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Inter-segmental coordination strategies during initial sprint acceleration

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Proficient sprint acceleration requires a combination of large mass-specific force applied against the ground with a horizontally orientated force vector, short ground contact times and high step frequencies. To achieve this, athletes must produce kinematic solutions to position their limbs in such a way that enables optimal muscle forces to be generated across joints and to translate the centre of mass forwards and upwards. This combination of kinetic and kinematic parameters establishes 'sprint acceleration technique', which is of interest to anyone looking to enhance performance of this task.

The body is a complex system with numerous redundant degrees of freedom. Coordination patterns in the execution of motor skills (such as sprint acceleration) emerge by self-organisation through interaction with a set of constraints imposed by the nature of the task, the environment and the individual. In research and practice, sprint acceleration technique is typically studied by analysing the configuration of specific body segments and joints at key events during the stride. However, the measurement of isolated kinematic variables at discrete points in time fails to capture the coordination pattern that occurs between these events and does not directly assess the relative motion of multiple segments. Recent studies have provided the first description of inter-segmental coordination during initial sprint acceleration in highly trained athletes and revealed some characteristic features that indicate strong task constraints. However, between-athlete variation is also evident due to individual constraints and there are potentially important performance implications of these coordination pattern variations. Once these are understood, it would be beneficial for practitioners to have a framework for identifying movement strategies to guide any technical or physical interventions.

This presentation will, firstly, summarise the typical features of inter-segmental coordination and the implications for understanding the demands of initial sprint acceleration. Secondly, novel findings of coordination pattern sub-groups and the association with sprint acceleration performance will be presented. Finally, a practical framework for assessing athletes coordination pattern will be proposed.

The target audience would include researchers with an interest in sprinting or the biomechanics and motor control of movement tasks, in particular during running. Furthermore, coaches and sport scientists who are interested in understanding the technical demands of sprint acceleration would also be addressed. The topic is of relevance to provide a more holistic understanding of sprint acceleration technique and is directly related to the growing area of coaching interest in this field, supporting the integration of research and practice.

Topic: **Biomechanics**

Presentation **Invited**