

Functional differences in the activity of hamstring muscles with increasing running speed

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In this study, we examined hamstring muscle activation during different running speeds, so as to provide scientific data to better understand the functional characteristics of each hamstring muscle. Eight healthy male track and field athletes (20.1 ± 1.1 years) performed treadmill running at 50%, 75%, 85%, and 95% of their maximum velocity. Lower extremity kinematics of the hip and knee joint were calculated. The surface electromyographic activities of the biceps femoris (BF) and semitendinosus (ST) muscles were also recorded. Increasing the running speed from 85% to 95% significantly increased the activation of the hamstring muscles during the late swing phase (BF, $p < 0.05$; ST, $p < 0.01$), while lower extremity kinematics did not significantly change. During the middle swing phase, the activity of the ST was significantly greater than that of the BF at 75%, 85%, and 95% running speed ($p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively). Statistically significant peak activation time differences between the BF and ST were found during 95% running ($p < 0.05$ at stance phase, $p < 0.01$ at late swing phase). Significant differences in the activation patterns between the BF and ST muscles were observed as the running velocity increased, indicating that complex neuromuscular coordination patterns occurred during the running cycle at near maximum sprinting speeds.