

“Effect of Muscle Activation Techniques on Muscle Efficiency”

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HYPOTHESIS

I hypothesized that Muscle Activation Techniques (MAT) will improve muscle efficiency in terms of grip strength. MAT is “a dynamic approach to treating muscular imbalances that will...speed muscle recovery” (pamphlet). Based on my own experience, MAT worked to restore muscle fatigue and increase joint stabilization. The purpose of this project is to determine whether MAT is scientifically sound.

METHODS USED

The subject for this experiment was a 21 year old male. The electrode pads were placed on the subject’s non-dominant (left) forearm according to Figure 1 after abrading the skin with alcohol prep pads. The non-dominant forearm was used at the advice of the MAP specialist to eliminate the possibility of joint instability associated with the dominant forearm. In other words the more often a muscle is used, the greater the chance of a pre-existing joint instability.

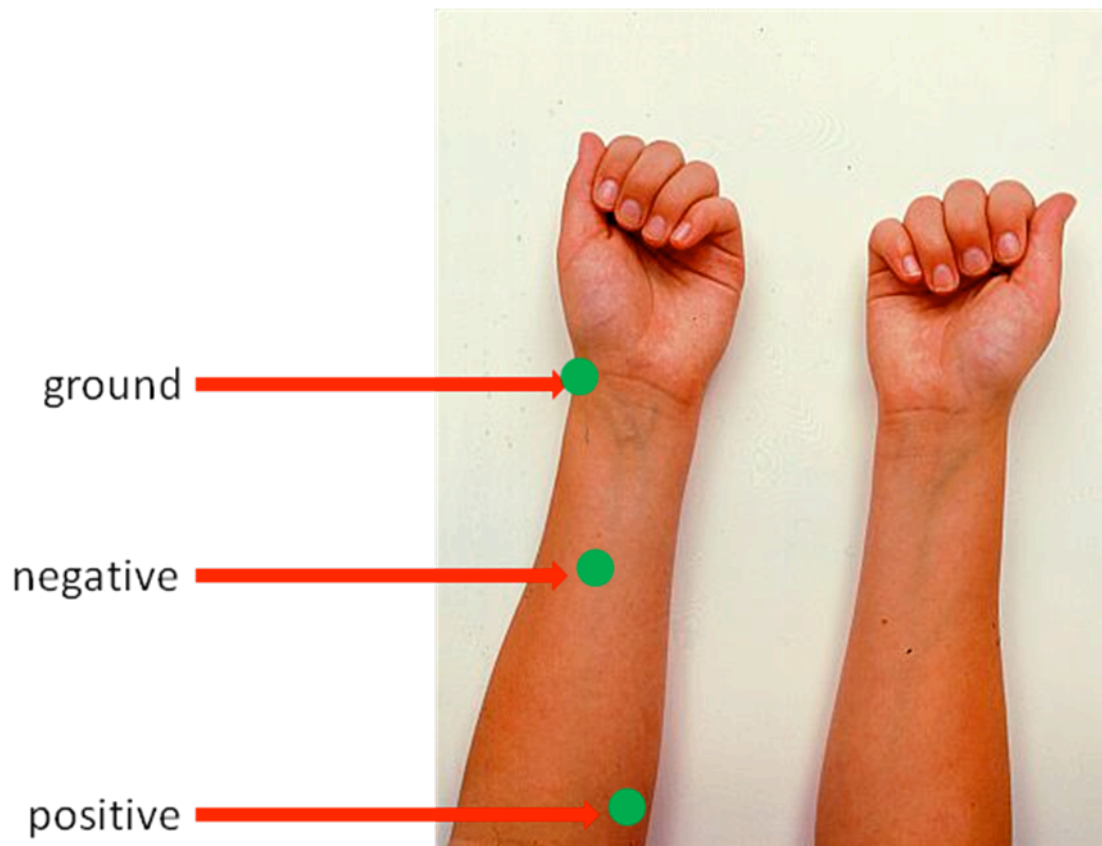


Figure 1: Placement of electrodes

The iWorx box was turned on and the LabScribe software was started. The settings were altered to display the EMG, EMG Integral, and Force channels. The leads were then placed on the electrode pads according to Figure 1.

At 1550 baseline test was performed to determine the subject's normal grip strength efficiency. This was accomplished by having the subject squeeze the dynamometer bulb 5 times with increasing force. Each of the five contractions were 2 seconds long with 3-4 seconds of rest between.

