Breathing Deep:
Lung Health and Aerobic Capacity in Career Firefighters

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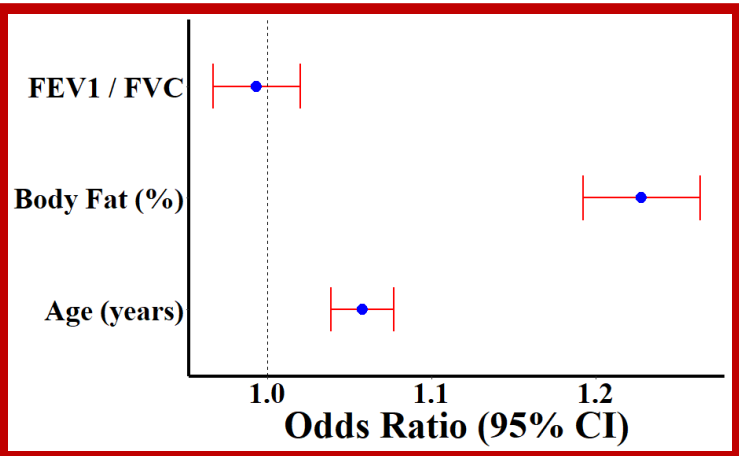
BACKGROUND

- Firefighters require optimal aerobic capacity to perform their critical and essential occupational tasks
  - The average firefighter is middle aged and display higher amounts of body fat relative to the general population
- Pulmonary function testing is used to assess lung capacity, and is a popular metric of lung health
- While pulmonary function is known to decline with age, its influence on occupational performance is unknown

PURPOSE: The purpose of this study was to examine the influence of pulmonary function (i.e., forced expiratory volume at one second [FEV1], forced vital capacity [FVC]) on aerobic capacity (i.e., VO_{2max}) in career firefighters, after adjusting for body fat percentage (BF%) and age.

SUMMARY



After adjusting for BF% and age,
pulmonary function did not influence the odds of having optimal aerobic capacity

METHODS

Retrospective Data
- Retrospective data was analyzed for 1302 career firefighters (females = 51;4%)
  - Age = 39 ± 10 yrs
  - Height = 170.0 ± 7.2 cm
  - Body mass = 94.1 ± 15.4 kg
  - BMI = 29.4 ± 4.3 kg/m^2

Design
- Data were collected during one testing session
- Body composition and pulmonary function assessed as a part of their annual departmental physical
- Multi-frequency bioelectric impedance analysis was used to estimate BF%
- Participants FEV1 and FVC assessed via pulmonary function testing
  - FEV1 was normalized to FVC (FEV1/FVC)

Cardiopulmonary Exercise Testing
- Participants performed graded exercise testing on a cycle ergometer to determine maximal oxygen consumption (VO_{2max})
- To calculate relative VO_{2max}, the absolute VO_{2max} was divided by body mass (kg)
- Aerobic capacity was dummy coded as:
  - "optimal = 0" if it was above 38 mL/kg/min and
  - "suboptimal = 1" if it was below 38 mL/kg/min

Statistical Analysis
- A logistic regression model was built to predict suboptimal aerobic capacity using FEV1/FVC, body fat percentage (BF%), and age as predictor variables
- Odds ratio (OR) with 95% confidence intervals (CI) excluding 1.00 were deemed significant

RESULTS

- 297 (29.5%) out of the 1005 firefighters were found to have optimal aerobic capacity
- FEV1/FVC did not influence the odds of having suboptimal aerobic capacity
- One-unit increases in BF% and age were associated with increased odds of having suboptimal aerobic capacity

	Odds Ratio	95% CI	
BF%	1.23	1.20 - 1.26	*
Age	1.06	1.04 - 1.08	*
FEV1/FEVC	0.99	0.97 - 1.02	

Table 1. Outcomes of logistic regression model used to predict suboptimal aerobic capacity using body fat percentage (BF%), age, and forced expiratory volume at one second [FEV1] normalized to forced vital capacity [FVC])

CONCLUSIONS

- The findings suggest pulmonary function did not influence the odds of having optimal aerobic capacity
  - Poorer BF% and increased age were independently associated with increased odds of having suboptimal aerobic capacity in healthy career firefighters
- Fire administrators and policy makers may wish to incentivize firefighters to improve their body composition in order to decrease the odds of having suboptimal aerobic capacity

FRONT LINE MOBILE HEALTH