

# Prospective Hip and Knee Strength Measures Associated with Increased Risk for Patellofemoral Pain Incidence

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**Objectives:** Hip and knee strength abnormalities have been implicated in patellofemoral pain (PFP) in multiple studies in the recent literature. However, many authors have noted that hip muscle weakness has not yet been defined as having a causal relationship to PFP due to the fact that many studies used subjects already diagnosed with PFP. The purpose of this study was to compare prospective hip and knee isokinetic strength measures in young females who subsequently went on to develop PFP relative to their uninjured healthy peers.

**Methods:** Middle and high school female athletes (n=255) were evaluated by a physician for PFP prevalence. Isokinetic strength measurements of the knee (flexion and extension at 300°/sec) and hip (abduction at 120°/sec) were obtained prior to the start of their basketball and soccer seasons. Isokinetic torque measures (newton\*meters) were normalized to leg length by mass and are described as a normalized torque (NT). Those diagnosed with PFP at pre-season were excluded and the remaining athletes were monitored by certified athletic trainers for PFP incidence during their competitive seasons. A one-way ANOVA was used to determine significant differences in knee and hip strength measures between the incident PFP and the control groups.

**Results:** Young females who developed PFP were not different in age  $12.6 \pm 0.9$  yrs., mass  $51.4 \pm 13.2$  kg, height  $158.8 \pm 7.3$  cm, or leg length  $83.8 \pm 4.2$  cm compared to the referent control group ( $P > 0.05$ ). Females who developed PFP demonstrated increased normalized hip strength  $0.013 \pm 0.003$  NT relative to the referent control group  $0.011 \pm 0.003$  NT ( $P < 0.05$ ). Normalized knee extension and knee flexion strength were not different between the females with incident PFP compared to the referent control group ( $P > 0.05$ ).

**Conclusion:** The findings in this study indicate that young females with greater hip abduction strength may be at an increased risk for the development of PFP. Previous studies that have looked at landing biomechanics indicated that those with PFP have increased knee abduction and increased hip adduction during landing. Combining our current data and previous literature, we theorize that greater hip abduction strength may be a resultant symptom of increased eccentric loading of the hip abductors associated with increased dynamic valgus biomechanics demonstrated to underlie increased PFP incidence. Future research is warranted to dissect the relative contributions of hip strength and recruitment and dynamic valgus alignments during landing to the pathomechanics of PFP.

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