

Relationship between Muscular Performance Changes and Increases in Body Mass During Overfeeding Plus Resistance Training

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ABSTRACT

Two critical components of muscular performance are muscular strength (e.g., the maximal load that can be lifted for a given exercise) and muscular endurance (e.g., the maximal number of repetitions that can be performed at a given load). When seeking improvements in muscular performance, it is common to employ nutritional strategies that create an energy surplus and a resultant gain in body mass. Varying rates of body mass gain are often prescribed to optimize training adaptations, including improvements in muscular performance; however, the relationship between rate of body mass gain and muscular performance improvements, if any, is not entirely clear. **PURPOSE:** The purpose of this analysis was to elucidate if there is a relationship between the rate of body mass gain and changes in muscular performance resulting from a resistance training program. **METHODS:** Nineteen resistance-trained males (age: 21.7 ± 2.6 ; body mass [BM]: 74.1 ± 11.5 kg; body fat percentage: $13.7 \pm 5.2\%$; bench press maximal strength: $1.3 \pm 0.2 \times \text{BM}$; leg press maximal strength: $3.4 \pm 0.9 \times \text{BM}$) completed a supervised resistance training program plus overfeeding. Muscular performance testing took place at baseline and after the 6-week intervention. For the bench press and leg press exercises, strength was assessed via 1-repetition maximum (1RM), and endurance was assessed via repetitions to failure using 70% of the baseline 1RM. Simple linear regression analysis was used to determine if the relative rate of BM gain was related to relative improvements in maximal muscular strength and endurance. Standardized regression coefficients (β) and associated 95% confidence intervals (CI) were generated. **RESULTS:** The rate of BM gain was related to improvements in bench press 1RM ($p=0.05$; $\beta=0.46$ [0.02, 0.89], mean [95% CI]) and endurance ($p=0.007$, $\beta=0.61$ [0.23, 1.00]), but not leg press 1RM ($p=0.16$, $\beta=0.33$ [-0.11, 0.78]) or endurance ($p=0.76$, $\beta=0.08$ [-0.42, 0.58]). A 1.0% increase in the relative rate of BM gain corresponded to relative increases of 1.2% (CI of 0.1 to 2.4%) in bench press 1RM and 6.7% (CI of 2.5 to 10.9%) in bench press repetitions to failure. **CONCLUSION:** The relative rate of body mass gain was positively related to performance improvements in the bench press exercise, but not the leg press exercise. One speculative explanation for this relationship is that the increase in upper body muscularity that results from body mass gain during resistance training could have decreased the range of motion on the bench press exercise, thereby facilitating easier execution of the movement for both strength and endurance tests.