

'You kick like a girl': Men and women use different leg and hip muscles during soccer kick

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Significant differences in knee alignment and muscle activation exist between men and women while kicking a soccer ball, according to a study published this month in the *Journal of Bone and Joint Surgery*. Data reveals that males activate certain hip and leg muscles more than females during the motion of the instep and side-foot kicks - the most common soccer kicks - which may help explain why female players are more than twice as likely as males to sustain an Anterior Cruciate Ligament (ACL) injury.

Soccer is one of the fastest-growing sports in the United States with approximately 20 million registered players and an annual participation increase of more than 20 percent , according to statistics from the National Collegiate Athletic Association (NCAA) . Women also are playing this sport on more competitive levels. Prior research shows that females are more prone to non-contact ACL injuries than males and though many theories exist, a direct cause for the disparity is unknown.

"By analyzing the detailed motion of a [soccer](#) kick in progress, our goal was to home in on some of the differences between the sexes and how they may relate to injury risk," said orthopaedic surgeon Robert H. Brophy, MD, study author and assistant professor of orthopedics, Washington University School of Medicine in St. Louis. "This study offers more information to help us better understand the differences between male and female athletes, particularly soccer players."

Dr. Brophy and his colleagues from the Motion Analysis Laboratory and Sports Medicine Service at the Hospital for Special Surgery in New York used 3-D video-based motion analysis and [electromyography](#) to examine the differences between 13 male and 12 female college soccer players during the action of kicking a soccer ball.

Using eight to 10 video cameras, 21 retroreflective markers and 16 electrodes simultaneously, researchers measured the activation of seven muscles (iliacus, gluteus maximus, gluteus medius, vastus lateralis, vastus medialis, hamstrings and gastrocnemius) in both the kicking and supporting legs; as well as two additional muscles (hip adductors and tibialis anterior) in the kicking leg only. Five instep and five side-foot kicks were recorded for each player. Muscle activation was recorded as a percentage of maximum voluntary isometric contraction.

They found that male players activate the hip flexors (inside of the hip) in their kicking leg and the hip abductors (outside of the hip) in their supporting leg more than females.

- In the kicking leg, men generated almost four times as much hip flexor activation as females (123 percent in males compared to 34 percent in females).
- In the supporting leg, males generated more than twice as much gluteus medius activation (124 percent in males compared with 55 percent in females) and vastus medialis activation (139 percent in males compared with 69 percent in females).

"Activation of the hip abductors may help protect players against ACL injury," said Dr. Brophy, a former collegiate and professional soccer player and past head team physician for the former St. Louis Athletica professional women's soccer club. "Since females have less activation of

the hip abductors, their hips tend to collapse into adduction during the kick, which can increase the load on the knee joint in the supporting leg, and potentially put it at greater risk for injury."

Brophy said that although the study does not establish a direct cause-and-effect relationship between muscle activation and knee alignment and ACL injuries, the data "moves us toward better understanding of what may contribute to differences in injury risk between the sexes and what steps we might take to offset this increased risk in females."

The current research in the area of ACL injury prevention has shown some promise. For example, in 2008, the Centers for Disease Control and Prevention published a study that found a new training program called the Prevent Injury and Enhance Performance (PEP) program, was effective in reducing ACL injuries in female soccer players. Developed by the Santa Monica Orthopedic and Sports Medicine Research Foundation and supported by the American Academy of Orthopaedic Surgeons (AAOS) among other medical and athletic associations, PEP is an alternative warm-up regimen that focuses on stretching, strengthening and improving balance and movements and can be conducted during regular practice time and without special equipment.

"Programs focusing on strengthening and recruiting muscles around the hip may be an important part of programs designed to reduce a female athletes' risk of ACL injury," said Dr. Brophy. "Coaches and trainers at all levels, from grade school through professional, should consider using strategies that demonstrate potential to prevent these injuries."

He said that additional research is warranted to investigate how the differences in [hip](#) muscle activation and alignment between the sexes may relate to differences in the risk of lower extremity injury among athletes in soccer and other sports.

More information: For more information on injury prevention and ACL tears, visit orthoinfo.org

Provided by American Academy of Orthopaedic Surgeons

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