Evaluation of Muscle Imbalances and the Presence of Upper- and Lower-Crossed Syndromes among Powerlifters

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Weight training for powerlifters (PLs) is centered on the three maximal lifts (i.e. bench press, squat, and deadlift); thus, PLs may overemphasize particular muscle groups and develop muscle imbalances, range of motion (ROM) deficits, or postural changes associated with upper-crossed syndrome (UCS) or lower-crossed syndrome (LCS). **PURPOSE**: Determine the presence of muscle imbalances, ROM limitations, and postural abnormalities among male PLs that may indicate the presence of UCS and/or LCS. **METHODS**: An ex post facto study design compared fifteen male PLs with age and weight matched controls (35±15 yo; 97±19 kg). Isometric strength testing was measured via handheld dynamometry to determine agonist/antagonist strength ratios. ROM was assessed using handheld goniometry and Apley's Scratch test. Postural assessments included pelvic tilt, pectoralis minor length, and spinal curvature via unilevel inclinometry. **RESULTS**: A significantly greater strength imbalance was observed among PLs for shoulder horizontal adduction/abduction strength ratio (2.6±0.6 vs 1.8±0.3; $p<0.01$) while PLs had a more balanced knee flexion/extension strength ratio (0.6±0.2 vs 0.5±0.1; $p=0.03$). Passive glenohumeral (GH) extension (10.5±11.2° vs 19.1±8.6°; $p=0.03$) and internal rotation (43.1±12.6° vs 52.9±13.6°; $p=0.05$) were also significantly decreased among PL's and related to the horizontal adduction/abduction strength ratio ($r=-0.44$; $p=0.05$ and $r=-0.56$; $p=0.02$, respectively) among PLs. The knee extension angle (KEA) of PLs was significantly less than that of the controls (20.2±7.5° vs 29.9±6.4°; $p<0.01$) and positively correlated with the knee flexion/extension strength ratio among PLs ($r=0.45$; $p=0.04$). No significant differences were observed between kyphotic (37.7±9.4° vs 39.1±10.9°; $p=0.72$) and lordotic curves (25.0±7.6° vs 23.0±8.4°; $p=0.50$). **CONCLUSION**: The muscle imbalance observed among PLs at the shoulder (horizontal adduction:abduction strength ratio) was related to decreased GH ROM. The PLs demonstrated greater hamstring flexibility and a larger hamstring:quadriceps strength ratio, however, a larger hamstring:quadriceps strength ratio was related to decreased hamstring flexibility among the PL group. Despite the observed muscle imbalances among PLs, there was no evidence of UCS or LCS.