

STUDY REGARDING THE EFFECTIVENESS OF EMS FITNESS TRAINING ON IMPROVING PHYSICAL CONDITION

Ștefan DINU-CRISTINESCU^{1*}, Virgil TUDOR¹

¹ National University of Physical Education and Sport, Faculty of Physical Education and Sport, Bucharest, Romania

*Corresponding author: stefan_dinu17@yahoo.com

<https://doi.org/10.35189/dpeskj.2021.60.s13>

Abstract. *The paper aims to highlight the existence of innovative means for muscle conditioning (and strengthening) provided by the fitness and wellness industry. In this context, we want to increase interest in leisure physical activities by emphasising the effectiveness of EMS (Electrical Muscle Stimulation) fitness technology to improve physical condition. The research has assumed that good physical condition in adults is the result of maintaining the body mass index (BMI) at a normal value, which is not necessarily associated with intense physical activity, and this ideal (aspiration) can be reached through EMS fitness training. The quasi-experiment was conducted at the XBody Titan Studio in Bucharest, sector 3, between November 2020 and March 2021, and involved 60 people (generally motivated by the desire to adjust fat deposits) for whom data sheets were prepared with somatic indicators, BMI and the Squat test. The sheets were drawn up during the first training session and completed monthly. In December 2020, online questionnaires were administered to both people engaged in EMS fitness training and physical education and sport specialists, being then analysed and interpreted. The specific EMS fitness training programme using XBody equipment was performed twice a week, and the results were tabulated, statistically processed, interpreted and graphically represented. Among the most important conclusions of the paper, we mention: the values of somatic indicators (weight) and BMI decrease from the first phase of XBody training, and energy consumption is higher due to increased muscle activity.*

Keywords: *fitness, EMS training, physical condition.*

Introduction

Fitness is especially important for the contemporary population whose physical condition needs to be optimal to meet job-specific tasks (Furtado et al., 2015).

The truth that independent or systematic exercise has beneficial effects on the whole body has long been demonstrated and supported by empirical or scientific studies (Bălan et al., 2020).

Scientific evidence on the importance of physical activity is a challenge for high-tech society to increase people's engagement in this activity (Washington, 2005).

“Efforts to promote physical activity have focused on identifying determinants and designing interventions that might effectively promote regular physical activity.” (Seefeldt et al., 2012, p. 143)

The study conducted by Park et al. (2014) suggests that efforts to promote physical activity among adults and the elderly “should focus on enhancing self-efficacy, social support, and self-regulation skills” (p. 45).

Taking into account the influence of education and vocational training on the individual, special attention has been paid to the impact of people's livelihoods on their development.

The opportunity to use EMS (electrical muscle stimulation) fitness technology is limited by both people's living standards but also their general level of knowledge. If we take into account that XBody EMS technology is closely related to the sporting environment (especially in Romania), we can easily observe that the material endowments of XBody EMS equipment will condition the practice of leisure sports and competitive sports.

“Workouts are highly varied and often ‘scored’ (e.g., time required to complete tasks), which is common in many occupational fitness tests to assess and document improvements.” (Poston et al., 2016, p. 628)

EMS fitness technology offers a broad range of services related to competitive sports and sports for all, which will result in a wide openness of the Romanian society to the benefits of this technology. The promotion of EMS fitness motor activities in Romania should start from both the interests of society as a whole and the personal interests of each individual.

Research purposes

Through this scientific approach, we aim to reveal how the use of EMS fitness technology (XBody equipment) can influence the physical condition of individuals (in Romania) due to the innovative means for muscle conditioning (and strengthening) provided by the fitness and wellness industry. We also want to highlight the effectiveness of XBody EMS equipment in improving fitness to increase interest in leisure physical activities. At the same time, we aim to raise awareness among decision-makers about the possibilities of using EMS fitness technology in competitive sport.

Research hypothesis

The research has assumed that good physical condition in adults is the result of maintaining the body mass index (BMI) at a normal value, which is not necessarily associated with intense physical activity, and this ideal (aspiration) can be reached through EMS fitness training.

Methodology

Research methods

The research methods used are: quasi-experimental method, observation, mathematical statistics and graphical method (Păunescu, 2013).

A computerised method was used to analyse weight and body mass index via the TANITA BC-587 InnerScan Body Composition Analyser.

For the statistical data processing, we used the sheets created by us but also the results obtained from the Squat test.

Content of the quasi-experiment

Research participants, men and women aged 18-57 years, perform XBody EMS fitness training. The quasi-experiment took place at the XBody Titan Studio in Bucharest.

At the beginning of the study, participants stated that the workplace could negatively influence the XBody training programme, which, in our opinion, might largely be the result of a sedentary lifestyle whose functional approach is emphasised in this quasi-experiment. Clients had to perform a Squat test to monitor their lower limb strength (Tudor, 2013), somatic indicators (weight, height) and BMI during both an initial assessment and a final assessment that was conducted after 180 days to analyse individual preparedness for the improvement of physical condition.

We developed several XBody training programmes using means specific to gymnastics (raising the arms sideways, squats, knee bends, crunches, lifting the legs from the back side, etc.) and fitness (Neagu et al., 2020), which can be performed with the instructor during EMS fitness training (Mitu et al., 2020).

