

Relationships Between Lower Body Muscular Strength and Power After Downhill Running

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ABSTRACT

The purpose of this investigation was to assess relationships between maximal isometric lower body strength and three different measurements of maximal lower body neuromuscular power after a bout of eccentric lower body exercise. Forty-five recreationally active males performed 20 minutes of downhill running (7.5 mph, -10% grade). Isometric knee extensor strength (KE), maximal cycling power (P_{MAX}), vertical jump height (VJ), and 10-meter sprint time (10m) were assessed immediately prior to exercise (baseline) and repeated 2, 24, 48, 72, and 96 h after exercise. Data are reported as mean \pm SEM. There was a significant effect of time on all measurements throughout the 96 h period after exercise. Isometric KE strength was 129.0 \pm 3.3, 113.2 \pm 3.3, 115.8 \pm 3.3, 119.0 \pm 3.2, 118.1 \pm 3.3 and 119.7 \pm 3.4 kg at baseline, 2, 24, 48, 72, and 96 h post-exercise, respectively. P_{MAX} was 1086 \pm 31, 1014 \pm 28, 1024 \pm 32, 1042 \pm 31, 1042 \pm 30, and 1044 \pm 31 watts at baseline, 2, 24, 48, 72, and 96-hours post-exercise, respectively. VJ was 50.2 \pm 1.2, 48.7 \pm 1.2, 49.1 \pm 1.3, 49.7 \pm 1.3, 50.6 \pm 1.3, and 50.5 \pm 1.3 cm at baseline, 2, 24, 48, 72, and 96-hours post-exercise, respectively. 10m sprint time was 1.76 \pm 0.02, 1.80 \pm 0.03, 1.80 \pm 0.02, 1.79 \pm 0.02, 1.77 \pm 0.02, and 1.77 \pm 0.02 sec at baseline, 2, 24, 48, 72, and 96-hours post-exercise, respectively. There were significant relationships between isometric KE strength and both P_{MAX} ($R^2=0.31$, $p<0.05$) and VJ height ($R^2=0.11$, $p<0.05$). Additionally, there was a significant relationship between isometric KE strength and P_{max} at each time point ($R^2=0.23-0.34$, $p<0.05$). This was not true for VJ height or 10m sprint time. No relationship was present between isometric KE strength and 10m sprint time ($R^2=0.01$). The primary finding of this study was a significant relationship between isometric KE strength and P_{MAX} and that this relationship was maintained at each time point after eccentric exercise. Therefore, we conclude that P_{MAX} is a reliable method to assess decrements in neuromuscular power and athletic performance after a bout of muscle damaging eccentric exercise.

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