A Comparison of Overground and Treadmill Gait Biomechanics in Individuals with Anterior Cruciate Ligament Reconstruction and Healthy Controls

Anterior Cruciate Ligament Reconstruction (ACLR) leads to an increased risk for post-traumatic osteoarthritis (PTOA). Although the exact cause of this is unknown, ACLR individuals exhibit altered gait biomechanics, specifically in the internal knee extension moment (KEM), which have been linked to this increased risk for PTOA. Gait biomechanics are commonly researched using embedded in-ground force plates and instrumented treadmills. Treadmill gait tends to show smaller knee extension moments in healthy individuals as compared to the over ground condition. Therefore, it is unknown if we are able to detect aberrant gait biomechanics on the treadmill in ACLR individuals, as the treadmill might mask some alterations that might be evident over ground. The purpose of this study was to compare gait biomechanics over ground and on an instrumented treadmill between ACLR individuals and healthy controls. Subjects performed trials at a self-selected walking speed over embedded in-ground force plates and on a split-belt instrumented treadmill. The treadmill condition generally decreased the KEM as compared to the over ground condition; however, decreases were more substantial in the ACLR limb than in the contralateral limb, as well as compared to the control limbs. Rather than masking aberrant gait biomechanics as we originally predicted, the treadmill might actually exacerbate altered gait biomechanics in ACLR individuals. These findings imply potential for future research and clinical efforts to restore normal walking during ACLR rehabilitation.