Several fitness exercises were performed using the following accessories: dumbbells (0.5 kg, 1 kg and 2 kg), kettlebell/dumbbell (4 kg), gym ball, elastic bands and stepper.

The 60 participants trained twice a week for 180 days, and each EMS fitness session lasted 20 minutes. The XBody workout was done in the evening with a number of repetitions or at intervals of 4 to 60 seconds an exercise, depending on the selected programme.

Current XBody equipment allows the simultaneous activation of 10 muscle regions (legs or deltoid, femoral biceps, quadriceps, buttocks, abdominal, pectoral and lumbar areas, latissimus dorsi, trapezius and arms including biceps or triceps brachii) with different intensities that can be adjusted depending on each individual. Pulse intensity can be selected and changed individually during an EMS training session.

The XBody device uses a modulated current with a pulse frequency between 7-100 Hz, alternatively with a pulse depth between 50-450 μ s (microseconds) to partially avoid the occurrence of unpleasant reactions, being applied to the motor point of the muscle (Tudor & Crişan, 2007).

The quasi-experiment was performed at the XBody Titan Studio in Bucharest, sector 3, in compliance with all hygiene and distancing rules to prevent the spread of the SARS-CoV-2 virus (Simion & Croitoru, 2020). It took place between November 2020 and March 2021 and included 60 people (generally motivated by the desire to adjust fat deposits) for whom data sheets were prepared with somatic indicators, BMI and the Squat test.

During this period, we developed two questionnaires on XBody technology to find about participants' sports knowledge and experiences. The questionnaires were administered to both people engaged in EMS fitness training and physical education and sport specialists and were completed online using Google Forms.

The two questionnaires were designed as follows:

- A 17-item questionnaire was intended for people performing XBody training, who were aged between 18 and 56 years. Gender distribution was 86% female and 12.2% male.
- A 14-item questionnaire was intended for physical education and sport specialists, who were aged between 20 and 60 years. Gender distribution was 54.5% female and 45.5% male, which suggests that women allocate more time to improve their physical condition.

We mention that there are over 20 XBody sports clubs and associations in Bucharest, which offer interested people the opportunity to get involved in exercise programmes.

The survey was conducted over a period of six months, between December 2020 and April 2021, covering several stages:

- Designing the questionnaire items;
- Identifying the groups of participants to conduct the survey;
- Applying the questionnaire;
- Gathering raw information;
- Determining the percentages for each question;
- Analysing the results;
- Drawing conclusions.

Results

After applying the questionnaire, 119 responses were received from people performing EMS fitness training and 77 responses from physical education and sport specialists.

In the following, we will analyse some important items and the responses given by those engaged in XBody EMS training.

1. What could negatively affect your XBody training programme?

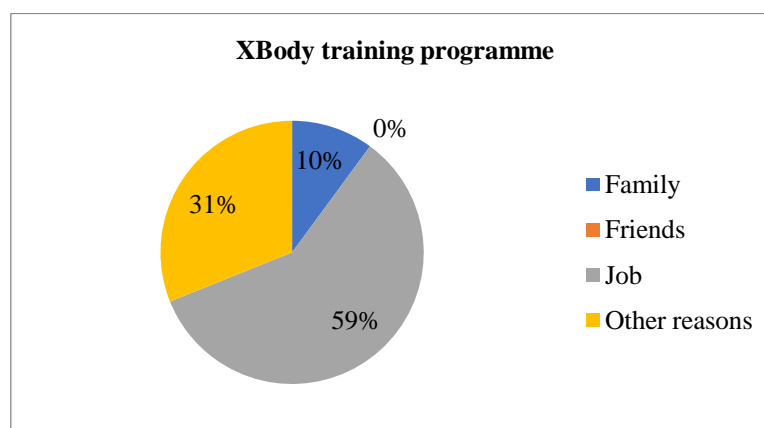


Figure 1. Responses given by XBody participants to Question 1

Analysing the responses to this item, it is observed that 59% of participants choose the job as an excuse not to do EMS training, 31% invoke other reasons, and 10% say that their families negatively influence their engagement in EMS fitness training (Figure 1).

A literature search revealed a large number of studies (more precisely, 168) addressing the influence of stress on physical activity, which “varied widely in their theoretical orientation and included perceived stress, distress, life events, job strain, role strain, and work-family conflict but not lifetime cumulative adversity” (Stults-Kolehmainen & Sinha, 2014, p. 81). A systematic search of PubMed, Web of Science and SPORTDiscus was used by these authors to identify all relevant studies focusing on human participants, and the key terms were

‘stress’, ‘exercise’ and ‘physical activity’. Their conclusion is that everyday events related to stress and exhaustion lead to reduced motor activity.

