

Do Cardiometabolic Biomarkers Impact Aerobic Capacity in Career Firefighters?

Kealey J. Wohlgenuth¹, Carina M. Velasquez¹, Emilie Burnham², Michael J. Conner², Zachary Y. Kerr³, Jacob A. Mota¹

¹Department of Kinesiology and Sport Management, Texas Tech University, Lubbock, TX

²Front Line Mobile Health, Georgetown, TX

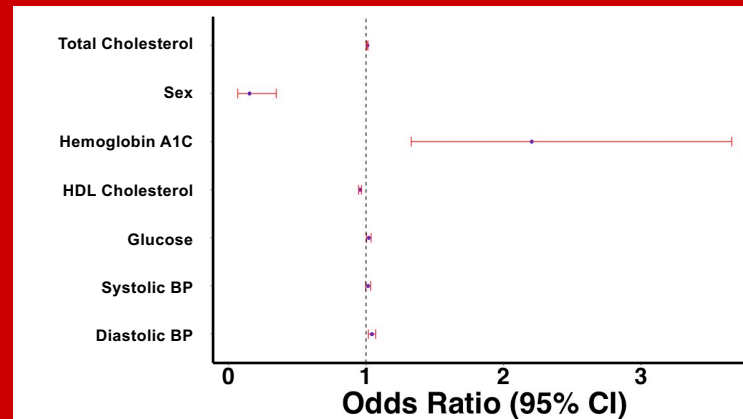
³Department of Exercise and Sport Science, The University of North Carolina at Chapel Hill, Chapel Hill, NC

BACKGROUND

- Firefighters play critical roles in public safety and emergency response
- Both fatal and non-fatal injuries plague the fire service
 - Fatal cardiac events often happen in the line of duty
- Career firefighters also present with poor cardiometabolic health profiles
- Many occupational specific tasks require optimal aerobic capacity in order to be completed
 - However, the direct link between cardiometabolic factors and aerobic capacity needs to be further elucidated

PURPOSE: The purpose of this study was to examine the influence of various cardiometabolic biomarkers (i.e., HDL cholesterol, total cholesterol, hemoglobin A1C, glucose, systolic and diastolic blood pressure) on aerobic capacity (i.e., VO_{2max}) in male and female career firefighters.

SUMMARY



Fire administrators may consider
improving cardiometabolic biomarkers within
firefighters to improve performance

RESULTS

- In the logistic regression model, “suboptimal” aerobic capacity (VO_{2max}) was associated with
 - HDL, TOT, A1C, GLU, DBP, and being female
- There was no association with SBP and “suboptimal” aerobic capacity (VO_{2max})

	β	p
HDL Cholesterol	-0.04	< 0.001*
Total Cholesterol	0.01	< 0.001*
Hemoglobin A1C	0.79	0.002*
Glucose	0.02	0.012*
Diastolic Blood Pressure	0.04	0.001*
Systolic Blood Pressure	0.015	0.104
Sex	-1.88	< 0.001*

Table 1. Outcomes of logistic regression model. Standardized beta (β) coefficients are presented. *indicates $p < 0.05$

CONCLUSIONS

- The findings from the current study suggest firefighters with “suboptimal” aerobic capacity (i.e., $VO_{2max} < 38$ mL/kg/min) were associated with being:
 - Female; having poorer HDL cholesterol, total cholesterol, hemoglobin A1C, glucose, and diastolic blood pressure.
- These results highlight the impact of poor cardiometabolic health on aerobic capacity and suggest a need for improving cardiometabolic health to enhance occupational performance.

METHODS

Retrospective Data

- Retrospective data was analyzed for 1302 career firefighters
 - Age = 39 ± 10 yrs
 - Height = 170.0 ± 7.2 cm
 - Body mass = 94.1 ± 15.4 kg
 - BMI = 29.4 ± 4.3 kg/m²
- 51 females (4%)
- 1251 males

Design

- Data were collected on two separate days
 - Blood collection and physical examination
- Blood biomarkers assessed as a part of their annual departmental physical
- Collection of blood samples occurred 2-3 weeks prior to the physical
 - Participants were asked to arrive following a 9-hour fast



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 estimated the influence of HDL cholesterol (HDL), total cholesterol (TOT), hemoglobin A1C (A1C), glucose (GLU), systolic (SBP) and diastolic blood pressure (DBP) on aerobic capacity (i.e., VO_{2max})
- Standardized beta (β) coefficients from the logistic regression model are presented
- Alpha level of 0.05 was selected