

## **Key Challenges Confronting Biomechanists Aiming to Predict ACL Injury Mechanisms**

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Even though everyone is predisposed to anterior cruciate ligament (ACL) injuries, the highest incidences of non-contact ACL injuries are seen among athletes. There is significant amount of in-vivo and in-vitro studies, musculoskeletal and computational modeling studies, as well as other related study approaches aimed at improving our understanding of non-contact ACL injury mechanisms. Despite these studies, there is still no clear understanding of ACL injury mechanisms. Consequently, there is no clear consensus that identified risk factors implicated to cause ACL injuries are indeed risk factors. The objective of this gap study is to provide insights as to why the mechanisms of injury to the ACL during non-contact events remain unknown. This study has found several key reasons which include the lack of material properties of human tissues, shortcomings in problem definition, wide inter and intra-subject variability, and limitations of present study approaches. In addition, the lack of test standards and specifications in the biomechanics field continues to hinder dialogue among researchers. In order to predict ACL injury mechanisms new approaches or coupled approaches, as well as, benchmarks are needed. Until this can be done, our ability to identify, develop, and improve prevention and training strategies to mitigate the risk of ACL injuries, is limited by an incomplete understanding of the causes of these injuries.