

Acute hormonal and neuromuscular responses to hypertrophy, strength and power type resistance exercise

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Abstract The purpose of the current study was to determine the acute neuroendocrine response to hypertrophy (H), strength (S), and power (P) type resistance exercise (RE) equated for total volume. Ten male subjects completed three RE protocols and a rest day (R) using a randomized cross-over design. The protocols included (1) H: 4 sets of 10 repetitions in the squat at 75% of 1RM (90 s rest periods); (2) S: 11 sets of three repetitions at 90% of 1RM (5 min rest periods); and (3) P: 8 sets of 6 repetitions of jump squats at 0% of 1RM (3 min rest periods). Total testosterone (T), cortisol (C), and sex hormone binding globulin (SHBG) were determined prior to (PRE), immediately post (IP), 60 min post, 24 h post, and 48 h post exercise bout. Peak force, rate of force development, and muscle activity from the vastus medialis (VM) and biceps femoris (BF) were determined during a maximal isometric squat test. A unique pattern of response was observed in T, C, and SHBG for each RE protocol. The percent change in T, C, and SHBG from PRE to IP was significantly ($p \leq 0.05$) greater in comparison to the R condition only after the H protocol. The percent of baseline muscle activity of the VM at IP was significantly greater following the H compared to the S protocol. These data indicate that significant acute increases in hormone concentrations are limited to H type protocols independent of the volume of work completed. In addition, it appears the H protocol also elicits a unique pattern of muscle activity as well. RE protocols of varying intensity and rest periods elicit strikingly different acute

neuroendocrine responses which indicate a unique physiological stimulus.

Keywords Testosterone · Cortisol · Force

Introduction

The acute responses of both the endocrine and nervous system to hypertrophy (H), strength (S), and power (P) type resistance exercise (RE) have not been defined within a single investigation. Much research has been conducted on H type RE protocols which incorporate large muscle group (lower body) at intensities of 70–80% of one repetition maximum (1RM), volumes of three sets of 10–12 repetitions, and rest periods of short duration (60–90 s) (Crewther et al. 2006; Kraemer et al. 1990). However, there is a paucity of research regarding the acute neuroendocrine response to strength type RE, which has included higher intensities (85–90% 1RM), lower volumes (3–5 sets of 3–5 repetitions) and extended rest periods (3–5 min) (Crewther et al. 2006; Kraemer et al. 1995; Willardson and Burkett 2006b). Additionally, little research has investigated the acute neuroendocrine response to power type RE, which has included high velocity total body movements (jump squats) with lower intensity (0–30% 1RM) and significant volumes (3–5 sets of 6 repetitions) and moderate rest periods (3 min) (Cormie et al. 2007; Linnamo et al. 2005).

H type RE has been observed to elicit acute increases in testosterone (T), cortisol (C), sex hormone binding globulin (SHBG), and lactate (La) (Kraemer et al. 1990; Kraemer et al. 2002; Kraemer and Ratamess 2005; Linnamo et al. 2005; McCall et al. 1999). Previous literature has advocated RE of increased volume and relatively short rest periods to elicit an acute hormone response and possibly

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