Can You Replay That For Me? What Can Video Analysis of Anterior Cruciate Ligament (ACL) Tears in the English Premier League Teach Us

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Introduction: Anterior Cruciate Ligament (ACL) tears are some of the most devastating, yet common, injuries in soccer, affecting over 200,000 soccer players (both professional and non-professional) per year[1]. Evidence suggests that players who have previously torn their ACL are at an increased risk for re-injury, early onset knee arthritis, and reduced career lengths[2]. For these reasons, understanding not only the mechanism of ACL tears in the sport, but also various playing style factors that render a player more vulnerable to injury, is vital. A common mechanism of injury has not been widely elucidated in the literature, and little research has investigated the mechanism of these injuries specifically in the English Premier League (EPL). For these reasons, we evaluated ACL injuries in the EPL in the seasons between 2011-2023. The study aimed to uniquely utilize publicly available databases to investigate the biomechanical and playing style factors of ACL tears in the EPL, offering insight for players and teams to optimize ACL tear prevention strategies.

Methods: To collect the sample, the website TransferMarkt.us, a public database documenting injury history for every player in the major soccer leagues, was used to find all occurrences of ACL injuries in the EPL from the seasons 2011-2012 to 2022-2023. Injuries were confirmed by official injury releases from the associated teams. Thereafter, a thorough YouTube search was conducted to determine if a video could be found that allowed for biomechanical analysis. For each viable video, the following biomechanical factors were studied: contact or non-contact injury, ground or aerial play, hip movement (flexion, extension, abduction, adduction, external rotation, internal rotation), knee movement (flexion, extension, varus, valgus), and ankle movement (inversion, eversion). The following playing style factors were then investigated: time in the game, player position, type of play, and area of field where the injury occurred. A chi-square goodness-of-fit analysis was then conducted to determine significant differences in each of these variables ($p<0.05$).

Results: 102 ACL tears were identified in EPL games between the 2011-2012 and 2022-2023 seasons. 29 suitable YouTube videos were found that allowed for biomechanical assessment of ACL injury, generating a video yield of 28.4% (Figure 1). It was found that 79% of injuries occurred in the right leg ($p = 0.0016$) and 86% occurred on plays where the player was contacting the ground ($p < 0.0001$). 65% occurred due to hip external rotation ($p < 0.0001$), 68% occurred due to valgus knee movement ($p < 0.0001$), and 65% occurred due to ankle eversion ($p = 0.0011$)—all of which were statistically significant (Figure 2, 3a). No significant difference was found in the number of injuries that occurred due to contact. When assessing playing style factors, 45% of injuries occurred in players whose primary position is as a defender ($p = 0.018$) and 55% occurred on defensive plays ($p = 0.0009$). No significant difference was found in the number of injuries that occurred based on the time in the game or the location of the field where the injury occurred (Figure 3b).

Discussion: This study utilized publicly available databases to evaluate the factors that most commonly contribute to ACL tears in the EPL. Similar to the previous studies on ACL injuries in the sport, the combination of hip external rotation, valgus knee movement, and ankle eversion presented most commonly. Past studies investigating ACL injuries in European soccer indicate a predilection of ACL tears occurring from non-contact situations when a player was pressing the opponent; however, the literature in this area is relatively scarce[3-5]. Our results, however, found no significant difference between the incidence of injuries through contact and non-contact plays. In assessing playing style factors, defenders and players performing defensive actions were more prone to ACL injuries, supporting past studies and suggesting a potential correlation between the movements and pivoting required when defending and the risk of ACL tear. No significant difference was found based on the time in the game or the location of the field where the injury occurred, countering the notion that fatigue later in a game may contribute to injury risk. This study was limited to injuries where a meaningful video could be found on YouTube, leading to many injuries being excluded from the dataset that could have impacted the results.

Significance/Clinical Relevance: This study was the first to investigate the mechanism of ACL injuries, based on both biomechanics and playing factors, in the EPL, potentially allowing players and teams to assess risk factors to avoid future injury. Furthermore, it establishes a methodology for the evaluation of injuries in soccer fully utilizing publicly available outlets.

References:
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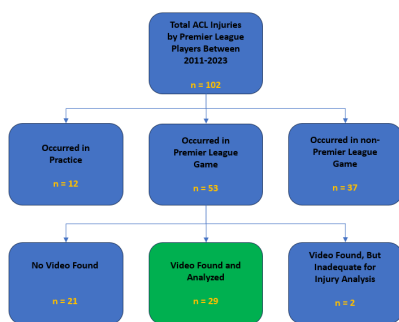
Images and Tables:

Figure 1. Schematic of sample collection shows that of the 102 ACL injuries in the Premier League between 2011-2023, 29 were suitable for YouTube video analysis (Yield = 28.4%).
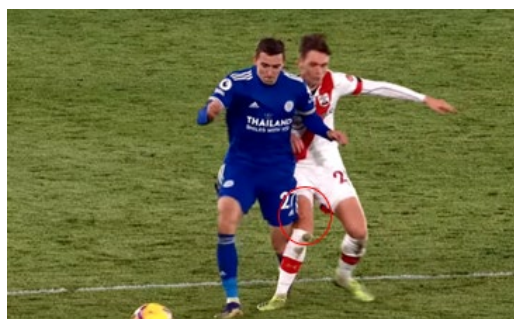

Figure 2. Common mechanism of ACL tear showing hip external rotation, knee abduction, and ankle eversion

Figure 3a. Biomechanical analysis showing increased incidence of ACL tears due to right hip external rotation, knee abduction, and ankle inversion on non-aerial plays.

Figure 3b. Assessment of playing style factors contributing to ACL tears shows increased incidence of injury in defenders and on defensive plays.