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OPTIMIZING THE PHYSICAL DEVELOPMENT OF ADULTS BY USING EMS FITNESS TECHNOLOGY IN LEISURE TIME MOTOR ACTIVITIES

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Abstract. EMS Fitness is an electrical muscle stimulation, a full-body training method that offers the combination of strength training and cardio training through a machine that uses electrical impulses to stimulate muscle contraction.
The aim of the study was to follow the effects of electrostimulation training on body composition, weight loss and muscle strength increase. Ten people, women and men, aged between 25 and 50, were studied. We want to demonstrate the hypothesis that the use of the EMS Fitness technique over a period of 90 days will lead to a decrease in body weight, optimisation of body mass index and increase in muscle strength. Participants in the exercise group performed 12 weeks of high-intensity training using specific EMS equipment in an Xbody. The objective of the experiment was to identify whether the use of EMS technology contributed to changes in body mass, skeletal muscle mass, body fat and visceral fat.
All exercise sessions were constantly supervised; in addition, exercise intensity, volume and frequency were recorded in training logs. A body composition scale was used for testing, which provides accurate body analysis using BIA technology. The training scheme was used for 12 weeks, changing the dosage and intensity for each subject, with the first signs of weight loss appearing after the first week.
Methods used in the research: experimental method, graph-tabel method, observation method, bibliographic study method.
Our results support the hypothesis, as the use of the EMS Fitness technique over a period of 90 days led to decreased body mass, optimized body mass index and increased muscle strength.
In conclusion, I believe that people in Romania should have a wider openness in practicing physical exercise in their free time in order to develop a healthy generation and decrease the possibility of reaching the stage of obesity and stopping diseases, and a good help in achieving this goal is presented by training using EMS Fitness technology.

Keywords: EMS Fitness, leisure time, xbody, weight loss, health.

Introduction

In the 21st century, we are in a society that is constantly changing, and stress, the passage of time much faster, intellectual demands exist in the life of every man, so the formation of the individual from the moral, physical, aesthetic, psychological points of view, must develop in harmony with the requirements of society. EMS Fitness Tenology includes several equipment, of which only one Just Fit Prp-EMS was used in this work. If we take into account that the Xbody equipment is closely related to the world of sports, both worldwide and in Romania, we can see that the material equipment of EMS Fitness technology will condition the practice of leisure and performance sports in the future.

EMS trainingis one of the most effective forms of exercise (Zatsiorsky 2006), EMS fitness technology offers a wide range of services to sport for all and performance sport, which will open up Romanian society to the benefits of practicing this sport. The interests of society as a whole, as well as the personal interests of each individual, are driven by promoting motor activities to stimulate muscle power through fitness exercises.

Through this scientific work we aimed, by highlighting the effectiveness of the means of actuation, to demonstrate that EMS fitness technology can combat obesity, the effects of sedentarism, increase interest in leisure time exercise.

The topicality of this topic stems from the need to create a healthy lifestyle in which movement and participation in electrical muscle stimulation training plays a special role. At the same time, our experience in conducting and organising EMS Fitness training can help us to identify the importance of training and participation.

Research findings through have shown that EMS training has significant effects on body composition using a small volume of exercise (Kemmler et al., 2009).

Electromyostimulation (EMS Fitness) is a common and established method to increase muscle strength and performance. Systematic analyses have documented the beneficial influence of locally applied EMS on neuromuscular system parameters. Other studies have revealed positive effects on jumping and sprinting ability. The reasons for improvements using EMS are a higher number of motor units recruited during EMS exercise compared to voluntary dynamic contractions alone (Junger et al., 2020). In addition, activation of fast moving fibres at relatively low force levels also plays a relevant role. Most studies have used the maximum pain threshold (maximum tolerated amperage) to adjust the pulse intensity (amperage). However, a high level of muscle tension due to EMS limits the range of dynamic movements. Therefore, in dynamic exercise modes with overlapping EMS, the pulse intensity should be adjusted to ensure sufficient movement 70% of the maximum pain threshold is considered practical and might be more promising, as the subjective feeling of increase remains comfortable, thus the pulse intensity can be selected and modified individually (Holzer et al., 2021). The device has a technology with a protocol that can be programmed at low intensity/low amplitude level (Wolfgang et al., 2013).

In recent years, specialized literature has testified to the importance of carefully and concisely directed physical exercise for improving life, preventing injuries, recovering from various ailments and not least for health (Bota. A. 2011). Obesity has nowadays become one of the main health problems worldwide. This disorder can also appear in the early stages of life, such as childhood and/or adolescence. It is considered a major risk factor for the development of other diseases responsible for high morbidity and mortality in adulthood. Nowadays, it is considered a multifactorial disease in which environmental, genetic, neuro-psychological and endocrine factors are involved (Lobstein et al., 2004). Living in a "society of abundance" , together with a large supply of high-calorie nutrients, changes in lifestyle, people's sedentary lifestyle coexisting with eating habits lacking knowledge of the nutritional characteristics of food, is the axis on which the development of overweight and then obesity is based (De Onis et al., 2010).

Workouts using EMS Fitness have been shown to be successful in improving physical performance (Filipovic et al., 2012).

Motor skills play a crucial role in all phases of life. People of all ages perform fundamental motor skills such as walking and running, exercise, or specific skills such as shooting hoops or driving a car. Measurement of motor skills is one of the fundamental aspects of measuring human performance (Hadel et al., 2004). It is well known that ageing is accompanied by sensorimotor impairments as well as cognitive and perceptual functioning. Older adults need to practise and learn new known motor skills, i.e. as part of a new task training, recreational activities or rehabilitation (Shumway-Cook et al., 2000).

Methodology

Participants and testing procedures

Participants in the EMS exercise group performed 12 weeks of high-intensity training, or EMS, in a well-equipped local Xbody gym. All exercise sessions were constantly supervised; in addition, exercise intensity, volume and frequency were recorded in exercise logs. All participants were asked to maintain their regular medication, dietary habits, physical activity and exercise outside the study protocol throughout the study course.

Subjects performed the guided and supervised low-intensity, resistance protocols. In short, this EMS equipment allows simultaneous activation of muscles in 16 regions (e.g. upper legs, upper arms, glutes, abdomen, chest, lower back and upper back) at different dedicated intensities.

Overall, the exercise protocol of our study closely copied the typical setting of commercial WB-EMS sessions with their low load and short duration strategy. An electric current was applied with a frequency of 90 Hz at the maximum tolerance limit of the subject. The exercise protocol lasted 20 minutes and combined dynamic exercises were performed for all muscle groups performed with and without additional weights. Squat movements with a 90 to 180° knee joint flexion movement were performed during all exercises. Thus, the exercises were divided into 2 large sets with a 3-minute break in between, with an intensity between 50% and 80%. Exercises were customized for each subject, modifying stimulus volume, intensity and frequency. A rest day was given between the compulsory training sessions, with training on Mondays, Wednesdays and Fridays. To measure the effects of EMS training, subjects undergo a 12-week intervention training program. The results of this study were measured by initial, intermediate and final test results.