2. Do you think that XBody training is a significant aspect of your daily life?

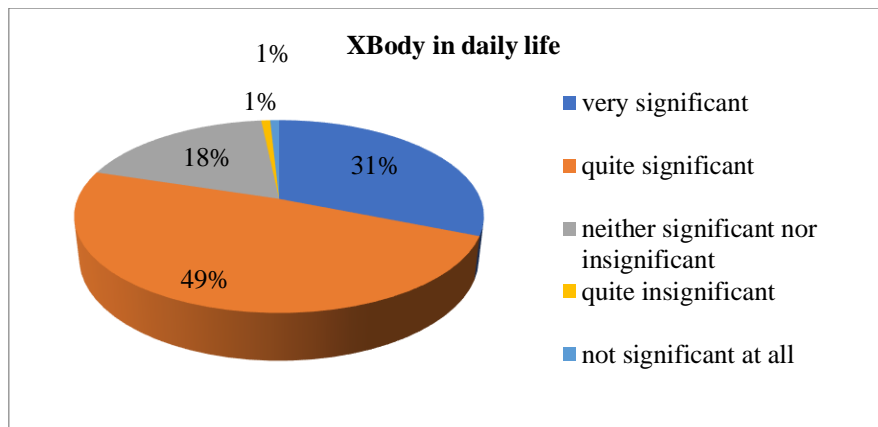


Figure 2. Responses given by XBody participants to Question 2

Among the 119 people engaged in XBody training, 49% state that it is ‘quite significant’ in their daily lives, 31% say that it is ‘very significant’ because nowadays time is very precious and they prefer this way of training, 18% believe that EMS training is ‘neither significant nor insignificant’, 1% think that it is “quite insignificant” and the same percentage of 1% think that it is ‘not significant at all’ (Figure 2).

3. Do you think that XBody exercises/activities can increase your self-esteem?

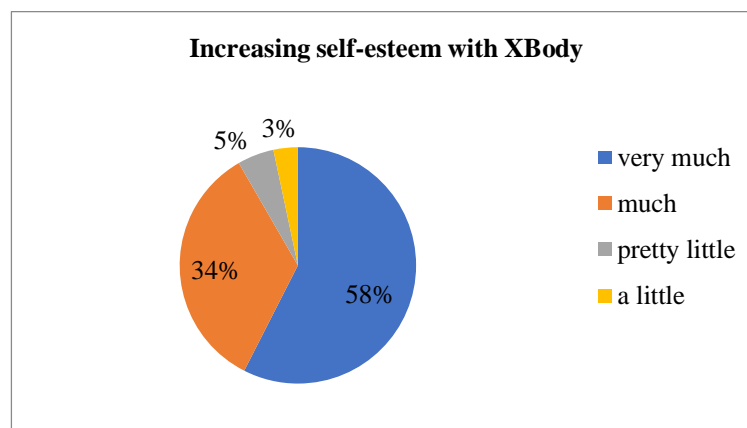


Figure 3. Responses given by XBody participants to Question 3

It is observed that 58% of respondents believe that XBody exercises/activities lead to increased self-esteem, while 34% say that they contribute a lot to increasing self-esteem. However, approximately the same percentage is also obtained for ‘pretty little’ (5%) and ‘a little’ (3%). (Figure 3)

Some important questions for physical education and sport specialists are presented below.

4. What is your level of education?

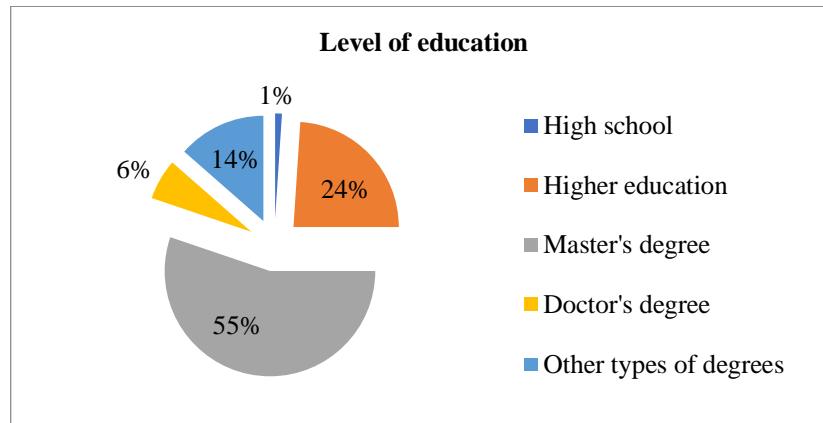


Figure 4. Responses of physical education and sport specialists to Question 4

According to Figure 4, more than half (55%) of physical education and sport specialists have completed higher education (Master's degree), which indicates continuing education throughout their lives. However, 24% have not completed higher education. Respondents with other types of degrees in the field are in a proportion of 14%, followed by those with a Doctor's degree (6%), which reveals that some of them are highly motivated and want to deepen their knowledge in the field of physical education and sport science. Regarding high school, the percentage is 1%, therefore very small, and the percentages in the figure above show that our specialists are highly trained in their field of activity.

5. Do you think that XBody workouts (EMS fitness exercises) are effective for the body?

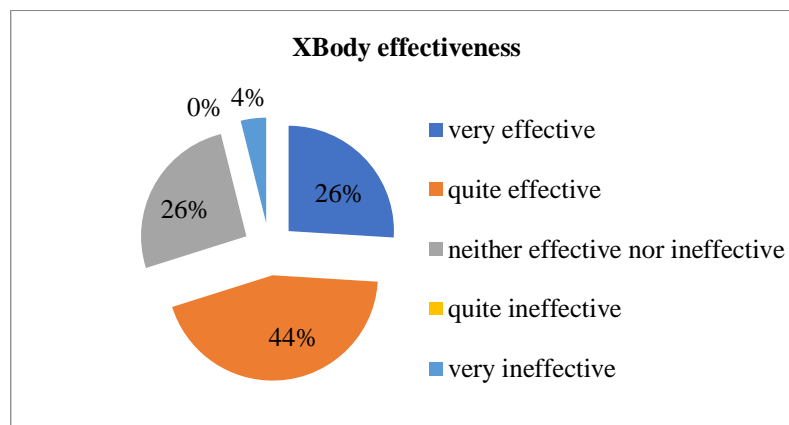


Figure 5. Responses of physical education and sport specialists to Question 5

Responses to this question are as follows: 44% - 'quite effective', 26% - 'very effective', and 26% - 'neither effective nor ineffective'; the lowest percentage was 4% for 'quite ineffective' (Figure 5).

