Critical power: how it can be determined and its importance in setting physical training intensity

Professor Jonathan Doust, Chelsea School of Sport,
University of Brighton, England

(A35)

Physical fitness is often characterised by the maximal oxygen uptake (VO2 max) which is the maximum rate at which oxygen can be used during a fitness test to exhaustion. But many sports, most physical training, and many recreational activities can be considered "submaximal" and take place at a lower intensity of effort. At low intensities of effort the body can attain a steady-state and exercise can continue for a very long time (several hours). At higher intensities of exercise, but still below the V02 max, a steady state cannot be attained and a variety of metabolic changes occur including a rise in blood lactate concentration, hyperventilation, and changes in phosphocreatine, inorganic phosphate and potassium levels. The intensity at which these changes occur has been variously referred to as the "anaerobic threshold", the "lactate threshold" or the "critical power". Identification of this threshold is helpful in setting the optimum exercise intensity for training.

This paper will review a variety of ways by which the threshold may be measured by the sports scientist including determining the ventilatory threshold, the lactate threshold, the maximal lactate steady-state and the critical power. The review will consider the physiological basis to the tests. Consideration will also be giving to practical issues such as the equipment needed, simplicity, accuracy, and athlete acceptance.

These physiological considerations will then be applied to practical training for sports or for general fitness. Examples will be shown from continuous training, 3 minute on/off interval sessions, red-lining, and 1 minute step intervals. The aim will be to demonstrate that understanding of the body's physiological adjustments to exercise enables the scientist and coach to improve the effectiveness of physical training.