

Introduction

The Army Combat Fitness Test (ACFT) assesses active-duty army personnel and Reserve Officers' Training Corps (ROTC) cadets' physical readiness across six events: three-rep maximum deadlift (MDL), standing power throw (SPT), hand-release push-up (HRP), sprint-drag-carry (SDC), plank hold (PLK), and two-mile run (2MR). Performance on the ACFT is influenced by muscular strength, power and aerobic endurance, all of which contribute to combat readiness. While fat-free mass (FFM) has been shown to enhance various physical fitness metrics, its role in ACFT performance remains unclear. Given the variability in training methodologies across military units understanding the relationship between FFM and ACFT performance may provide insight into training strategies for strength and conditioning specialists to optimize ACFT performance.

Purpose

To examine the relationships between FFM, ACFT performance, and metrics of explosive performance in ROTC cadets.

Methods

- 179 ROTC cadets (134 male, 45 female)
- Age: 21.0 ± 4.2 yrs; Mass: 74.4 ± 14.1 kg; BF%: 20.9 ± 7.6
- Body composition via bioelectrical impedance (FFM calculated)
- Fat-free mass (FFM) calculated using the formula: $FFM = \text{body mass} \times (1 - BF\%)$.
- Peak power & force testing using countermovement jump on force plate
- ACFT completed within 48–72 hours of physical testing
- Pearson's correlation coefficient (r) assessed the relationship between FFM, ACFT performance, and fitness measures. Hopkins scale was used to qualify the correlations (trivial: 0–0.1; small: 0.1–0.3; moderate: 0.3–0.5; large: 0.5–0.7; very large: 0.7–0.9; near perfect >0.9).

Key Findings

- 1. Fat-free mass (FFM) was significantly associated with ACFT performance, particularly in strength and power-based events.**
- 2. Large positive correlations observed for MDL ($r = 0.75$) and peak power ($r = 0.74$).**
- 3. Results suggest hypertrophy-focused training may enhance combat readiness by improving ACFT outcomes.**

Figure 1: Correlations between FFM, ACFT performance and explosive performance metrics

Correlation Matrix	FFM	SPT	SDC	Plank	2MR	MDL	HRP	Con PF
FFM	—							
SPT (m)	0.761***	—						
SDC (s)	-0.700***	-0.807***	—					
Plank (s)	0.054	0.283***	-0.346***	—				
2MR (s)	-0.154*	-0.228**	0.387***	-0.278***	—			
MDL (kg)	0.754***	0.820***	-0.777***	0.322***	-0.258***	—		
HRP (reps)	0.284***	0.537***	-0.605***	0.539***	-0.327***	0.587***	—	
Con PF (N)	0.172*	0.209**	-0.186*	0.063	0.006	0.159*	0.217**	—
PeakPower (W)	0.741***	0.811***	-0.688***	0.300**	-0.009	0.741***	0.492***	0.802***

Notes: Correlations statistical significance: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Correlations strength were classified as: trivial: 0–0.1; small: 0.1–0.3; moderate: 0.3–0.5; large: 0.5–0.7; very large: 0.7–0.9; near perfect >0.9. Dark grey represents very large correlations, and light grey represents large correlations. Abbreviations: FFM: Fat free mass, ACFT: Army Combat Fitness Test total score, MDL: Maximum Repetition Deadlift, SPT: Standing Power Throw, HRP: Hand Release Pushup, SDC: Spring-Drag-Carry, PLK: Plank, 2MR: Two Mile Run, Con PF: Concentric Peak Force.

Results

- FFM significantly correlated with most ACFT and fitness metrics
- Strong, positive correlations: MDL and FFM ($r = 0.75$, $p < 0.001$) and Peak power ($r = 0.74$, $p < 0.001$)
- Strong, negative correlation: FFM and SDC ($r = -0.70$, $p < 0.001$)
- Smaller, but significant correlations: FFM and HRP ($r = 0.28$, $p < 0.001$) and 2MR ($r = -0.15$, $p = 0.040$) and Concentric peak force ($r = 0.17$, $p = 0.028$)
- No correlation with FFM and PLK ($r = 0.05$, $p = 0.476$)

Conclusion

- Results indicate that FFM positively influences performance in most ACFT events and fitness metrics, particularly power-based tasks such as the SPT and peak power.
- The strong correlations with MDL performance and SDC time suggest FFM contributes to both strength and anaerobic capacity.

Practical Applications

Increasing FFM may enhance performance in strength and power-based tasks within the ACFT. Hypertrophy programs could be beneficial for US Army ROTC cadets. Although the sample was comprised of ROTC cadets, these insights could help strength and conditioning professionals optimize training programs to support combat readiness and occupational performance in military settings.