Abstract

Maximal oxygen uptake (VO$_2$ max) was first described in the 1920’s as the oxygen uptake attained during maximal intensity exercise that could not be increased despite further increases in exercise intensity, thereby defining the limits of the cardiorespiratory system. Today, VO$_2$ max is one of the most commonly used measurements in exercise science. A PubMed search for “VO$_2$ max” yields more than 7,000 results and underscores the seminal importance of this concept for understanding physiological function and outcomes associated with both health and performance of recreational athletes, elite athletes and workers in physically demanding occupations. However, the appropriate and accurate measurement protocol and importance of VO$_2$ max as it relates to physically demanding public safety occupations is surprisingly unclear. The energy demand of physical activities and job-related tasks in physically demanding occupations is commonly determined by measuring the associated oxygen consumption (VO$_2$). As such, VO$_2$ max values are customarily used to quantify occupational physiological fitness demands. The measurement of VO$_2$ max is routinely employed to ensure that applicants and incumbents in physically demanding emergency occupations (i.e. structural firefighters, wildland firefighters, police officers, correctional officers, etc.) have sufficient aerobic power to carry out the critical job-related physically demanding tasks in a safe and efficient manner.

The purpose of this research is to examine the role of aerobic power as it relates to the “industrial or occupational athlete”. The three proposed studies will examine (a) the use of supramaximal discontinuous workloads for the determination of a verified VO$_2$ max, (b) the relationship between aerobic power and the pass/fail rates in the job-related task components of the physical fitness employment requirements for structural firefighter applicants, and (c) the impact of detraining on the physical and physiological fitness of industrial/occupational athletes and their ability to safely and efficiently perform the critical job-related emergency tasks.