Samples used for evaluation

A body composition scale was used for testing, which provides accurate body analysis using BIA (Bioelectrical Impedance Analysis) technology based on 8 sensors to ensure accurate determination. This scale has the following functions:

- Measurement of total body meal;
- Measurement of the percentage of adipose tissue – using BIA (Bioelectrical Impedance Analysis) technology the percentage of adipose tissue can be calculated;
- Measurement of skeletal muscle mass;
- Measurement of Body Mass Index (BMI) – the indicator measures total body fat in relation to height and weight.

	Monday	Wednesday	Friday	Intensity
Introductory Part	-20 seconds running with knees up on the spot -10 x kneeling with TRX -10 x kneeling on one (left) leg with TRX -10 x kneeling on one leg (right) with TRX	-20 seconds running with knees up on the spot -10 x kneeling with TRX -10 x kneeling on one (left) leg with TRX -10 x kneeling on one leg (right) with TRX	-20 seconds running with knees up on the spot -10 x kneeling with TRX -10 x kneeling on one (left) leg with TRX -10 x kneeling on one leg (right) with TRX	50%
Fundamental Part	-15 x knees with 2 kg weights in each hand -10 x side-step left lunge followed by kick -10 x lateral lunge step - right followed by kick -10 x forward and backward step-split on the same left leg -10 x forward and backward lunge on same leg-right -2 x 20 stepper crunches -Pause 3 minutes -10 x oblique knee raise up-right -10 x oblique knee raise up-left -15 x triceps x 2 kg on each arm -20 x step lunge with jump -10 x biceps x 4 kg	-30 seconds jumping jacks -30 seconds palms on the ground running with knees to chest -15 x step bent diagonally back-right -15 x step bent diagonally back-left -2 x 20 crunches on stepper -Pause 3 minutes -30 seconds jumping jacks with skipping -10 x 5kg biceps - right -10 x 5kg biceps- left -20 x back extensions -2 x 20 oblique crunches on stepper	-10 x 5 kg front/back lunge with right foot -10 x 5 kg front/back lunge with left foot -20 x alternating side step knee bends with elastic band -15 x knee bends with jump -10 x push-ups -10 x biceps + side step- left -10 x biceps + side step- right -3 x 15 seconds plank -Pause 3 minutes -20 x knees with touching the top of the lift -15 x 6 kg triceps -10 x military plank -10 x side step lunge + right kick -10 x lateral lunge step + left kick	70%
Concluding part	-2 x 30 seconds plenk	-2 x 20 seconds running with knees up on the spot	-2 x 20 stepper crunches	80%

Figure 1. Physical training program

Results and discussions

Table 1. Results of the 10 subjects over 12 weeks

Characteristics	Week 1	Week 6	Week 12
I.R: Weight	92.5	87.7	82
Body Fat	44.5	39.6	30.2
Visceral Fat	12	8	6
Skeletal Muscle	25.2	27.4	38.4
T.S: Weight	81.4	77.2	69.3
Body Fat	31.2	30.2	28.1
Visceral Fat	10	7	5
Skeletal Muscle	32	32.5	33.1
B.A: Weight	70.5	68.2	65.1
Body Fat	26.8	25.3	24.1
Visceral Fat	10	7	6
Skeletal Muscle	34.3	35.6	36.2
T.M: Weight	93.7	86	83.9
Body Fat	31.9	30.1	27.9
Visceral Fat	14	9	7
Skeletal Muscle	32.5	32.7	33.4
D.A: Weight	110.1	108.1	96.3
Body Fat	40.9	36.5	33.1
Visceral Fat	9	9	7
Skeletal Muscle	26.9	30	34.2
S.E: Weight	82.9	78.4	77.3
Body Fat	43.8	38.3	29.9
Visceral Fat	9	6	7
Skeletal Muscle	24.5	26.2	33
V.G: Weight	78.8	72.2	67.7
Body Fat	25.3	23.1	20.2
Visceral Fat	12	8	6
Skeletal Muscle	37.8	39.1	39.5
A.A: Weight	88.7	81.3	75.8
Body Fat	40.5	36.2	33.1
Visceral Fat	18	12	9
Skeletal Muscle	23.7	24.4	26.1
A.A: Weight	81	75.2	65
Body Fat	38.5	33.2	28.1
Visceral Fat	12	8	5
Skeletal Muscle	26.9	27.9	25.1
O.G: Weight	134	123	114
Body Fat	39.5	36.33	33.67
Visceral Fat	11	8	7
Skeletal Muscle	29.2	29.7	30

Each participant was tested at the same time of day (± 1 hour). All follow-up tests were performed after a weekend of rest. The tests were performed in one day within 60 minutes. During the 90 days, all participants had a healthier diet of their own, carbonated beverages, sodas, sweets, bread were eliminated and fruit was introduced daily. Thus, following the analyses it can be seen in figure (1,2,3,4,5,6,7,8,9,10) that both their weight loss and the indices analyzed were done gradually, achieving remarkable results.

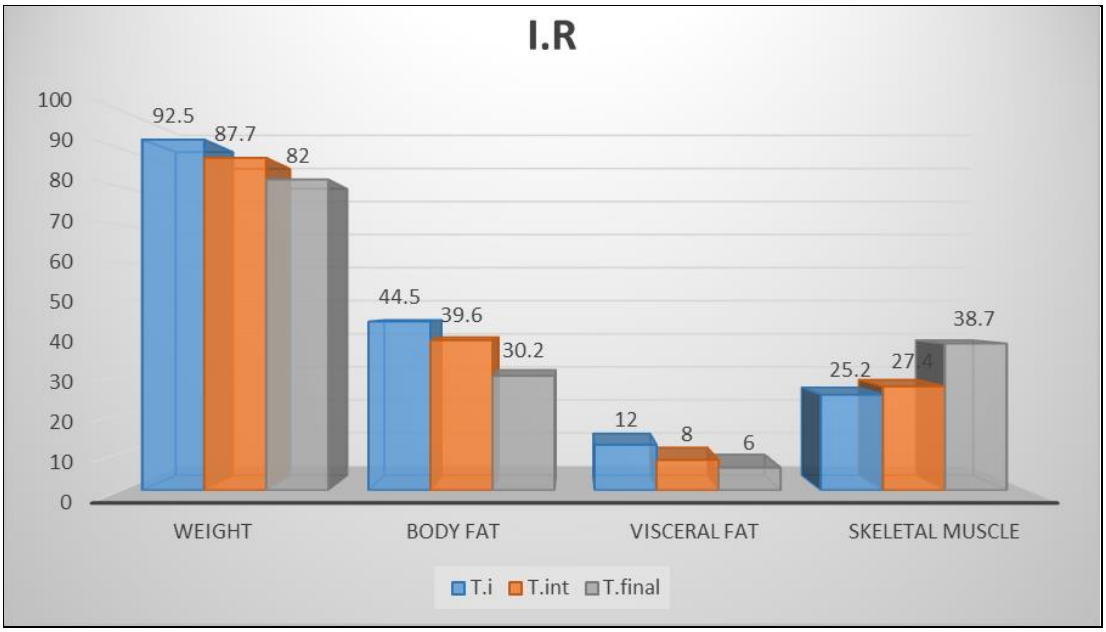

Figure 1. Evolution of I.R. subject indices

Figure 1 analyzes subject I.R is male, 1.61m tall. At the start of testing he presented with a BMI of 35.49, obesity grade I. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50–90 Hz. The training outcome showed a percentage decrease of 11.35%, falling into the first class with a BMI of 31.63.

