MENTAL FATIGUE AND PHYSICAL PERFORMANCE; INSIGHTS IN THE ROLE OF THE BRAIN IN SPORTS PERFORMANCE.

VAN CUTSEM JEROEN

Friday, April 5th 2019 at 17:00

Room D 2.01 (Promotion Room), campus Etterbeek

Please confirm your presence by March 29th at vub.ac.be/events/2019/phdvancutsemjeroen

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ABSTRACT OF THE PHD RESEARCH

Within sport science, the question why and how people fatigue has intrigued scientists for decades. Different lines of research on exercise-induced fatigue (e.g., exercise physiology and psychology) have provided insightful knowledge. However, to further progress this field of research, increased interaction with one another is crucial. Mental fatigue is a research topic that contains aspects of both exercise physiology and psychology and as such might prove to be a valuable asset in the attempt to increase interaction.

Mental fatigue research in sport science attempts to provide further insights into the mechanisms behind the underperformance on physical tasks following the execution of a prolonged demanding cognitive task. In attempting to do so, the role of physiological and psychological factors in physical performance is assessed. The research topic mental fatigue has only recently gained attention and as such the present PhD aimed to further explore the link between mental fatigue and physical performance. In order to do so, it consists of one systematic review of the literature and four randomized controlled trials. All five manuscripts were written as stand-alone papers of which four have been accepted and one is submitted in relevant international exercise physiology, psychology, and behavioural neuroscience journals.

In order to provide a clear overview on the current body of knowledge on the effect of mental fatigue and physical performance, a first aim in this PhD was to conduct a systematic review of the available literature on the topic. This review pointed out that mental fatigue impairs endurance performance, and the underlying mechanism of this impairment appears to be a higher than normal perceived exertion. Physiological variables traditionally associated with endurance performance (heart rate, blood lactate concentration, oxygen uptake, cardiac output) were not directly affected by mental fatigue during and after endurance performance. Maximal strength, power, and anaerobic work were not affected by mental fatigue. This led to the conclusion that duration, intensity, and a cognitive component in the physical task appear to be important moderating factors in the effect of mental fatigue on physical performance.

In our search to further explore the link between mental fatigue and physical performance we aimed: (1) to assess in further detail the possible moderating role of heat in the effect of mental fatigue on endurance performance, (2) to observe the impact of mental fatigue on sport-specific psychomotor performance, and (3) to evaluate a possible countermeasure of mental fatigue.

These aims resulted in completing four experimental studies that eventually demonstrated that:

- Mental fatigue did not affect endurance performance in the heat. Heat thus appears to be a moderating factor of the mental fatigue-induced endurance impairment.
- Heat stress and mental fatigue may share a common psychobiological mechanism. The negative valence of emotions associated with both heat stress and mental fatigue increases perception of effort and subsequently impairs physical performance.
- Mental fatigue does not only impair endurance sports, but also impairs sport-specific psychomotor performance.
- The level of training (untrained vs. athletes) does not seem to moderate the effect of mental fatigue on sport-specific psychomotor performance.
- A serial caffeine-maltodextrin mouth rinse counteracts subjective, behavioural, and electrophysiological effects of mental fatigue.

Overall these results point out that mental fatigue has important implications in physical performance, and that these are mediated by a strong neurophysiological and psychobiological component. Continuation of this research is of importance as mental fatigue - and other neurophysiological and psychobiological mediators of physical performance - have only recently gained attention in sports science. Besides being an important topic in sports science, mental fatigue is an issue that is encountered in a multitude of settings that are encountered in daily life (work, driving a car, disease, ...) and as such this research also forms a useful basis for translational research.

CURRICULUM VITAE

In 2009 Jeroen Van Cutsen (born 16 October 1991 in Halle, Belgium) started to study Physiotherapy at the Vrije Universiteit Brussel. After graduating in 2014, Jeroen started his PhD at the Vrije Universiteit Brussel in the same year. Throughout his PhD Jeroen presented his work on multiple national and international conferences. In 2014 he won the Gaston Beunen-Price for young researchers, best oral presentation of the Symposium. Currently Jeroen has authored and co-authored 13 peer reviewed articles that were published in international exercise physiology, psychology, and behavioural neuroscience journals.