Whole-Body Fat-Free Mass Correlates Strongly with Strength in Female Weightlifters, Not Segmental or Fat Mass

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BACKGROUND

- Strength performance in resistance training is influenced by various physiological factors, including neuromuscular adaptations and body composition.
- Fat-free mass has been shown to contribute to force production, but limited research has examined the relationship between total and segmental body composition and maximal strength in female weightlifters.
- The purpose of this study was to determine the relationship between total and segmental body composition parameters and 1RM of the deadlift and bench press in female weightlifters.

METHODS

- Twenty-four female weightlifters (age = 24.9 ± 5.4 years, height = 163.8 ± 6.4 cm, weight = 66.3 ± 7.4 kg) participated in the study.
- Dual energy X-ray absorptiometry (DXA) was used to obtain the following body composition parameters: total body fat-free mass (FFM_{TOTAL}), total body fat mass (FM_{TOTAL}), fat-free mass of the arms (FFM_{ARMS}), fat-mass of the arms (FM_{ARMS}), fat-free mass of the legs (FFM_{LEGS}), and fat mass of the legs (FM_{LEGS}).
- Each participant performed 1RM tests for the supine bench press and deadlift across on the same day, separated by 10 min, following standardized warm-up procedures. Proper technique was verified by a Certified Strength and Conditioning Specialist.

KEY FINDINGS

Deadlift 1RM was strongly linked to fat-free mass in the total body, arms, as well as legs, but not to fat mass in any region.

Bench press strength was significantly related to lean mass in the total body, arms, legs, and leg fat, but not to total or arm fat mass.

- FFM_{TOTAL} is strongly correlated with both lifts ($r \approx 0.70$).
- Strength and conditioning professionals should prioritize training strategies that promote increases in fat-free mass to enhance maximal strength performance in female weightlifters.
- Assessing body composition, particularly fat-free mass, may help guide training programs to optimize strength development.

RESULTS

TABLE 1. MEANS AND STANDARD DEVIATIONS OF THE STUDIED VARIABLES, AS WELL AS THE CORRELATION COEFFICIENTS.

		Correlation coefficients (r), p values	
Variable	M ± SD (kg)	BP 1RM	DL 1RM
FFM_{TOTAL}	44.6 ± 4.7	**0.71, p < 0.001**	**r = 0.70, p < 0.001**
FFM_{LEGS}	15.3 ± 2.2	**r = 0.41, p = 0.04**	**r = 0.64, p < 0.001**
FFM_{ARMS}	5.0 ± 1.0	**r = 0.62, p = 0.001**	**r = 0.67, p < 0.001**
FM_{TOTAL}	20.5 ± 4.4	r = 0.38, p = 0.07	r = 0.37, p = 0.08
FM_{LEGS}	10.0 ± 3.9	**r = 0.43, p = 0.04**	r = 0.34, p = 0.11
FM_{ARMS}	2.7 ± 2.0	r = 0.12, p = 0.59	r = -0.12, p = 0.57
BP 1RM	53.8 ± 14.4	-	-
DL 1RM	103.5 ± 27.9	-	-

FFM_{TOTAL} = total fat-free mass, FFM_{LEGS} = fat-free mass of the legs, FFM_{ARMS} = fat-free mass of the arms, FM_{TOTAL} = total fat mass, FM_{LEGS} = fat mass of the legs, FM_{ARMS} = fat mass of the arms, BP 1RM = supine bench press 1-rep maximum, DL 1RM = deadlift 1-rep maximum.

FIGURE 1. REGRESSION ANALYSIS SHOWING THE STRONG ASSOCIATION BETWEEN TOTAL FAT-FREE MASS AND 1RM VALUES FOR THE SUPINE BENCH PRESS AND DEADLIFT.