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# The effects of full body Electro Muscle Stimulation (EMS) on the muscle mass and the subcutaneous fat changes of the body.

## STUDY OBJECTIVE

The objective of this study was to assess the positive impacts of the XBody EMS (Electro Muscle Stimulation) workout on the body: decreasing subcutaneous body fat and increasing muscle mass.

The study examines how effective it is to stimulate all major muscle groups at the same time and what changes the participants' experience.

## METHODOLOGY

XBody New Wave EMS training machine was used to complete the study, in which 25 people (19 female, 6 male) volunteered to participate.
The circumferences of seven different body parts were measured, and 10 different samples of skin fold thickness were taken to measure subcutaneous fat; measurements in the same areas were taken after the study, and results were compared. All measurements were taken by the same examiner on the right side of the body. Each skin fold thickness was measured three times, and the average of the two closest was recorded. Skin fold measurement is one of the most accurate ways to measure body fat.

Tests, measurements, and applications were performed under the direction and supervision of a fitness professional.

**Body Part Circumferences**:

Measurements were taken with spring loaded body circumference steel tape using the metric system (centimeter and millimeter) and were converted to the English System of Measurement (inches and 1/16 for uniformity). Measurements were taken at the following locations:

1) Upper arm girth at mid length of humerus
2) Chest girth: a) circumference at the level of the nipples
   b) circumference at the apex of the sternum
3) Waist girth at the level of the umbilicus (belly button)
4) Hip girth at 5 cm (2 in) below the top of hip bone
5) Thigh girth at the mid length of the femur
6) Knee girth at 5 cm (2 in) above the knee cap
7) Calf girth at the thickest part of the calf

**Skin Fold** :

Measures were taken with a millimeter fat caliper at the following locations:

1) Biceps mid length
2) Triceps mid length
3) Chest at the level of the apex of the sternum at the mid-clavicular line
4) Umbilicus laterally 1 in to the right side
5) Lateral aspect of the waist at the level of the umbilicus
6) Lateral aspect 5 cm below the tip of the hip bone
7) Superficial to quadricep measured at the mid length of femur
8) Superficial to hamstring measured at the mid length of femur
9) Knee on frontal side 5 cm (2 in) above the knee cap
10) Calf at the superficial aspect at the widest circumference

Study participants underwent 20 minutes of full body electro muscle stimulation (EMS) with the XBody system on average twice a week for a total of 16-18 sessions. They began at a 60% intensity level that increased to 75% after 5-6 minutes. 75% stimulation is a high, still comfortable level individually adjusted for every participant. The participants were lying on

their back in a comfortable position. They received 4 seconds of electro muscle stimulation followed by a 2 second break repeatedly for 20 minutes. The stimulation frequency was 80 muscle contractions per second.

The group was instructed not to alter their diet or their way of exercising.

28% of the group exercised prior to the study on a weekly basis
20% had done training occasionally
52% had not engaged in any significant physical activity for 6 months prior to the study.

## RESULTS

Changes experienced in **Body Part Circumferences**:

| | | |
|---|---|---|
| 1) | Upper arm | -1.2 cm = 4.0 % decrease |
| 2) a. | Chest nipple | -4.0 cm = 4.0 % decrease |
| b. | Chest sternum | -3.6 cm = 4.0 % decrease |
| 3) | Waist | -4.3 cm = 4.9 % decrease |
| 4) | Hip | -5.1 cm = 5.1 % decrease |
| 5) | Thigh | -2.6 cm = 4.5 % decrease |
| 6) | Above knee | -2.9 cm = 6.5 % decrease |
| 7) | Calves | -0.7 cm = 1.8 % decrease |

