



The American Orthopaedic  
Society for Sports Medicine

## The Influence of Soccer-Specific Fatigue on Peak Isokinetic Torque Production of the Knee Flexors and Extensors

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### Abstract

**Background:** Epidemiological findings of higher muscular thigh strain injury incidence during the latter stages of soccer match play have been attributed to fatigue.

**Hypothesis:** Soccer-specific fatigue will significantly reduce peak isokinetic torque of the knee flexors and extensors.

**Study Design:** Descriptive laboratory study.

**Methods:** Ten male professional soccer players (mean age,  $24.7 \pm 4.4$  years; body mass,  $77.1 \pm 8.3$  kg; maximum oxygen consumption [ $VO_2$  max],  $63.0 \pm 4.8$  mL/kg/min) completed an intermittent treadmill protocol replicating the activity profile of match play. Before exercise and at 15-minute intervals, each player completed 1 of 2 randomized isokinetic dynamometer protocols. The first protocol quantified peak concentric knee extensor and flexor torque, while the second quantified peak concentric and eccentric knee flexor torque at isokinetic speeds of 180, 300, and 60 deg/s (3.14, 5.25, and 1.05 rad/s) with 5 repetitions at each speed.

**Results:** Concentric knee extensor and flexor peak torque were maintained throughout the duration of the exercise protocol, irrespective of movement speed. However, peak eccentric knee flexor torques at the end of the game ( $T_{300eccH105} = 127 \pm 25$  N·m) and at the end of the passive half-time interval ( $T_{300eccH60} = 133 \pm 32$  N·m) were significantly reduced relative to the first 15 minutes ( $T_{300eccH00} = 167 \pm 35$  N·m,  $P < .01$ ;  $T_{300eccH15} = 161 \pm 35$  N·m,  $P = .02$ ).

**Conclusion:** Eccentric knee flexor strength decreases as a function of time and after the half-time interval.

**Clinical Relevance:** This suggests a greater risk of injuries at these specific times, especially for explosive movements, in accord with epidemiological observations.