



**PURPOSE:** Some firefighting departments are composed of professional firefighters (career firefighters) while some smaller towns cannot fully fund a professional firefighting department and rely on their citizens to volunteer their time and put their lives at risk to perform fire suppression and other related firefighting tasks when those events arise. The purpose of this study was to assess the potential similarities and differences in health and physical fitness profile between career firefighters and volunteer firefighters.

**METHODS:** The research protocol consisted of a health and physical fitness assessment testing the 5 components of health-related fitness (body composition, cardiovascular fitness, muscular strength, muscular endurance, and flexibility) using previously published and accepted protocols. The participant population consisted of career firefighters (CFF) who were all members of the Bowling Green Fire Department in Bowling Green, KY and voluntary firefighters (VFF) were all members of the Warren County Fire Department (Warren County, KY). The total sample size consisted of 139 firefighters comprised of 120 CFF and 19 VF.

**RESULTS:** An independent *t*-test showed evidence of CFF having a significantly higher value/score for the following variables: height ( $p = 0.034$ ),  $VO_2$  max ( $p = 0.006$ ), push-ups completed ( $p = 0.023$ ), and plank time ( $p < 0.0005$ ). VFF had a significantly higher value for the following variables: fat mass ( $p = 0.002$ ), body fat percentage ( $p < 0.0005$ ), and absolute grip strength ( $p = 0.029$ ). There were not shown to be any significant differences between groups for the following variables: age ( $p = 0.299$ ), body mass ( $p = 0.161$ ), fat-free mass ( $p = 0.292$ ), body mass index ( $p = 0.056$ ), flexibility ( $p = 0.097$ ), or relative grip strength ( $p = 0.934$ ).

**CONCLUSIONS:** In regards to the physical fitness testing of the current sample, the VFF had a significantly worse health and fitness profile across a number of variables compared to the CFF. Despite the financial and commitment status of volunteer firefighting departments, they perform an equally dangerous and important job as firefighters of professional/career firefighting departments and more attention should be directed at developing the fitness and performance of these firefighters as well.

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### Handgrip Strength Levels in Male and Female Brazilian Military Firefighters

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Low handgrip muscular strength (HMS) is associated with increased morbi-mortality. HMS has been shown to predict some firefighters' job-related task performance. However, little is known about firefighters HMS descriptive values and there is no specific fitness categories for grip strength for firefighters.

**PURPOSE:** To describe HMS in Brazilian military firefighters in association with gender and job experience.

**METHODS:** We evaluated 290 firefighters (70% men) with mean age of 28.9±6.4 yrs. HMS was measured using a calibrated handgrip dynamometer (SaehanCorp, Korea). Volunteers performed to maximally maximal contractions with each hand, holding the dynamometer in line with the forearm in the upright position (ACSM 10<sup>th</sup> ed guideline). Final score was the sum of the highest values on each hand and categorized by ACSM guideline. Fair or poor HMS were classified as suboptimal, all other categories (excellent, very good and good) were classified as good strength. Data are presented as median (min-max) values due to nonparametric distribution (Kolmogorov-Smirnov test). Chi-square (of Fisher) test was used to compare classification. Job experience was classified as rookie (those who have just finished training academy) and as veteran. Mann-Whitney test was used for comparisons.

**RESULTS:** Absolute HMS was higher in men as compared to women: 100 (61-156) vs 64 (45-97) kg/f ( $p=0.05$ ). However, the proportion of volunteers in each category was similar among genders ( $p=0.26$ ). Proportions of HMS categories are shown on Table 1.

**CONCLUSION:** This cross-sectional study showed that about 25% of volunteers showed suboptimal HMS and that male veterans had higher strength than rookies. Data support the recommendation for upper limbs strength training among firefighters, mainly among those joining the corporation.

Table 1: Handgrip strength classification among male and female firefighters by job experience

Sex	Strength Classification	Rookie	Veteran	p value*
Male	Good	101 (63.1%)	35 (83.3%)	0.01
	Suboptimal	59 (36.9%)	7 (16.7%)	
Female	Good	58 (73.4%)	7 (77.8%)	1.00
	Suboptimal	21 (26.6%)	2 (22.2%)	

\*: Chi-square or Fisher test

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### Total Energy Intake and Self-selected Macronutrient Distribution During Wildland Fire Suppression

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Wildland firefighters (WLFF) are required to work long hours in extreme environments resulting in high daily rates of total energy expenditure (TEE) (Ruby, 2002; Cuddy, 2015). Increasing the number of eating episodes throughout the workshift and/or providing rations that better promote convenient nutrient delivery (Cuddy, 2007; Montain, 2008) has been shown to augment self-selected work output on the fireline. Regular consumption of supplemental carbohydrate (CHO) has also demonstrated enhanced work output, particularly during the shifts' latter hours (Cuddy, 2007). However, it remains unclear how current feeding strategies of WLFF compare to more frequent nutrient delivery.

**PURPOSE:** The aim of the current study was to determine the self-selected field total energy intake (TEI), composition and patterns of WLFF feeding during wildland fire suppression shifts.

**METHODS:** 86 WLFF (16 female, 70 male; 27.5±6.4 yrs) were deployed to 12 different wildland fire assignments across six regions of the US during the 2018 fire season. Pre- and post-shift food inventories were collected at WLFF basecamp and provided item-specific nutrient content (calories [kcal], CHO, fat, protein). Workshift nutrient consumption (TEI, feeding frequency [total number of and interval between feeding episodes], feeding episodic composition) was monitored in real-time by field researchers on the fireline via observational data capture in mobile tablets.

**RESULTS:** Workshift length averaged 14.0±1.2 hr, with a TEI of 1523±639 kcal (51±10, 37±9, 14±5 % for CHO, fat, and protein, respectively). The total number of eating episodes was 4.3±1.7 with an average interval of 117±76 min. Eating episodes averaged 346±311 kcal and included 44±38 g CHO. Using similar intake metrics, TEI was 893±353 and 1356±560 kcal for breakfast and dinner, respectively.

**CONCLUSION:** The present workshift TEI approximates 34% of the TEE compared to our prior doubly labeled water studies (Ruby, 2002; Cuddy 2015). These data also demonstrate that WLFF consumption patterns using current rations may not deliver adequate nutrients for the occupational demands of WLFF. Future work should elucidate the impact of workshift provisions on overall patterns of self-selected work output.

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