6. Does XBody training help raise awareness and improve body posture?

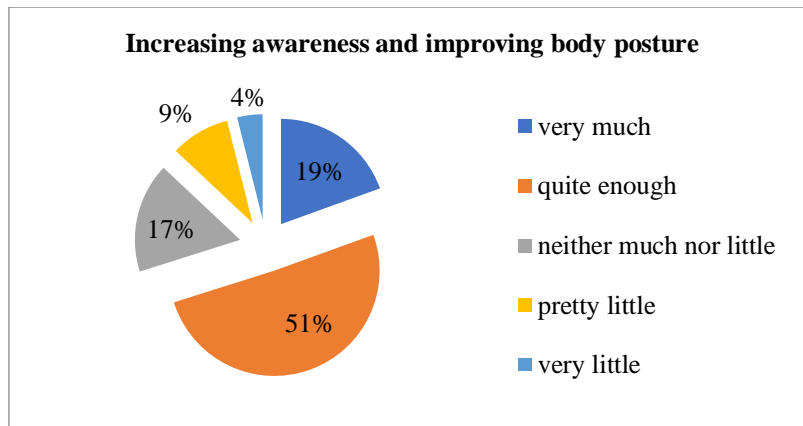


Figure 6. Responses of physical education and sport specialists to Question 6

According to the responses to Question 6, 19% of physical education and sport specialists believe that XBody training is very useful for increasing awareness and improving body posture. With a high percentage (51%), physical education and sport specialists chose the response 'quite enough', and 17% - 'neither much nor little'. The other options have a small percentage, namely 9% - 'pretty little' and 4% - 'very little'. (Figure 6)

7. Are XBody exercises using EMS fitness technology more advantageous for improving physical condition than classic gym exercises (without XBody equipment)?

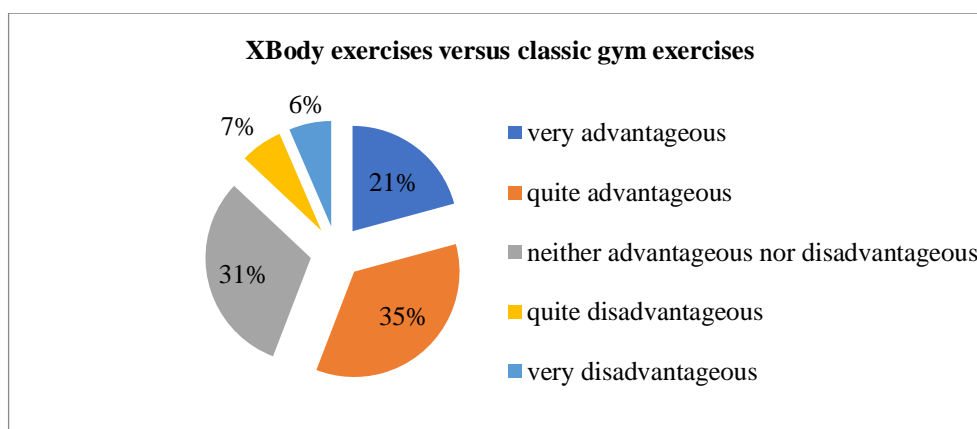


Figure 7. Responses of physical education and sport specialists to Question 7

Figure 7 shows a percentage of 21% for 'very advantageous', and the highest level is 35% for 'quite advantageous' in terms of exercises aimed at fitness improvement with the help of XBody technology compared to classic gym exercises. Respondents chose the option 'neither advantageous nor disadvantageous' in a proportion of 31%, while 'quite disadvantageous' and 'very disadvantageous' obtained the percentages of 7% and 6%, respectively.

8. Can XBody become a lifestyle and a form of exercise to be practised weekly?

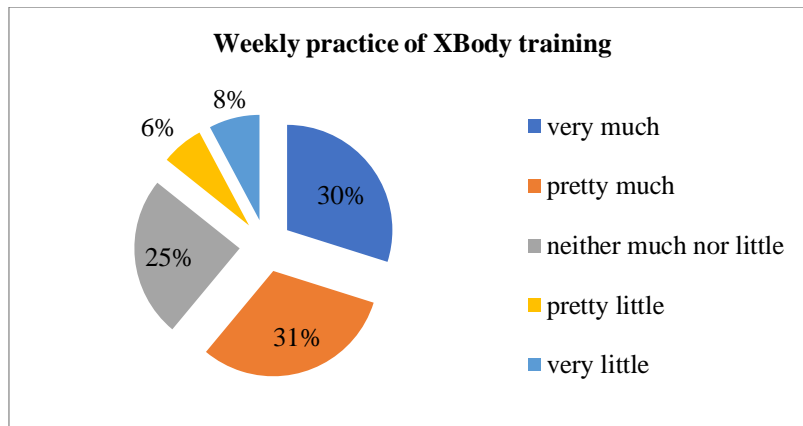


Figure 8. Responses of physical education and sport specialists to Question 8

According to Figure 8, 31% of physical education and sport specialists chose the response ‘pretty much’ for the weekly practice of XBody training as a lifestyle and a form of exercise, while 30% had the option ‘very much’, which suggests that this new concept can become a healthy lifestyle for contemporary people. The response ‘neither much nor little’ was chosen by 25%, ‘pretty little’ was the option of 6%, and ‘very little’ was indicated by 8%.

