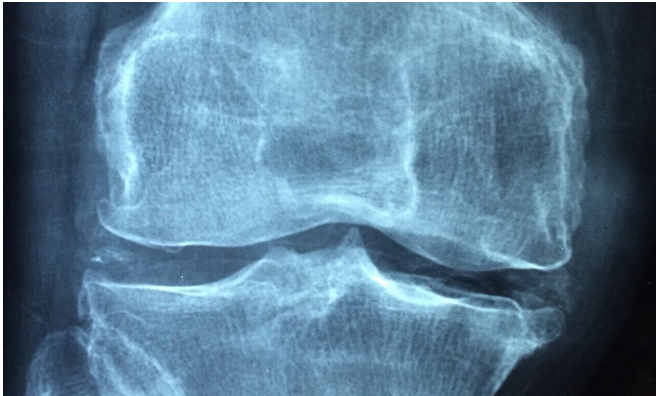


# New hope for ACL injuries: Adding eccentric exercises could improve physical therapy outcomes

13 May 2020, by Laura Bailey



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People with anterior cruciate ligament injuries can lose up to 40% of the muscle strength in the affected leg—with muscle atrophy remaining a big problem even after ACL reconstruction and physical therapy.

Now, a new University of Michigan study challenges conventional wisdom about which exercises are most beneficial during post-injury [physical therapy](#), and findings suggest that adding eccentric exercises could dramatically increase [muscle volume](#) and improve outcomes for patients.

Eccentric exercises contract the muscle during lengthening—think of the downswing of a bicep curl or walking downhill. Those exercises are much more effective at growing muscle than concentric exercises, where muscles shorten while producing force—think of the upswing of a bicep curl, said Lindsey Lepley, U-M assistant professor of kinesiology.

Historically, the lengthening component of eccentric exercises has been thought to cause

muscle damage during physical therapy, so they're omitted, Lepley said. But concentric exercises alone don't achieve the muscle growth required to get patients to pre-injury [muscle strength](#). This holds true for all sports-related muscle strains and injuries requiring physical therapy, not just the 300,000 ACL reconstructions performed annually.

"Our group has long believed that incorporating eccentrics into PT is beneficial to muscle," said Lepley, whose earlier research found that incorporating eccentric exercise into an ACL rehabilitation program increased strength by 30%, compared to concentric exercise alone.

"The catch is that in order to combat this outdated notion that eccentrics are dangerous, we need to directly evaluate the immediate effects—hence the purpose of this study."

This study found that a single, 15-minute bout of eccentric exercise to novice muscle (a muscle unexposed to prior eccentric exercise) was better than concentric exercise at promoting growth, with very limited injury, Lepley said.

In the study, Lepley and colleagues had rats run uphill or downhill on specially designed rodent treadmills. They then examined the muscle fibers for injuries and protein synthesis indicative of muscle growth.

The researchers found only one damaged fiber in 9,000-plus [muscle fibers](#), and that was in the concentric (uphill) exercise group. They also found a significant increase in protein markers associated with muscle growth in the eccentric group after exercise, compared to the concentric group.

Next, researchers hope to test the direct effect of eccentric [exercise](#) on [muscle](#) after ACL injury,

using a noninvasive rodent model of ACL that mimics human [injury](#), Lepley said.

"Our goal is to translate our findings from the bench-top to the sidelines," Lepley said. "We want this information to get to clinicians and patients who have had musculoskeletal injuries to promote lifelong health and wellness."

The study appears in the April issue of the *Journal of Athletic Training*. JAT has also developed a podcast for clinicians that explains the research.

**More information:** Lindsey K. Lepley et al. Morphology and Anabolic Response of Skeletal Muscles Subjected to Eccentrically or Concentrically Biased Exercise, *Journal of Athletic Training* (2020). [DOI: 10.4085/1062-6050-174-19](https://doi.org/10.4085/1062-6050-174-19)

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