STUDY ON IMPROVING PHYSICAL CONDITION THROUGH XBODY TECHNOLOGY

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Abstract. *This study aims to point out that the fitness and wellness industry provides innovative means for muscle conditioning. Therefore, our purpose is to increase people's interest in leisure motor activities by highlighting the effectiveness of EMS (Electrical Muscle Stimulation) fitness technology in improving physical condition. The research hypothesis is that good physical condition in the adult population depends on the normal values of their visceral fat, which is not imperatively related to vigorous physical activity, and this aspiration can be fulfilled by using EMS fitness training. The quasi-experiment took place at the XBody Titan Studio in Bucharest from September 2021 to March 2022 and included 50 people (wanting to adjust their fat deposits) for whom we prepared record sheets with somatic indicators (bone mass, muscle mass, visceral fat, metabolic age and number of kilocalories). The sheets were written at the first training and completed every month. The study participants performed specific EMS fitness workouts using XBody equipment twice a week, and their results were tabulated, statistically processed, interpreted and graphically represented. Some conclusions drawn from this research are: the values of metabolic age and visceral fat are lower from the first phase of XBody training, and energy consumption is higher due to increased muscle activity; correct posture is obtained only after a few sessions; within 6 months, the measurements of somatic indicators are visible in the improved strength of the lower limbs and increased muscle mass, and these results are closely associated with physical condition and diet.*

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

Introduction

The World Health Organization (WHO) recommends people of all ages to engage in regular and appropriate physical activity. If this recommendation cannot be fulfilled due to health problems, international guidelines state that people should be as physically active as possible (Jones et al., 2021).

"A large proportion of adults in Western cultures is physically inactive, despite several decades of warnings about the potentially negative health consequences of a sedentary lifestyle. Efforts to promote physical activity have focused on identifying its determinants and designing interventions that might effectively promote regular physical activity. The multitude of factors that induce adults to initiate and maintain physical activity programmes have been divided into those that are invariable (age, gender, race, ethnicity) and those that are presumed to be modifiable (behavioral and personality characteristics, environmental circumstances and community settings)." (Seefeldt et al., 2002, p. 143).

Electrical muscle stimulation (EMS) has been used in physical therapy as a method of muscle rehabilitation after injury or surgery. In the 1960s, EMS was often used to prevent muscle atrophy, but with advances in EMS technology, its use has become increasingly popular in the treatment of patients suffering from central nervous system damage secondary to brain injury. (Porcari et al., 2002)

EMS technology aims to both strengthen the extremities of patients who have undergone orthopaedic surgery and prevent pain in the lower back, knees, shoulders and muscles. EMS training does not put pressure on the joints and reduces the risk of injury due to the absence of weights. (Kemmler et al., 2010)

EMS (Electrical muscle stimulation) technology achieves muscle contraction with the help of electrical impulses. EMS fitness in recent years has received increasing attention for the following reasons, being able to increase muscle mass, power and muscle strength. (Morbey, R., 2019).

EMS technology offers a wide range of services to improve the physical condition of Romanian people engaged in EMS fitness training.

This paper aims to highlight how the use of EMS fitness technology can affect the physical condition of individuals.

Optimization is the act of choosing and using the most suitable solutions, and the status of an athlete is reflected in his level of training and physical condition. (Hidi, 2007).

The *purpose* of this paper is to point out that the fitness and wellness industry provides innovative means for muscle conditioning. Therefore, the aimed was to increase people's interest in leisure motor activities by highlighting the effectiveness of EMS fitness technology in improving physical condition.

The research *hypothesis* is that good physical condition in the adult population depends on the normal values of their visceral fat, which is not imperatively related to vigorous physical activity, and this aspiration can be fulfilled by using EMS fitness training.

Methodology

Participants

The participants were 50 people aged between 18 and 57 years, 10 male and 40 female clients of the XBody Titan Studio, who wanted to increase their muscle mass and bone mass during 7 months, which is why they performed EMS training twice a week for 20 minutes per session.

