

# Assessing Differences in Health and Physical Capabilities Between Firefighter Recruits and Incumbents Across Ranks

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## BACKGROUND

- The fire service is a physically demanding occupation
- Typically composed of a variety of ranks, which are loosely aligned with tenure
  - For example: Recruit, Firefighter, Lieutenant, Captain, Battalion Chief
- Pre-employment physical standards are in place to guide new-hires
  - Recent NFPA 1582 standards have declined in rigor
  - Standards across ranks of service may not remain high relative to new cadets
- Unfortunately, the health and physical capabilities of firefighters across ranks has yet to be assessed

**PURPOSE:** The purpose of this investigation was to determine differences in characteristics of health and physical ability between cadets, firefighters, and officers within the fire service.

## PRACTICAL APPLICATIONS

Senior ranking fire officers displayed worse health metrics than firefighters or recruits



Fire administrators may consider different departmental standards to increase health for fire officers

## METHODS

### Retrospective Data

- Recruits:** n = 37; age, 29 ± 5 yrs; 5 females
- Firefighters:** n = 82; age, 30 ± 7 yrs; 5 females
- Officers:** n = 41; age, 41 ± 6 yrs; 1 female
  - Engineer, Lieutenant, Captain, Battalion Chief

### Body Composition

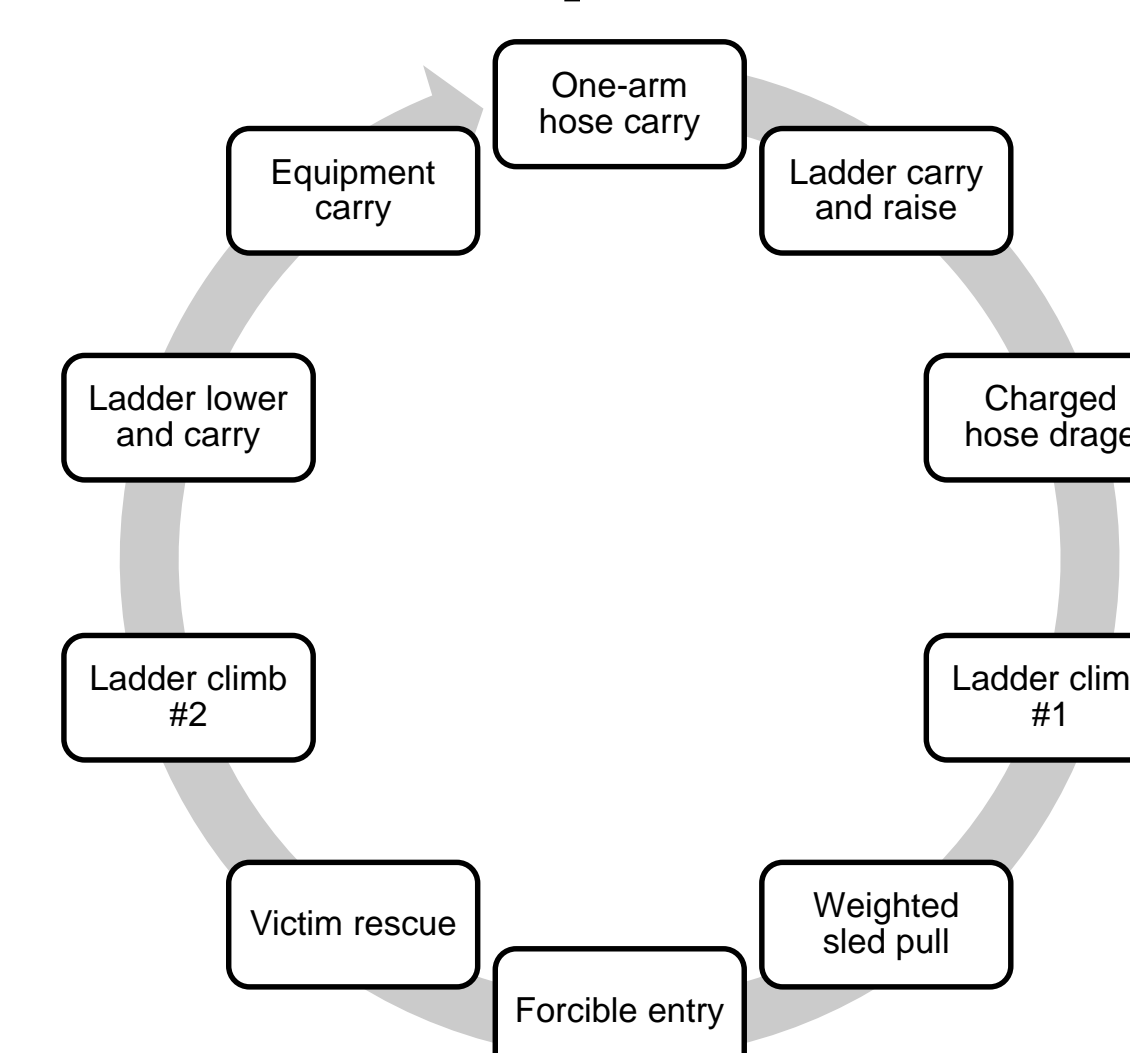
- Body fat % (%BF)
- 3 hour fast



### Cardiopulmonary Exercise Testing



### Air Consumption Test (ACT)



### Statistical Analysis

- Five one-way ANOVAs
  - Partial eta squared ( $\eta^2$ ) effect size measures
  - In the event of a significant main effect, Bonferroni-corrected post-hoc analyses were utilized
  - Data are presented as mean ± SD

## RESULTS

	F	p	$\eta^2$
BMI (kg/m <sup>2</sup> )	4.6	0.01*	0.06
%BF (%)	10.7	0.01*	0.12
VO <sub>2</sub> MAX (ml/kg/min)	14.1	0.01*	0.15
HR <sub>MAX</sub> (BPM)	4.3	0.02*	0.05
ACT Time (minutes)	0.8	0.44	0.01

*Table 1.* Outcomes of the 5, one-way ANOVAs examining the effect of rank on each dependent variable. \*indicates  $p < 0.05$ .

	Recruits	Firefighters	Officers
BMI (kg/m <sup>2</sup> )	26.5 ± 2.3*	28.8 ± 4.4	28.6 ± 4.3
%BF (%)	17.5 ± 4.9*	24.1 ± 8.5	23.9 ± 7.3
VO <sub>2</sub> MAX (ml/kg/min)	40.4 ± 4.6*	34.5 ± 6.4	34.2 ± 6.5
HR <sub>MAX</sub> (BPM)	181.0 ± 9.3*	177.0 ± 11.3	174.0 ± 10.9
ACT Time (minutes)	6.9 ± 0.8	7.1 ± 0.7	7.1 ± 0.7

*Table 2.* Main effects from the aforementioned one-way ANOVAs across rank. \*indicates a  $p < 0.05$  main effect for firefighter rank with Bonferroni adjustment.

## CONCLUSION

The current study suggests differences in anthropometric and physiological metrics across ranks of firefighters. **Recruits demonstrated better aerobic capacity and body composition than their more senior counterparts.** Interestingly, occupational performance did not differ across ranks. These outcomes suggests that while more senior workers may be able to perform their physical duties in a similar capacity, their **health and chronic disease risk may significantly differ.**