After the baseline test was accomplished, the subject was instructed to squeeze a dynamometer that measures grip strength repeatedly to 40 kgf for 4 minutes. At the end of the 4 minutes the subject could no longer squeeze at 40 kgf – rather the maximum grip strength was 20 kgf. After the muscle fatigued, another EMG test was conducted at 1554 to determine grip strength efficiency once again.

After the second test was finished a certified MAT specialist treated the muscles affected by the fatigue. The muscles treated were: Palmaris longus, Flexor carpi radialis, Flexor carpi ulnaris, Interossei dorsal, Flexor pollicis longus, and Flexor pollicis brevis. The subject recalled tenderness associated with the treatment of the affected muscles.

Once the treatment concluded at 1607, the last EMG test was conducted and the test was concluded.

RESULTS

The following results were found. Figure 2 is a screenshot of the LabScribe interface to show how the results were recorded and analyzed.

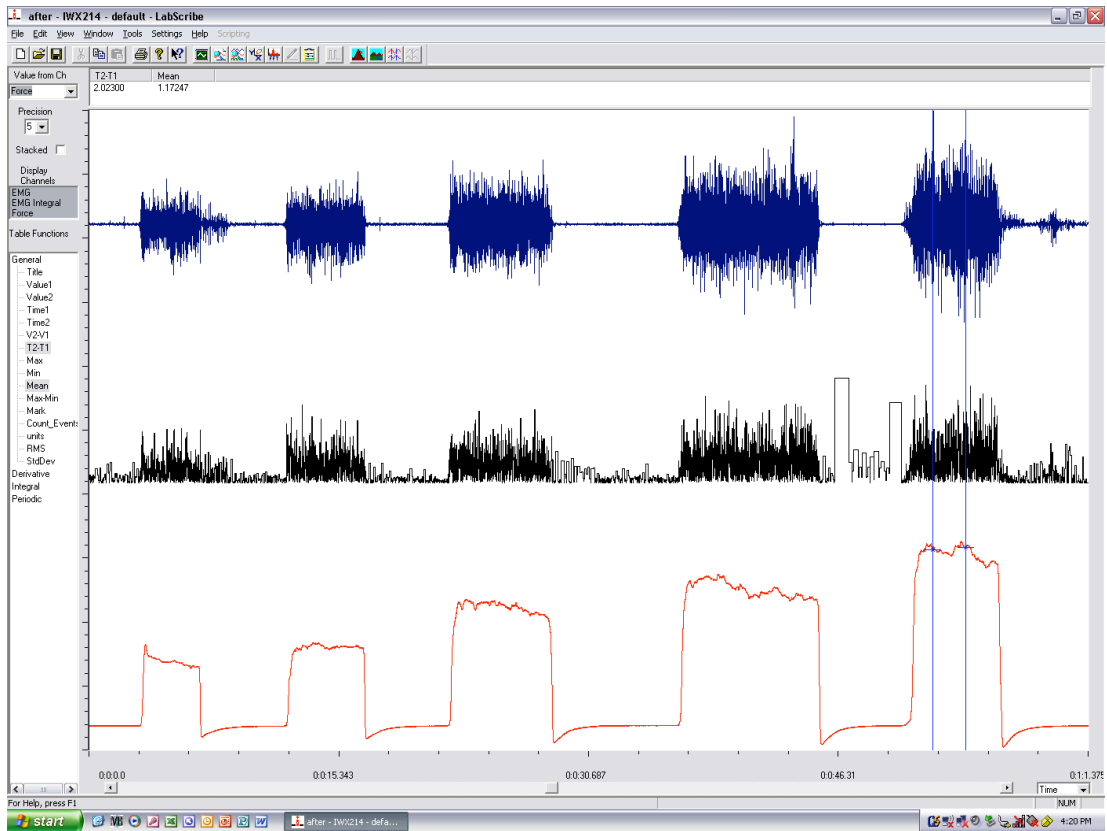


Figure 2: Screenshot of results

These results show the EMG results on the top, the EMG integral results in the middle, and the force exerted on the dynamometer on the bottom. The EMG integral was averaged for each contraction over 2 seconds to find the mean for each contraction. The force was also analyzed the same way. The results were used to form the graph shown in Figure 3.