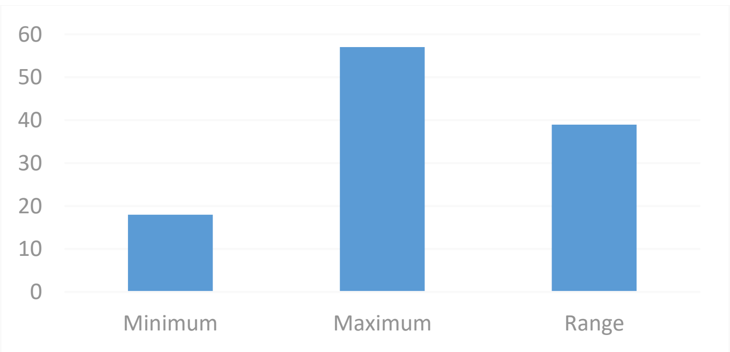

Figure 1. Age of participants

The statistical calculation shows an average age of 36.16 years, so they fall into the category of young adults. The range is large (having the value 39), with a minimum age of 18 years and a maximum age of 57 years. (Figure 1)

The present study was conducted taking into account the indicators of the participants in EMS fitness workouts at the Titan Studio, which were entered into an Excel table corresponding to the anthropometric method of measuring visceral fat (Tudor & Crișan, 2007).

Methods

The research methods used were: documentation, observation, quasi-experiment, questionnaire survey, mathematical statistics and graphical method (Păunescu, 2013).

Documentation - was used to collect information about EMS technology and the beneficial effects and the popularity of this state-of-the-art device. Thus, manuals, monographs, books and articles from specialised websites were analysed with the help of this method.

Observation - during the EMS training programme, participants were constantly monitored and their progress was observed on a weekly basis. Given that observation is a limited, therefore an insufficient method, it was complemented with the amelioration-type quasi-experiment.

Quasi-experiment - is a systematic and rational approach to interpretive and constant scientific research. In this study, the quasi-experimental model included: the dependent variable (positive difference in visceral fat percentage) and the independent variable (people using EMS equipment). The direct quasi-experimental method was applied in the present study.

Questionnaire survey - is used to obtain data and information about a sample of participants. The questionnaire illustrates particular statements in a certain order and with a certain configuration for assessing a group or knowing the points of view of individuals.

Also around this time we developed an questionnaire survey to examine EMS fitness knowledge and experiences that was completed online using the google form.

Graphical method - with the help of this method, the data obtained from the study were translated into graphs in order to obtain representative objective images and facilitate their interpretation.

For the quasi-experiment, a computerised method was used to analyse muscle mass, bone mass, visceral fat, body water, the number of kilocalories and metabolic age via the InnerScan Tanita BC-587 Body Composition Analyser. Statistical data processing was based on the record sheets designed by us. The record sheets include the following measurable indicators (bone mass, muscle mass, visceral fat, metabolic age and number of kilocalories) and have the role of monitoring the evolution of the subjects participating in the research.

The research was conducted over 7 months, from September 2021 to March 2022, and covered several stages:

Preparing client sheets

Identifying the groups of participants to carry out the quasi-experiment

Measuring and assessing the group of participants

Collecting raw information

Determining percentages for each measurement

Analysing the results obtained
Drawing conclusions

Content of the quasi-experiment

At the beginning of the EMS fitness programme, all the clients had to complete a sheet. They were measured and assessed when the programme started (initial test) and when the programme ended (final test), recording in our sheets the following parameters: abdominal circumference, right arm circumference, left arm circumference, hip circumference, left thigh circumference and right thigh circumference. After performing the measurements, each client also received a diet plan to achieve their desired goal.

The food plan was customized according to the body assessment carried out with the help of the tanita scale, which calculated the daily calorie intake (DCI) and performed by a nutrition technician.

The personalized diet plan was made by days, calculating proteins, lipids and carbohydrates according to age, weight, gender, height and level of physical activity.

In the initial phase, when completing the personal sheets, participants claimed that they had no time to engage in leisure motor activities due to their jobs and family obligations. We can thus state that these factors could negatively influence the EMS training programme, which is largely used to combat the sedentary lifestyle.

The research participants were measured with a centimetre to monitor their somatic indicators (Tudor, 2013) and with the Tanita scale for their bone mass, muscle mass, visceral fat, metabolic age and number of kilocalories. There was an initial assessment and, 7 months later, a final assessment took place to analyse each client's specific preparation for fitness improvement.

