
3. Gathercole, R., Stellingwerff, T. & Sporer, B. “Comparison of three vertical jump tests and 20-m sprint testing for neuromuscular fatigue detection” Journal of Sports Sciences [In review]


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**PROGRAMME**

The Final Oral Examination for the Degree of

DOCTOR OF PHILOSOPHY

(School of Exercise Science, Physical and Health Education)

ROBERT GATHERCOLE

2008 Leeds Metropolitan University MSc
2007 Leeds Metropolitan University BSc

“Countermovement Jump Assessment for Athlete Neuromuscular Fatigue Monitoring”

Monday August 18, 2014
5:00pm
David Turpin Building, room A136

Supervisory Committee:
Dr. Lynneth Stuart-Hill, School of Exercise Science, Physical and Health Education, University of Victoria (Co-Supervisor)
Dr. Ben Sporer, School of Exercise Science, Physical and Health Education, UVic (Co-Supervisor)
Dr. Trent Stellingwerff, Canadian Sport Institute Pacific (Outside Member)

External Examiner:
Dr. Stuart Cormack, School of Exercise Science, Australian Catholic University

Chair of Oral Examination:
Dr. Andrew Newcombe, Faculty of Law, UVic
Abstract

Neuromuscular (NM) fatigue can be defined as an exercise-induced decrease in skill-based performance and/or capacity originating within the NM system (Boyas & Guével, 2011). Although fundamental to athlete training and competition, NM fatigue can decrease performance and increase injury risk in the short term, whilst its accumulation can result in long-term deleterious performance and health consequences. Athlete fatigue monitoring is recommended to prevent these deleterious consequences and optimize athlete performance preparation. Regular NM function testing is considered essential to this monitoring process, however the most suitable means of assessing fatigue-induced effects on NM function is unclear and complicated by the myriad of factors including the task performed (e.g. intensity, duration, mode), the individual (e.g. age, gender, training status), and the stage of post-exercise recovery (e.g. immediate, delayed), that can influence the NM responses displayed. This series of investigations aimed to improve understanding around athlete fatigue monitoring by first determining the most suitable NM function tests amongst four popular methods, and then exploring the usefulness of this test for identification of NM responses accompanying different fatigue-related circumstances (i.e. acute fatigue, post-exercise recovery, accumulated training stress).

The countermovement jump (CMJ) test was initially identified as most suited for NM fatigue detection, owing to a high repeatability and sensitivity to delayed NM fatigue effects. Utilising the CMJ test and a combination of novel and traditional CMJ analytic methodologies, subsequent investigations revealed that different fatiguing and training stimuli tend to elicit marked changes in how the CMJ movement is performed (CMJ ‘mechanics’; e.g. eccentric function, jump duration) which may not always occur alongside decreases in CMJ output (e.g. peak power/force, jump height).

This research highlights the value of the CMJ test for athlete fatigue monitoring and also the complexity of NM changes that can manifest in response to various fatiguing stimuli. While, NM fatigue is generally examined in terms of whether an athlete can produce the same or similar output, subtle changes in how a movement is performed may also have important performance implications. For example, an athlete requiring more time to perform the same skilled movement is likely to be less successful than one requiring less time, while repeatedly performing a less energetically efficient movement may lead to an acceleration of subsequent fatigue-induced performance decline.

Awards, Scholarships, Fellowships

2012 – Dr. Gord Sleivert Young Investigator of the Year Award, SPIN Summit, Vancouver

Presentations


Publications