

## How Stair Negotiation Affects Knee Joint Contact Forces in Individuals Post-Total Knee Arthroplasty

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Within 10 years of a primary total knee arthroplasty (TKA), approximately 50% of patients require an additional TKA on the contralateral limb [1]–[3]. This may be the result of asymmetric gait patterns that offload the surgical limb and put undue stress on the non-surgical limb [4], [5]. It has been shown that excessive loading of the non-surgical limb increases the risk of knee osteoarthritis (OA) progression in that limb [6]–[8]. However, little is known about the contact forces occurring inside the knee joint during asymmetric gait or how these forces affect the progression of knee OA, especially during tasks other than level walking. Tasks more physically demanding than level walking, such as stair negotiation, have the potential to augment biomechanical differences observed in the gait pattern of individuals post TKA. The purpose of the current study will be to investigate how stair negotiation affects internal knee joint contact forces in individuals post-TKA compared to healthy controls and level, overground walking. Subjects will perform overground walking trials across in-ground force platforms and stair negotiation trials on an instrumented staircase. Opensim modeling software will be used to build a 3D, subject-specific, model to calculate knee joint contact forces in all three conditions [9]. Kinematic and kinetic gait parameters along with joint contact forces will be calculated for each subject. The symmetry index will be calculated using a formula proposed by Robinson et al. [10]. The results of this study will provide a greater understanding of how stairs affect the internal forces at the knee in individuals post-TKA.

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