

Effect of Tibial Component Misalignment on the Lower Limb Joint Kinematics During Squat

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The component orientation of the total knee replacement is critical to surgical outcomes. There have been many studies focused on knee movement for different component rotations. However, the effect of component misalignment on a dynamic movement, especially which requires high knee flexion, is not widely studied. The aim of this study is to investigate the effect of tibial component misalignment on a squat motion by predictive simulation. Squat motions with different replacement component alignments were predicted by formulating an optimal control problem. The result indicates that component misalignment on coronal and horizontal planes reduces peak joint flexion angles and the external rotation on the horizontal plane has the most negative impact. Misalignment in external rotation resulted in the greatest reduction of peak joint flexion angles. The simulation was validated by comparison with experimental data, which showed a high level of correlation with the predicted motion.