Effects of Plyometric Training on Rate of Torque Development Post-ACL Reconstruction

Layman’s Summary

Injury to the anterior cruciate ligament (ACL) is highly prevalent among athletic populations. It most commonly results from non-contact mechanisms such as sudden changes in direction, abrupt stops, and landing from a jump. The ACL primarily provide stability to the knee during explosive movements. Upon injury, there will be complaints of sudden weakness and instability, as though their knee will “give way” when putting weight on it. The inability to bear weight on the injured leg, increased pain and swelling, and the sensation of being unsteady or “wobbly” when walking are significant factors that will not only prevent the individual from returning to active participation, but also make it difficult to perform activities of daily living.

Standard treatment for ACL injuries is surgery. Surgery is often suggested to young and/or highly active individuals. During surgery, the torn ACL is replaced with tissue extracted from the patient’s own body or with donated tissue. After surgery, the injured knee is treated super conservatively with immobilization using a full-leg brace, walking on crutches and the slow limited physical activity for as long as 4 to 6 weeks. It then follows a typical progression of exercises to restore range of motion, muscle strength, balance, and functionality before being cleared for return to activity. However, this treatment plan has proven to be ineffective because it does not prevent the recurrence of ACL injury. These traditional treatments are also unsuccessful in correcting poor biomechanics and muscular imbalances that are key risk factors of ACL injury. The high incidence of re-injuring the ACL on the same or opposite leg is a major concern for patients and health care providers.

Overall costs for the surgery and rehabilitation are extremely expensive, only accounting for the short-term consequences of the injury including the surgical repair, lengthy recovery, and lost time from sports participation. Long-term consequences include early onset of osteoarthritis and joint laxity. Recent studies are studying the effectiveness of plyometric exercises in preventing second ACL injury and promoting long-term joint health. Plyometrics are quick, explosive movements that generate force through strong muscular contractions commonly involving jump and land mechanisms. The assumption is that focused plyometric training after surgery can improve biomechanics and muscular strength.

Plyometric training has been suggested to improve outcomes for recovery from ACL injury and surgery. For the purpose of this paper, the primary question being investigated is if significant relationship exists between lower leg muscle strength is significantly improved after plyometric intervention. In order to determine if this is true, the rate of torque development in the knee will measure how quickly the individual can go from zero to maximum strength. The study will be conducted on participants who have undergone ACL surgery. Participants in the plyometric intervention group will then undergo a series of exercises over a period of 12 sessions total while the control group receives no intervention as is standard for general patients following surgery. Benefits of this study is reducing the risk of reinjury and avoiding further financial burdens.