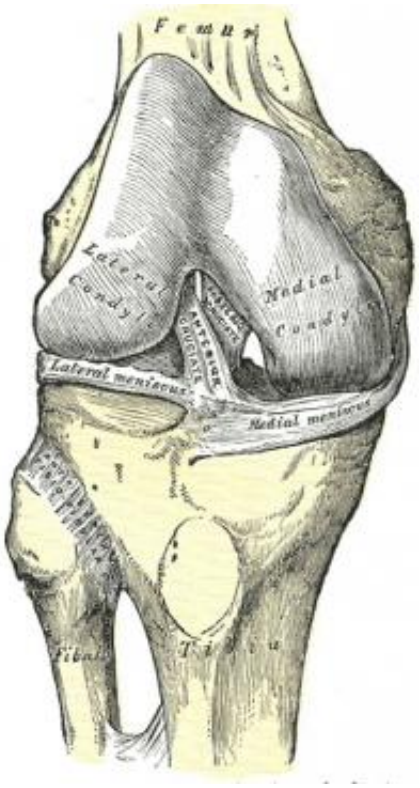
Knee injuries in women linked to motion, nervous system differences

April 17 2012



The knee in women is more susceptible to anterior cruciate ligament, or ACL injuries, than in men. (Image courtesy of Oregon State University)

Women are more prone to knee injuries than men, and the findings of a new study suggest this may involve more than just differences in muscular and skeletal structure – it shows that males and females also differ in the way they transmit the nerve impulses that control muscle

force.

Scientists at Oregon State University found that men control nerve impulses similar to individuals trained for explosive muscle usage – like those of a sprinter – while the nerve impulses of women are more similar to those of an endurance-trained athlete, like a distance runner.

In particular, the research may help to explain why women tend to suffer ruptures more often than men in the anterior cruciate ligament of their knees during non-contact activities. These ACL injuries are fairly common, can be debilitating, and even when repaired can lead to osteoarthritis later in life.

More study of these differences in nervous system processing may lead to improved types of training that individuals could use to help address this issue, scientists said.

"It's clear that women move differently than men, but it's not as obvious why that is," said Sam Johnson, a clinical assistant professor in the OSU School of Biological and Population Health Sciences.

"There are some muscular and skeletal differences between men and women, but that doesn't explain differences in injury rates as much as you might think," Johnson said. "No one has really studied the role of the nervous system the way we have in explaining these differences, specifically the way sensory information is processed and integrated with motor function in the spinal cord."

In this study, just published in the *European Journal of Applied Physiology*, the scientists found that most aspects of spinal motor control and rapid activation of muscles were similar in 17 men and 17 women that were examined – with one exception. Men had a higher level of "recurrent inhibition," which is a process in the spinal cord that helps

select the appropriate muscle response.

Even a process as simple as walking is surprisingly complicated, as people process large amounts of information and use varying forces to move around obstacles, change direction or simply climb up a step. And when you slip on an icy patch, the need for extremely rapid and accurate muscle response might be all that stands between you and a broken hip.

For some reason, women tend to have knee motions that make them more susceptible to injury. Among other things, when landing from a jump their knees tend to collapse inward more than that of most men. They suffer significantly more ACL injuries during physical activity.

"We're finding differences in nervous system processing that we believe are related to this," Johnson said. "The causes for those differences are unclear, but it may be due either to a biological difference, such as hormones, or a cultural difference such as different exercise and training patterns."

This research was supported by the National Athletic Trainers' Association Research and Education Foundation. Researchers at Marquette University collaborated on the work.

While researchers continue to study what might help address this, Johnson said it's already possible for women to be more aware of these common differences and do exercises that should reduce problems.

Many ACL injury prevention programs incorporate strength, balance, flexibility, and jump training. However, based on these and other findings, women – especially athletes – should consider training with motions more similar to those of their sport, such as squatting, lunging, jumping or cutting side-to-side.

Use of heavy weights may not really be necessary, Johnson said, so much as mimicking the motions that often cause this injury.

More information:
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Provided by Oregon State University