Throughout the 7 months, we developed (as EMS specialists) several EMS fitness training programmes using means specific to both fitness (Neagu et al., 2020), which can be performed with the coach during EMS fitness training (Mitu et al., 2020), and gymnastics (squats, crunches, lateral arm raises, lunges, lying leg raises, etc.).

Some fitness exercises were performed using the following accessories: gym ball, elastic bands, elastic ropes with handles, stepper, dumbbells (0.5 kg, 1 kg, 1.5 and 2 kg), kettlebell/ dumbbell (4 kg).

The 50 participants of which 10 male and 40 female, trained twice a week during the quasi-experiment, and each EMS fitness session lasted 20 minutes. EMS training is adapted to the individual client's physical condition, which is why beginner, intermediate and advanced programmes have been developed.

For the beginner programme, the device setting is 4 seconds break and 6 seconds impulse, for the intermediate programme, its setting is 4 seconds break and 10 seconds impulse, while the advanced programme uses continuous impulse. Therefore, workouts can be performed by sets with a number of repetitions or using intervals of 4 to 60 seconds per exercise, depending on the selected programme.

The quasi-experiment was conducted at the XBody Titan Studio in Bucharest, sector 3, from September 2021 to March 2022, in compliance with all hygiene and distancing rules to avoid the spread of the SARS-CoV-2 virus (Simion & Croitoru, 2020). It included 50 people (commonly motivated by the desire to adjust their fat deposits) for whom record sheets with somatic indicators (bone mass, muscle mass, visceral fat, metabolic age and number of kilocalories) have been prepared. The sheets were written at the first training and completed at the initial and final testing

Description of the training programme

The training programme performed at the XBody Titan Studio in Bucharest included exercises specific to athletics, gymnastics and fitness as follows:

- Walking on the spot with hands close to the body;
- Walking on the spot with high knees;
- Skipping rope on the spot;
- Running on the spot with high knees;
- Standing with feet apart and hands on hips, alternating forward lunges;
- Standing with feet apart, side lunges to the left and right;
- Standing with feet apart and hands raised forward, thigh flexion on the calf (Squats);
- Standing with feet apart and hands on hips, thigh flexion on the calf (Squats) while alternately lifting the leg to the rear;
- With support on palms and one knee, lifting the outstretched leg to the ceiling;
- With support on palms and knees, lifting the knee bent to 90 degrees while the sole of the foot alternately points to the ceiling (Butt Kicks);
- With support on palms and knees, horizontal push-ups;
- Horizontal push-ups with support on knees and one hand on the medicine ball, alternately changing the hand on the ball;
- Standing with feet apart, alternating forearm flexion on the arm with the dumbbell;
- Standing with the torso slightly bent, the forearm acts as an extension of the arm while holding a dumbbell in the hand (Triceps);
- With heels lying against the stepper, arm flexion on the forearm (Reverse push-ups);
- Standing with feet apart, side raises with dumbbells;
- Standing with feet apart, simultaneous front raises with dumbbells;
- Standing with the torso bent forward, paddling with dumbbells;
- Lying face down, hip extension with arms up;
- Lying face up with hands close to the body, lifting the outstretched legs to the ceiling;
- Lying face up with legs raised to 90 degrees, tiptoe lifts with hands on the temples;
- Lying face up with the feet flat on an exercise mat, knees bent and hands on the temples, shoulders lifts off the floor (Crunches);
- With horizontal support on paddles and outstretched legs, alternating forward knee bends (Climbing).

At the beginning of the quasi-experiment, bodyweight exercises were used, and then an accessory was introduced in each training session to also work with low additional weight.

The duration of a series was 30 seconds and no more than two sets were performed per exercise because any workout had to include as many exercises and their derivatives as possible, which were adjusted with the help of accessories in order to avoid monotony and boredom.

The weights and accessories used throughout the study were: dumbbells, discs, elastic bands, elastic rope, skipping rope, stepper, medicine ball, fitness ball, gymnastics stick, sandbags, etc. All of this should be gradually introduced in all training programmes and will be increased depending on the abilities of each participant.

The exercise intensity becomes higher even from the second session by increasing the frequency of the EMS device (either for all or only a few more important muscle groups) as often as possible throughout the workout. The training is thus rendered more difficult, but everything is adjusted according to the resistance of each individual client.

