

Determining an optimal recovery time after exercising to exhaustion in a controlled climatic environment: application to construction works

Abstract

This study aims to determine an optimal recovery time after a participant has exercised to exhaustion in a controlled climatic condition. Ten male and four female volunteers were examined under hot (30°C) and humid (75% relative humidity) environment in a climatic chamber to simulate typical summer outdoor working conditions of construction workers in Hong Kong. The participants (age 31.3 ± 9.3 years; height 168.5 ± 9.8 cm; weight 62.5 ± 7.1 kg; and percentage body fat $22.9 \pm 7.2\%$) performed graded upper body exercise at a target cadence of 70 rotation per minute (RPM) until exhaustion and were recovered inside the climatic chamber until their physiological conditions returned to the pre-exercise level or lower. Physiological Strain Index (PSI) was used as a yardstick to determine the rate of recovery. The physiological conditions of the participants were monitored by recording their ear temperature (to estimate core temperature), heart rate, oxygen consumption, respiratory exchange ratio and Ratings of Perceived Exertion (RPE). It was found that on average a participant could achieve 97% energetic recovery in 40 min; 90% in 35 min; 82% in 30 min; 75% in 25 min; 68% in 20 min; 60% in 15 min; 53% in 10 min; and 46% in 5 min. Linear regression results showed that recovery time is a significant independent variable to determine the rate of recovery ($R^2 = 0.95$, $P < 0.05$). Depending on the level of recovery, an optimal recovery time after exhaustion in a hot- humid environment can be determined based on these findings.