P-C-36: Fatigue effects on two return-to-sport jump tests

Filippo Bertozzi(1), Matteo Zago(2), Luca Pulici(3), Giulia Campanini(4), Claudia Brunetti(2), Alice Gatti(2), Manuela Galli(2), Chiarella Sforza(1)
(1)Università degli Studi di Milano, (2)Politecnico di Milano, (3)FC Internazionale Milano SpA, (4)Università di Pisa

BACKGROUND AND AIM: Return to activity remains the most notable concern following a sport injury. Many functional test batteries, consisting of different stability and jump tasks, have been proposed for return to sport after an ACL injury [1]. Among them, Counter Movement Jump (CMJ) and Single Leg Hop (SLH) are two of the most common functional tests evaluated following ACL reconstruction [2,3]. However, despite evidence demonstrating that neuromuscular fatigue reduces functional performance and knee stability, functional tests are often not performed in a fatigued condition [3]. We aim to investigate the effect of a sport-specific fatigue protocol on performance and knee kinematics during two different functional jump tests. METHODS: Eleven female soccer players (age: 20-31 years, BMI: 18.4-22.7 kg·m⁻²), playing in the first or second Italian division ("Serie A" and "B") were evaluated. After a warm-up, two jump tests were performed in rest condition (2 repetitions for CMJ and 2 repetitions per limb for SLH). Then, participants performed a fatigue protocol consisting of a 5-m shuttle-run (SR) until exhaustion. Peak blood lactate concentration was measured at the end of SR. Afterwards, the jump tests were repeated in a fatigue condition. The three-dimensional position of 37 reflective markers was acquired during the tests with an optoelectronic motion analysis system (BTS, Italy). Knee 3D kinematics was obtained from a biomechanical model within Visual 3D (C-Motion, USA).

Repeated measures one-way (pre vs. post SR) and two-way (pre vs. post SR and right vs. left limb) ANOVAs were conducted to evaluate differences in height for CMJ and length for SLH, respectively. Statistical Parametric Mapping (SPM) unpaired t-tests were used to compare knee kinematics during CMJ and SLH tests, before and after SR. RESULTS: Post-exercise blood lactate concentration was 10.7±3.0 mmol·L⁻¹. No significant differences were found for CMJ height and SLH length before and after SR. SMP revealed no significant side differences for knee kinematics, except for SLH abduction moment in fatigued conditions, from 2% to 13% of the weight acceptance phase (t=3.051, p=0.016). CONCLUSIONS: We did not observe differences for jump tests performed before and after the SR fatigue protocol. This result is probably due both to the limited duration of the protocol (less than 5 minutes) and to the time between the end of SR and the repetition of jump tests (at least 1 minute for lactate sampling). These factors probably allowed participants to recovery from neuromuscular fatigue induced by the SR protocol before the second jump tests. However, the asymmetry for SLH abduction moment suggests a potential effect of fatigue on knee kinematics during the initial part of the landing. The findings of this pilot study can be useful for future research aiming to enhance ecologically valid return-to-sport test batteries, in which the role of fatigue should be evaluated. 1. Hildebrandt et al, Knee Surg Sports Traumatol Arthrosc, 23:1273-1281,2015 2. van Melick et al, Knee Surg Sports Traumatol Arthrosc, 27:549-555, 2019 3. O'Malley et al, J Athl Train; 53:687-695, 2018