MUSCLE TONE, SPRINT PERFORMANCE AND FORCE PRODUCTION CHARACTERISTICS OF MALE SPRINTERS
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Muscle tone has been extensively studied primarily in clinically oriented medical science (Leonard et al. 2001). No data is available on the relationship between muscle tone and athletic neuromuscular performance. Therefore, the purpose of the present study was to investigate the muscle tone of the lower limbs in sprinters and its relations to sprint performance and force production characteristics.

Eighteen sprinters (23.6 ± 4.3 yrs) and eight physically active controls (23.1 ± 1.6 yrs) with similar anthropometric variables participated in the study. The sprinters’ best official time in the 100-m race ranged from 10.98 to 11.99 s (11.57 ± 0.31 s). Muscle tone was measured from the vastus lateralis muscle (VL) of the right leg using a computer-controlled tissue compliance meter (Ylinen et al. 1993). The absolute (aMT) and soft tissue related muscle tone (rMT) were determined. In the sprint performance test the times of acceleration and maximal speed phases together with stride parameters and ground reaction forces of the full sprint stride were collected. The force production tests consisted of isometric voluntary maximal leg extension together with maximal and explosive (40 and 60% 1RM) half squats. For the control group muscle tone and isometric leg extension force were measured.

aMT and rMT values of the sprinters (316 ± 59 mJ and 68 ± 17 mJ/cm) were statistically significantly larger (p<0.001) compared to controls (205 ± 26 mJ and 46 ± 8 mJ/cm) indicating smaller muscle tone in the sprinters than in the controls. aMT was significantly related to 100-m competition result, maximal velocity phase, contact time and propulsive time of the sprint performance (p<0.01). rMT correlated significantly also with stride frequency. Breaking and propulsive vertical and propulsive horizontal forces of the contact phase were significantly related to aMT. In the sprinters a significant relationship was observed when aMT and rMT were compared to maximal half squat load, maximal isometric leg extension force and the force created during the first 500 ms (p<0.01-0.05). rMT correlated significantly with peak force production during explosive half squat repetitions at 40 and 60% 1RM. In the control group no significant relationships were observed between muscle tone and force production characteristics of the lower limbs.

It has been previously suggested (Kubo et al. 2000) that the compliance and elasticity of VL at high force production levels might influence the sprint performance. The present results indicate that more relaxed muscles at the resting state seem to be able to generate higher forces at faster rate during dynamic exercises such as sprint running.


Keywords: Force Measurement, Muscle Tone, Sprint

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