9. Does XBody training contribute to weight loss by changing body composition?

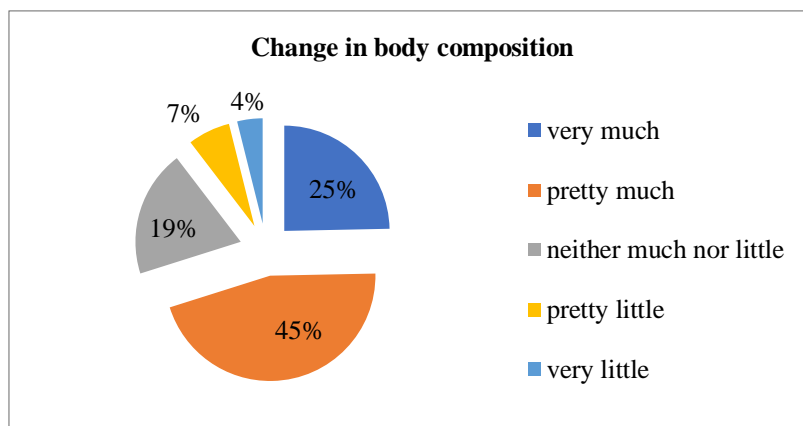


Figure 9. Responses of physical education and sport specialists to Question 9

Figure 9 shows that the response ‘pretty much’ has a percentage of 45%, followed by ‘very much’ with 25%. ‘Neither much nor little’ is represented by 19% of responses, and ‘pretty little’ and ‘very little’ have percentages of 7% and 4%, respectively. The data provided indicate that XBody training has proven its effectiveness and contributed to weight loss by changing body composition.

In the next stage of the quasi-experiment, we chose 60 people from Bucharest to exercise on the XBody EMS training device; it should be noted that they came for the first time to the body remodelling studio and had never practised any sport before. They were receptive and eager to take part in the proposed quasi-experiment.

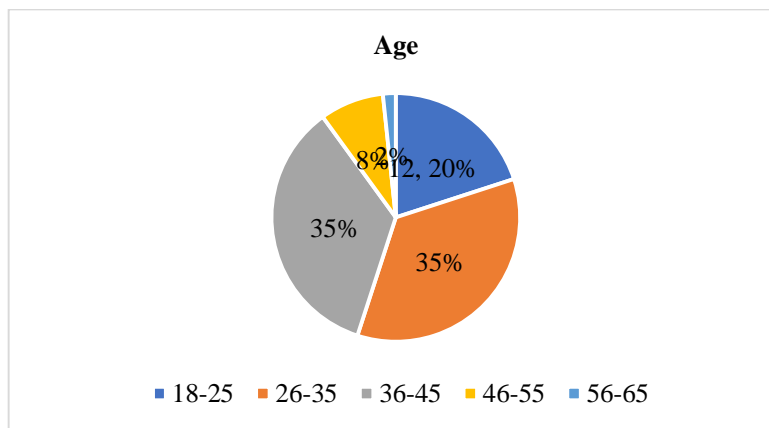


Figure 10. Age categories

The study participants are female and male. The statistical calculation shows an average age of 33.5 years, which places them in the category of young adults. The range is high (having the value 38), with a minimum age of 18 years and a maximum age of 56 years. Figure 10 reveals that the age categories 36-45 and 46-55 are better represented.

The study was conducted taking into account the participants' indicators that were entered in an Excel table corresponding to the anthropometric method of measuring the percentage of body fat (Tudor & Crişan, 2007). The data were extracted from client files and completed during the six months of the quasi-experiment by their instructor (D.Ş.), who had more than 5 years of experience as a bodybuilding and fitness specialist at the XBody Titan Studio.

We chose a measurable parameter, namely weight, because it was thought to be the most important from the perspective of both the instructor and clients, representing the main visible areas in shaping the human body and being responsible for its aesthetics.

For the initial and final tests, in addition to weight, BMI and the Squat test were used.

BMI quantifies the amount of tissue mass (muscle, fat and bone) of a person and, based on the value obtained, classifies that person into one of the following categories: underweight, normal weight, overweight or obese.

Body composition is defined as the approximate percentage of adipose tissue and dynamic muscle mass in total body weight; health status is influenced by body composition, the personal constitutional type being an important index (Bota, 2006).

“While much research has focused on the costs of obesity and economic factors that drive obesity growth, little economic research has examined the factors that contribute to obesity - physical inactivity and poor nutrition.” (McInnes & Shinogle, 2009, p. 3)

Body mass index or Quetelet's index is derived from an individual's mass (weight) and height. BMI is defined as the body mass divided by the square of body height and is uniformly expressed in units of kg/m^2 resulting from mass in kilograms and height in meters.

