

Clements A, Ericksen H, Gribble P, Lepley A, Pietrosimone B, Sohn D. Neural excitability alterations after anterior cruciate ligament reconstruction. *J Athl Train.* 2015;50(1):000-000.

Context: Anterior Cruciate Ligament (ACL) tears are a familiar occurrence in the athletic world. ACL reconstructive surgeries are used to improve the patient's (mostly athletes) physical performances and regain their normal day to day activities. Complications and alterations do occur for many patients; these alterations are as follows: atypical loading patterns of the knee joint, compromised neuromuscular coordination, and chronic stiff knee. *Objective:* The purpose of the study was to determine whether primary spinal-reflexes differed from the affected side to the unaffected side, on unilateral ACL reconstructive patients. *Design:* A case controlled design was used for this study in evaluating injured vs. uninjured limbs and ACL reconstructive patients vs. control group. *Setting:* The setting of this study was a laboratory. *Subjects and Other Participants:* There were 28 participants in this study that had unilateral ACL Reconstructive surgeries (9 men and 19 women, age = 21.28 ± 3.79 years, height = 170.95 ± 10.04 cm, mass = 73.18 ± 18.02 kg, time after surgery = 48.10 ± 36.17 months), and 29 completely healthy participants volunteered their time and served as a control group (9 men and 20 women, age = 21.55 ± 2.70 years, height = 170.59 ± 8.93 cm, mass = 71.89 ± 12.70 kg). *Interventions:* Participants were tested on three basic functions of the nervous system: Coricomotor Excitability, Spinal-Reflex Excitability, and Voluntary Activation. Coricomotor Excitability was tested by placing the participant in a seat and the knee and hip joints were positioned at 90° and 85° of flexion. Restraints were used to keep the participant from moving out of placement. Two 10-mm pregelled silver/silver chloride EMG electrodes were placed over the belly of the vastus medialis. A swim cap was then placed on their head and a coil transmitter was attached. The participants were provided with visual torque feedback and instructed to maintain a contraction at 5% of their maximal voluntary contraction while the transcranial magnetic stimulation was applied. This process was performed though 5-10 trials. Spinal- Reflex Excitability was tested by laying the participant in a supine position and then, using the same electrode configuration, placing a 2-mm shielded disc-stimulating electrode positioned over the femoral nerve, also placing an adhesive electrode over the hamstrings. Peak-to-peak H-reflex amplitudes were measured and increased until a plateau. Finally the H-reflex values were recorded. Voluntary Activation was tested by positioning the participant in the seated position (same as Coricomotor Excitability test), and then assessed using the superimposed burst technique. Two adhesive electrodes were placed distally and proximally over the rectus femoris muscle. A square wave stimulator was used to stimulate the electrode at 100 pulses per second. This system measured torque output, when the output was no longer able to exceed the torque production from the previous trial, the test was over. *Main Outcome Measures:* Data that was collected from the vastus medialis using the transcranial magnetic stimulation throughout the average of 5-10 trials. To evaluate this data the team used the Hoffman Reflex Normalized to Maximal Muscle Responses Ratio. Voluntary Activation was measured with the superimposed burst technique. This data was analyzed by using the Central Activation Ratio. *Results:* The authors determined that the AMT was higher in the injured limbs of patients that underwent ACL Reconstructive surgery and also the control group that used their dominant leg as the affected side. The H-reflex values were significantly higher in the ACL Reconstructive group rather than the control group. The quadriceps Central Activation Ratio was bilaterally lower in the group of participants that had ACL Reconstructive surgery. The ACL Reconstructive participants also had lower Voluntary Activation, whereas the control group had a higher value. *Conclusions:* The higher vastus medialis AMT in the injured limbs of ACL Reconstructive patients suggest that Coricomotor deficiency was present after surgery. Although the high bilateral H-reflex amplitudes in these patients suggest that the body develops a way to increase its own excitability to maintain voluntary activation. *My Interpretations:* I found this study to be reliable and relevant. ACL Reconstructive surgeries are so commonplace now-a-days that it effects everyone in some way, shape, or form. Understanding the body's natural reaction to these surgeries could lead us into figuring out new ways of therapeutic rehabilitation to get back to the exact function as before surgery.

Key Words: Corticomotor, EMG, Voluntary Activation, Transcranial Magnetic Stimulation, Spinal-Reflex
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