proceedings

MDPI

Abstract

Association between Sprinting Performance and Force-Velocity Mechanical Profile of Men's and Women's World-Class Sprinters †

Ioannis Stavridis * and Giorgos Paradisis

School of Physical Education and Sport Science, National and Kapodistrian University of Athens, 17237 Athens, Greece

* Correspondence: ioastavridis@phed.uoa.gr

† Presented at the 9th Greek Conference of Biochemistry and Physiology of Exercise, Thessaloniki, Greece, 18–20 October 2019.

Published: 3 September 2019

Abstract: AIM: The aim of this study was to examine the relationship between the performance of men's and women's finalists in the 100-m finals of IAAF World Championship 2017 and the mechanical properties of horizontal force-velocity-power (FVP) profile produced by each athlete. **MATERIAL & METHOD**: The spatio-temporal data from the 16 finalist sprinters (8 men and 8 women with 10.04 ± 0.12 s and 10.97 ± 0.09 s 100-m performance, respectively), were obtained from recordings of the distance-time curve in men's and women's 100-m finals during the IAAF World Championships 2017. The variables of horizontal FVP profile were calculated in order to determine the relationship between horizontal FVP profile [theoretical maximal values of force (F0), velocity (V0), and power (Pmax), the proportion of the theoretical maximal effectiveness of force application in the forward direction (RFmax), the rate of decrease in the ratio of horizontal force (DRF)] and the 10-m split-time, as well as the sprint running performance of men's and women's finalists in 100-m race. **RESULTS**: Spearman's correlation analysis revealed highly negative linear associations between Pmax ($r = -0.87$, $r^2 = 0.76$; $p < 0.001$), RFmax ($r = -0.81$, $r^2 = 0.66$; $p < 0.001$), V0 ($r = -0.78$, $r^2 = 0.61$; $p < 0.001$), and F0 ($r = -0.66$, $r^2 = 0.44$; $p = 0.005$) with 100-m performance. The 10-m split-time was highly negatively linearly associated with RFmax ($r = -0.98$, $r^2 = 0.97$; $p < 0.001$), F0 ($r = -0.96$, $r^2 = 0.93$; $p < 0.001$), Pmax ($r = -0.96$, $r^2 = 0.91$; $p < 0.001$), V0 ($r = -0.62$, $r^2 = 0.38$; $p = 0.011$). DRF was not correlated with 10-m split-time or 100-m performance ($p > 0.05$). **CONCLUSION**: The mechanical properties of FVP profile strongly influenced the 100-m performance of men's and women's world-class sprinters. This study highlights the importance of the technical capability of world-class athletes to effectively orient the horizontal force onto the supporting ground during the initial sprint-acceleration.

Keywords: force-velocity profile; maximal power; sprinting