3-DIMENSIONAL KINETIC ANALYSIS OF OLYMPIC SNATCH LIFT

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INTRODUCTION

Olympic Weightlifting (OL) is a sport requiring tremendous muscular effort in addition to excellent coordination and timing [1]. The components of Olympic Weightlifting, the snatch and the clean & jerk, involve all large muscle groups and are performed with emphasis on speed of movement and technical mastery [1]. Limited 3-dimensional kinetic research has been conducted on OL movements [2]. This study will examine selected kinetic and kinematic differences in lift mechanics as barbell load varied between 80-90% of maximal.

METHODS

The selection method was opportunistic to ensure competent lifting performances. The five male participants (4 adult, 1 junior) were National or International caliber weightlifters. A 14-segment rigid-link model represented the musculoskeletal system. Participants executed 3 snatch lifts at predetermined relative capacities. Trial order was balanced to limit order effects. A five-camera Vicon MX system, sampling at 200 Hz, captured lift kinematics. Trajectories were low-pass filtered using Butterworth filters with 6 Hz cut-offs. Ground reaction forces of both feet were recorded from two Kistler force platforms and digitally filtered (10 Hz cut-offs). Net moments and powers were computed using Visual3D.

RESULTS

Figure 1 shows the results of one subject’s successful and unsuccessful attempt at a 95% capacity lift. Peak moments of force and powers about the joints of the lower extremity in the sagittal plane across both trials are presented in Table 1 below.

DISCUSSION AND CONCLUSIONS

Inspection of Figure 1 shows sagittal plane angular velocities, moment of force and power about the joints of the lower extremity are similar. Ankle net moment of force was plantiflexor from lift-off through to explosion its power production was punctuated with two distinct periods of positive work occurring during barbell lift-off (A1) and explosion (A2) with a small burst of negative between.

REFERENCES


ACKNOWLEDGEMENTS

Kind regards to PM for assisting with participants.

Table 1: Summary of peak moments of force and powers across successful and an unsuccessful 95% snatch lift

<table>
<thead>
<tr>
<th></th>
<th>Ankle Moment (N.m)</th>
<th>Ankle Power (W)</th>
<th>Knee Moment (N.m)</th>
<th>Knee Power (W)</th>
<th>Hip Moment (N.m)</th>
<th>Hip Power (W)</th>
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<tbody>
<tr>
<td>Successful</td>
<td>-268.52</td>
<td>832.76</td>
<td>174.4</td>
<td>685.96</td>
<td>-315.28</td>
<td>707.26</td>
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<tr>
<td>Unsuccessful</td>
<td>-265.13</td>
<td>909.5</td>
<td>211.7</td>
<td>802.14</td>
<td>-311.73</td>
<td>802.14</td>
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