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# Keep away from simple, use complex movements

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Many of the SPARTA high school athletes are going off to college in the fall. In preparation, their college strength coaches have sent them workout programs so they can be ready for the increased workload they are sure to face when they get to school. One reoccurring theme in these workouts is the prevalence of isolation exercises. These exercises, which aim to target a specific muscle, or small muscle group, are typically prescribed to prevent injuries. Specific muscles contribute greatly to the health of certain joints, and the thought is that training them (the muscles) in isolation is the fastest way to get them stronger. But is this really the case?

It is widely accepted that greater quadriceps (thigh muscles) strength helps prevent many knee injuries. Most rehabilitation programs after knee surgeries focus on regaining quadriceps strength. In a study from the Department of Neuroscience and Locomotion from Linkoping University in Sweden, subjects recovering from ACL reconstruction were tested while performing resisted knee extension (straightening the knee joint — a popular isolation exercise) and two-leg squats. The quadriceps activation during the squats was greater than during the leg extensions, an exercise which directly targets the quadriceps. In addition, during squats, coactivation (both working together) of the quadriceps and gastrocnemius (calves) was seen, a pattern very important for knee stability during land based activity (i.e. running, jumping etc.). A study from the Department of Physical Therapy and Exercise Science from State University in Buffalo, N. Y., showed that not only were squats more effective than leg extension, but that they were safer, shifting the bones in the lower leg less and thus putting less strain on the repaired ACL.

What about other exercises and muscle groups? A study from The Department of Physical Therapy at The University of South Dokata compared single-leg lunges and step-ups (complex movements) with various isolation exercises (side bridge, hip abduction, etc.). The research showed that muscular activation of the lower limbs was greatest during the complex movements (step-ups and lunges). Complex exercises challenge a larger amount of muscles and involve multiple joints moving through their range of motion. Squats, lunge variations, step ups and Olympic lifting variations are all good examples of complex movements. In addition to creating greater muscular activation, these exercises promote greater athleticism and injury prevention because they challenge an athlete's balance and coordination. They more closely mimic movements athletes are faced with during their sport.

So when it comes to preparing for sports or recovering from injuries, focus on more complex movements. You'll not only get stronger, but you'll improve your balance and coordination, teaching your muscles to work better together.

Dr. Wagner is the Director of SPARTA Performance Science in Menlo Park. To learn more, visit www.SpartaScience.com or join the discussion at SpartaScience.blogspot.com .