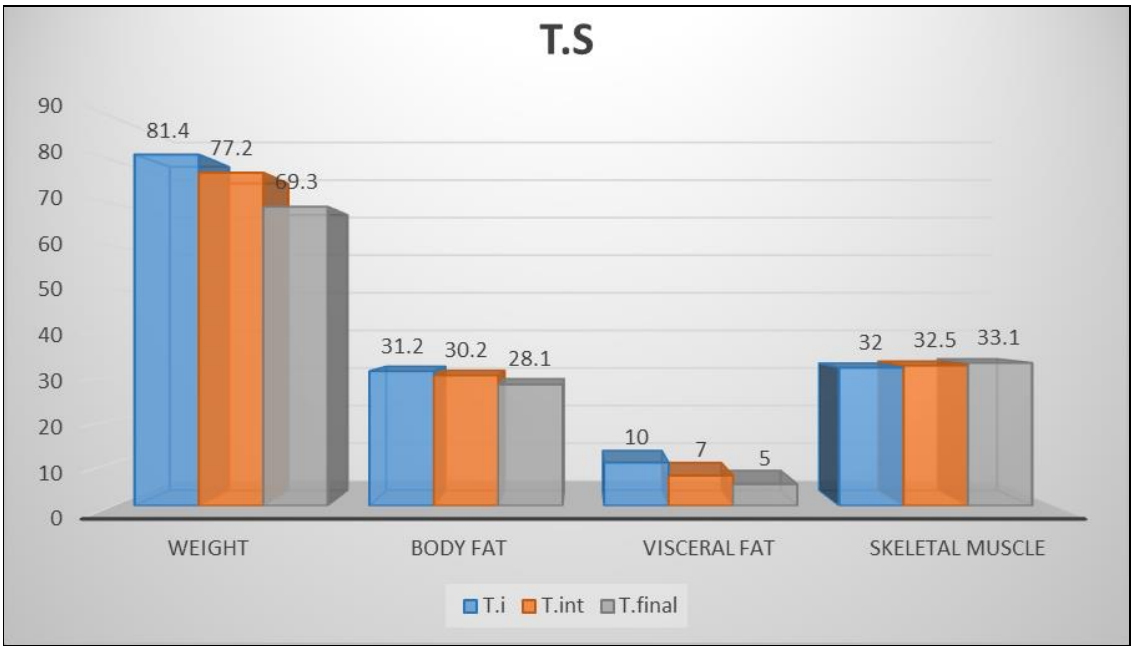

Figure 2. Evolution of T.S. subject indices

Figure 2 analyzes subject T.S is female, with a height of 1.65m. At the beginning of the test being overweight, she presented with a BMI of 29.75. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50–90 Hz. The result of the training showed a percentage decrease of 14.87%, being at the beginning of the overweight classification with a BMI of 25.34.

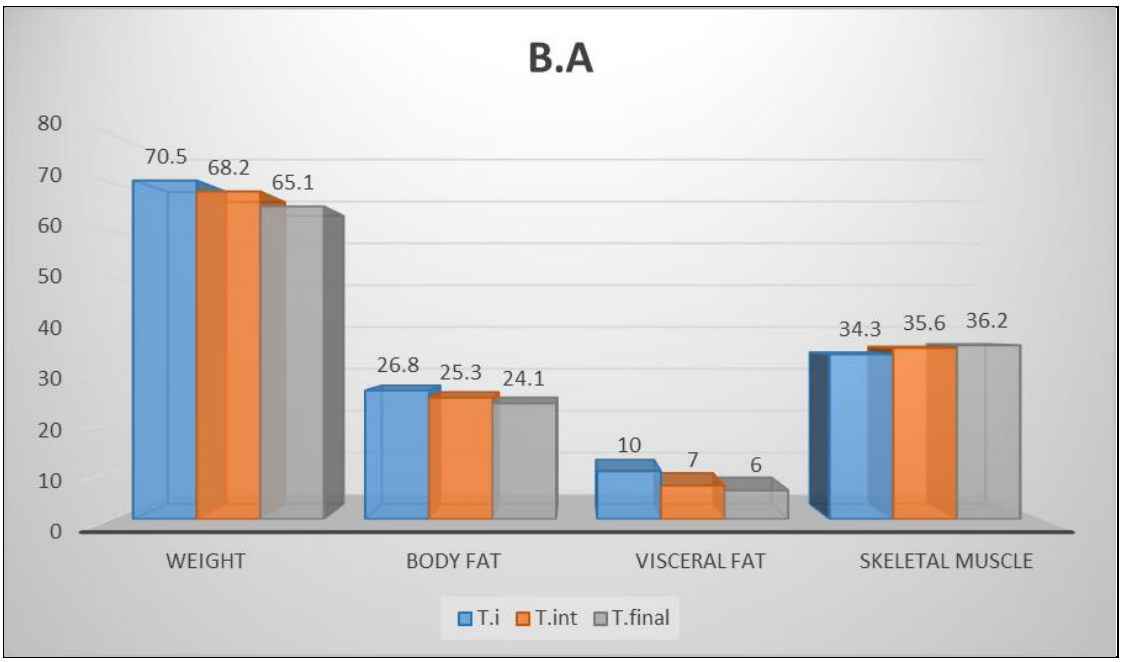

Figure 3. Evolution of B.A. subject indices

Figure 3 analyzes subject B.A is female, 1.70m tall. At the start of testing she has a normal weight, no risk of disease with a BMI of 24.22. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50–90 Hz. The result of the training showed a percentage decrease of 7.66%, maintaining normal weight with a BMI of 22.46.

