

BACKGROUND

- The prevalence of obesity in the fire service is as high as the general population¹
- A common comorbidity of obesity includes hormonal dysfunction²
- Career firefighters rely on their aerobic capacity to perform their critical and essential occupational tasks³
- There is an inverse relationship between body mass and testosterone levels²
 - There are no previous reports which quantify the association between testosterone and directly assessed aerobic capacity while accounting for BMI

PURPOSE: The purpose of this study was to determine the relationship between testosterone and VO_{2PEAK} in career firefighters.

METHOD

PARTICIPANTS

- Data from 1151 career firefighters (age = 39 ± 9 years, BF% = $30.2 \pm 1.5\%$) were examined from an annual routine health screening
- Firefighters were from fire departments across the United States

BODY COMPOSITION

- Body composition was assessed through a multi-frequency bioelectrical impedance analysis (MF-BIA) device (InBody 570, InBody USA, Cerritos, CA, USA)

CARDIOPULMONARY EXERCISE TESTING

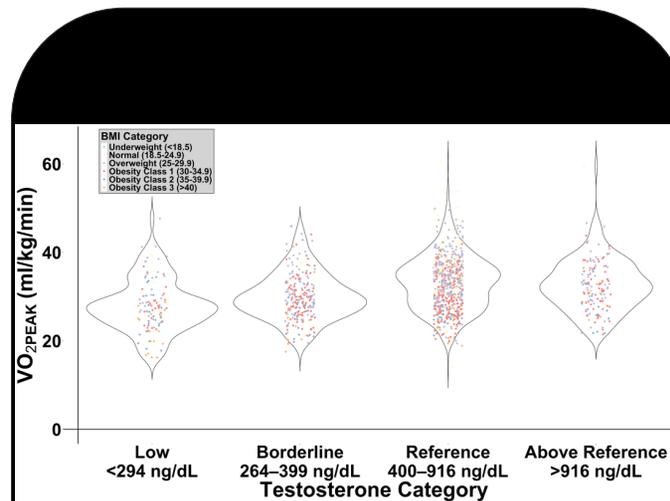
- Participants performed grades testing exercise on a cycle ergometer to determine maximal oxygen consumption (VO_{2PEAK})

SERUM TESTOSTERONE

- In the morning, following a 9-hour fast, participants visited a local lab in order to acquire blood samples via venipuncture
- Testosterone levels were categorized as low (<264 ng/dL), borderline (264-399 ng/dL), reference (400 – 916 ng/dL), and above reference range (>916 ng/dL)³

STATISTICAL ANALYSIS

- Linear mixed effect models were employed to predict VO_{2PEAK}
 - Fixed effects included testosterone categories and BMI categories
 - Random effects included random intercepts for subjects nested within fire department locations
- All data were analyzed using R



Low testosterone is associated with reduced VO_{2PEAK} in career firefighters

RESULTS

BMI and Testosterone Categories	β -Value	p-value
Normal	4.24 ml/kg/min	0.42
Overweight	1.85 ml/kg/min	0.72
Obese Class 1	-2.00 ml/kg/min	0.70
Obese Class 2	-4.91 ml/kg/min	0.35
Obese Class 3	-8.21 ml/kg/min	0.12
Borderline	0.51 ml/kg/min	0.41
Reference Range	2.30 ml/kg/min	<0.0001
Above Reference Range	2.63 ml/kg/min	0.001

Table 1. Outcomes of a linear mixed-effect model on the effect of testosterone on aerobic capacity while adjusting for BMI. Underweight and low testosterone categories are used as reference.

CONCLUSIONS

- Firefighters within the borderline or lower testosterone categories have lower VO_{2PEAK} than those within the reference and above reference range, after adjusting for BMI
- Firefighters within and above the reference range for testosterone displayed significantly higher aerobic capacity than those within the low and borderline categories
- Interestingly, BMI did not have a significant effect on VO_{2PEAK} in career firefighters.

PRACTICAL APPLICATION

- Tactical Strength and Conditioning Facilitators who work with the fire service should monitor testosterone levels in order to support higher aerobic capacity.

REFERENCES

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