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Forum de Physique Statistique @ ENS

Mercredi 16 Mars 2022, 14 :30
LPENS, Salle Djebar (29 rue d'Ulm)(For a zoom link, please ask xiangyu.cao@ens.fr)
Domaines : cond-mat.stat-mech

Titre : *Exercise Physiology from a Physics Perspective*

Orateur : **Thorsten Emig (LPTMS)**

Résumé : *A boom in scientific interest in sports science has moved the field forward substantially, from an isolated sub-discipline of physiology to a shining example of the impact of multidisciplinary science. The rapidly growing amount of available exercise data, that is currently almost unexplored, holds a great potential for new quantitative research. While traditional studies are limited by a small sample of participants, big data collections make it possible to bring the laboratory to the field, and study millions of subjects under real world conditions.*

In this talk I shall give two examples for physics inspired research in exercise physiology :

(1) The analysis of a large dataset obtained by runners from wearable exercise trackers (covering about 20 million running kilometres), guided by a mathematical model for running performance. From this we obtained a better understanding of the complex interplay between training and performance. Identification of key performance parameters allows accurate race time prediction and quantification of correlations with training volume and intensity. Additionally, application of the model to the last 100 years of running world records provides novel insights into the evolution of physiological characteristics of runners, the detection of doping, and the effect of new training approaches and of new technological advances.

(2) The study of fluctuations of the human heart beat during physical exercise. I shall show that running across various training and racing events changes the scaling and correlations of beat-to-beat intervals (BBIs), using methods for the analysis of non-stationary time series. These changes can be related to the exercise intensity quantified by the heart rate. BBIs how mul-

tiscale anticorrelations with both universal and individual scale-dependent structure.