BMI is represented by the following categories (Bota, 2006):

- Morbid obesity - with a value of 40.00 or more
- Class II obesity - between 35.00 and 39.99
- Class I obesity - between 30.00 and 34.99
- Overweight - between 25.00 and 29.99

- Normal weight - between 18.50 and 24.99
- Underweight - with a value of 18.49 or below

Overweight and obesity are caused by many factors. For each individual, body weight is determined by a combination of genetic, metabolic, behavioural, ecological, cultural and socioeconomic influences (US Department of Health and Human Services, 2001).

After recording all the parameters monitored in the initial and final tests, we calculated the arithmetic mean of the progress rate, which was the most important statistical indicator in our study.

Using the Excel table, we created graphs to highlight changes in the monitored parameters.

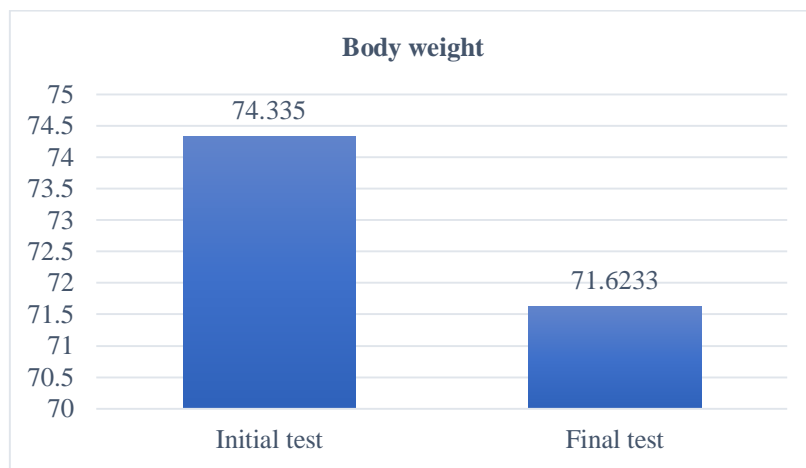


Figure 11. Changes in body weight

According to Figure 11, the calculation of the arithmetic mean revealed a weight difference of 2.71 kg (74.3 kg in the initial test and 71.62 kg in the final test). Overall, progress has been made in fulfilling the participants' desire.

“Overweight is a risk factor for certain medical conditions, including coronary heart disease, diabetes, and some types of cancer” (Flegal & Kalantar-Zadeh, 2013, p. 1744) but also osteoarthritis, gout and more.

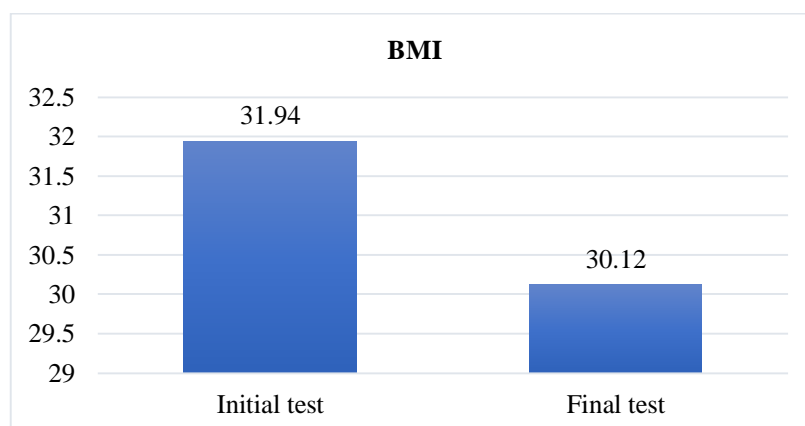


Figure 12. Changes in BMI

Statistically, the group of people with whom we interacted during the six months of the study had an average BMI of 31.94 (Class I obesity) in the initial test, but this value decreased to 30.12 in the final test (Figure 12), indicating a BMI improvement of 1.81.

Obesity is common in all parts of the world. It has been scientifically calculated that obesity shortens people’s lives by 10-15 years (Cheța & Mihalache, 1989).

Therefore, the problem of overweight and obesity has emerged as one of the most pressing global issues we will face in the coming decades, which requires the attention of the health community, researchers and policy-makers (Nguyen & El-Serag, 2011).

To monitor leg strength according to Squat test standards (Figure 13), we present below the results in the initial test (Figure 14) and the final test (Figure 15).

Squat Test Norms						
Men	Age: 18-25	Age: 26-35	Age: 36-45	Age: 46-55	Age: 56-65	Age: 65+
Excellent	>49	>45	>41	>35	>31	>28
Good	44-49	40-45	35-41	29-35	25-31	22-28
Above average	39-43	35-39	30-34	25-38	21-24	19-21
Average	35-38	31-34	27-29	22-24	17-20	15-18
Below Average	31-34	29-30	23-26	18-21	13-16	11-14
Poor	25-30	22-28	17-22	13-17	9-12	7-10
Very Poor	<25	<22	<17	<9	<9	<7

Women	Age: 18-25	Age: 26-35	Age: 36-45	Age: 46-55	Age: 56-65	Age: 65+
Excellent	>43	>39	>33	>27	>24	>23
Good	37-43	33-39	27-33	22-27	18-24	17-23
Above average	33-36	29-32	23-26	18-21	13-17	14-16
Average	29-32	25-28	19-22	14-17	10-12	11-13
Below Average	25-28	21-24	15-18	10-13	7-9	5-10
Poor	18-24	13-20	7-14	5-9	3-6	2-4
Very Poor	<18	<20	<7	<5	<3	<2

