ASSOCIATION BETWEEN COUNTERMOVEMENT JUMP METRICS AND SPRINT COMPLETION TIMES IN YOUTH ATHLETES

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Introduction

The countermovement jump (CMJ) is a widely used athletic assessment that evaluates lower body power and neuromuscular function. The countermovement jump utilizes the stretch-shortening cycle (SSC) in the eccentric, amortization, and concentric phases. The SSC relies on both mechanical and physical components. Similarly, linear sprinting relies on the SSC, particularly during later phases during a 40-yard maximum sprint.

Purpose

Determine the association between countermovement jump performance and 40-yard sprint completion times in youth athletes.

Methods

Thirty youth athletes participated in the study. Athletes performed two CMJs on force platforms, with hands placed on the pelvis. Participants were instructed to jump vertically as high as possible. Between jumps, athletes rested for one to two minutes. Force plates captured vertical ground reaction forces during the CMJ, allowing for the calculation of jump metrics of interest. Each athlete also completed a 40-yard sprint. Timing gates captured completion times during maximal effort sprints (0-10 yards; 10-40 yards; 0-40 yards). The order in which athletes were tested was randomized. Spearman's rho correlations were used to determine the association between measures of interest.

Results

RSI displayed a negative correlation with 10–40-yard sprint completion time (r_s = -0.391; 95%CI [-0.658, -0.035]; p = 0.033) and 0–40-yard sprint completion time (r_s = -0.364; 95%CI [-0.640, -0.004]; p = 0.048). Jump Height demonstrated a negative association with 10-40-yard sprint completion time (r_s = -0.357; 95%CI [-0.636, 0.004]; p = 0.053) and 0-40-yard sprint completion time (r_s = -0.354; 95%CI [-0.633, 0.007]; p = 0.055). Jump Peak Power displayed a negative correlation with 10-40-yard sprint completion time (r_s= -0.394; 95%CI [-0.660, -0.039]; p = 0.031) and a negative association with 0-40-yard sprint completion time (r_s = -0.351; 95%CI [-0.632, 0.010]; p = 0.057).

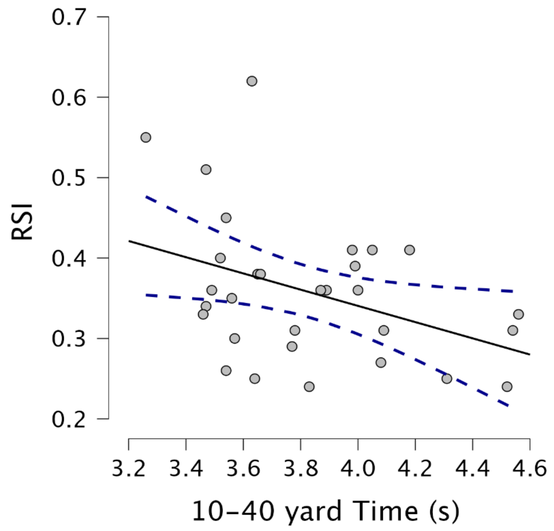

Figure 1. Association between RSI with 10–40-yard sprint completion time

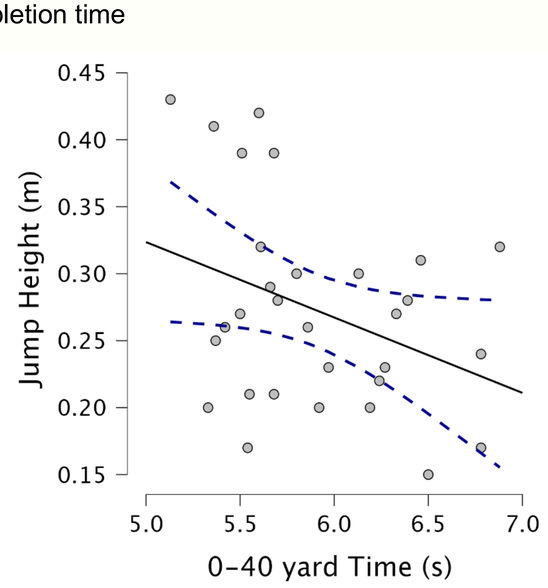

Figure 2. Association between Jump Height with 0–40-yard sprint completion time

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Results

In contrast, Peak Force showed no significant correlations with any sprint performance metrics, and RSI, Jump Height, and Peak Power did not significantly relate to Sprint 0-10 performance.

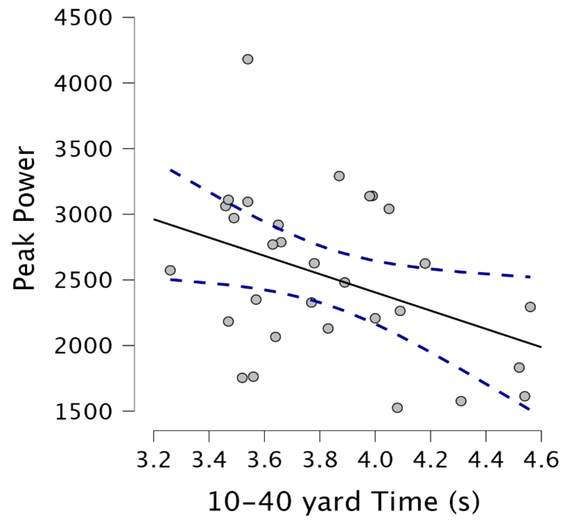

Figure 3. Association between Jump Peak Power with 10–40-yard sprint completion time

Conclusion

RSI, Jump Height, and Peak Power displayed the strongest associations with late-stage sprinting, with RSI and peak power exhibiting the strongest associations. Sprint completion time during the 0–10-yard distance was not associated with any CMJ variables.

Practical Application

Vertical jumping and linear sprinting rely on the athlete's ability to generate force quickly and efficiently, reflected in the various CMJ metrics associated with sprint completion times. Coaches may consider implementing a structured plyometric training to enhance muscular power output and neuromuscular efficiency which may translate to improvements in jumping and sprinting.