Lean Mass Asymmetry Influences Force and Power Asymmetry During Jumping in Collegiate Athletes
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Jumping is a combination of power, strength, and coordination and provides an estimate of muscle function. Deficiencies in lower extremity lean mass may reduce the ability to produce force and power during jumping, thus negatively influencing performance. Lean mass asymmetry may provide useful insight into force and power asymmetry during jumping and begin to clarify morphological versus neuromuscular contributions to performance. PURPOSE: The purpose of this investigation was to examine how asymmetry in lower extremity lean mass influenced force and power asymmetry during jumping. METHODS: 167 Division I athletes were tested after their competitive season in the spring of 2012. Peak force (kN) and power (kW) were assessed from each limb using bilateral force plates during a countermovement jump. Lean mass (g) of the pelvis, thigh, and shank was assessed via Dual-Energy X-Ray Absorptiometry. A limb symmetry index (LSI) was established using the following equation for each variable of interest: LSI = (right limb - left limb) / 0.5 (right limb + left limb) X 100. In this equation, zero indicates symmetry between limbs; a positive (+) value indicates that the right limb is greater; and a negative (-) value indicates the left limb is greater. Forward stepwise regressions were performed to determine the influence of lean mass LSI on force and power LSI. All statistical analyses were performed in R Statistical Software, with significance set a priori at P < 0.05. RESULTS: Lean mass LSI of the thigh (2.7 ± 6.7%) and shank (2.6 ± 3.3%) entered into the model and explained 20% of the variance in peak force LSI (1.2 ± 7.4%, R² = 0.20, P < 0.001). For peak power LSI (0.4 ± 5.8%), lean mass LSI of the pelvis (0.2 ± 5.6%), thigh and shank all contributed to the model, explaining 25% of the variance (R² = 0.25, P < 0.001). CONCLUSION: While lean mass asymmetry appears to be a significant contributing factor in force and power asymmetry, there still remains a large percentage of the variance unexplained. Other factors not assessed in this study most likely account for the remaining variance including neuromuscular control, muscular strength, and joint coordination. Future research should attempt to examine morphological and functional asymmetry and their influence on injury rates.