EMS fitness technology generates electrical impulses that are delivered through cables to electrodes that are turned on to the surface of the skin and muscles to be stimulated. (Morbey, R., 2019).

The duration does not increase but remains constant during an EMS fitness session because the device software sets it to last 20 minutes from the moment of starting the programme.

Current EMS fitness technology allows the simultaneous activation of 10 muscle regions (abdomen, chest, lower back, longissimus dorsi, trapezius and arms, including biceps or triceps brachii, calves or deltoid, biceps femoris, quadriceps and buttocks) with different frequency, depth and intensity, which can be adjusted according to the desire of each client. The EMS specialist can select and change the intensity of any parameter individually during an EMS training session.

EMS fitness technology can alternately use modulated current with an impulse frequency set between 7 and 100 Hz and an impulse depth set between 50 and 450 microseconds in order to partially avoid unpleasant reactions, being applied to the motor point of the muscle (Tudor & Crișan, 2007).

Results

EMS exercise protocols are time-efficient and can be the best choice for people who aim to improve their general strength and body composition (Kemmler et al., 2016).

For this stage of the quasi-experiment, we selected 50 participants in EMS workouts at the Titan Studio in Bucharest, and when they first came to the body remodelling centre, they wrote in their personal sheets that they had never practised any sport before. Those who joined the XBody Titan programme were receptive and eager to take part in our quasi-experiment.

According to research ethics, the participants gave their consent in written form.

The data were extracted from the clients' files completed by their coach (more precisely, the first author of this paper), who had seven years of experience as a specialist in bodybuilding, fitness, physical education and leisure motor activities, as well as an EMS specialist at the XBody Titan Studio in Bucharest.

Two measurable parameters were chosen, namely visceral fat and muscle mass, because they were the most important from our perspective but also that of XBody Titan clients, who wanted to stimulate their muscles through EMS fitness training, which could help them reshape their bodies. The EMS fitness device activates all the muscles, both the main groups and the smaller (secondary) ones that are responsible for the body aesthetics.

In the initial and final tests, visceral fat and muscle mass were measured.

Using visceral fat as a statistical indicator is first of all an attempt to quantify the amount of fat in a person's abdominal and pectoral areas, and then, based on the values obtained, to classify that person into the underweight, normal weight, overweight or obese category.

The accumulation of intra-abdominal adipose tissue is often called visceral obesity and involves the dysfunctional expansion of subcutaneous adipose tissue but also the ectopic storage of triglycerides. (Tchernof & Després, 2013).

The study conducted by Elffers et al. (2017) also reveals that especially visceral fat is strongly associated with cardiometabolic risk factors.

Visceral fat is defined as a hormonal active component of body fat, which may have unique biochemical characteristics and influence several pathological and normal processes in the human body.((Shuster et al., 2012).

Tanita Body Composition Analyser assesses body fat levels and groups them as follows:

- Normal: between 1 and 12
- Risk: between 13 and 59

Using the Tanita Body Composition Analyser in our study, various interpretations of the beneficial limits were displayed.

Given that all the parameters monitored in the initial and final tests had been recorded, we used the Excel package to calculate the arithmetic mean, the minimum and maximum values and the progress rate, which was the most important statistical indicator in our study. With the same Excel program, we made graphs to show changes in the tracked parameters.

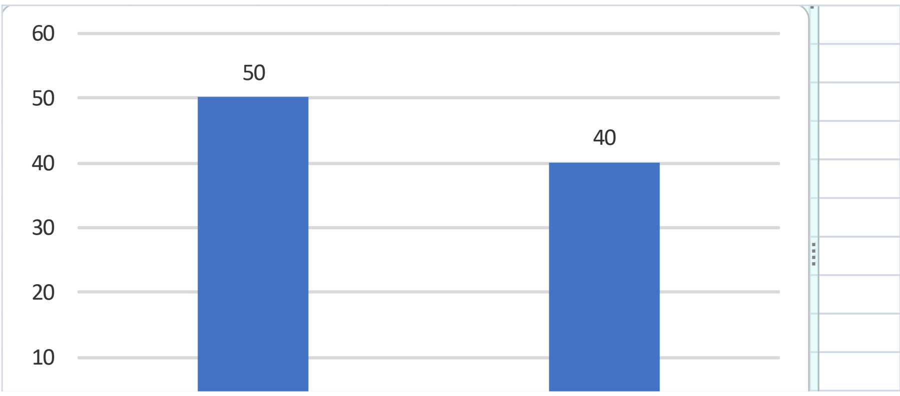

Figure 2. Changes in visceral fat percentage

According to Figure 2, the arithmetic mean highlights a difference of 10% in visceral fat (50% in the initial test and 40% in the final test). Overall, there is a decrease in visceral fat percentage for all participants, meaning that they have made progress in fulfilling their desire. The minimum value of visceral fat is 1, and its maximum value is 19, which involves a rather high health risk for people who reach this percentage.