Figure 13. Squat test standards (Tudor, 2013)

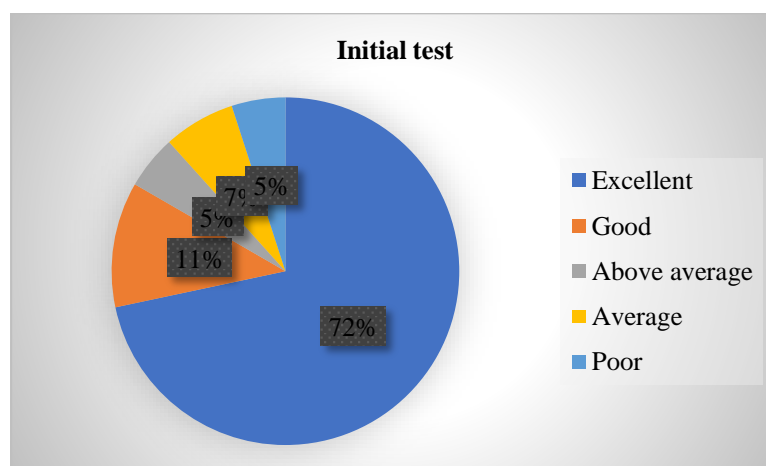


Figure 14. Squat test performance in the initial test

According to Figure 14, the results of 43 people (72%) were graded as ‘excellent’ for leg strength performance in the initial test, 7 (12%) were graded as ‘good’, 6% received ‘average’ grades, and 5% obtained ‘above average’ and ‘poor’ grades.

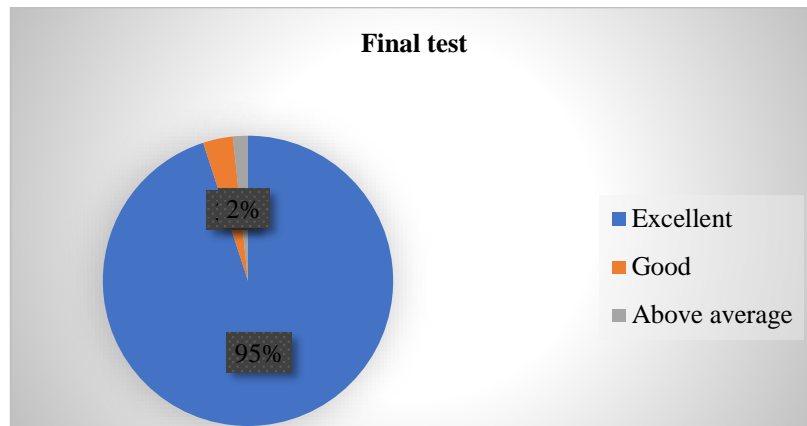


Figure 15. Squat test performance in the final test

In the final test, the number of poor results decreased by one, two people (3%) improved their grades to 'good', and the remaining 57 obtained an 'excellent' grade for their leg strength performance, which allows us to state that all participants have made visible progress (Figure 15).

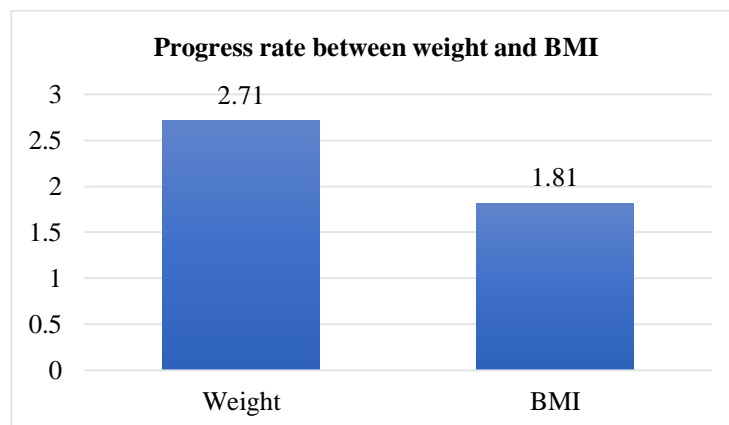


Figure 16. Arithmetic mean of the progress rate

Figure 16 shows a good progress rate of the participants' body weight: the arithmetic mean is 2.71 kg, with a minimum decrease of 0.77 kg and a maximum decrease of 3.60 kg, which indicates obvious progress in combating excess weight.

The arithmetic mean of the progress rate in terms of BMI has a favourable dynamic, going towards normality. Each individual is unique, reacts differently to stimuli, and this aspect is revealed in Figure 16, where the improvement of BMI (at group level) is 1.81.

Statistically, the group of participants had an average BMI of 31.94 (Class I obesity) in the initial test, which reached 30.12 in the final test, therefore their BMI improved by 1.81.

Thus, there is a visible improvement in BMI and body weight, with participants progressing from medium/poor to better physical condition.

Conclusion

The study of the literature related to the research topic reveals that both health risks and healthcare costs due to overweight and obesity are considerable.

