

CARDIOVASCULAR RESPONSE IN FIREFIGHTER RECRUITS DURING THREE MODES OF EXERCISE

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Introduction

Firefighting is well known for its vigorous physical demands. U.S. firefighters have one of the nation's highest occupational fatality rates, and 45% of these fatalities can be attributed to coronary heart disease (1). Due to these high numbers of deaths, several organizations including the National Fire Protection Agency, International Association of Firefighters, and International Association of Fire Chiefs are now considering physical training recommendations for fitness in order to decrease fatalities. (2)

Because of high heart rate, energy cost, and oxygen consumption rates necessary for firefighting, training the aerobic and cardiovascular systems are important for the safe and efficient performance of job related duties (3, 4). A training protocol that improves efficiency of oxygen exchange and decreases the amount of stress placed upon the heart would likely decrease fatalities due to coronary heart disease. The purpose of this study was to investigate which type of cardiovascular training had the greatest impact on the cardiovascular system.

Purpose

In order to safeguard against acute cardiovascular incidences and inherent job-related hazards, professional firefighters are encouraged to maintain adequate levels of health and fitness. It is imperative that an exclusive approach to exercise training is pursued that mimics the specific metabolic characteristics of the firefighting occupation. Accordingly, the purpose of this study was to examine the contributing effects of wearing a weighted vest (Xvest) on heart rate and oxygen consumption (VO₂), while participating in different modes of exercise.

Methods

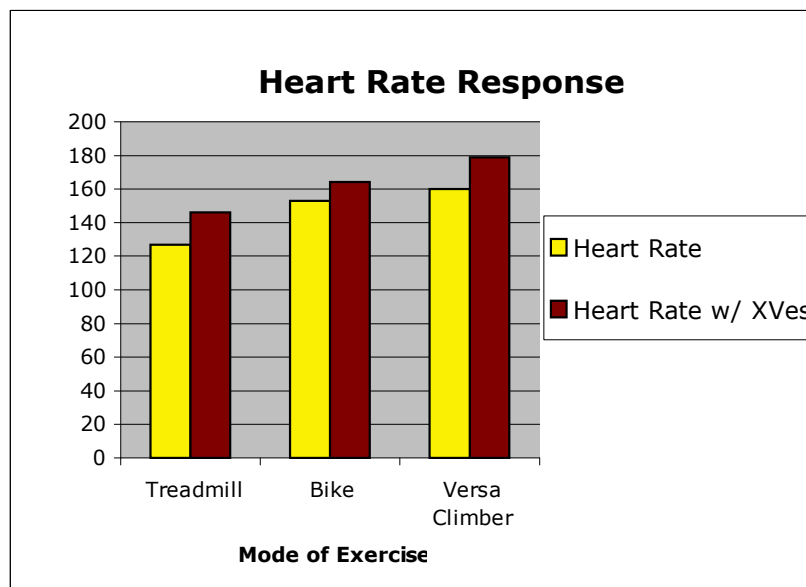
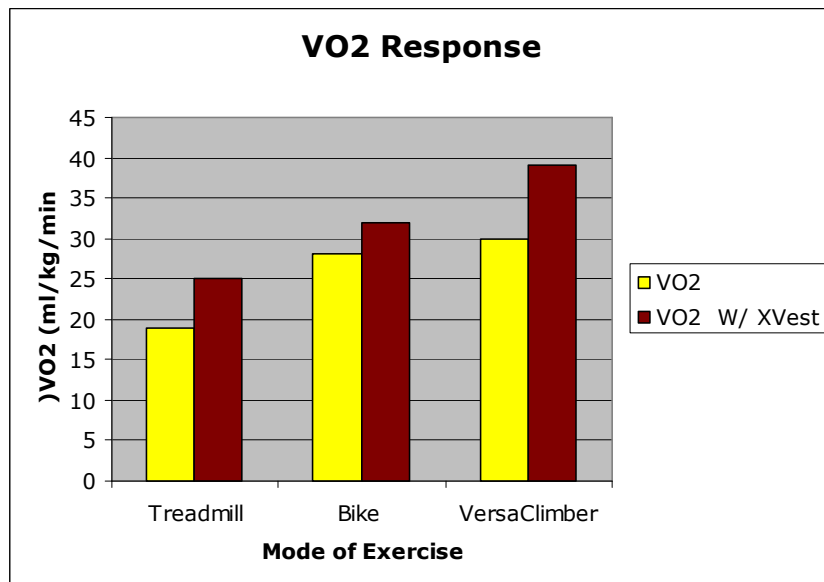
Twelve male firefighter recruits completed six separate exercise routines, including two sessions each of the bicycle ergometer, treadmill, and VersaClimber apparatus with and without an 80-pound weighted vest. Heart Rate (HR) and oxygen consumption (VO₂) were measured by Polar heart rate monitors and the CardioCoach portable metabolic unit. HR and VO₂ values were recorded in the final 15 seconds of a three-minute exercise session. Data were statistically analyzed using a repeated measures ANOVA.

Results

Significant differences in heart rate and VO₂ response were demonstrated in the weighted vest treatment for the treadmill and VersaClimber tests ($p < .01$) compared to non-significant differences found between the loaded and unloaded bicycle ergometer tests ($p > .05$).

Practical Applications

Firefighting as a profession has a high VO₂ demand. Training at an appropriate level may prevent undue cardiovascular stress, as heart attack is the perennial killer of firefighters (1). Wearing a weighted vest approximates wearing a self-contained breathing apparatus (SCBA), firefighter protective clothing as well as a high-rise pack (hose bundle). The VersaClimber with the use of the Xvest was the only mode of exercise that approximated the recommended 43ml/kg/min level of VO₂ with an average exercise VO₂ of 39.4 ± 7.94 ml/kg/min (5). Therefore wearing a weighted Xvest and training on a VersaClimber seems to be an appropriate mode of exercise for firefighters.



Conclusions

The data suggests that use of a weighted vest was significantly more effective for inducing a cardiovascular response over the unloaded treatment. Furthermore, participation in weight-bearing physical training (i.e. Treadmill and VersaClimber), demonstrated a significantly greater cardiovascular response than exercising in the non-weight bearing (i.e. bicycle ergometer) exercise conditions.

- References** NFDC, *Firefighter Fatalities in the United States in 2000*. United States Fire Administration, Federal Emergency Management Agency. 2001.
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