Tibiofemoral Cartilage T1ρ Relaxation Times and Limb Loading 1 Month Post-ACL Reconstruction

Knee osteoarthritis (OA) is widely observed among people who have undergone anterior cruciate ligament reconstruction (ACLR) and manifests quickly[1]. Therefore, to aid in reducing OA risk, it is important to determine what contributes to cartilage degradation. T1ρ relaxation times are successful at detecting changes in cartilage composition, with longer T1ρ relaxation times indicating decreased proteoglycan content, which precedes structural changes, such as joint space narrowing, that are hallmarks of OA[2]. While lesser loading rates determined using vertical ground reaction force (vGRF) are associated with longer T1ρ relaxation times at 6 months post-ACLR[3], it is unclear whether this association is consistent at earlier times points. The purpose of this study was to determine the associations between tibiofemoral T1ρ relaxation times and vGRF and loading rates in the ACLR limb at 1 month post-ACLR. It was hypothesized that smaller vGRF magnitude and lower loading rates would be associated with longer T1ρ relaxation times 1 month post-ACLR. While associations between lesser vGRF instantaneous loading rates and longer T1ρ relaxation times supported the hypothesis, associations between lesser vGRF linear loading rates and shorter T1ρ relaxation times were opposite of the hypothesis. The results show that vGRF instantaneous and linear loading rates influence femoral and tibial cartilage content and degradation differently in the ACLR limb.