

EDITORIAL

Firefighters Fighting Cardiovascular Death

Eliza Prodel^{1,2} *Laboratory of Exercise Sciences, Fluminense Federal University,¹ Niterói, RJ - Brazil**School of Medical Sciences, University Center of Volta Redonda,² Volta Redonda, RJ - Brazil***Editorial referring to the article: Heart Rate Reactivity to Acute Mental Stress is Associated With Parasympathetic Withdrawal and Adiposity in Firefighters**

Cardiovascular diseases are the primary cause of death worldwide.¹ Chronic stress and obesity are important risk factors for the development of all cardiovascular diseases.² Studies have shown that firefighters seem to be at higher risk of cardiovascular death,³ and one possible explanation is high levels of chronic stress in addition to a routine in favour of fat weight gain. An autonomic imbalance in favour of sympathetic activation to the detriment of vagal modulation might be an underlying mechanism for increased cardiovascular risk. This could trigger an acute event in a susceptible population, for instance, firefighters who undergo major stress.⁴

Mendes et al. (2023) tested firefighters' autonomic response during acute mental stress (3 minutes of Stroop colour word test) and its relationship to adipose tissue.⁵ The authors sought to investigate possible physiological parameters which would impact the heart rate response to mental stress. In their study, mental stress decreased vagal modulation (RMSSD) and increased heart rate and blood pressure. Therefore, the group of participants was separated into three subgroups according to heart rate response. Even with different heart rate and RMSSD responses, blood pressure increased similarly between the subgroups. However, the subgroup with lower body fat responded with higher heart rate during mental stress. This result was confirmed using multiple linear regression.

The authors also assessed cardiac baroreflex sensitivity, and the sensitivity seemed to reduce during mental stress for the increase of blood pressure, which was similar between the subgroups. Indeed, in healthy eutrophic subjects, the baroreflex sensitivity seems to reduce during

mental stress,⁶ indicating a physiological response in this group of firefighters.

One interesting result about the firefighters' mental health (i.e., depression, anxiety, and stress) is that these factors were statistically similar between groups; thus, they probably did not influence the acute response to mental stress. However, a tendency for higher scores for depression in the subgroup which did not increase heart rate during mental stress was reported. The lack of heart rate response during acute stress could indicate a pathophysiological response.⁷

Although the subgroup with higher heart rate response was statistically different from the group in which heart rate did not increase during mental stress, the overall group was overweight but not obese. Therefore, those results might have been different if more participants, including obese patients, had been enrolled in the experimental protocol. Another important parameter to consider is the proportion of subcutaneous fat and visceral fat deposition, since the latter is related to insulin resistance, chronic lower-grade inflammation, and higher cardiovascular risk.⁸

The standard deviation for participants' years of service is large, and it would be interesting to investigate fat weight gain, mental health, and stress response according to years of service.

Unfortunately, the study by Mendes et al. (2023) did not have a control group; therefore, it is not possible to know whether the cardiovascular responses found in this group of firefighters are similar to a population under lower chronic stress.

In conclusion, there is sufficient evidence that chronic stress and obesity are important risk factors for increased risk of cardiovascular death.⁹ However, more studies are needed to fully understand the crosstalk between fat deposition, stress response, and cardiovascular risk.

Keywords

Autonomic Response; Cardiovascular Diseases; Mental Stress

Mailing Address: Eliza Prodel

Universidade Federal Fluminense, Physiology and Pharmacology. Rua Alameda Barros Terra, S/N. Postal code: 24020-150. Niterói, RJ – Brazil
E-mail: eprodel@id.uff.br

References

1. Huang L, Wang A, Wu Z, Chen S, Zheng Y, Wu S, et al. Life's Essential 8 and Risk of All-Cause Mortality in Individuals with Cardiovascular Diseases: A Prospective Community-Based Study. *Clin Cardiol*. 2023. doi: 10.1002/clc.24119.
2. Lloyd-Jones DM, Allen NB, Anderson CAM, Black T, Brewer LC, Foraker RE, et al. Life's Essential 8: Updating and Enhancing the American Heart Association's Construct of Cardiovascular Health: A Presidential Advisory from the American Heart Association. *Circulation*. 2022;146(5):e18-43. doi: 10.1161/CIR.0000000000001078.
3. Kales SN, Soteriades ES, Christophi CA, Christiani DC. Emergency Duties and Deaths from Heart Disease Among Firefighters in the United States. *N Engl J Med*. 2007;356(12):1207-15. doi: 10.1056/NEJMoa060357.
4. Hadaya J, Ardell JL. Autonomic Modulation for Cardiovascular Disease. *Front Physiol*. 2020;11:617459. doi: 10.3389/fphys.2020.617459.
5. Mendes HC, N. Lima, L.R.A. Speretta, G. Heart Rate Reactivity to Acute Mental Stress is Associated With Parasympathetic Withdrawal and Adiposity in Firefighters. *Int J Cardiovasc Sci*. 2023. Ahead of the print. doi: 10.36660/ijcs.20210234.
6. Fauvel JP, Cerutti C, Quelin P, Laville M, Gustin MP, Paultre CZ, et al. Mental Stress-Induced Increase in Blood Pressure is Not Related to Baroreflex Sensitivity in Middle-Aged Healthy Men. *Hypertension*. 2000;35(4):887-91. doi: 10.1161/01.hyp.35.4.887.
7. Jones A, McMillan MR, Jones RW, Kowalik GT, Steeden JA, Deanfield JE, et al. Adiposity is Associated with Blunted Cardiovascular, Neuroendocrine and Cognitive Responses to Acute Mental Stress. *PLoS One*. 2012;7(6):e39143. doi: 10.1371/journal.pone.0039143.
8. Kolb H. Obese Visceral Fat Tissue Inflammation: From Protective to Detrimental? *BMC Med*. 2022;20(1):494. doi: 10.1186/s12916-022-02672-y.
9. Heymsfield SB, Wadden TA. Mechanisms, Pathophysiology, and Management of Obesity. *N Engl J Med*. 2017;376(3):254-66. doi: 10.1056/NEJMra1514009.

