

Preventing ACL injury in a high-risk population

July 25 2013, by Beth Krane

Effectively preventing anterior cruciate ligament injuries is a critical focus of sports medicine. ACL injuries often require surgery, followed by an extensive period of rehabilitation; there are high rates of re-injury to the ACL, which keeps the knee stable; and ACL injuries often lead to early development of osteoarthritis.

Recent studies have determined significant risk factors for ACL injury, and suggest that exercise-based interventions help prevent such injury, but pressing questions remain.

Lindsay DiStefano, an assistant professor of kinesiology in the Neag School of Education and a principal investigator at the Center for Health, Intervention, and Prevention (CHIP), is studying the effectiveness of a lower-extremity [injury prevention](#) intervention in a high-risk population – nearly 1,200 incoming U.S. Military Academy cadets.

Her research is funded by a one-year grant from the National Athletic Trainers' Association Research and Education Foundation.

DiStefano is in the process of determining whether a single "dose" of such an intervention is sufficient, and whether a "train the trainers" approach could allow for the effective and widespread dissemination of lower-extremity injury prevention programs.

"Can the intervention be delivered one time, like a vaccine, with the

effects sustained over time, or does it need to be repeated every season or year?" she asks. The intervention typically lasts between six and eight weeks, or an entire sports season.

Injury prevention program

DiStefano began working with the U.S. Military Academy as a doctoral student at the University of North Carolina. She was part of the research team that conducted JUMP_ACL, an NIH-funded clinical trial to determine risk factors for ACL injury, from 2004 to 2009. The study, which involved more than 6,000 cadets from three major U.S. service academies (U.S. Military Academy, U.S. Naval Academy, and U.S. Air Force Academy), remains to date one of the largest prospective sports medicine studies ever conducted. And it led to the development of the evidence-based injury prevention program currently being evaluated.

Since 2010, DiStefano has been studying the effectiveness of the lower-extremity injury prevention program for ACL injuries and for stress fractures. Her research team has shown preliminary success reducing these injury rates and modifying risk factors associated with ACL injury.

Last summer DiStefano's research team implemented the 10-minute neuromuscular intervention, comprised of balance, plyometric, and strengthening exercises, approximately three times a week during the cadets' six-week summer training.

Delivered as a warm-up before their physical training, the intervention is designed to help the cadets improve the way they control their bodies while performing various tasks. DiStefano's research team taught half the cadets in the study how to decelerate their bodies more efficiently, how to land more softly, how to help their bodies absorb the force of landing better, and how to keep their bodies aligned properly with their

base of support.

The other half of the cadets made up the study's control group, which was led in a standard warm-up prior to physical training.

A population at risk

DiStefano says the U.S. Military Academy at West Point provides an ideal setting for this study. Because of the amount and intensity of their physical activity, the cadets are at increased risk for ACL and other lower-extremity injuries. For instance, every cadet must participate in an organized sport in addition to their basic physical training. The military setting also offers her research team advantages in that they are working with a controlled active population and are part of a closed medical system.

To evaluate the effectiveness of the intervention over time, DiStefano returned to West Point in October and December to collect follow-up measurements. She returned again in March and in May, collecting more data for the time series panel study.

Her research team uses a standardized test to collect its follow-up data – having cadets jump off a platform onto a force plate in the ground.

"If a cadet just stands on the force plate, it measures his or her weight," DiStefano says. "But, if he or she jumps on it, it gives more information – the force with which the cadets land, the angle of their landing, and how fast the force is absorbed."

The researchers are also videotaping the cadets as they jump onto the force plate. This, combined with the force plate data, helps them understand how the cadets are controlling their bodies.

"This study is novel in that it is simultaneously collecting injury data and risk factor data," DiStefano says. "We'll not only be able to tell if the cadets' rates of injuries are reduced – we'll be able to see if those reductions in injuries are because of changes in the way an individual moves."

Disseminating the intervention

The other key component of the study is determining the best way to disseminate an effective lower-extremity injury prevention program.

The program was designed to be delivered as a 10-minute warm-up routine with dissemination in mind.

"The amount of time the intervention takes to implement is key to its successful dissemination, particularly in a military academy setting, where cadets have scheduled activities most minutes of the day," DiStefano says. This is also true when working with sports teams, where every minute of practice is considered critical, she adds.

Training people to implement the intervention effectively is another critical piece of its successful dissemination.

At the U.S. Military Academy, the cadre of upper-class cadets who orient the incoming cadets were trained by DiStefano's team in how to implement the intervention during their warm-up exercises.

Half of the incoming cadets who received the intervention had their warm-ups led by the cadre, while the other half had their warm-ups led by members of the research team. This will allow the researchers to determine whether the cadre implemented the intervention correctly and the "train the trainers" approach is a viable model for future dissemination.

In addition to the National Athletic Trainers' Association Research and Education Foundation funding, the study also has been supported by a University of Connecticut Faculty Large Grant; an internal grant at the Uniformed Services University of Health Sciences in Bethesda, Md.; the American Medical Society for Sports Medicine; and the Department of Defense.

The research team includes investigators from the U.S. Military Academy, the University of North Carolina at Chapel Hill, and the Uniformed Services University of Health Sciences.

Provided by University of Connecticut

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