



The Effects of Electrical Muscle Stimulation on Muscle Strength, Power, and Size.

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Purpose

The purpose of this pilot study was to evaluate the Vertical Jump, Margaria-Kalamen(M-K), 1 Repetition Maximum (1RM) for a toe raise, and circumference of the belly of the gastrocnemius between groups who received EMS treatment, plyometric training, or both EMS treatment while performing plyometric training to determine any differences.

Methods

17 out of 20 recreationally active subjects completed the study. Subjects were recruited from the Maverick Activity Center, and randomly assigned to one of four groups; a control group, a treatment group, a training group, and a group that received treatment while performing training (both). See Table 1.

	Number	Age	Std. Dev.	Range	Male	Female
Control	5	22.60	2.24	7.00	3	2
Treatment	4	23.50	3.35	10.00	2	2
Training	3	22.00	0.00	1.00	2	1
Both	5	21.60	0.49	2.00	5	0
Total	17	22.41	2.17	10.00	12	5

The control group only performed the pre- and post-tests without receiving any training or treatment.

The treatment group received 100 total minutes, spread out over a period of 4 weeks, of stimulation from the OMNISTIM® FX² Pro Sport, on the calf muscle using the Lower Extremity Triphasic PENS Protocol set to a level that produced a strong visible contraction.

The training group performed 100 total minutes, spread out over a period of 4 weeks, of plyometric training, consisting of box jumps and depth jumps for 1 minute followed by 1 minute of rest.

The group that received the treatment while performing training followed a combined protocol. Over a period of 4 weeks, they performed a total of 100 minutes of plyometric training, consisting of box jumps and depth jumps for 1 minute followed by 1 minute of rest, while receiving 100 total minutes of stimulation from the OMNISTIM® FX² Pro Sport, on the calf muscle using the Lower Extremity Triphasic PENS Protocol set to a level that produced a strong visible contraction.

The data were analyzed using a one way ANOVA with 4 levels.

The dependent variables were percent change (pre-post/pre) for calf circumference (right, left), 1RM, vertical jump, and Margaria-Kalamen.

Fisher's LSD Multiple-Comparison were used for post-hoc testing. Alpha was set a priori at 0.05.

See Figures.

Methods(cont'd)

