

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

Stephen J. Gadomski, Paul T. Cutrufello, Nicholas A. Ratamess

The University of Scranton, Scranton, PA, The College of New Jersey, Ewing, NJ

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 ($10.5\pm 11.2^\circ$ vs $19.1\pm 8.6^\circ$; $p=0.03$) and internal rotation ($43.1\pm 12.6^\circ$ vs $52.9\pm 13.6^\circ$; $p=0.05$) 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 ($20.2\pm 7.5^\circ$ vs $29.9\pm 6.4^\circ$; $p<0.01$) 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 ($37.7\pm 9.4^\circ$ vs $39.1\pm 10.9^\circ$; $p=0.72$) and lordotic curves ($25.0\pm 7.6^\circ$ vs $23.0\pm 8.4^\circ$; $p=0.50$). **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.