

Investigating the relationship between countermovement jump performance and lower-extremity injuries

Author: Cara Segal¹, Steve Clark², Alex Pacitti², Grace Yawman², Ian C. Kenny¹

¹ University of Limerick

² Northeastern University



INTRODUCTION

- 50% of total injuries sustained by Division 1 collegiate athletes are lower-extremity injuries.
- It is important to consistently monitor athletes' to potentially identify individuals at-risk of injury.
- The countermovement jump (CMJ) monitors physical capabilities, neuromuscular response to training and game play stimuli and individual/team physical readiness.
- Aim: examine CMJ performance and its relationship to concomitant season-long injury epidemiology to identify factors or athletes potentially at-risk of a lower-extremity injury.

METHODS

- 149 Division 1 collegiate athletes (male = 61; female = 88).
- Sports: soccer, basketball, volleyball, field hockey, and ice hockey.
- 9-month timeframe; all athletes regularly every week performed the CMJ on Hawkin Dynamic force plates using a standardised procedure.
- All injuries were electronically recorded using the software Sportsware.
- An electronic spreadsheet was created to isolate results for the 48 athletes sustaining an injury.
- CMJ metrics: average relative propulsive power (ARPP), CMJ depth, mRSI, left/right propulsive impulse index (L/R PII).
- Trends analysed for a relationship between force plate data and injury data in the 90-days vs. 14-days prior to injury.

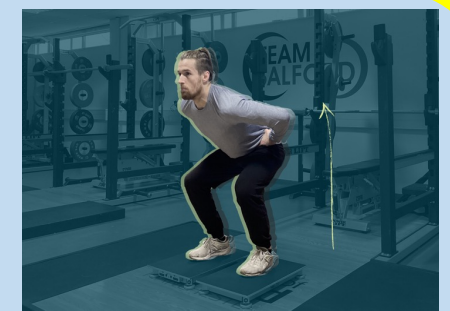


Figure 1. CMJ

RESULTS

Figure 2. Location of lower-extremity injuries for the injured cohort.

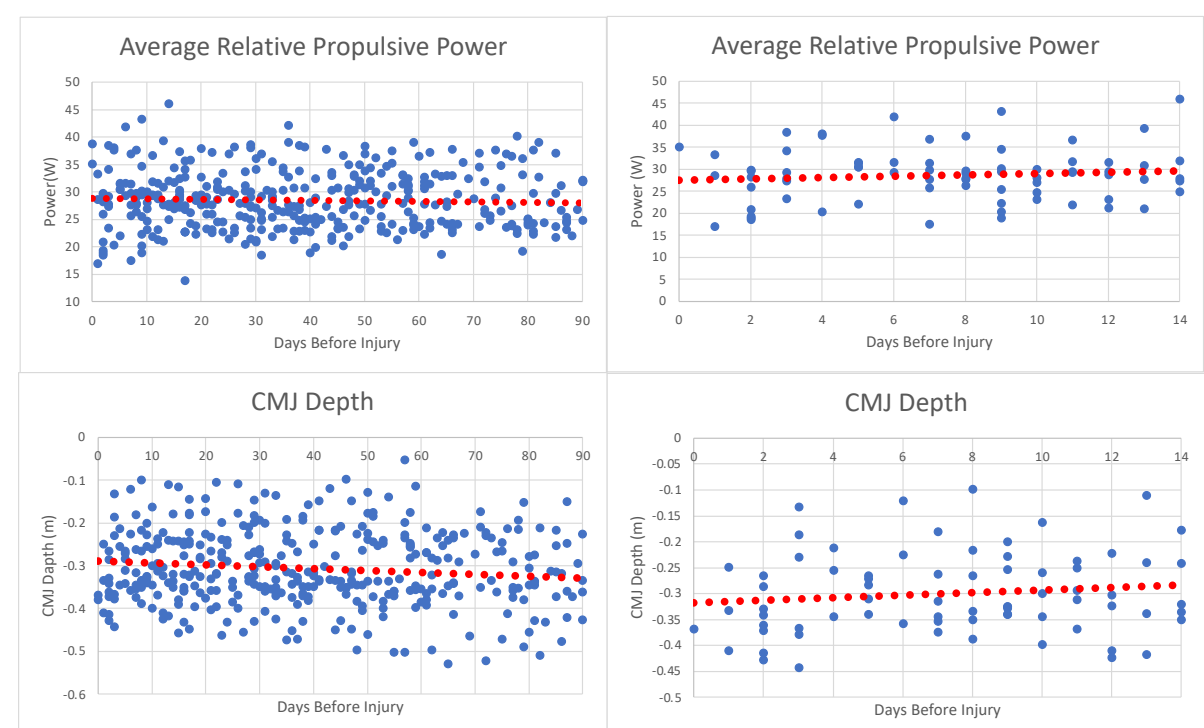
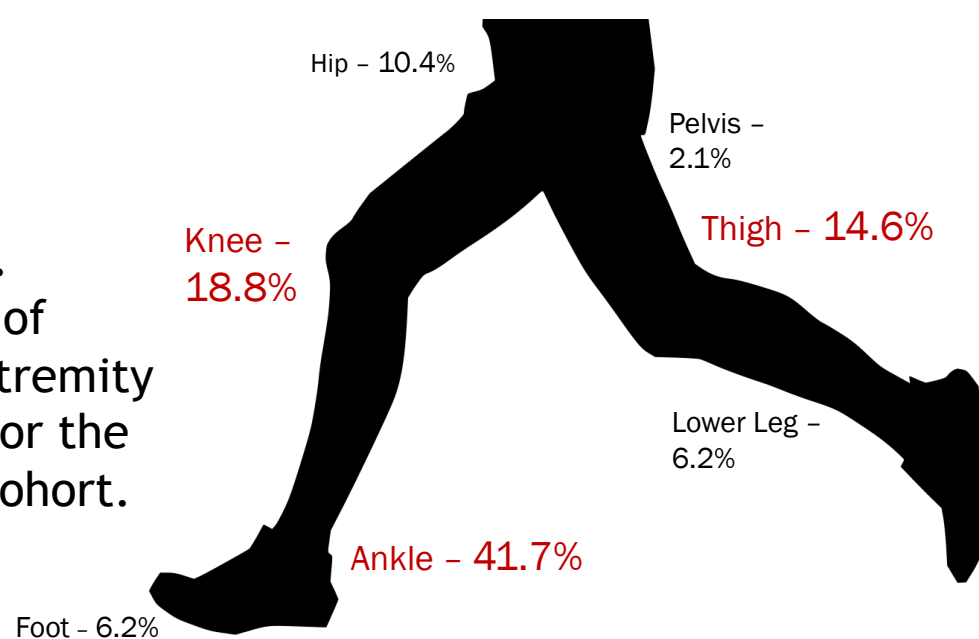