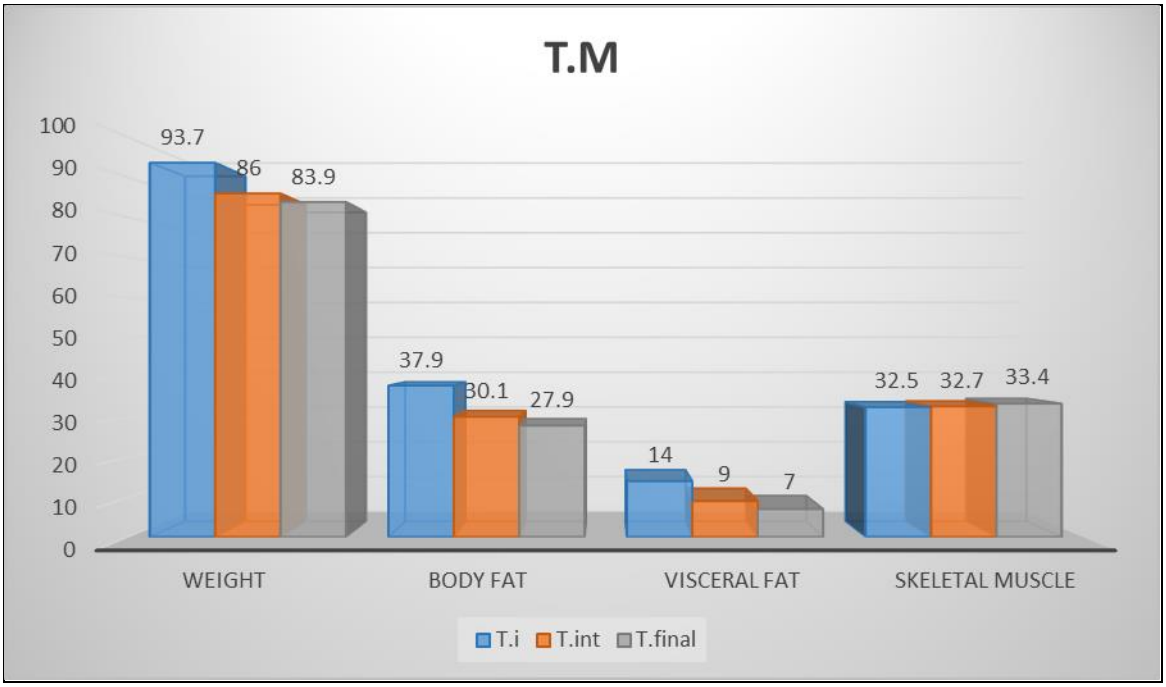

Figure 4. Evolution of T.M. subject indices

Figure 4 analyzes subject T.M is male, 1.75m tall. At the beginning of the test being overweight, he presented with a BMI of 30.37. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50-90 Hz. The result of the training showed a percentage decrease of 10.27%, being at the beginning of the overweight classification with a BMI of 27.10.

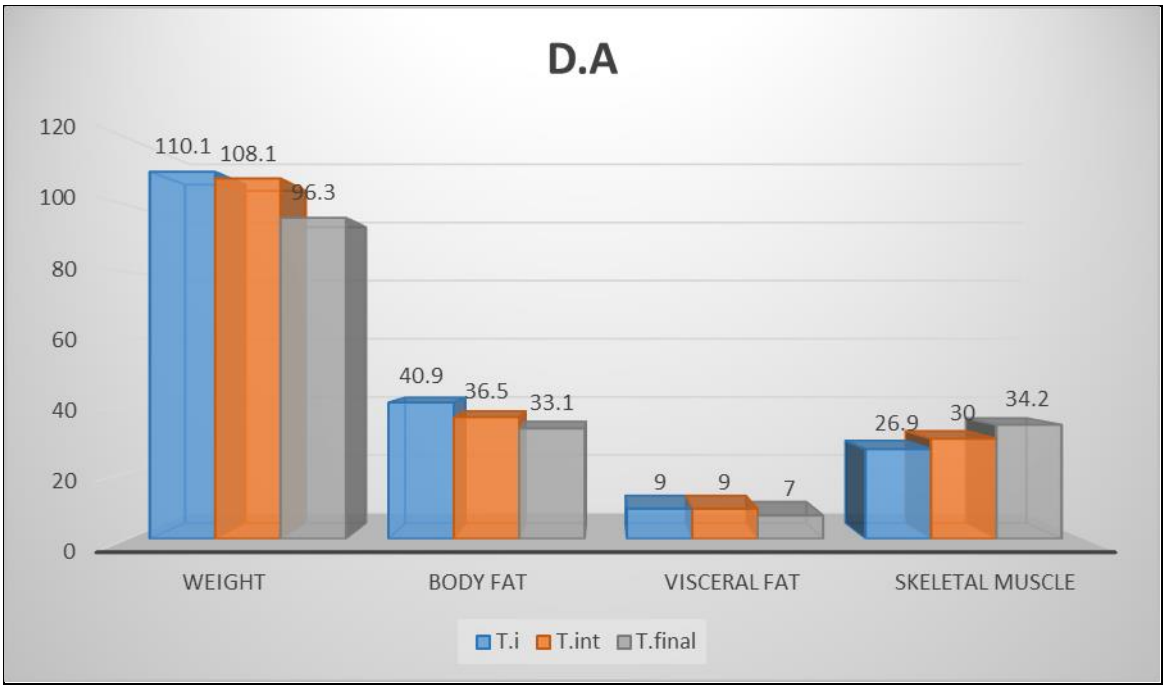

Figure 5. Evolution of D.A. subject indices

Figure 5 analyzes subject D.A is male, with a height of 1.83m. At the beginning of the testing he was in obesity class I with a BMI of 32.85.During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50-90 Hz. The result of the training showed a percentage decrease of 12.54%, which led to a drop in the ranking, being in the overweight category with a BMI of 28.67.

