Regina Stump – Abstract

“Effects of Fatigue Induced by Intermittent Running on Muscular Strength, Power, and Glycogen Content in Female Soccer Players”

A majority of ACL injuries in female soccer players occur during the later stage of a game when fatigue is likely present. In a fatigued condition, reductions in the strength ratio of hamstrings to quadriceps and the lower extremity muscular strength and power can cause altered landing techniques that predispose female athletes to a higher risk of ACL injuries. Additionally, a significant reduction in the muscle glycogen content have been reported after a simulated soccer game. The current study investigates a role of the muscle glycogen content with knee strength and power in the presence of fatigue.

Seventeen female subjects participated in the study (age:21.5±2.9yrs, height:166.9±7.2cm, and weight:63.7±6.6kg). Before and after an intermittent running protocol, subjects completed a battery of testing including maximal isokinetic knee flexion and extension muscular strength normalized to their body weight (%BW), a drop-jump onto a force plate to measure reactive strength index (RSI), and non-invasive ultrasound-based muscle glycogen content of six lower limb muscle groups. Based on normality, paired t-tests or Wilcoxon signed-rank test were performed to compare the strength, RSI, and muscle glycogen content pre- and post-fatigue. Additionally, correlation analyses were used to examine the relationships between the baseline muscle glycogen level and the changes (post/pre-fatigue values) in muscle glycogen content with the changes in muscular strength and power. Significance was set at $p<0.05$ a priori.

After the fatigue protocol, knee flexion strength, knee extension strength, and the flexion/extension strength ratio were significantly decreased while RSI was significantly increased. There were no significant differences in muscle glycogen content before and after the fatigue protocol ($p>0.05$). For correlational analyses, the baseline vastus medialis muscle glycogen content was significantly correlated with the changes in knee flexion strength and knee extension strength. There were no significant correlations in any other comparisons ($p>0.05$). A lack of significant findings on muscle glycogen content indicates potential limitations with the current noninvasive ultrasound-based system. Future studies should continue exploring methodologies to measure muscle glycogen content and its relationship with other neuromuscular characteristics during a fatigued condition.