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Lean Mass Asymmetry Influences Force and Power Asymmetry During Jumping in Collegiate Athletes

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Abstract

The purpose of this investigation was to: (1) examine how asymmetry in lower extremity lean mass influenced force and power asymmetry during jumping, (2) determine how power and force asymmetry affected jump height, and (3) report normative values in collegiate athletes. Force and power were assessed from each limb using bilateral force plates during a countermovement jump in 167 Division 1 athletes (mass=85.7±20.3kg, age=20.0±1.2years, 103M/64F). Lean mass of the pelvis, thigh, and shank was assessed via dual-energy X-ray absorptiometry. Percent asymmetry was calculated for lean mass at each region (pelvis, thigh, and shank) as well as force and power. Forward stepwise regressions were performed to determine the influence of lean mass asymmetry on force and power asymmetry. Thigh and shank lean mass asymmetry explained 20% of the variance in force asymmetry (R^2=0.20, P<0.001), while lean mass asymmetry of the pelvis, thigh and shank explained 25% of the variance in power asymmetry (R^2=0.25, P<0.001). Jump height was compared across level of force and power asymmetry (P>0.05) and greater than 10% asymmetry in power tended to decrease performance (effect size>1.0). Ninety-five percent of this population (2.5th to 97.5th percentile) displayed force asymmetry between −11.8 to 16.8% and a power asymmetry between −9.9 to 11.5%. A small percentage (<4%) of these athletes displayed more than 15% asymmetry between limbs. These results demonstrate that lean mass asymmetry in the lower extremity is at least partially responsible for asymmetries in force and power. However, a large percentage remains unexplained by lean mass asymmetry.

Keywords

Imbalance; Vertical jump; bilateral; DXA; Body composition

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