THERMOREGULATION IN WHEELCHAIR BASKETBALL AND RUGBY ATHLETES WITH A SPINAL CORD INJURY

FABIAN GROSSMANN

PUBLIC PHD DEFENCE FOR THE DEGREE OF
DOCTOR IN MOVEMENT AND SPORT SCIENCES

FRIDAY, OCTOBER 28TH 2022 AT 17:00
ROOM D0.07, CAMPUS ETTERBEEK

SUPERVISORS
Prof. dr. Bart Roelands (VUB)
Prof. dr. Romain Meeusen (VUB)
Dr. Joelle Fluck (Swiss Paraplegic Centre)
Dr. Claudio Perret (Swiss Paraplegic Centre)

EXAM COMMISSION
Prof. dr. Nele Adriaenssens (VUB) - chair
Prof. dr. Dirk Aerenhouts (VUB)
Prof. dr. Kevin De Pauw (VUB)
Prof. dr. Vicky Goosey-Tolfrey (Loughborough University)
Prof. dr. Thomas Abel (German Sport University Cologne)

Click here to join online.

VUB PHYSICAL EDUCATION & PHYSIOTHERAPY

swiss olympic MEDICAL CENTER
Sports Medicine Nottwil

ABSTRACT OF THE RESEARCH

The complete or incomplete transection of the spinal cord lead to a malfunction of the motoric, sensory and vegetative functions. Consequently, information taken up by thermoreceptors in the skin does not reach the thermoregulatory center in the hypothalamus. As a result, vaso- and sudomotor functions are disturbed below the level of lesion. Thus, thermoregulation in individuals with a spinal cord injury can be impaired and lead to heat-related injuries. During exercise, this problem is more accentuated
It was shown in able-bodied athletes, that heat stress can lead to significant performance decrement during training or competition. Currently research is not able to provide any evidence for the influence of heat stress on performance in wheelchair team sports, mainly through the lack of research. In this thesis, the first study in this field is presented, which analyzed the thermal and thermoregulatory responses as well as the effects of environmental conditions on performance during competitive wheelchair basketball games. The findings suggest that performance in wheelchair basketball was not affected by the ambient temperature. This means performance parameters as covered distance, mean velocity or number of sprints were not significantly different between hot and temperate environmental conditions. It was suggested that the game intensity was too low and therefore the associated produced metabolic heat was as well too low to let body core temperature increase into critical levels, where performance will be impacted. On the other hand, it was shown that during hot environmental conditions athletes with a spinal cord injury were able to dissipate more heat via an increasing sweating rate. The higher evaporative heat loss seems to have positively affected body core temperature and the measured values in hot conditions did not exceed the values assed during the temperate game.
Field-based research is often associated with several limitations, for example, the characteristics (e.g., intensity, tactics, breaks, substitutions) of a real game cannot be influenced. Thus, drawing any overall conclusion from only two games was impossible and the development of a submaximal field test seemed to be helpful to overcome this gap. The self-developed field test showed good reliability for sprinting times, heart rate and rate of perceived excretion and it seems that the test is able to mimic a real game concerning increase in body core temperature, body weight loss and sweat rate. To be ready to use for the further analysis of different external and internal impacts on thermal and thermoregulatory responses as well as on performance parameters (e.g., precooling techniques, training interventions, nutritional interventions) the test has to be further improved and assessed with a larger number of participants Furthermore, in case of confirmed validity and reliability this test could be a crucial tool to investigate the influence of the level of the lesion and the completeness of the spinal cord injury on thermal and thermoregulatory responses as well as the influence on performance. Further research is needed, first to verify the findings of this thesis, second to generate more evidence on the influence of environmental conditions, level of lesion, training or nutritional intervention, or the use of pre-cooling techniques on the performance of athletes with a spinal cord injury.
In conclusion this thesis confirmed earlier findings from laboratory studies on thermal and thermoregulatory responses in individuals with a spinal cord injury in an unprecedented field research, whereas the effects of thermal strain on performance still remain unclear. The new developed reliable and valid field test seems to be applicable in a first phase. Nevertheless, to be ready to become implemented in wheelchair rugby to measure a wide variety of interventions and influences on athlete' thermal and thermoregulatory responses as well as on performance, the field test must be further improved and validated. Additionally, this field test provides a solid basis for future development to other wheelchair team sports (e.g. wheelchair basketball) and would help to fill the gap in evidence concerning a wide range of influences on performance.

CURRICULUM VITAE

Already during my childhood, my affinity and love for sports made itself felt by not wanting to stop playing football or skiing at a very young age. This extraordinary love remained so strong that it then drove me to study sports sciences. After completing a Bachelor's degree in Exercise and Health Sciences at the University of Basel, I wanted to devote myself more to elite sports and completed a Master's degree in Sport Sciences with specialization in elite sports at the Swiss Federal Institute of Sport in Magglingen. After gaining various work experiences in the field of sports sciences, but also in athletic training and performance diagnostics, my studies have now come to a preliminary end with the completion of my PhD. During this time I never let myself be stopped from doing sports and I found the balance to the head-heavy PhD in running, mountaineering, cycling, skiing, ski touring, cross-country skiing and playing volleyball.