Introduction

- Excessive Dynamic knee valgus during functional tasks has been reported to be associated with the anterior cruciate ligament and patellofemoral joint injuries. Previous research supports the idea that athletes can exhibit at-risk knee mechanics across tasks (1,2,3). Limited published research is available on whether poor squatting mechanics transfer to complex tasks such as cutting & landing, which would validate the use of the squatting to identify athletes that display poor dynamic knee control during a variety tasks.

- The aim of this study is to investigate the association between biomechanical variables during single leg squat (SLS), single leg landing (SLL), running (RUN), 90° cutting (CUT) tasks.

Method

- Participants
50 recreational athletes from the university population, 33 males & 17 females, (age 25.3 ± 4.1 years; height 171.3 ±7.3 cm; and mass 69.6 ±9.5 kg).

- Data Collection
10 cameras (Qualysis) & a force platform (AMTI) collected 3D data during the support phase. Participants performed a series of SLS, SLL, 90° side step cutting and running tasks.

- Data Processing
A lower limb biomechanical model was used (4), Visual 3D (C-Motion) utilised to calculate lower limb joint angles and valgus moment for the right leg.

- Statistical Analysis
Normality was checked using the Shapiro-wilk test, & the association between amongst tasks were investigated using Pearson’s correlation coefficients for parametric data & Spearman’s correlation coefficients non-parametric data.

Results

The table below illustrates that hip internal rotation and knee valgus angles showed large to very large correlations among all tasks. Whereas knee valgus moment correlations showed moderate to good (r= 0.40-0.66) between SLS, SLL, & RUN. No correlation were found in knee valgus moment during cutting with SLS & SLL, but it was moderate with RUN(ρ = 0.37)

<table>
<thead>
<tr>
<th>Task</th>
<th>SLS vs. SLL</th>
<th>SLS vs. RUN</th>
<th>SLS vs. CUT</th>
<th>SLL vs. RUN</th>
<th>SLL vs. CUT</th>
<th>RUN vs. CUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hip Adduction Angle</td>
<td>r= 0.56” (R= 30%)</td>
<td>r= 0.34” (R=12%)</td>
<td>r= 0.29” (R= 8%)</td>
<td>r= 0.40” (R=16%)</td>
<td>r= - 0.01 (R= 0%)</td>
<td>r= 0.17 (R=1%)</td>
</tr>
<tr>
<td>Hip Int. Rotation. Angle</td>
<td>r= 0.75”(R=57%)</td>
<td>r= 0.71”(R=50%)</td>
<td>r= 0.68”(R=47%)</td>
<td>r= 0.65”(R=43%)</td>
<td>r= 0.53”(R=28%)</td>
<td>r= 0.60”(R=36%)</td>
</tr>
<tr>
<td>Knee Valgus Angle</td>
<td>r= 0.75”(R=57%)</td>
<td>r= 0.59”(R=0.34)</td>
<td>r= 0.63”(R=40%)</td>
<td>r= 0.82”(R=68%)</td>
<td>r= 0.67”(R=44%)</td>
<td>r= 0.72”(R=52%)</td>
</tr>
<tr>
<td>Knee Valgus moment</td>
<td>ρ= 0.66”(R=31%)</td>
<td>ρ= 0.40” (R= 7%)</td>
<td>ρ= 0.11 (R=1%)</td>
<td>ρ= 0.49”(R=32%)</td>
<td>ρ= 0.06 (R= 2%)</td>
<td>ρ= 0.37”(R=11%)</td>
</tr>
</tbody>
</table>

(p)Spearman’s Correlation Coefficient; (r)Pearson’s Correlation Coefficient; (R) Coefficient of Determination; (*)Statistically significant at p≤ .05 and (**) significant at p≤ .01

Discussion

- The findings clearly demonstrate that there are significant relationships in knee valgus & hip internal rotation angles among all tasks. These results support previous research between different functional tasks (2,3,4). The absence of a significant correlation in knee abduction moments between both SLS & SLL with cutting could be caused by different technical parameters in each task will effect knee valgus moments at the knee such as foot progression angles during cutting.

- The findings of the current study support that those individuals who exhibit poor SLS & SLL biomechanics also show poor running and cutting biomechanics, thus providing support for the use of squat and landing as screening tasks to identify individuals at increased risk of knee injuries.

References