

## **Muscle Wins Again: Examining the Relationship Between Maximal Strength and Body Composition Metrics**

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### **ABSTRACT**

Maximal strength is the greatest force a muscle group can produce during a single maximal effort. Strength is a key determinant of both athletic performance and functional capacity, and understanding its relationship with body composition offers valuable insights for optimizing overall health and physical performance. **PURPOSE:** The purpose of this study was to assess the relationships between maximal strength and various body composition measurements, with the objective of determining whether fat-related or muscle-related metrics are stronger predictors of strength outcomes. **METHODS:** Per the available subject pool, trained biological males ( $n=20$ ;  $21.6\pm 1.9$  yrs;  $175.2\pm 5.5$  cm;  $80.3\pm 9.5$  kg; Dots:  $268.7\pm 39.2$  au) participated in a BodPod analysis to assess body fat percentage (BF%), fat mass (FM), and fat-free mass (FFM). Body mass index (BMI), Fat-mass index (FMI), Fat-free mass index (FFMI), lean body mass (LBM), skeletal muscle estimation (SME), and skeletal muscle quality (SMQ) were computed using basic physiological computations. Maximal strength was assessed through 1-repetition-maximum back squat, bench press, and deadlift, then summed together for a maximal strength total (TOT). Pearson correlations and Hopkins effect size were used to evaluate relationships between TOT maximal strength and body composition metrics. Alpha level was set at  $p\leq 0.05$ . **RESULTS:** Significant muscle-related variables demonstrated very large to moderate relationships against TOT, including SMQ (ES=0.880,  $p<0.001$ ), FFM (ES=0.61,  $p=0.004$ ), LBM (ES=0.57,  $p=0.009$ ), and SME (ES=0.57,  $p=0.008$ ). Significant very large and moderate relationships were also observed for indexed variables FFMI (ES=0.85,  $p<0.001$ ) and BMI (ES=0.51,  $p=0.024$ ), but not for FMI (ES=0.18,  $p=0.441$ ). No meaningful relationships were found for fat-related variables FM (ES=0.18,  $p=0.440$ ) and BF% (ES=0.06,  $p=0.792$ ). **CONCLUSION:** These findings show that muscle-related metrics, such as SMQ and FFMI, are stronger predictors of strength outcomes when considering body composition variables in males. Incorporating SMQ and FFMI into health assessments offers a free non-invasive way to evaluate functional strength, metabolic health, aging, and disease risk, supporting early detection and intervention.