improved because of using XBody technology.

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