According to the literature, the use of XBody equipment is an effective alternative strategy to be used in competitive sport for re-education, training and prevention. After an injury or surgically healed injury, the XBody method helps maintain muscle groups and contributes to fighting against muscle atrophy. The research has shown that XBody equipment appears to be effective in improving the areas of contemporary fitness.

Due to the fact that EMS technology reduces the number of hours spent in a gym or stadium, it is preferable for the modern individual, whose time is extremely valuable.

The research shows that the efforts made, together with the use of EMS fitness technology, have led to an improvement in BMI and consequently in physical condition.

The use of XBody equipment managed to improve the participants' body weight in the desired direction, thus redefining their shape.

In conclusion, this ascertaining quasi-experiment has validated the research hypothesis that good physical condition in adults is the result of maintaining the body mass index (BMI) at a normal value, which can be achieved with the help of X-Body equipment.

EMS technology exploits the sport science to put itself at the service of health and aims for a better quality of life. It combines competence and innovation with a pleasant environment.

Authors' Contributions

Both authors have equally contributed to this study and should be considered as main authors.

References

- Bălan, V., Strazdina, N., Dirzininka, I., & Mujea, A. M. (2020). Study on learning the bocce-specific technique. In *Book of Proceedings of the 10th International Congress of Physical Education, Sport and Kinetotherapy* (pp. 1-11). <https://doi.org/10.51267/icpesk2020bp01>
- Bota, A. (2006). *Exerciții fizice pentru o viață activă* [Exercise for an active life]. Cartea Universitară.
- Park, C.-H., Elavsky, S., & Koo, K.-M. (2014). Factors influencing physical activity in older adults. *Journal of Exercise Rehabilitation*, 10(1), 45-52. <https://doi.org/10.12965/jer.140089>
- Cheța, D., & Mihalache, N. (1989). *Efortul fizic și metabolismul* [Exercise and metabolism]. Sport-Turism.
- Furtado, H., Sousa, N., Simão R., Pereira, F., & Vilaça-Alves, J. (2015). Physical exercise and functional fitness in independently living vs. institutionalized elderly women: A comparison of 60- to 79-year-old city dwellers. *Clinical Interventions in Aging*, 10, 795-801. <https://doi.org/10.2147/CIA.S80895>
- Flegal, K. M., & Kalantar-Zadeh, K. (2013). Perspective: Overweight, mortality and survival. *Obesity*, 2(19), 1744-1745. <https://doi.org/10.1002/oby.20588>

- McInnes, M. M., & Shinogle, J. A. (2009). *Physical activity: Economic and policy factors*. Working paper: 15039 (pp. 1-42).
https://www.nber.org/system/files/working_papers/w15039/w15039.pdf
- Mitu, D. C., Neamțu, M., Tudor, M., & Tudor, I. D. (2020). Motivational aspects regarding participation in physical education classes of students with partial medical exemption. In *Book of Proceedings of the 10th International Congress of Physical Education, Sport and Kinetotherapy* (pp. 95-105). <https://doi.org/10.51267/Icpesk2020bp09>
- Neagu, N., Leonte, N., Popescu, O., & Răchită I. (2020). Improving sports performance in breaststroke swimming through the means of fitness. In *Book of Proceedings of the 10th International Congress of Physical Education, Sport and Kinetotherapy* (pp. 83-94).
<https://doi.org/10.51267/Icpesk2020bp08>
- Nguyen, D. M., & El-Serag, H. B. (2011). The epidemiology of obesity. *Gastroenterology Clinics of North America*, 39(1), 1-7. <https://doi.org/10.1016/j.gtc.2009.12.014>
- Păunescu, M. (2013). *Metode de cercetare științifică* [Scientific research methods]. Discobolul.
- Poston, W. S. C., Haddock, C. K., Heinrich, K. M., Jahnke, S. A., Jitnarin, N., & Batchelor, D. B. (2016). Is High Intensity Functional Training (HIFT)/CrossFit® safe for military fitness training? *Military Medicine*, 181(7), 627-637.
<https://doi.org/10.7205/MILMED-D-15-00273>
- Seefeldt, V., Malina, R. M., & Clark, M. A. (2012). Factors affecting levels of physical activity in adults. *Sports Medicine*, 32(3), 143-68.
<https://doi.org/10.2165/00007256-200232030-00001>
- Simion, A., & Croitoru, D. (2020). Dangerous sports in pandemic times: Analysis for children's public sport units of Romania. In *Book of Proceedings of the 10th International Congress of Physical Education, Sport and Kinetotherapy* (pp. 164-172).
<https://doi.org/10.51267/Icpesk2020bp14>
- Stults-Kolehmainen, M., & Sinha, R. (2014). The effects of stress on physical activity and exercise. *Sports Medicine*, 44(1), 81-121. <https://doi.org/10.1007/s40279-013-0090-5>
- Tudor, V. (2013). *Măsurare și evaluare în sport* [Measurement and evaluation in sport]. Discobolul.
- Tudor, V., & Crișan D. I. (2007). *Forța – Aptitudine motrică* [Strength - A motor ability]. Bren.
- US Department of Health and Human Services. (2001). *The Surgeon General's call to action to prevent and decrease overweight and obesity*. Rockville, Office of the Surgeon General.
- Washington, D. (2005). *Does the built environment influence physical activity?: Examining the evidence* (Special Report 282). <https://www.nap.edu/read/11203/chapter/1>