

9. SWACSM Abstract

Coordination of Ankle, Knee, and Hip Joint Torques During an American Football Long Snap

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ABSTRACT

Research has studied upper-body kinematics (Balentine 2020) and whole-body kinetics during the American Football long snap (Goldstein 2020). There are no studies describing lower extremity (LE) joint kinetics during this movement. **PURPOSE:** This study aimed to understand how players coordinate LE torques while completing a long snap. We hypothesized there would be plantarflexor torques at the ankle and extensor torques at the knee and hip. **METHODS:** Subjects included college-aged football players (n=5) and high school football (n=5) players with ≥ 2 years experience. All subjects provided informed consent per local IRB. Average age of participants was 18.9 ± 1.3 years, average mass was 99.57 ± 7.49 kg, and average experience was 9.0 ± 2.57 years. Sagittal plane video (30 Hz) was collected and digitized on the left side. Force data was collected with one foot on each force plate (Kistler, 1200 Hz). Torques at the ankle, knee, and hip were calculated using inverse dynamics. **RESULTS:** The group average extensor torques were generated at the hip (203.3 ± 60.9 Nm) and plantar flexor torques were generated at the ankle (173.1 ± 40.9 Nm) for all subjects. However, flexor knee torques were found for college athletes (55.4 ± 50.2 Nm), while an extensor knee torques were generated by high school athletes (-28.9 ± 22.7 Nm). Knee joint torque magnitude was relatively small compared to the ankle and hip torques. This may occur because the posterior two-jointed muscles that cross flex the knee also work to extend the hip (e.g. biceps femoris) and plantarflex the ankle (e.g. gastrocnemius). The extension/plantarflexion at the hip and ankle may prioritize these posterior two-jointed muscles, while sacrificing extension torque at the knee in the college athletes. Whereas high school athletes may rely on more extension torque at the knee to successfully complete the long snap. **CONCLUSIONS:** Identifying LE torques provides information in determining joint coordination strategies of college and high school athletes during a long snap. This information can be helpful for athletes to target specific muscle sets and joint coordination strategies during training for better long snap performance.