DOES QUADRICEPS STRENGTH EXPLAIN DROP VERTICAL JUMP GROUND REACTION FORCE ASYMMETRY IN PATIENTS WITH ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION (ACLr) AT 12 MONTHS POST-OPERATIVE?

Marc Morissette, Brittany Bruinooge, Sheila McRae, Peter Macdonald, Dan Ogborn
Pan Am Clinic Foundation; University of Manitoba

Capacity vs Compensations after ACLr

Some level of physical capacity required to complete complex athletic skills
Quadriceps strength may be associated with inter- and intra-limb compensations
Unclear whether impaired physical capacities contributes to persistent compensations following ACLr


Purpose
To define the relationship between isokinetic, concentric quadriceps strength and between-limb symmetry in GRFs during a drop jump task (DVJ) and kinematics (LESS-RT) in patients at one-year following primary ACL reconstruction.

Hypothesis
Reduced quadriceps strength and higher quad LSI would be associated with reduced affected limb vGRF and vGRF LSI in all phases of the DVJ task and higher LESS-RT scores.
Methods

75 patients (78.3 ± 17.9 kg, 175.3 ± 9.4 cm) of varying grafts (n= 26 bone-patellar-tendon-bone, 27 quadriceps tendon and 22 hamstring grafts)

Three repetitions of a DVJ (30cm box) to dual force plates positioned at 50% of participant’s height from the box (scored with LESS-RT)

Five repetitions of concentric isokinetic knee flexion and extension at 90°/s

Reduced quadriceps strength

Reduced ACLr limb vGRFs
Relationship between $v\text{GRF}_{\text{TO}}$ and strength

$R^2 = 0.097, F(1,73) = 8.95, p = 0.004$

$Y = 64.618 + (0.365 \times \text{Quad LSI})$

$R^2 = 0.081, F(1,72) = 7.4, p = 0.008$

$Y = 76.3 + (0.365 \times \text{Quad (nm·kg}^{-1})$

Comparable LESS-RT by graft type

$R^2 = 0.0474, F(1,72) = 3.58, p = 0.0624$

$Y = 10.54 + (-1.384 \times \text{Quad})$

$R^2 = 0.0039, F(1,73) = 0.295, p = 0.59$

$Y = 7.493 + (0.013 \times \text{Quad}_{\text{LSI}})$
Conclusion

Quad strength and LSI only partially explain ground reaction force asymmetry in the concentric (take-off) phase of the DVJ task.

Shielding behaviours may result from the interplay of multiple factors beyond simple physical measures.

Behavioural approaches that include measures of readiness and confidence alongside performance may improve RTS decision making.

Acknowledgements

Pan Am Clinic Foundation
Pan Am Clinic Surgical Staff
Alexander Gibson Fund