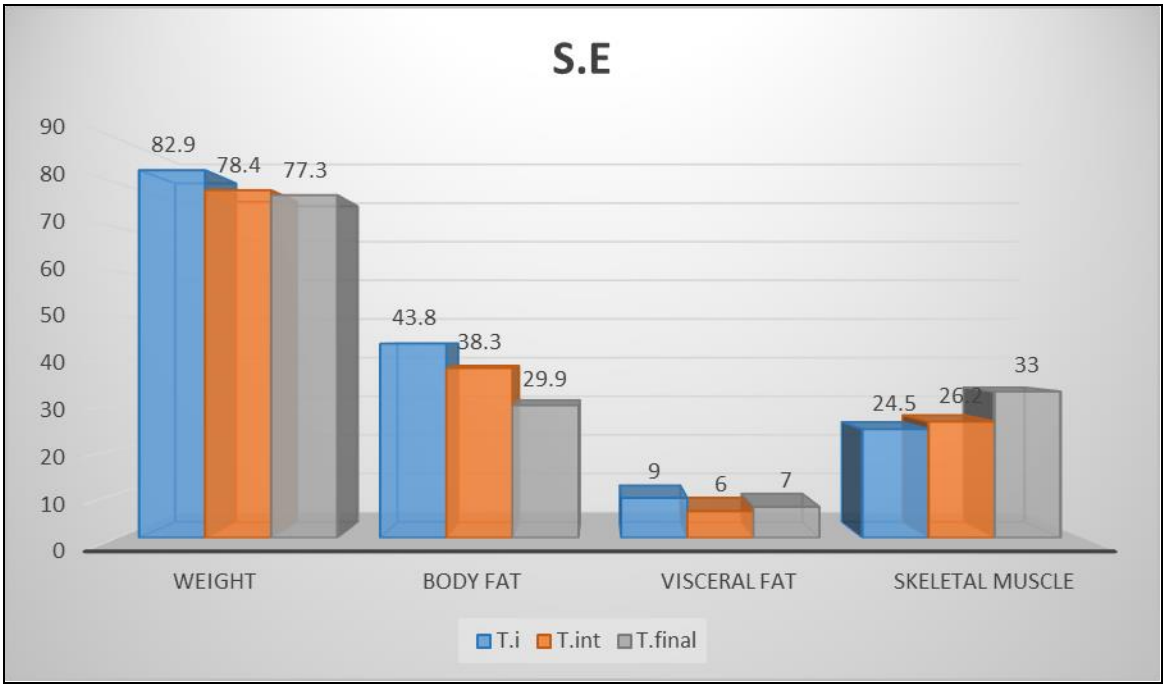

Figure 6. Evolution of S.E. subject indices

Figure 6 analyzes subject S.E is female, with a height of 1.68m. At the beginning of the test being overweight, she presented with a BMI of 29.05. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50–90 Hz. The result of the training showed a percentage decrease of 6.76%, with a BMI of 27.28.

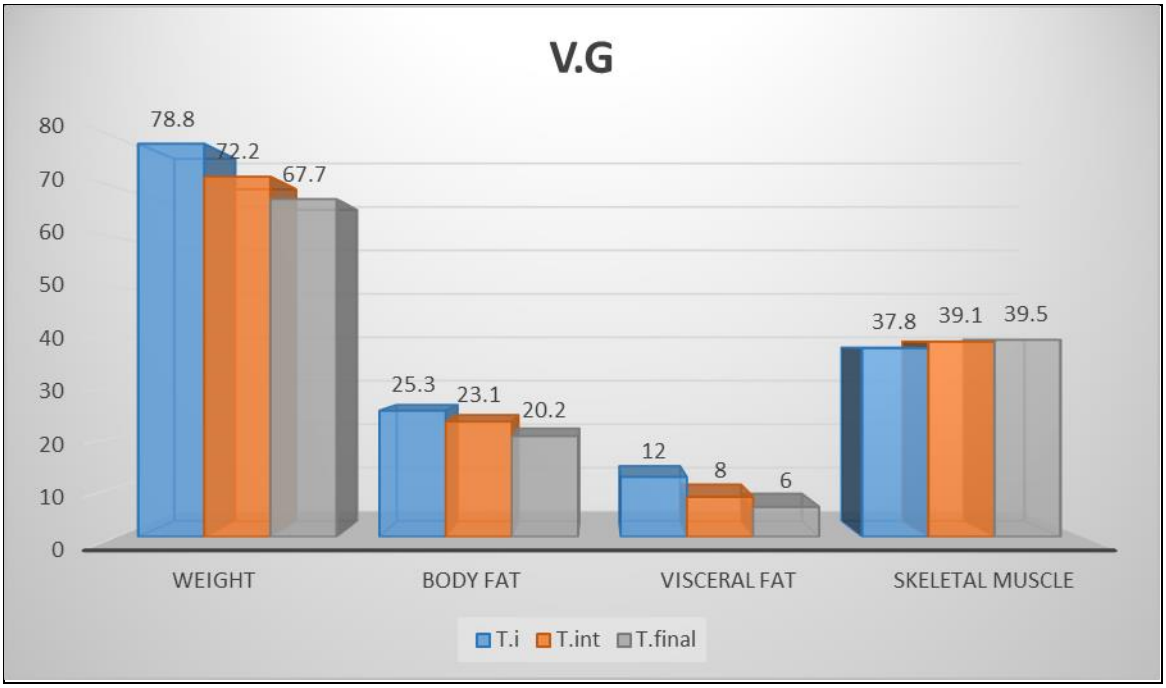

Figure 7. Evolution of V.G. subject indices

Figure 7 analyzes subject V.G is female, with a height of 1.57m. At the beginning of the testing she was in obesity class I with a BMI of 31.64 .During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50–90 Hz. The result of the training showed a percentage decrease of 14.09%, being at the beginning of the overweight classification with a BMI of 27.18.

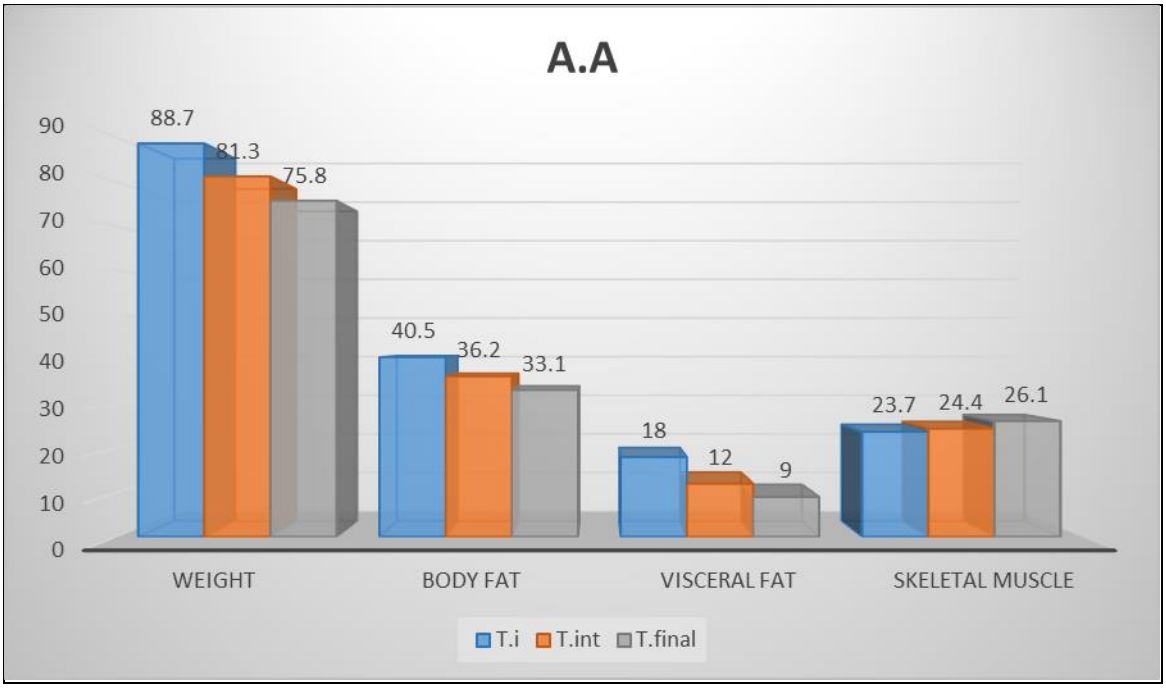

Figure 8. Evolution of A.A. subject indices

Figure 8 analyzes subject A.A is female, with a height of 1.57m. At the beginning of the test she was in the class of obesity class II , BMI 35.70. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50-90 Hz. The result of the training showed a percentage decrease of 14.55%, a significant decrease going down to the beginning of the overweight classification with a BMI of 30.43.

