The Effects of Kinesiology Tape on Calf Activation and Endurance

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INTRODUCTION

• The gastrocnemius and soleus, together known as the triceps surae (TS), contribute 80% of plantar flexion strength.1
• TS activation can be affected by various factors such as injury or overactivity of an opposing muscle.2,3
• Overactivity of a muscle (tibialis anterior, TA) may decrease activation in the opposing muscle (TS); this is known as reciprocal inhibition.3
• A decrease in activation from the TS places an individual at risk for injury and/or decrease in sports performance.4
• Specific application of Kinesiology tape is suggested to alter muscle activation.5
• Kinesiology tape directly applied to the gastrocnemius enhances strength, as well as electromyography (EMG) activity from the muscle.4,6
• Currently, there are limited studies that examine the effects kinesiology tape has on reciprocal inhibition and opposing muscle function.6
• The single leg heel-rise test (SLHR) is one way to assess isolated muscle function of the TS.7

HYPOTHESES

• Kinesiology tape applied to the TA will increase peak EMG amplitude of the TS compared to the control limb.
• Kinesiology tape applied to the TA will increase the number of repetitions performed during a SLHR test compared to the control limb.

MATERIALS AND METHODS

Study Design: Pre-test post-test randomized control group design

Independent Variables: Group (kinesiology tape versus control) and time (pre versus post intervention)

Dependent Variables: Δ of peak EMG amplitude of the medial gastrocnemius, lateral gastrocnemius, and soleus and Δ of repetitions performed during SLHR test

Participants: 4 female Daemen College community members over 18 years old, free from lower extremity injury within the past 6 months that currently limits activities of daily living, allergy to the tape/adhesive, or excessive lower leg hair

Instrumentation:
• Kinesiology Tape
  • Kinesio Tex Classic 2” (Kinesio Holding Corp. Albuquerque, NM)
  • Base of 1st metatarsal and medial cuneiform to upper lateral half of tibia (insertion to origin) with 25% tension7 (Figure 1)
• Electrodes
  • Dual Ag/AgCl surface electrodes (BIOPAC Systems Inc. Goleta, CA)
  • Placed according to previously published guidelines8 (Figure 2)
• EMG Assessment
  • BSL MP56 system (BIOPAC Systems Inc. Goleta, CA)
  • Sampling frequency of 1000 Hz
  • Bypass filtered 200-500 Hz
  • Impedance < 10 kOhm
• MVIC
  • 3 sets of 2 sec for both full knee extension and 90/90 position (Figures 3 & 4)
• SLHR Test
  • Performed as described by Ross & Fontenot9
  • Performed until participant chooses to terminate due to fatigue, falls out of line with the metronome, or does not meet 5 cm mark
• Statistical Analysis
  • Independent t-test used to compare change scores of peak EMG amplitude and number of repetitions performed between control and experimental limb
  • Change scores calculated by taking differences of pre and post measurements of repetitions performed and normalized peak EMG activation (% MVIC)
  • IBM SPSS version 23 used (IBM, Armonk, NY) with alpha level p ≤ 0.05

RESULTS

Table 1: Independent t-test results for change scores of peak EMG amplitudes for medial gastrocnemius, lateral gastrocnemius, and soleus between the experimental (1) and control (2) limb. All change scores are represented as percentages.

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD) Pre</th>
<th>Mean (SD) Post</th>
<th>Mean Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastroc</td>
<td>377.36 (482.83)</td>
<td>65.39 (74.61)</td>
<td>49.88 (38.08)</td>
</tr>
<tr>
<td>Lat Gastro</td>
<td>170.93 (162.28)</td>
<td>86.36 (53.67)</td>
<td>96.02 (99.78)</td>
</tr>
<tr>
<td>Soleus</td>
<td>96.02 (99.78)</td>
<td>.449 (.664)</td>
<td>.421</td>
</tr>
</tbody>
</table>
P-value       | .449 (.664) | .421 |

Table 2: Independent t-test results for SLHR repetitions between the experimental (1) and control (2) limb

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD) Pre</th>
<th>Mean (SD) Post</th>
<th>Mean Δ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetition</td>
<td>25.75 (11.21)</td>
<td>25.25 (10.56)</td>
<td>0.5</td>
</tr>
</tbody>
</table>
P-value     | .168 |

PROCEDURE

Figure 1: Kinesiology tape placement

Figure 2: Electrode placement

Figure 3: MVIC full knee extension

Figure 4: MVIC 90/90

DISCUSSION

• The results of this study do not support the hypotheses.
• Despite there being no statistically significant results, a large increase in peak EMG amplitude was found for the medial gastrocnemius compared to the lateral gastrocnemius and soleus; the activation was more than doubled in the taped group compared to the control group.
• Limitations of the study include a small number of participants as well as the kinesiology tape may not have been long enough for an effect to occur. TA activity was also not assessed with electrodes so it cannot be sure that it was truly inhibited.
• More research is necessary to compare the direct effects of kinesiology tape on muscle activation.

BIBLIOGRAPHY