Gluteus Maximus Activity during Bilateral Countermovement Jump in D1 Female Athletes

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Abstract
The objective of this study was to compare left and right Gluteus Maximus muscle activation in division one (D1) female basketball players, while performing a countermovement jump (CMJ). The study asked, “What impact does the bilateral CMJ have on gluteal activation in D1 female athletes?” The null hypothesis stated no significant differences would be found in gluteal activation between the right and left Gluteus Maximus muscles. Nine female participants volunteered for the study. Pre-screening of participants involved assessment of the Functional Movement Screen™ squat pattern and muscular voluntary isometric contractions (MVIC) of the right and left Gluteus Maximus. Surface electrodes were placed on the belly of each gluteus maximus to record muscle activation while performing three trials of the CMJ. Data was analyzed using the Delsys EMGWorks® software. Root mean square (RMS) values were normalized to the MVIC for each Gluteus Maximus. A matched paired t-test compared the right and left Gluteus Maximus activation for the CMJ and the landing. Results indicated no statistically significant differences in Gluteus Maximus during CMJ task. The null hypothesis is accepted.

Introduction
A bilateral countermovement jump is used to evaluate muscle activation of the lower extremities.1 A countermovement jump activates the gluteal muscles and provides a relationship between muscle activation and vertical jump height.2 Vertical jump height during the countermovement is affected by depth squat and gluteal activation.3 Gluteus Maximus provides stability, explosiveness, strength, aids in generating bilateral movement, and increased amount of MVIC trials for continuous, unequal gluteal activation and favoring one side to another may result in an overuse injury and cause a gradual increase in muscle imbalances.4 Researcher concluded that EMG of the CMJ did not indicate a high degree of variance in muscle activation between right and left Gluteus Maximus. Future research should include a larger sample size, a more demanding and force generating bilateral movement, and increased amount of MVIC trials for normalizing data.

Methods
Setting
• Small DI Midwestern University laboratory
• Fall 2019
Participants
• 9 female Division I basketball players
Procedures
• Five-minute dynamic warm-up on exercise bike.
• FMS™ squat assessment was performed and video was recorded.
• Skin surface above R & L Gluteus Maximus prepared and secured with electrode sensors.
• MVIC collected for each muscle.
• 3 CMJs performed while video-recorded.
• Jump heights were recorded for each CMJ.
• Electrodetecting muscle activity sent data via Bluetooth to computer program.
• Matched-paired t-test with replication used to analyze the data.

Results

Table 1
Mean Countermovement Jump Height (in)
<table>
<thead>
<tr>
<th>Participant</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Mean (x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGM</td>
<td>20.6</td>
<td>16.1</td>
<td>20.6</td>
<td>16.7</td>
<td>15.7</td>
<td>16.6</td>
<td>17.1</td>
<td>19.1</td>
<td>18.4</td>
<td>17.9</td>
</tr>
</tbody>
</table>

Table 2
Comparison of mean percent MVIC muscle activation: CMJ
<table>
<thead>
<tr>
<th>Participant</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Mean (x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGM</td>
<td>82.0</td>
<td>35.8</td>
<td>197.3</td>
<td>179.7</td>
<td>152.0</td>
<td>20.2</td>
<td>68.8</td>
<td>86.3</td>
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<td>102.8</td>
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<td>LGM</td>
<td>90.3</td>
<td>42.5</td>
<td>83.5</td>
<td>112.3</td>
<td>122.8</td>
<td>16.1</td>
<td>92.6</td>
<td>33.4</td>
<td>331.3</td>
<td>74.17</td>
</tr>
</tbody>
</table>

*RGM = Right Gluteus Maximus; LGM = Left Gluteus Maximus

Table 3
Comparison of mean percent MVIC muscle activation: Landing
<table>
<thead>
<tr>
<th>Participant</th>
<th>1</th>
<th>2</th>
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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>Mean (x)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RGM</td>
<td>70.1</td>
<td>25.7</td>
<td>153.5</td>
<td>226.7</td>
<td>48.4</td>
<td>24.1</td>
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<td>19.9</td>
<td>128</td>
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<tr>
<td>LGM</td>
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<td>26.1</td>
<td>24.0</td>
<td>77.6</td>
<td>36.8</td>
<td>16.1</td>
<td>n/a</td>
<td>59.6</td>
<td>74.8</td>
<td>40.5</td>
</tr>
</tbody>
</table>

*Excludes participant #7

Acknowledgements
I would like to express my deepest gratitude to Dr. Kelly Helm for her assistance, encouragement, and guidance she provided during this research project. I would like to thank Professor Goeller and Alice Lampannon from College of Engineering for their help during data collection. I would also like to thank Terrence Wade, from the statistics department, for assisting in the statistical analysis in this research project. A special thanks to the Valparaiso University women’s basketball team for their willingness to participate in the research and the coaches for their approval.

References