Excess visceral fat is a risk factor for certain medical conditions such as heart disease, diabetes, osteoarthritis, gout, etc. (Flegal & Kalantar-Zadeh, 2013) and is found in people all over the world. It has been scientifically proven that excess visceral fat shortens people's lives by 10-15 years (Cheța & Mihalache, 1989).

Overweight and obesity are therefore one of the biggest problems that humans will face in the coming years, which is why these medical conditions require greater attention from the health community, researchers and policy makers (Nguyen & El-Serag, 2010).

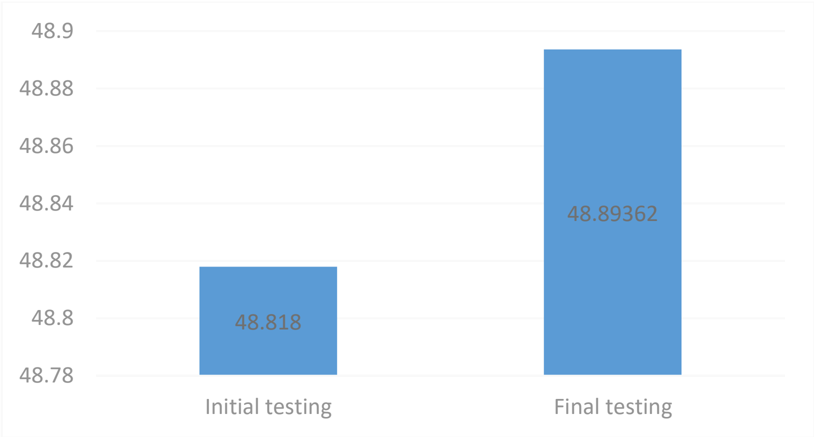

Figure 3. Changes in muscle mass percentage

In statistical terms (Figure 3), the group of participants with whom we interacted during the 7 months of the quasi-experiment had an average muscle mass percentage of 48.81 in the initial test and 48.89 in the final test, which indicates a little improvement for this parameter.

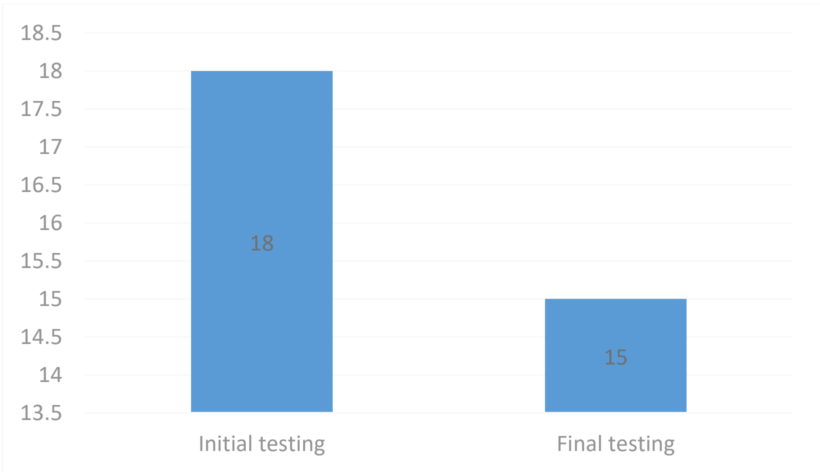

Figure 4. Changes in the range of visceral fat percentage

Figure 4 highlights a positive change in the range of visceral fat percentage, which was 18 in the initial test and 15 in the final test.

Values of the visceral fat percentage range have a favourable trend in one direction, namely towards normality.

Therefore, visible progress in visceral fat percentage is noted for the group, whose modest or even poor physical condition has clearly improved.