Figure 3. CMJ performance throughout the 90-days and 14-days for ARPP and CMJ depth.

DISCUSSION

- The nature of a sport is a key determinant of the types of injuries sustained by athletes.
- The soccer, basketball, and volleyball teams reported the highest incidence of lower-extremity injuries.
- The large GFR during the recurrent jumping and landing movements make the lower extremity more susceptible to injuries at the knee and ankle joints (Fatahi et al., 2021).
- The change in the trend of the jump data between 90-days prior and 14-days prior to injury for ARPP and CMJ depth suggest minor modifications in movement strategies and physical capabilities in the few days before an injury.

CONCLUSION

In summary, the results of this study suggest mRSI, CMJ depth and average relative propulsive power can help monitor an athlete's movement strategies, physical capabilities and readiness during training and competition. Left/right propulsive impulse index showed no indication of an upcoming injury. Future large-scale prospective studies are needed to establish the sensitivity of other CMJ variables to detect at-risk individuals of a lower-extremity injury.

Badby, A.J., Mundy, P., Comfort, P., Lake, J. and McMahon, J.J. (2022). 'Agreement among countermovement jump force-time variables obtained from a wireless dual force plate system and an industry gold standard system.' *ISBS Proceedings Archive*, 40(1), p.58.

Brumitt, J., Heiderscheit, B.C., Manske, R.C., Niemuth, P.E. and Rauh, M.J. (2013). 'Lower extremity functional tests and risk of injury in division iii collegiate athletes.' *International journal of sports physical therapy*, 8(3), p.216.

Fatahi, A., Yousefian Molla, R. and Ameli, M. (2021). 'The Relationship Between Maximum Jump Performance and Force-time Variables of Block Landing Skill in Junior Elite Volleyball Players.' *Physical Treatments-Specific Physical Therapy Journal*, 11(3), pp.171-180.

Lytle, J.B., Parikh, K.B., Tarakemeh, A., Vopat, B.G. and Mulcahey, M.K., 2021. Epidemiology of Foot and Ankle Injuries in NCAA Jumping Athletes in the United States During 2009-2014. *Orthopaedic Journal of Sports Medicine*, 9(4), p.2325967121998052.