



UNIVERSITA' CAMPUS BIO-MEDICO DI ROMA

# Seminari

## Sports sensors: what should we measure, why and how?

**Andrea Nicolò, PhD**

Department of Movement Human and Health Sciences,  
University of Rome "Foro Italico"

### **Abstract:**

Technological development is helping athletes and exercise practitioners optimize performance and minimize the risk of injury and illness. Yet, monitoring exercise is challenging due to several factors, including motion artefacts and the need to minimize the invasiveness of wearable devices. The challenge is even greater when attempting to extract simple and useful information from a myriad of data that are currently gathered during training and competitions. Furthermore, most sensors and devices currently used in sports have not been scientifically validated. Moreover, technological development is often guided by market forces rather than athlete or scientific needs, which may reduce the use of new technologies. A good example of how the development of wearable sensors should follow athletes' needs and be informed by scientific findings is given by the increasing attention devoted to respiratory frequency (fR) monitoring during exercise.

Substantial evidence suggests that fR plays an important role during exercise as a strong marker of physical effort, more so than other traditionally monitored physiological variables such as oxygen uptake, heart rate and blood lactate. Indeed, fR is closely linked with perceived exertion during a variety of exercise paradigms and experimental interventions affecting performance, including muscle fatigue, glycogen depletion, hyperthermia and hypoxia. Therefore, fR is sensitive to different fatigue states, and thus presents potentially important implications for training and recovery monitoring. Furthermore, fR is a good predictor of time to exhaustion during constant-work rate exercise and can help understand how effort is distributed during self-paced time trials. Moreover, monitoring fR may not only benefit endurance sports but also team sports and other intermittent-based sporting activities, given the very fast response observed to abrupt changes in work rate. However, the importance of fR as a marker of physical effort has emerged from recent investigations and fR is not currently measured during training. Furthermore, there is a paucity of respiratory sensors specifically designed for sporting activities, which is very relevant for companies, researchers and sensor developers.

The talk will present: i) current evidence suggesting the importance of respiratory frequency monitoring during exercise; ii) our current understanding of the mechanisms underlying the control of breathing during exercise; iii) currently available techniques and sensors for measuring respiratory frequency.



### **Biography**

Andrea Nicolò received his BSc (2009), MSc (2011) and PhD in Sports, Exercise and Ergonomics (2015) from the University of Rome "Foro Italico". He is currently a post-doc researcher at the University of Rome "Foro Italico". His research focuses on endurance physiology and performance, with special attention to the mechanisms and practical applications underlying the control of breathing during exercise. He has worked for different research projects funded by major national and international sports companies, with the aim of developing new exercise tests and training metrics, and of validating training devices and algorithms.



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**Sala Conferenze - PRABB**

**Università Campus Bio-Medico di Roma**

**Via Álvaro del Portillo, 21**

**Info: Emiliano Schena - e.schena@unicampus.it**