Table 1. t-Test: Paired Two Sample for Means for visceral fat

	Before	After the intervention
Variance	13.12	10.39
Observations	50	50
Pearson Correlation	0.92	
Hypothesized Mean Difference	0	
df	49	
t Stat	5.86	
P(T<=t) two-tail	3.75	
Mean	5.8	4.64
Standard Deviation	3.68	3.22

On the subjects' visceral fat we used the t-test for dependent samples to check if there was a significant decrease in visceral fat as a result of the XBody Titan training intervention.

The dispersions of the two samples regarding visceral fat as specified in table 1., is 13.12 at the initial testing and 10.39 at the final testing, results in the hypothesis that the dispersions change significantly.

The t stat is in table 1. of 5.86 and represents the calculated value of our test statistic, regarding visceral fat.

The value of 3.75 shown in Table 1. is greater than all common α values, resulting in the null hypothesis not being rejected.

From table 1, it appears that the average of the first test is 5.8 and at the final test 4.64, indicating a decrease in visceral fat.

The standard deviation is 3.68 at the initial testing and 3.22 at the final testing, resulting in a difference between the two tests.

Table 2. t-Test: Paired Two Sample for Means for muscle mass

	Before	After the intervention
Variance	92.86	112.26
Observations	50	50
Pearson Correlation	0.89	
Hypothesized Mean Difference	0	
df	49	
t Stat	0.25	

P(T<=t) two-tail	0.79	
Mean	48.81	48.65
Standard Deviation	9.63	10.59

The dispersions of the two samples regarding the percentage of muscle mass as specified in table 2., is 92.86 at the initial testing and 112.26 at the final testing, results in the hypothesis that the dispersions change significantly.

The t stat in the table is 0.25 and represents the calculated value of our test statistic, regarding the percentage of muscle mass.

The value of 0.39 from table 2. is higher than the usual α values, so the null hypothesis cannot be rejected.

The two-tailed critical probability (P(T<=t) two-tail) shows us that the value of 0.79 shown in table 2. is greater than all common α values, resulting in the null hypothesis not being rejected.

From table 2, it appears that the average of the first test is 48.81 and at the final test 48.65, indicating a decrease in muscle mass.

The standard deviation is 9.63 at pretest and 10.59 at posttest, resulting in a difference between the two tests.

Discussions and conclusion

The main result of our study is that EMS fitness training helps to decrease visceral fat and improve muscle mass in only 20 minutes per session performed twice a week.

Compared to standard training at a classic gym, EMS fitness has the advantage of being more time efficient. Kemmler et al. have shown that EMS fitness training is an effective, time-saving form of strength training that, when performed regularly, can achieve results comparable to conventional strength training. At the same time, the effort to the subjects is reduced and it could be the reason for the common popularity of this form of EMS fitnees training, leading to an explosion of studios in some countries such as Germany, Romania, etc.(Kemmler et. Al., 2016). Modern training methods and techniques in tune with new trends in EMS fitness technology applied in order to achieve sustained and quick demands have resulted in a certain body proportionality (decrease of visceral fat) and improvement of muscle mass.

The literature review has emphasised that health management costs are considerably higher due to the large number of obese and overweight people worldwide. (Lagerros & Rössner, 2013)

According to specialised studies, the use of 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 EMS method contributes to fighting muscle atrophy and allows muscle groups to stay fit. (Adams V., 2018).

This study has suggested that EMS fitness equipment seems to be effective in improving the activities of contemporary fitness centres.

By reducing the number of hours spent in a classic fitness gym or dedicated to other leisure motor activities, EMS technology is preferred by modern people, for whom time is very precious.

The present research emphasises that the combined efforts made while performing EMS workouts can lead to an improvement in muscle mass and thus to better physical condition.

EMS fitness training managed to reduce the participants' visceral fat in the desired direction, redefining the physical condition of their bodies.

The visceral fat assessment method showed increasingly smaller circumferences from one test to another and implicitly a decrease in visceral fat percentage.

In conclusion, this observational quasi-experiment states that good physical condition in the adult population depends on their normal values of visceral fat, which is not necessarily related to vigorous physical activity, and this aspiration can be fulfilled by using fitness training EMS.

EMS technology exploits the science of sport and physical education for health purposes and aims to ensure a better quality of life for contemporary people.

Authors' Contribution

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

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