

Sprint Acceleration Biomechanics



Abstract

The session will consist of performing kinetics and kinematics measurements of a sprint start and acceleration phase (starting-blocks and 40-m acceleration to top speed) on a track, and then directly analyze data from two perspectives. First (S Willwacher), push-off force measurements combined with high speed video analysis will allow a deep and detailed understanding of the sprint start and first steps technique and performance through kinetic and kinematic variables. Then (JB Morin) a new simple field method based on speed-time measurements using a radar device will allow the determination of horizontal net force and power output during the acceleration, and to study the external power-force-velocity profile of the subjects. Two athletes will be compared during the session in order to better discuss the interest of the methods presented in monitoring and coaching sprint technique and performance. Applications concern athletics, but also all sports that include sprint acceleration as a performance component.

Measurements will be performed on the track during the first 20-30min of the session, followed by analyzes and discussion.



Professor Jean-Benoit Morin's bio

Jean-Benoit (JB) Morin is currently Full Professor at the [Faculty of Sport Sciences of the University of Nice Sophia Antipolis](#) (France). He is a member of the [Laboratory of Human Motor Function, Education Sport and Health](#). He obtained a Track & Field Coach National Diploma in 1998 and graduated in Sport Science at the University of Besançon, France in 2000. He obtained his PhD in Human Locomotion and Performance in 2004 at the University of

Saint-Etienne, France (Prof. Alain Belli), in collaboration with the University of Udine, Italy (Prof. Pietro di Prampero).

He was an Assistant Professor at the Sport Science Department of the University of Saint-Etienne and member of the Laboratory of Exercise Physiology from 2005 to 2014. JB's field of research is mainly human locomotion and performance, with specific interest into running biomechanics and maximal power movements (sprint, jumps). He teaches locomotion and sports biomechanics, and strength training and assessment methods. He has published about 50 peer-review Journal articles since 2004. JB's main collaborations are with French sprinter Christophe Lemaitre and his group/coach, and he is member of the French Soccer Federation research group, teaching professional coaches about sprint mechanics and training for acceleration. He also collaborates with New-Zealand professional and national rugby teams, and with professional soccer clubs in France and Spain. He practiced soccer in competition for 10 years, practiced and coached track and field (middle distance and 400m hurdles) for 8 years, and he is now enjoying trail running, road cycling and triathlon.

[Research Gate profile](#)



Dr. Steffen Willwacher's bio

Steffen Willwacher (SW) finished his PhD at the [Institute of Biomechanics and Orthopaedics of the German Sport University in Cologne](#) in February 2014. His PhD work was in the field of running biomechanics with a particular focus on the effect of shoe design and running surface variations on running kinematics and kinetics. His work has been supervised by Prof. Gert-Peter Brüggemann.

Another field of research over the last years has been the analysis of sprint start kinetics and reaction times in sprinters of all levels of performance. SW is further involved in biomechanical performance diagnostics of the German national sprint team. Other research interests include the interaction of athletes with different kinds of technology in the sporting environment (including shoes, apparel, start block instrumentation, etc.) and the impact of disabilities on sport performance. SW is currently working as research assistant in the Institute of Biomechanics and Orthopaedics at the German Sport University Cologne. Further, he is lecturing Sports Biomechanics at the Coaches Academy of the German Olympic Sports Confederation and is involved in the analysis of elite and recreational athletes in the Institute of Functional Diagnostics in Cologne.

SW has practiced track and field (Decathlon) until the age of 25 and has transformed since then to work as a coach. He is currently coaching regional level athletes in the track and field team of the German Sport University and is working as speed and strength and conditioning coach with the 2014 female German champion in field hockey (Rot Weiß Köln).

[Research Gate profile](#)