Patellofemoral pain (PFP) is a common condition seen in orthopedic practice, accounting for approximately 25% of all knee injuries. A commonly cited hypothesis as to the cause of PFP is increased patellofemoral joint (PFJ) stress secondary to abnormal lower extremity kinematics (excessive hip internal rotation and knee valgus).1 Although persons with PFP have been shown to exhibit altered hip and knee kinematics,2 the influence of these motions on PFJ contact mechanics are unknown. Using finite element (FE) analysis,3 the purpose of this study was to assess the influence of femur internal rotation and knee valgus on PFJ stress. It was hypothesized that larger degrees of femur internal rotation and knee valgus would result in higher patella cartilage stresses.

The range of peak octahedral shear stresses of patella cartilage is shown in the figure above. Increasing femur rotation resulted in a linear increase in patella cartilage stress. In contrast, increasing knee valgus had little to no influence on patella cartilage stress. The combination of femur rotation and knee valgus did not result in higher PFJ cartilage stress compared to isolated femur rotation.

Patella cartilage stress appears to be influenced more by femur internal rotation as opposed to knee valgus. This is logical given that femur internal rotation decreases PFJ contact area.5 However, it is surprising that knee valgus had little influence on patella cartilage stress since this motion increases the lateral forces acting on patella. Our findings support the premise that persons exhibiting excessive hip internal rotation may be pre-disposed to elevated patella cartilage stress and pain.

REFERENCES