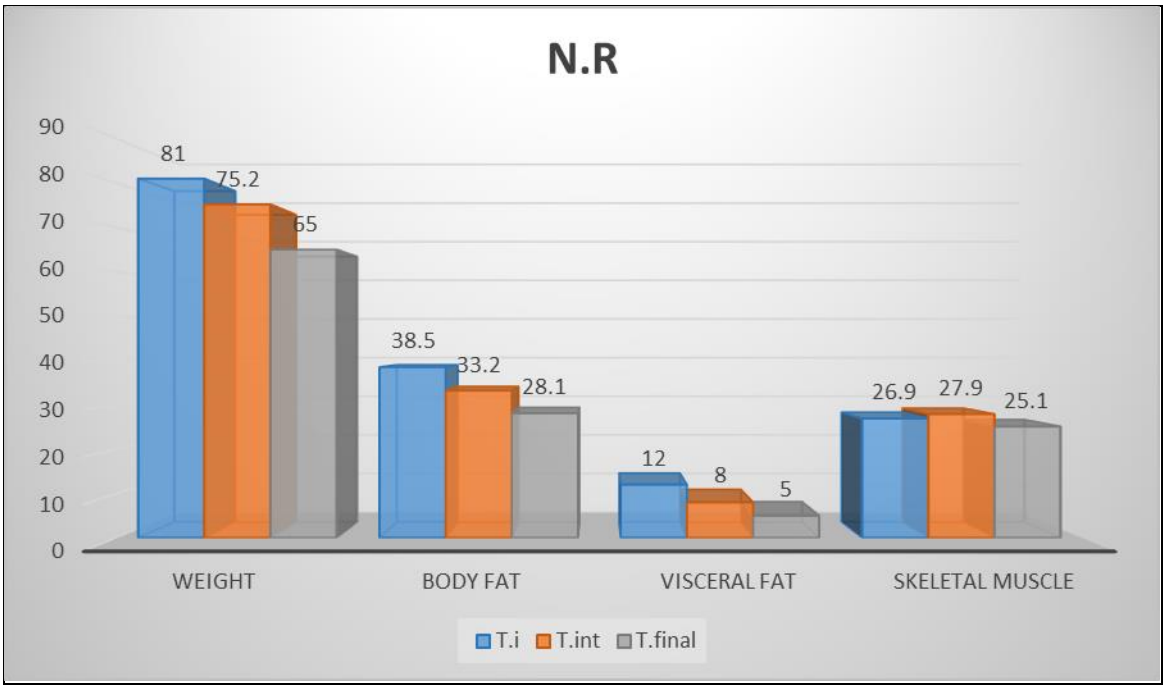

Figure 9. Evolution of N.R. subject indices

Figure 9 analyzes subject N.R is female, with a height of 1.62m. La is in obesity class I with a BMI of 30.82. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50-90 Hz. The training outcome showed the largest percentage decrease in the study, 19.76%, reaching a normal weight and BMI of 24.77.

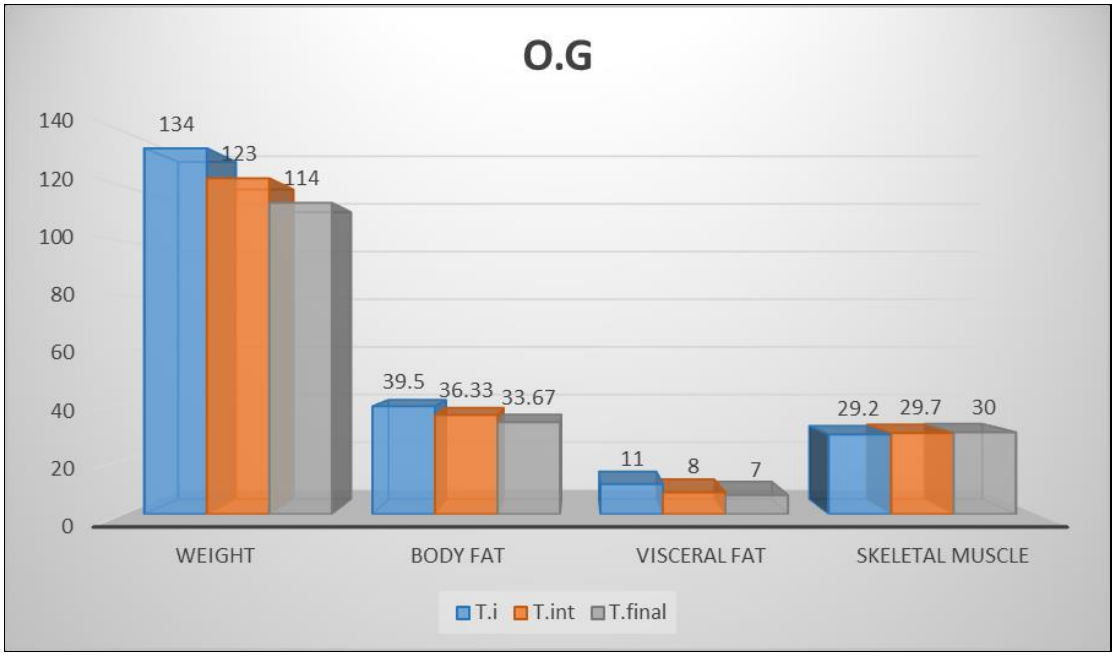

Figure 10. Evolution of O.G. subject indices

Figure 10 analyzes subject O.G is female, with a height of 1.84m. At the beginning of the testing she was at the bottom of the obesity grade II classification, with a BMI of 39.5. During the 90 days, the subject performed the proposed training scheme, initially using a frequency between 5 and 25 Hz of the EMS apart. Subsequently, the volume and intensity of training increased and the stimulus frequency was increased to 50–90 Hz. The result of the training showed a percentage decrease of 14.93%, reaching the obese class I with a BMI of 33.67.

