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Impact of sprint mechanical parameters on elite junior tennis performance

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INTRODUCTION:

Movement speed is considered essential for success in many team and racket sports. However, only split times have been used, compromising information about how two players might achieve a given split time during a linear sprint (LS). Therefore, this study aimed to correlate sprint mechanical parameters (SMP) of a 20m LS test obtained with a motorized resistance device (MRD) to the current gender-specific tennis ranking position in tennis (RP).

METHODS:

107 male and 86 female elite junior tennis players nationally ranked in the German Tennis Federation between 10 and 18 years participated in the study. The players original rankings on the overall list were revised so that the top-ranked player was placed first and the lowest-ranked player last. According to their age at peak height velocity (PHV), players were divided into pre-PHV, circa-PHV, and post-PHV groups. Players performed two maximal 20m sprints on an indoor tennis hard court. SMP, like maximal theoretical force (F_0 ; N/kg), and maximal theoretical velocity (v_0 ; m/s), maximal power (P_{max} ; W/kg), were derived from instantaneous time-velocity data measured with 333Hz. SMP of the LS were partially correlated with the current RP in the overall national ranking by controlling for biological maturation.

RESULTS:

Low to moderate correlations ($r_s = -0.1$ – -0.3) were found between SMP and the RP in all male and female age groups. However, separated by gender, low significant correlations between SMP and RP were found in females ($r_{sv0} = -0.33$; $r_{sP_{max}} = -0.31$; $r_{sRF_{max}} = -0.22$), whereas none were found in males. All linear SMP improved over maturation for both genders. After the PHV, F_0 values improve to a lesser amount compared to v_0 . Regarding sprinting performance, P_{max} showed the highest correlation of all SMP to 20m split time in both males ($r = -0.77$) and females ($r = -0.86$). Additionally, the correlations of F_0 are the strongest for short distances, while correlation values for v_0 increase for longer sprint distances.

CONCLUSION:

Sprint mechanical parameters have overall a low to moderate relevance for tennis performance which can be explained by the dimensions and high demands of technical and tactical skills. The importance of LS seems to be more pronounced in girls compared to males, most likely due to different playing styles. The relevance of physical attributes might hence be elevated in female junior tennis. Male and female players develop a more velocity-oriented F-v-Profile over maturation, which is mainly responsible for the increase in P_{max} . Since improvements of F_0 are diminished compared to v_0 , especially after PHV, training should be tailored to the development of force production at low velocities. It is reasonable to assume that such training emphasis could further increase performance given the usually short distances during match play.

Topic: Training and Testing

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