Changes experienced in **Skin Fold**:

| | | |
|---|---|---|
| 1) | Biceps | -6.0 mm = 66.7 % decrease |
| 2) | Triceps | -9.0 mm = 40.9 % decrease |
| 3) | Chest | -8.0 mm = 42.1 % decrease |
| 4) | Umbilicus | -11 mm = 35.5 % decrease |
| 5) | Hip | -10 mm = 35.7 % decrease |
| 6) | Waist | -11 mm = 37.9 % decrease |
| 7) | Quadriceps | -9.0 mm = 27.2 % decrease |
| 8) | Hamstrings | -11 mm = 33.3 % decrease |
| 9) | Knee | -12 mm = 48.0 % decrease |
| 10) | Calves | -4.0 mm = 23.5 % decrease |

## CONCLUSIONS

The study clearly shows that after 16-18 electro muscle stimulation sessions the muscle mass and the subcutaneous body fat have significantly changed. The average reduction in **Body Part Circumferences** was 4-6%, an equivalent to a 3.8 cm (1.5 inch). More surprising were the results of the **Skin Fold Measurements**. The average reduction in skin fold was 30-50 %, an equivalent to 9-11 mm (6/16 inch). Given the fact that skin fold measurements are the most accurate way to measure subcutaneous body fat, we can conclude that with the Electro Muscle Stimulation one is able to reduce overall body fat.

## DISCUSSION

It was observed that overweight participants experienced a more significant drop in body part circumference, skin fold, and self reported body weight loss in comparison to participants with average or fit body types. This indicates a significant loss of body fat for overweight participants. More fit participants lost fat and gained muscle mass, indicating that their body became more fit and toned. Growth of muscle mass compensated the fat reduction, causing their self reported body weight to stay unchanged.

The biggest differences in the results were based on the strength of stimulations and muscle contractions that the participants were exposed to. Higher contraction intensity resulted in greater muscle growth.
The electrical impulses from the XBody machine works on outer as well as deeper inner muscles, which are not easily reached through conventional methods of exercise.

Participants who were exercising on a regular basis (approximately 48% of study participants) self-reported increased strength and endurance while doing their every day gym training after starting the EMS study.

Compared to other EMS machines that only stimulate one body part at a time such as Contour Abs, TENS Unit, and RX8000, the XBody Electro Muscle Stimulation system stimulates the WHOLE BODY at the same time,

significantly reducing the required amount of time for overall weekly body training. The specialized full-body EMS training is a time saving and effective all-around training method that has far reaching positive effects on overall health and could benefit a broad range of individuals.

The muscle tension produced in a maximal XBody EMS contraction can be up to 30% higher than a maximal voluntary contraction. This finding was corroborated by independent studies and makes intuitive sense, given the nature of the body's energy conservation system.

Since individual muscle fibers can be completely exhausted in just a few seconds, the body has adopted several strategies to prolong endurance. Slow twitch (red) fiber is used first in voluntary contractions, as it is energy efficient, though not very powerful. Thereafter, the fast twitch (white) fiber begins contracting quickly and powerfully to handle the load.

In addition, muscles work their individual fibers in relays, always holding some back from even the most demanding load to maintain a reserve. Therefore, it's impossible to voluntarily contract all fibers simultaneously. The order of recruitment makes it likely that most of the fibers held in reserve will be white. EMS works directly on the muscles, bypassing the body's energy conservation system; thus there's no limit to the percentage of fiber that can be activated. The EMS stimulus "spills over" from fully contracted fiber to activate remaining fiber (given sufficient stimulation) allowing the individual to experience a training stimulus that's unattainable by any other means.

Besides the objective positive results of the study proven by the decreases in body part circumferences and skin fold measurements, the participants were asked their subjective opinion on self observations.

Based on their opinion and experiences the following was reported by the participants:

- 76% of participants experienced improvement in mood
- 72% felt more energetic during the day
- 64% reported being more vital
- 92% felt drastic change in physical appearance
- 80% felt improvement in their overall condition
- 84% experienced better body stability
- 76% felt more relaxed after training.
- 100% of those who had chronic back pain experienced a significant decline or disappearance in intensity of their back pain

The study demonstrates that EMS training is an effective and efficient way to reduce body fat and increase muscle mass by direct stimulation of muscles. As a result, there is improvement in overall physical condition and mood.

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