Results

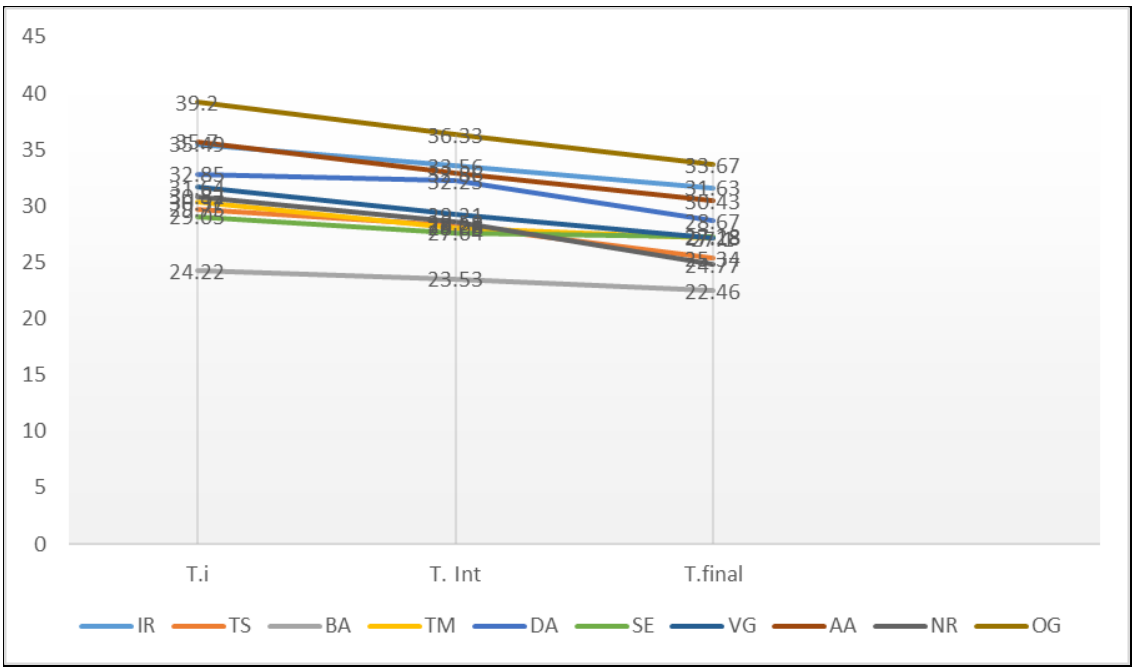

Figure 11. Evolution of body mass index

According to the research conducted, we have shown in Fig.11 that the efforts made in training using EMS Fitness technology, have codus to improve the body mass index (BMI).

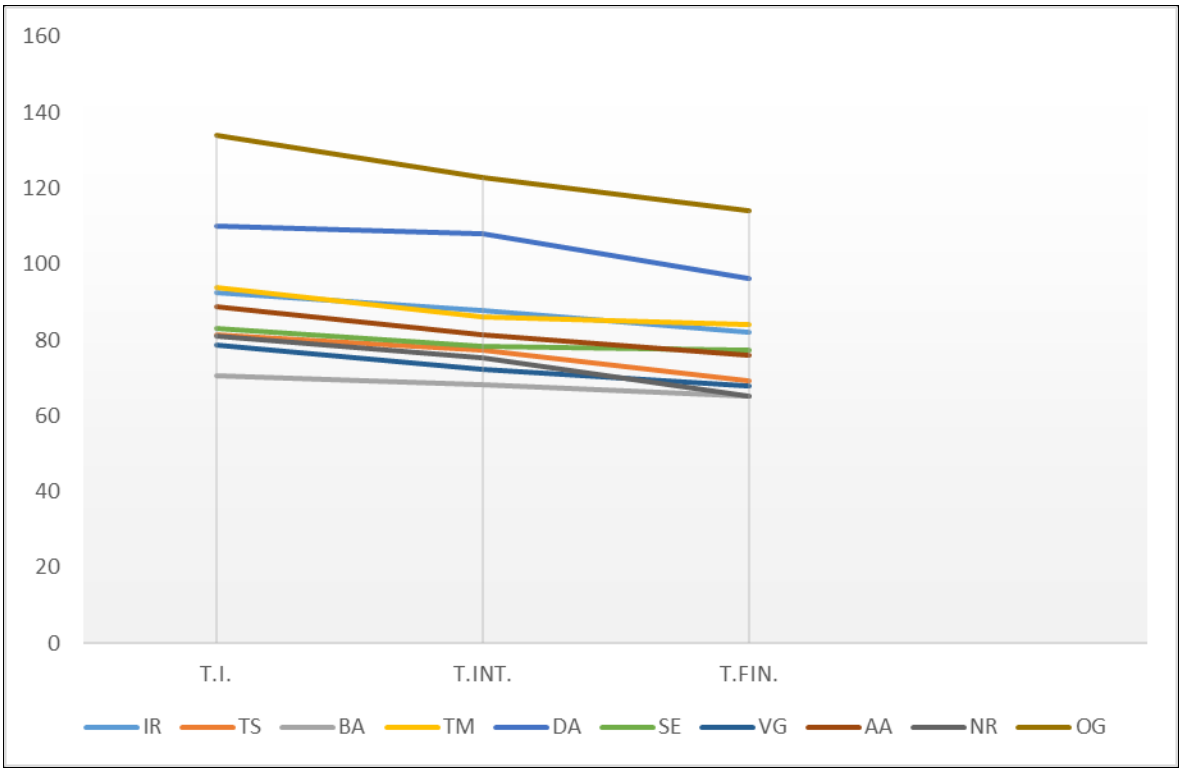

Figure 12. Evolution of the chondrom weight of the three tests

Figure 12. demonstrates that the applied program led to a decrease in body mass of each subject as shown by the three measurements.

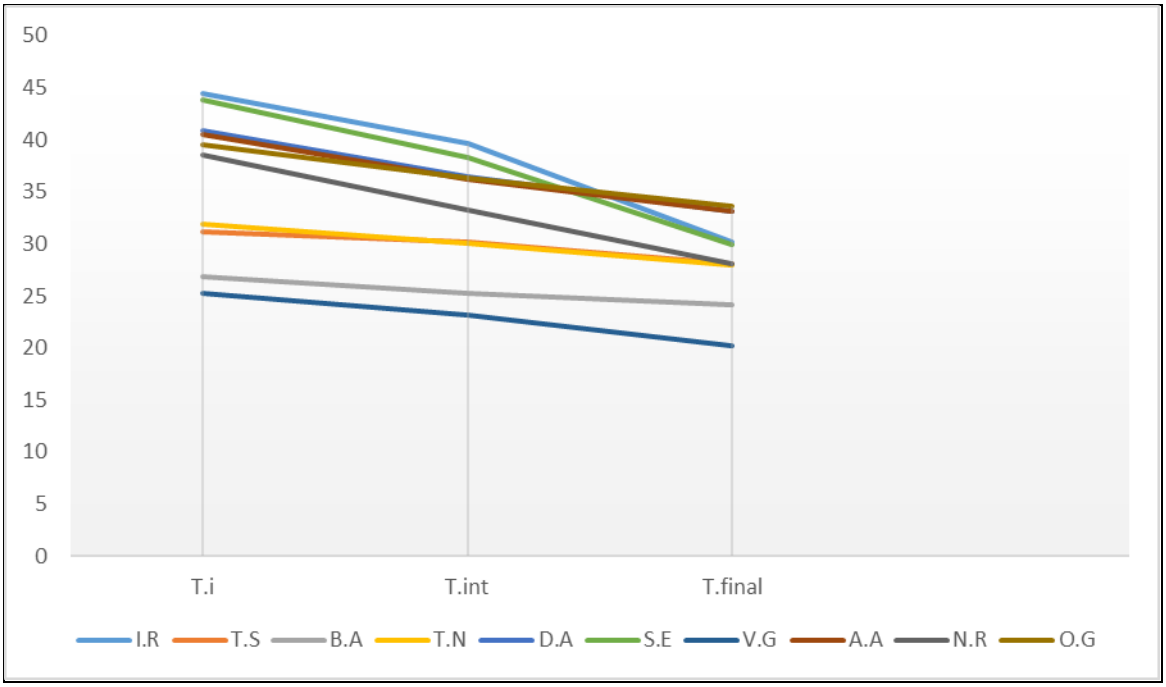

Figure 13. Evolution of body fat decrease during the three tests

Figure 13. demonstrates that following the program carried out by the subjects it is observed that the body fat decreased in each of them.