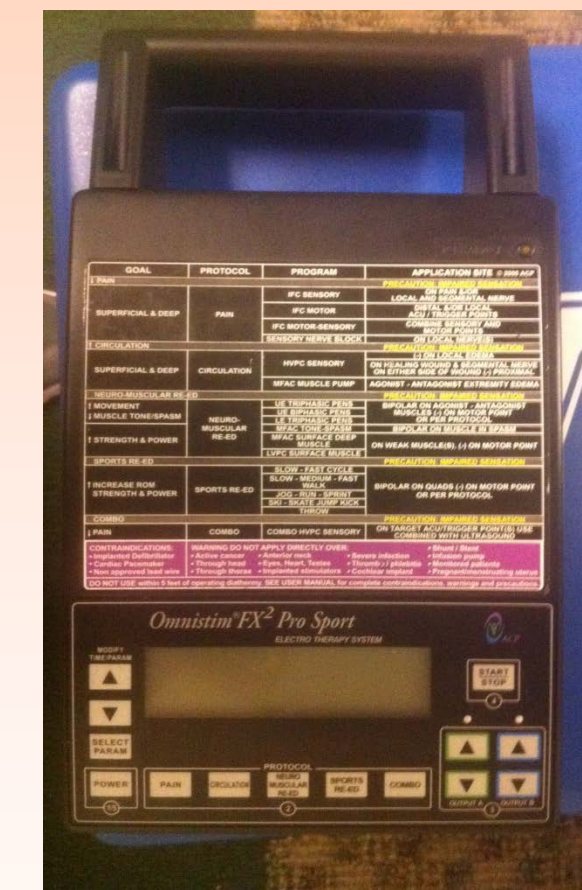


Figure 1. OMNISTIM® FX² Pro Sport



Figure 2. Performing Vertical Jump Test

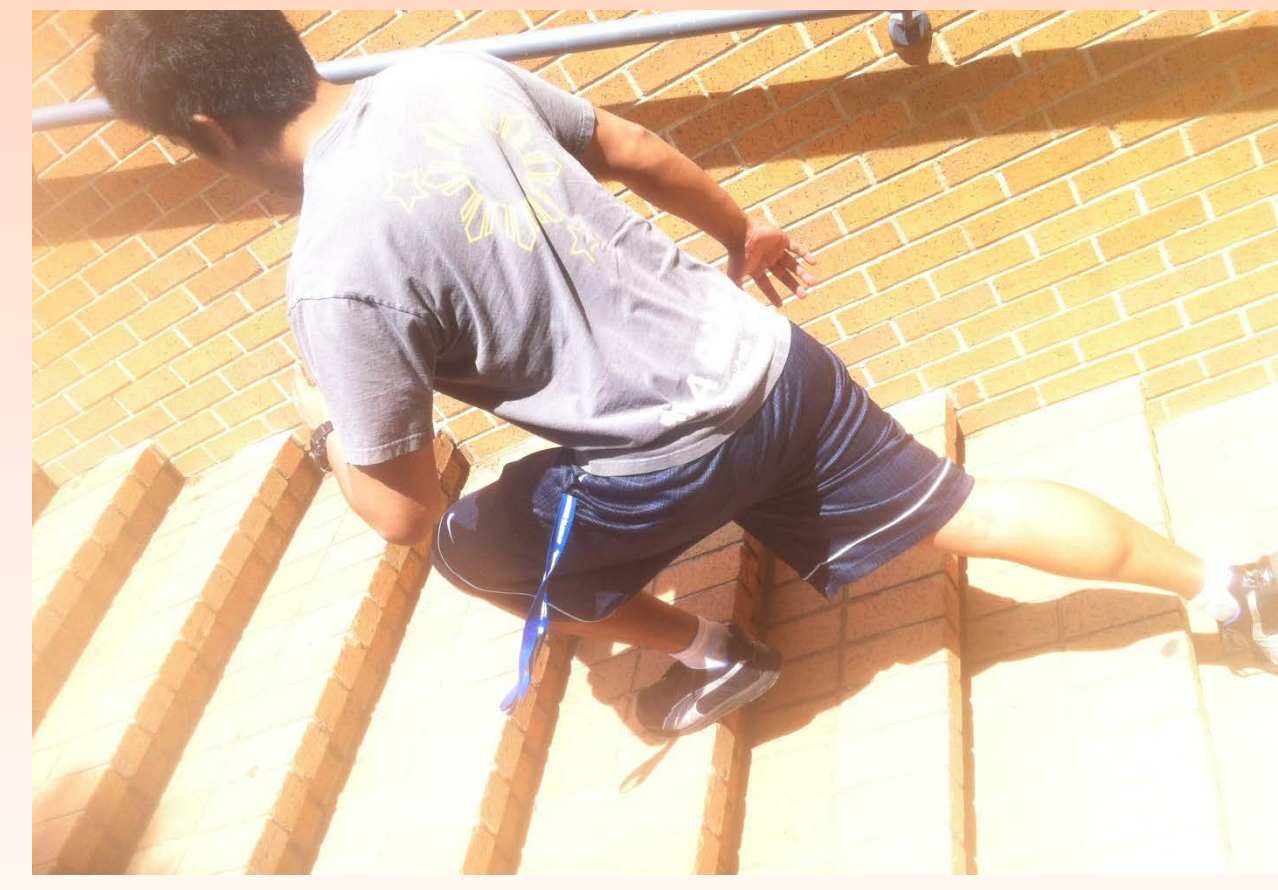


Figure 3. Performing Margaria-Kalamen Test



Figure 4. Performing 1RM Toe Raise



Figure 5. Measuring Calf Circumference



Figure 6. Treatment Group



Figure 7. Training Group



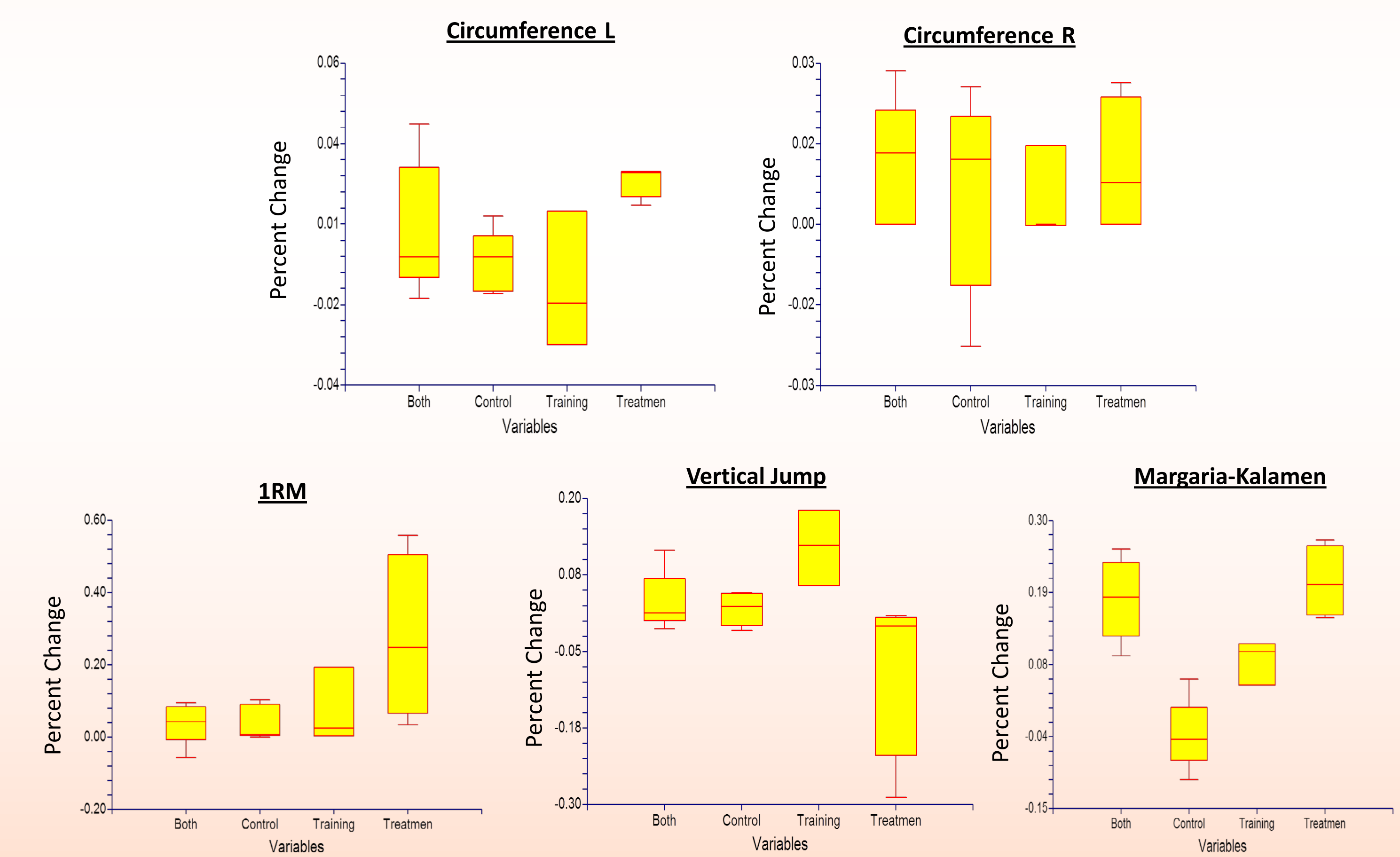
Figure 8. Both Group

Results (cont'd)

Table 2. Percent Change

Groups	Circumference L	Circumference R	1RM	Vertical Jump	Margaria-Kalamen
Control	-0.19%±0.87%	0.60%±1.65%	4.00%±4.26%	1.99%±2.42%	-3.44%±5.02%
Treatment*^	2.36%±0.45%	1.05%±1.12%	*27.32%±19.75%	-7.36%±12.43%	^20.48%±4.94%
Training+	-0.92%±1.73%	0.49%±0.69%	7.40%±8.41%	+12.10%±5.05%	8.19%±2.82%
Both^	0.84%±1.85%	1.12%±1.06%	3.96%±5.19%	3.08%±4.38%	^17.79%±5.63%

*Treatment group 1RM significantly differed from control and both group. +Training group VJ significantly differed from Treatment group. ^Treatment group M-K and Both group M-K significantly differed from Control group.



Results

- Circumference
 - Left; there was not a significant group effect ($F_{3,16}=3.21, p=0.058$).
 - Right; there was not a significant group effect ($F_{3,16}=0.21, p=0.887$).
- 1RM
 - There was a significant group effect ($F_{3,16}=3.43, p=.0492$).
- Vertical jump
 - There was a significant group effect ($F_{3,16}=3.50, p=0.0468$).
- Margaria-Kalamen
 - There was a significant group effect ($F_{3,16}=17.63, p<0.001$).

Conclusions

- The difference found between groups indicates that there were changes made due to the type of supplementation that can be added to a healthy adult's workout, and thus further studies on EMS supplementation should be warranted given that the subject pool be homogeneous and significantly greater.
- EMS using the OMNISTIM® FX² Pro Sport did have an effect on the subject's strength as indicated by the 1RM toe raise and their power as indicated by the Margaria-Kalamen performance.
- Plyometric training rendered an effect on power as indicated by the Vertical Jump while the EMS treatment showed no impact.
- Neither EMS treatment or plyometric training indicated significant improvement in Circumference for either leg, however there was evidence that the difference between legs might be improved and further studies on symmetry should be warranted.