

# Changes in Firefighter Cardiorespiratory Fitness (CRF) Following COVID-19

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## Abstract

**BACKGROUND:** Cardiorespiratory fitness (CRF) has been shown to significantly decrease in middle-aged individuals who were hospitalized or experienced very severe symptoms of the COVID-19 infection. However, the effects of SARS-CoV-2 on firefighters with mild cases of COVID-19 are unknown. Firefighters require moderate to high cardiorespiratory fitness because high-intensity work must be sustained for long durations. Therefore, the purpose of this study was to analyze the results of cardiopulmonary exercise testing (CPET) before and after the COVID-19 infection in firefighters based on results from annual occupational medical testing. **METHODS:** 103 firefighters from multiple fire departments in Arizona, USA with mild to moderate confirmed diagnoses of COVID-19 between February 2020 and February 2021, underwent longitudinal cardiopulmonary exercise testing during annual medical examinations in 2019 (pre-COVID) and 2020 at a single healthcare clinic. Researchers from Skidmore College compared the results of CPET before they were diagnosed with COVID-19 and after the infection. **RESULTS:** The average  $\text{VO}_2$  max in firefighters significantly decreased by 7.3% following COVID-19 ( $p < 0.001$ ). Significant declines were also shown in peak  $\text{O}_2$ -pulse (-6.5%,  $p < 0.001$ ) and in  $\text{O}_2$  consumption at AT (-24.3%,  $p < 0.001$ ). Significant declines in  $\text{VO}_2$  max were shown in groups examining changes based on age ( $\leq 45$  years,  $> 45$  years), sex (M/F), BMI ( $< 30$ ,  $\geq 30$ ), and time between COVID-19 and CPET ( $\leq 30$  days,  $> 30$  days). There was a weak positive correlation between time since the COVID-19 infection and improvements in  $\text{VO}_2$  max ( $R^2 = 0.049$ ). **DISCUSSION:** COVID-19 is associated with a significant decline in CRF in firefighters. CPET testing revealed that no pulmonary functional limitations caused the change in CRF observed. Significant declines in cardiovascular functional ability and oxygen utilization during maximal exercise resulted in significant declines in CRF. The trend in improvement of  $\text{VO}_2$  max with time indicates that some firefighters may improve, while variability suggests that some firefighters will experience decreased cardiorespiratory fitness for longer periods. **CONCLUSION:** COVID-19 is associated with significant declines in cardiovascular function and oxygen utilization, which directly affect CRF ( $\text{VO}_2$  max). Because firefighters require moderate to high cardiorespiratory fitness to safely perform their job, future investigation is required to maintain the cardiovascular health of firefighters following COVID-19. Personalized medical care may be required, as variability in our findings revealed that not all firefighters exhibited a decline in CRF.