

# ASSOCIATIONS BETWEEN BODY FAT PERCENTAGE, SKELETAL MUSCLE MASS AND MEASURES OF MUSCULAR POWER, STRENGTH AND ENDURANCE AMONG FIRST RESPONDERS



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## Introduction

- First responders require a high level of muscular fitness due to the physically demanding nature of their jobs (2,3).
- Body composition has been shown to potentially impact one's overall level of muscular fitness, which may impact occupational performance (2,4).
  - High performing first responders have been shown to be more fit in measures of dynamic fitness compared to low performers on occupationally-specific physical ability tests (2).

## Purpose

The purpose of this study was to determine if significant relationships exist between body composition measures of muscular fitness.

## Methods

- Anthropometric and physical fitness data were collected from 36 male first responders in a single testing session.
  - Police Officers: n=27; Firefighters: n=10
  - Age = 35 ± 8 years; Body mass = 96.9 ± 16.4 kg; BF% = 25.2 ± 8.1
- Height was collected with a portable stadiometer. Total body mass, estimated skeletal muscle mass (sKM), and body fat percentage (BF%) were collected using bioelectrical impedance (via InBody270).
- Muscular fitness tests included standing long jump (SLJ), grip strength (GS), isometric mid-thigh pull (IMTP), 60-second sit-ups (SU), and 60-second push-ups (PU).
- A Pearson correlation analysis was conducted to examine relationships between anthropometric variables and muscular fitness.

**BF% was negatively correlated to standing long jump, sit-up, and push-up performance.**

Variable	1	2	3	4	5	6	7
1. Skeletal Muscle Mass (sKM) (kg)	-						
2. Body Fat (BF%)	.07	-					
3. Grip Strength (GS) (kg)	.43	-.13	-				
4. Standing Long Jump (SLJ)(in.)	-.00	-.52*	.32	-			
5. Isometric Mid-Thigh Pull (IMTP) (kg)	.22	-.34	.15	.46	-		
6. Sit-ups (SU) (reps)	.11	-.65*	.20	.33	.51*	-	
7. Push-ups (PU) (reps)	.02	-.51*	.24	.33	.25	.49*	-

Table 1: Relationships between Body Composition and Muscular Fitness.

Note:  $p \leq 0.05$



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**Acknowledgements:** This research was supported by a grant from the National Strength and Conditioning Association (NSCA) Foundation. The opinions expressed in this work are those of the authors and do not necessarily reflect the views of the NSCA Foundation

## Results

- Moderate negative correlations were observed between estimated BF% was associated with the following muscular fitness variables:
  - SLJ ( $r = -0.52; p \leq 0.05$ )
  - SU ( $r = -0.65; p \leq 0.05$ )
  - PU ( $r = -0.51; p \leq 0.05$ )
- sKM was not correlated to any measured variables related to muscular fitness (Table 1).

## Conclusion

- These data demonstrate that higher BF% is associated with lower muscular fitness variables.
- This suggests that excess BF% may negatively impact performance in muscular power and endurance measures.

## Practical Applications

- **First responders should focus on training strategies that emphasize attaining and maintaining a healthy BF%.**
- **Healthy BF% for males ranges from 10-20%, while females should range from 16-26% (1).**
- **This approach may enhance key performance indicators critical to operational performance (2,3).**

## References

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