Gait and Force Asymmetry Following ACL Injury

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ABSTRACT

INTRODUCTION: The anterior cruciate ligament (ACL) is the most injured ligament in the knee joint and is fundamental for rotational stability of the knee joint and to minimize stress. Tearing of the ACL usually occurs due to a pivot-deceleration motion or traumatic injury that causes hyperextension of the knee. ACL surgery attempts to restore normal function and stability of the knee. However research shows altered kinematic patterns post ACL reconstruction. **PURPOSE:** The purpose of this study is to compare weight acceptance while running and knee joint strength in an individuals previously ACL reconstructed knee and their uninvolved knee. **METHODS:** Individuals who volunteered for this study included 9 women and 7 men (mean age 25 ± 6.7 yrs). Each subject completed 5 running trials across two ATMI force plates. Then each subject completed an isokinetic test for each leg on the Biodex machine. Isokinetic muscle capacities were measured for two repetitions and at each of the two speeds; first at 60 d/s and then at 240 d/s. Paired t-tests were used to compare the affected and unaffected side for each dependent variable. **RESULTS:** Running ground reaction forces showed there was a significantly greater ($p < 0.05$) thrust maximum on the unaffected leg (1736.662 ± 253.327 N) compared to the previous ACL injured leg (1628.124 ± 236.9 N). Biodex isokinetic testing also showed a significantly greater ($p < 0.05$) average power at 60d/s extension on the unaffected leg (95.763 ± 29.667 W) compared to the previously ACL affected leg (87.763 ± 34.042 W). **CONCLUSION:** Runner's exhibit reduced active vertical loading as a chronic adaptation from an ACL injury.

PURPOSE

The purpose of this study is to compare weight acceptance while running and knee joint strength in an individuals previously ACL reconstructed knee and their uninvolved knee. We hypothesized that the involved knee would have lower 50ms impulse and reduced strength.

METHODS

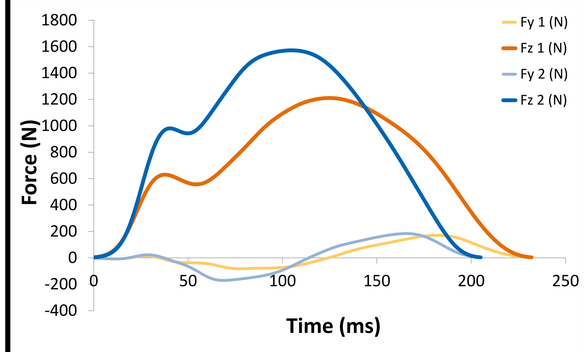
- Prior to testing each subject completed a questionnaire about their ACL surgery, exercise habits, and subjective stability.

16 Subjects	Averages
Age	25 ± 6.7 years
Height	67.38 ± 3.63 in
Weight	79.98 ± 12.72 kg
Months since surgery	48.75 ± 59.64 months

Run Test

- 5 running trials across 2 AMTI force plates.
- Affected (previously ACL injured leg) landed on plate 1.
- Unaffected landed on plate 2.
- Variables measured: Braking, Propulsion, 50 ms Impulse, Loading Rate, Thrust Max, Thrust Impulse
- The change in velocity in the a/p direction was constrained to ± 0.1 m/s.

Figure 1

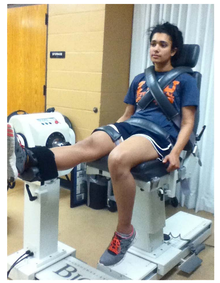


Force-time curve depicting ground reaction forces for both affected leg and unaffected leg.

METHODS

Biodex Isokinetic Test

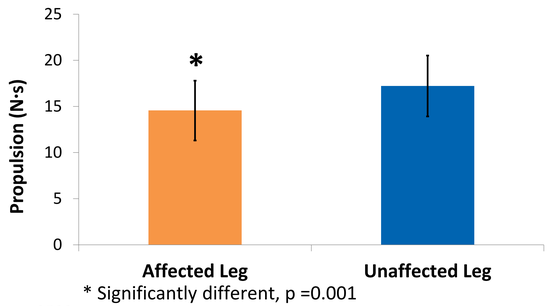
- Counterbalanced method determined which leg was tested first.
- Subjects completed 2 repetitions for each of the isokinetic speeds to measure knee joint strength for each leg.
  - 60 d/s
  - 240 d/s
- Variables measured: Average Power and Peak Torque



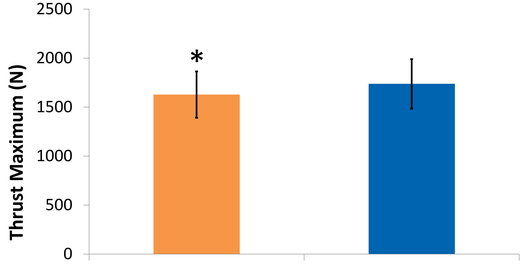
Data Analysis

Paired samples t-tests were used to compare the affected and unaffected leg.

RESULTS

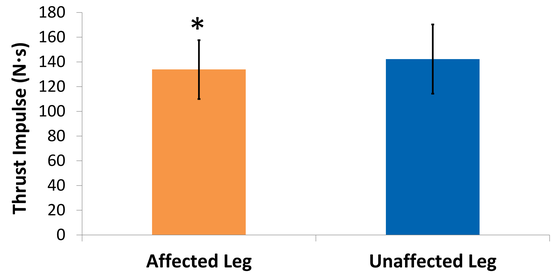


* Significantly different, p =0.001

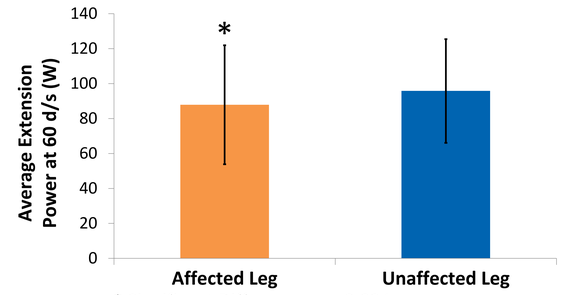


* Significantly Different, p = 0.000

RESULTS



* Significant Difference, p = 0.005



* Significant Difference, p = 0.024

Means and SD	Affected Leg	Unaffected Leg
Propulsion (N·s)	14.6 ± 3.2	17.2 ± 3.3
Thrust Max (N)	1628.1 ± 236.9	1736.7 ± 253.3
Thrust Impulse (N·s)	133.8 ± 23.8	142.3 ± 28.0
Average Extension Power at 60d/s (W)	87.9 ± 34.0	95.8 ± 30.0

CONCLUSION

- These results indicate that runners exhibit reduced active vertical loading as a chronic adaptation from an ACL injury.
- Compensation of the affected leg could potentially cause osteoarthritis of the knee.