AOPT Abstract for Jacob Capin's Career Development Grant

Title: Movement Asymmetry and Contralateral Knee Osteoarthritis after Primary Total Knee Arthroplasty

Abstract (300-word limit): 3.5 million total knee arthroplasty (TKA) surgeries are expected annually by 2030. Currently, 28% of those after primary TKA undergo a contralateral TKA within 3 years, thus there is urgent need to optimize TKA rehabilitation and prevent secondary sequelae. A proposed mechanism for rapid contralateral knee osteoarthritis progression is movement asymmetry. This project will answer important questions critical to understanding osteoarthritis progression and refining rehabilitation. We will: 1) determine if preoperative movement asymmetries (surrogates for longstanding asymmetries) are associated with early contralateral knee osteoarthritis severity; 2) determine the clinical, functional, imaging, and other factors associated with movement asymmetry, identifying targets for rehabilitation interventions and risk stratification; and 3) describe osteoarthritis progression using 10-week to 2-year post-TKA changes in early measures of osteoarthritis (i.e., quantitative magnetic resonance imaging [MRI]). Participants will be tested pre-operatively and at 10 weeks and 6 and 24 months after TKA on clinical and functional measures; biomechanical analyses during walking, sit-stand transitions, and stepping down; and contralateral knee sagittal MRI quantitative (cartilage thickness, T_2, $T_{1\rho}$) and semi-quantitative (WORMS) measures (10 weeks and 2 years only). Statistical analyses include: 1) Pearson correlations between movement asymmetries and MRI outcomes; 2) linear regression with backward selection; and 3) descriptive analysis of 10-week to 2-year changes in quantitative MRI values in those with and without symmetrical walking. This study has high potential to reveal biomechanical mechanisms of early knee osteoarthritis through quantitative assessments of multiple knee tissue characteristics. We will also leverage a comprehensive dataset to identify factors associated with movement asymmetry, refining rehabilitation to reduce knee osteoarthritis risk, disability, and socioeconomic burden. This project will support the Academy's vision of improving orthopedic physical therapy and the Grant's objective of promoting the applicant's development as an independent clinician-scientist committed to rehabilitation research.