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Visual Estimation of ACL Injury Risk: Efficient Assessment Method, Group Differences, and Expertise Mechanisms

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Introduction

Impact
• Over 2 million ACL injuries occur worldwide annually.
• Approximately 1 in 30 female athletes participating in landing and cutting sports (basketball, soccer) will tear their ACL within one season of play.
• Annual costs in U.S. likely exceed $3 billion (majority pursue surgery).
• Osteoarthritis occurs at 10 times the normal rate.

Potential Solutions

1.) To create an efficient and effective visual screening system for ACL injury risk

2.) Ensure biomechanical feedback during prevention programs is accurate

3.) Reduce screening time and cost

Musculoskeletal Injury Prevention

• Osteoarthritis occurs at 10 times the normal rate.
• Annual costs in U.S. likely exceed $3 billion (majority pursue surgery).
• Over 2 million ACL injuries occur worldwide annually.

Introduction: Skilled Movement Analysis

Objectives
• Establish injury mechanisms
• Identify injury risk factors
• Develop efficient screening method

Methods

Participants

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>ExSci Student</td>
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<tr>
<td>ExSci Academic</td>
<td>30</td>
</tr>
<tr>
<td>S&amp;C Coach</td>
<td>41</td>
</tr>
<tr>
<td>Athletic Trainer</td>
<td>52</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>59</td>
</tr>
<tr>
<td>Physician</td>
<td>39</td>
</tr>
<tr>
<td>Sport Coach</td>
<td>34</td>
</tr>
<tr>
<td>Parent of Athlete</td>
<td>26</td>
</tr>
<tr>
<td>Female Athlete</td>
<td>11</td>
</tr>
<tr>
<td>General Public</td>
<td>320</td>
</tr>
<tr>
<td>Total</td>
<td>660</td>
</tr>
</tbody>
</table>

Procedures

• Item Reduction
• Reliability Analysis
• Cross-Validation

Test Development

• Number of Items = 5
• Average Time (min:sec) = 2:24
• Test-retest (r) = .90
• Score Range = 0-100%
• Achieved Range = 26-95%

Results

Figure 2: Sample ACL-IQ item (snapshot of video sequence)

Group Differences

<table>
<thead>
<tr>
<th>Group</th>
<th>Average Time (min:sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ExSci Student</td>
<td>2:24</td>
</tr>
<tr>
<td>Physical Therapist</td>
<td>2:24</td>
</tr>
<tr>
<td>S&amp;C Coach</td>
<td>2:24</td>
</tr>
<tr>
<td>Physician</td>
<td>2:24</td>
</tr>
<tr>
<td>Sport Coach</td>
<td>2:24</td>
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<tr>
<td>Female Athlete</td>
<td>2:24</td>
</tr>
<tr>
<td>General Public</td>
<td>2:24</td>
</tr>
</tbody>
</table>

Discussion

• It will be important to target patients, athletes, coaches, and physicians for improving risk assessment performance or to adopt the ACL nomogram to aid their injury risk assessment in practice.

• The ACL-IQ is an assessment technology and feedback system for ACL injury risk prediction ability.

• Individuals can assess their ACL injury risk prediction ability with a short, free, and online (www.ACL-IQ.org) tool.

Moving Forward

• Future research will focus on developing efficient methods to improve visual risk prediction performance (e.g., see Decision Tree to the right) and establishing predictable evidence that individuals with high ACL-IQ can reduce ACL injuries.

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