

The Relationship between Broad Jump Distance and Sprint Profile in Collegiate Track and Field Athletes

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Category: Masters

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ABSTRACT

Broad jump performance is associated with the application of horizontal force to achieve greater jump distance. Similarly, horizontal force application is vital to attain high velocities during sprinting. The video analysis-based sprint profile provides insight into multiple measures of sprint performance including maximal theoretical horizontal force, maximal theoretical velocity, optimal velocity, and maximal speed.

PURPOSE: To determine the relationship between broad jump distance and the sprint profile of Division I track and field athletes. **METHODS:** Twenty-five athletes (18 males and 7 females) participated in the study. Subjects completed two countermovement broad jump trials and the distance from the start line to the closest landing mark was obtained with a measuring tape to the nearest centimeter. Subjects then completed two 30-meter maximal sprints. A mobile device with the MySprint mobile application was used to obtain subjects' sprint profile including maximal theoretical horizontal force, maximal theoretical velocity, optimal velocity, maximal speed, maximal power, maximal ratio of force, force-velocity slope, decrease in ratio of force. The best trial was used for statistical analysis. Pearson's or Spearman's correlation coefficients were conducted between jump distance and sprint profile measures. **RESULTS:** There were strong positive correlations between broad jump distance and maximal power ($r = 0.806$; $p < 0.001$); optimal velocity ($r = 0.777$; $p < 0.001$); maximal theoretical velocity ($r = 0.775$; $p < 0.001$); maximal theoretical horizontal force ($r = 0.714$; $p < 0.001$); maximal speed ($r = 0.710$; $p < 0.001$); maximal ratio of force ($r = 0.706$; $p < 0.001$). There were also negative correlations between broad jump distance and force-velocity slope ($r = -0.447$; $p = 0.022$); and decrease in ratio of force ($r = -0.211$; $p = 0.302$). **CONCLUSION:** Athletes displaying longer broad jump distances exhibited higher maximal power during sprinting, supporting the importance of explosive power during activities such as the broad jump and sprinting. Moreover, prior literature has indicated that high horizontal force generation is vital to achieve longer broad jump distances. The importance of horizontal force during both the 30-meter sprint and broad jump is apparent provided their strong correlation. Lastly, a smaller force-velocity slope decrease is correlated with increased broad jump distance, indicating a relationship between broad jump performance and the maintenance of horizontal force at high velocities.