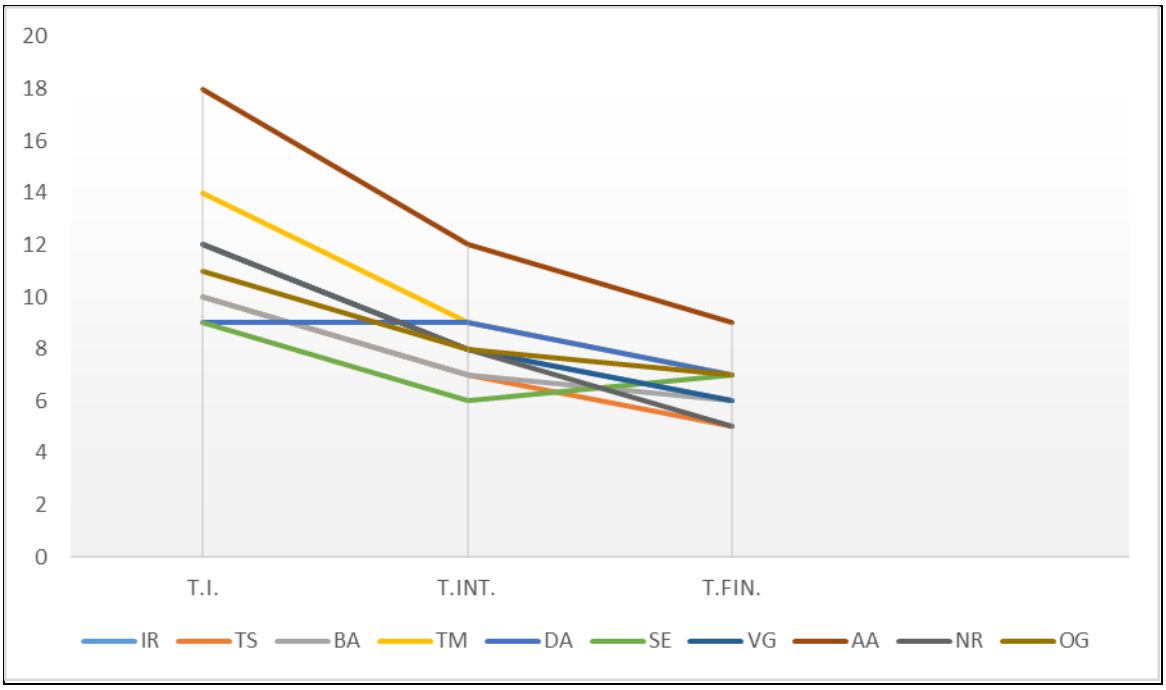

Fig.14. Evolution following the three visceral fat tests

According to Fig.14. it appears that for 9 out of 10 subjects visceral fat decreased. In the case of subject S.E, visceral fat decreased initially by 3 percent and then increased by one percent.

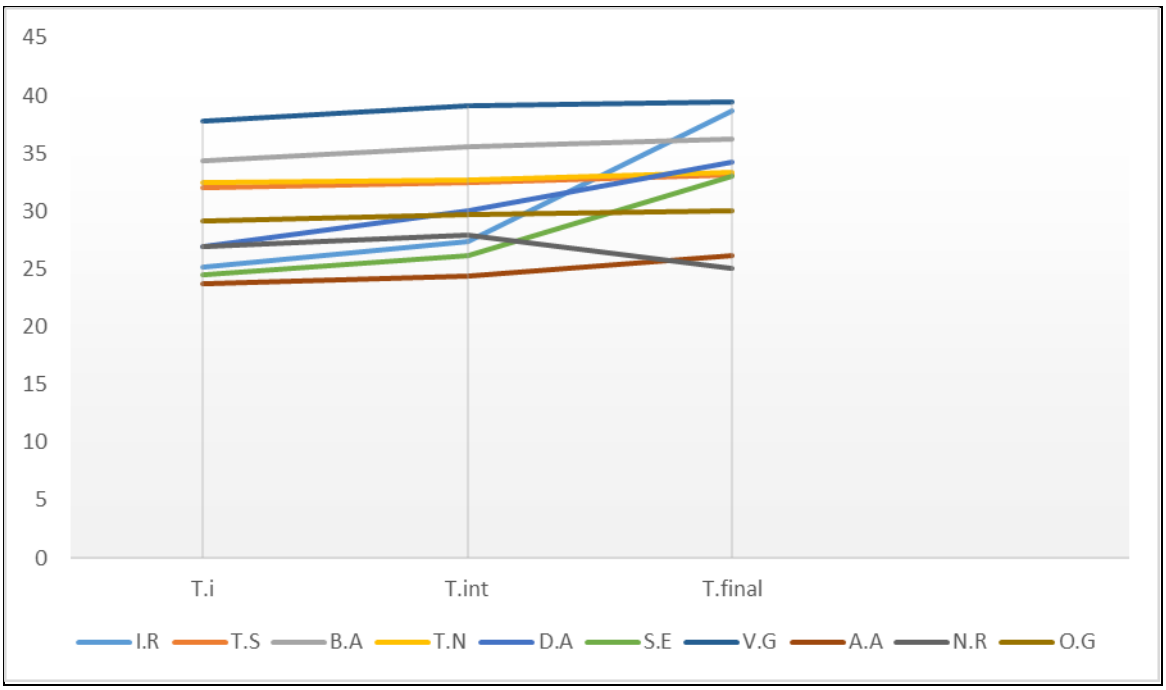

Figure 14. Evolution of skeletal muscles during the three tests

Regarding skeletal muscles, Fig.15. shows an increase in 9 out of 10 subjects. For subject N.R. the skeletal musculature showed a decrease compared to the intermediate test.

Conclusions

The objective of the experiment was to identify using EMS technology whether training contributed to changes in body mass, skeletal muscle mass, body fat and visceral fat. Based on this study, all results obtained are significant for all variables. These findings are beneficial for all human beings seeking a healthy lifestyle in their leisure time.

Our results support the hypothesis, as the use of EMS Fitness technique over a period of 90 days led to decreased body mass, optimized body mass index and increased muscle strength.

In conclusion, I believe that people in Romania should have a wider openness in practicing physical exercise in their free time in order to develop a healthy generation and decrease the possibility of reaching the stage of obesity and stopping diseases, and a good help in achieving this goal is presented by training using EMS Fitness technology.

Authors' Contributions

All authors have equally contributed to this study.

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