ABSTRACT

Background: Reduced lower extremity muscle strength as well as reduced lower extremity muscle pre-activity (defined as muscular activity just prior to initial ground contact) during high-risk movements are factors related to increased risk of non-contact ACL injury in adolescent female athletes. A strong relationship exists between muscle strength and muscle activity obtained during an isometric contraction, however, whether these two measures are related when muscle activity is obtained during a movement associated with a high risk of non-contact ACL injury is not known. Absence or presence of such a relationship may have implications for which training modalities to choose in the prevention of ACL injuries.

Purpose: The purpose of this study was to examine the relationship between maximal muscle strength of the hip extensors, hip abductors and knee flexors and the pre-activity of these muscle groups recorded during a sidecutting maneuver (high-risk movement) in adolescent female soccer and handball athletes.

Study design: Cross-sectional study.

Methods: Eighty-five adolescent (age 16.9 ± 1.2 years) female elite handball and soccer athletes were assessed for maximal hip extensor, hip abductor and knee flexor muscle strength; and muscle pre-activity (electromyography recordings over a 10 ms time interval prior to foot ground contact) of the gluteus maximus (Gmax), gluteus medius (Gmed), biceps femoris (BF) and semitendinosus (ST) during a standardized sidecutting maneuver.

Results: The results of the correlation analyses demonstrated poor and statistically non-significant correlations. Maximal hip extensor force (N/kg bw) and Gmax pre-activity \[ r_s = 0.012 \ (95\% \ CI -0.202 – 0.224), \ p = 0.91 \], maximal hip abductor force (N/kg bw) and Gmed pre-activity \[ r_s = 0.171 \ (95\% \ CI -0.044 – 0.371), \ p = 0.11 \], maximal knee flexor force (N/kg bw) and BF pre-activity \[ r_s = 0.049 \ (95\% \ CI -0.166 – 0.259), \ p = 0.65 \], and maximal knee flexor force and ST pre-activity \[ r_s = 0.085 \ (95\% \ CI -0.131 – 0.293), \ p = 0.44 \].

Conclusion: In the present exploratory study, the results imply that no relationship exists between maximal lower extremity isometric muscle strength and lower extremity muscle pre-activity during sidecutting. This means that athletes with low muscle strength may not necessarily demonstrate high (or low) muscle pre-activity during sidecutting - a well-known risk movement for sustaining non-contact ACL injury.

Levels of evidence: Level 3

Key words: Anterior cruciate ligament, electromyography, muscle strength, neuromuscular activity