Greater Motor Evoked Torque in ACLR Patients during Force Reproduction Task Compared to Health Controls

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ABSTRACT

Begin Persistent quadriceps dysfunction following anterior cruciate ligament reconstruction (ACLR) may lead to further pathological complication. Quadriceps weakness has been linked to corticospinal excitability. However, it remains unclear how this altered corticospinal excitability contributes to ACLR patients during knee strength tasks when compared to healthy controls. **PURPOSE:** The purpose of this study was to examine force reproduction strategies during isometric knee extension between ACLR patients and healthy controls. **METHODS:** Five ACLR (20.40±1.67yrs, 72.12±12.87kg, 171.07±7.40cm) participants and five matched healthy controls (21.00±1.73yrs, 65.77±13.61kg, 166.62±11.99cm) performed an isometric force reproduction task. They were instructed to maintain 10% of maximal voluntary isometric contraction (MVIC) in response to unexpected Transcranial Magnetic Stimulation (TMS) over the primary motor cortex, targeting the quadriceps. The TMS stimulations were randomly delivered at two different intensities: 120% and 140% active motor threshold (AMT). Additionally, resting twitch torque (RTT) was measured by delivering TMS stimulations at 100% intensity over the quadriceps. Motor evoked torque (MET, %) was calculated by normalizing the 120% and 140% peak change relative to 10% MVIC by RTT values. Comparisons were made using 2-way ANOVAs with one within factor (intensity, 2 levels) and one between factor (group, 2 levels). **RESULTS**: A significant TMS intensity by group interaction was observed for MET ($F_{[1,8]}$ = 18.639, p = 0.003). The ACLR group had higher MET than the control group at AMT 140% (196.12±40.83 vs 106.69±34.01%, p = 0.006), while there was no difference at 120% (117.19±36.72 vs 69.06±44.18%, p = 0.098). **CONCLUSION:** The ACLR group produced similar torque changes to the CONT group at 120% of AMT, but more torque changes at the higher intensity. This may indicate protective neural adaptations responsible for force production, particularly at the corticospinal tract. However, this altered corticospinal excitability may also cause heightened quadriceps contraction during high-intensity tasks, potentially resulting in anterior ACL translation, which could put stress on the ACL and increase the risk of re-tear.