Differences in quadriceps muscle strength and fatigue between lean and obese subjects

N.A. Maffiuletti, M. Jubeau, U. Munzinger, M. Bizzini, F. Agosti, A. De Col, C.L. Lafortuna, A. Sartorio

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The present study aimed to compare quadriceps femoris muscle strength and fatigue between obese (grade II and III) and nonobese adults. Ten obese (mean age: 25 years; mean BMI: 41 kg/m²) and ten lean (mean age: 27 years; mean BMI: 23 kg/m²) men were tested. Quadriceps muscle fatigue was quantified as the (percent) torque loss during a voluntary isokinetic (50 maximal contractions at 180°/s) and an electrostimulated (40 Hz) isometric protocol (5 min, 10% of the maximal torque). Maximal voluntary isometric and isokinetic torque and power were also measured. Voluntary torque loss was significantly higher (P<0.05) in obese (- 63.5%) than in lean subjects (- 50.6%). Stimulated torque decreased significantly (P<0.05) but equally in the two subject groups. Obese subjects displayed higher absolute (+ 20%; P<0.01) but lower relative (i.e., normalized to body mass) (- 32%; P<0.001) muscle torque and power than their lean counterparts. Obese individuals demonstrated lower fatigue resistance during voluntary but not during stimulated knee extensions compared to their nonobese counterparts. Peripheral mechanisms of muscle fatigue - at least those associated to the present stimulated test - were not influenced by obesity. The observed quadriceps muscle function impairments (voluntary fatigue and relative strength) probably contribute to the reduced functional capacity of obese subjects during daily living activities.