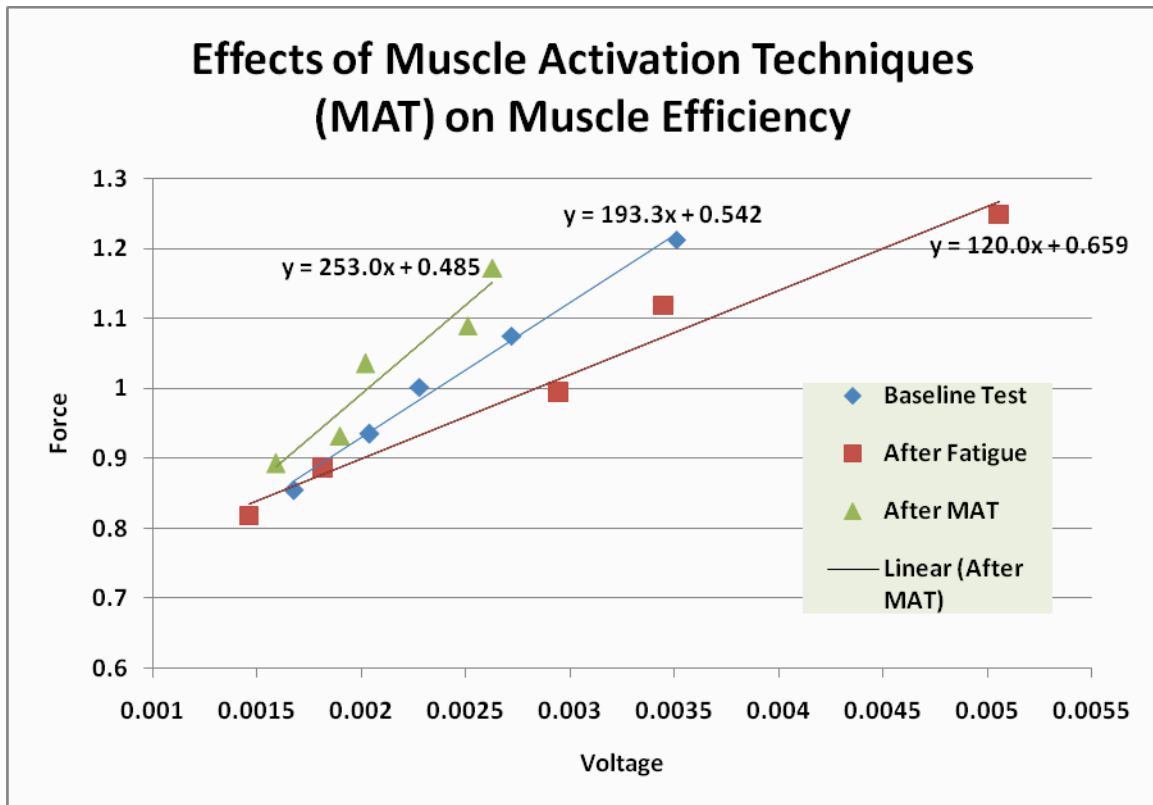


Figure 3: Graphical representation of the results

Using the equation calculated using Microsoft Excel, the slope of the trendline was determined and represents the efficiency of the muscle. The slope corresponds to the amount of power for every unit of voltage applied to the muscle by the nerves to cause the contraction. Muscle efficiency increases as more muscles respond and contract, causing force on the dynamometer, for the same amount of signal.

CONCLUSION

The results of the experiment proved my hypothesis true. The slope decreased from 253 to 193 after the subject was fatigued. This shows that the muscles were less efficient after becoming fatigued. The difference between the second and the last tests – before and after the MAT – show that MAT treatment did improve the efficiency of the muscle. Some improvement was expected between the second and third EMG tests because the muscles would self-repair during the 13 minutes of rest. The only problem with this conclusion was that the efficiency after MAT was higher than the baseline efficiency. The 133 point change in slope between the fatigued muscle and the 60 point increase between the baseline suggests that MAT significantly improved the efficiency of the muscle beyond just recovery from fatigue.

DOCUMENTATION

C1C David Garcia was my subject and helped me develop my idea.

Brad Carlson was the MAT specialist that aided in this study and provided the pamphlet quoted in the paper. <http://www.powerplaysportsperformance.com/>