Muscle morphology and jump performance: gender and intermuscular variability

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Aim. The present study aimed 1) to investigate the gender differences in jump performance and muscle architecture between men and women; and 2) to determine whether the differences in jump performance could be attributed to gender differences in the muscle architecture of the leg extensor muscles.

Methods. Sixty-two subjects volunteered for the study (34 women and 28 men): 19 club-level volleyball players, 20 physical education students, and 23 sedentary individuals. They performed trials of countermovement jumps (CMJ) and the muscle architecture of the vastus lateralis (VL), gastrocnemius medialis (GM), and lateralis (GL) were analyzed at rest by ultrasonography.

Results. There were significant differences in jump performance between men and women (CMJ height: 0.388±0.056 m in men and 0.279±0.060 m in women, P<0.001). There were also significant gender differences in the VL muscle thickness, while the relative fascicle length was significantly different in the three muscles studied, with longer fascicles in the VL muscle in men and longer fascicles in the gastrocnemii in women. There were significant associations between the VL muscle size and jump performance (r=0.49-0.50, P<0.001), and non linear relationships between muscle size parameters and pennation angles (R²=0.67-0.77, P<0.001).

Conclusion. These results confirm that there are gender differences in the muscle architecture of people with a wide physical activity background. The gender differences found in the

VL muscle size partially explained the differences in jump performance.

Key words: Quadriceps muscle - Sex characteristics - Athletic performance.

Gender differences in absolute strength are well documented; however, when maximal strength is adjusted by body mass, the differences between men and women in the lower limb muscles tend to be lower, or even disappear. Thus, this suggests that other factors are also involved besides the anthropometric differences. Moreover, men produce force faster than women, showing a greater rate of force development during isometric actions and greater jump heights than their female counterparts. Part of these differences could be explained because men have greater muscle thickness and cross-sectional areas, higher relative amount of fast-twitch fibers, greater concentrations of anabolic hormones, and higher neural activity during muscle contractions.

Muscle architecture represents the geometrical