

Sex-related Differences in Maximal and Rapid Hamstrings to Quadriceps Strength Capacities

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ABSTRACT

The balance between leg flexor and extensor strength, which is typically assessed using the hamstrings to quadriceps (H/Q) strength ratio, has been implicated as an important factor in the knee joint stability of younger populations. Sex differences in hamstrings and quadriceps maximal and rapid strength are commonly reported between young men and women; however, few studies have investigated the influence of sex on maximal and rapid strength H/Q ratios. **PURPOSE:** To examine sex-related differences in maximal and rapid strength H/Q ratios between college-aged men and women. **METHODS:** Ten physically-active men (age = 23 ± 3 years; height = 177 ± 5 cm; mass = 82 ± 8 kg) and 10 physically-active women (age = 22 ± 3 years; height = 165 ± 9 cm; mass = 66 ± 7 kg) performed three isometric maximal voluntary contractions (MVCs) of the leg extensors and flexors on a calibrated isokinetic dynamometer. For each MVC, participants sat in an upright position and were instructed to extend or flex the leg "as hard and fast as possible" for 3-4 seconds. Maximal and rapid isometric H/Q strength ratios were determined by taking the quotients between leg flexor and extensor peak torque (PT H/Q) and rate of torque development (RTD H/Q). Independent samples *t*-tests were used to compare demographic characteristics and PT and RTD H/Q ratios between the men and women. **RESULTS:** The men were taller ($P = 0.002$) and weighed more ($P < 0.001$) than the women. The women exhibited a lower RTD H/Q ratio (women = 0.44 ± 0.08 ; men = 0.54 ± 0.11 ; $P = 0.027$) than the men; however, there was no significant difference between the men and women for PT H/Q (women = 0.55 ± 0.09 ; men = 0.57 ± 0.11 ; $P = 0.576$). **CONCLUSION:** These findings demonstrated that the rapid strength H/Q ratio was significantly lower in the women than the men, while no difference was observed for the maximal strength H/Q ratio. Because a deficit in hamstrings to quadriceps rapid strength may decrease one's ability to stabilize the knee joint during explosive-type activities, it is possible that the sex difference in RTD H/Q ratio found in the present study may be a significant contributor to the high prevalence of knee-related injuries that are often observed in physically-active women. As such, lower-extremity muscle strengthening programs with an emphasis on explosive power training (particularly for the hamstrings muscles) may be warranted as a preventative measure for women who are highly susceptible to physical-activity induced injuries involving the knee.