

## Training Aerobic Capacity

One of the first things that comes to mind whenever anyone mentions the word aerobic or fitness are miles and miles of endless running. As aerobic capacity plays a key role in a number of sports, the training and testing of aerobic fitness is a crucial part of any athletes training programme. For those athletes that compete on land, a variety of methods have been used in a number of scientific research papers; some of which will be outlined below.

**Conventional Endurance Running:** The majority of research focusing on the development of aerobic fitness has used people who had previously not participated in exercise. The onset of sub-maximal exercise training over a prolonged period of time resulted in a number of changes that improved the delivery and usage of oxygen in working muscles. These changes combined with a reduction in heart rate at the same exercise intensity and an increase in blood volume, have caused improvements in maximal aerobic capacity following training. However, the problem with designing training programmes for athletes based on the results of such studies is that the population to which the findings are to be applied are not inactive to start with. For example, in soccer, elite players may cover up to 12 km in a match; therefore the training of these players relies upon some different training regimes. Support for alternative methods of training can be found in research that finds no extra benefit to aerobic capacity despite increases in the amount of sub-maximal training volume <sup>(1)</sup>.

**High Intensity Interval Training:** Due to the lack of application of conventional endurance training to athletes, high intensity interval training has been used as a method of improving performance. High intensity interval training is defined as a systematic cycling of repeated short to moderate duration bouts of exercise (i.e., anywhere between 10 s and 5 min), at an intensity that exceeds anaerobic threshold, that are also interspersed with low intensity activity (or inactivity) allowing for partial but not full recovery. In simple terms, this is a repetition of a short duration exercise such as sprints (that can be performed in any number of ways such as cycling, running, swimming etc.) that are separated by limited or no activity. Although the mechanisms of improved running performance remain unclear, the repeated stressing of the metabolic systems beyond an extent greater than that required during competition cause adaptive processes to develop that enhance exercise performance.

**Small Sided Games:** Sports-specific conditioning is an important part of all training programmes, and nothing is more sports specific than the use of competition itself to develop aerobic capacity. Although normal competitive encounters may not be considered a high enough intensity to improve fitness, mini versions of competition (such as small sided games in soccer) are often used as an alternative to interval training, especially in younger athletes. The modification of variables such as competition space, number of participants and time of performance can intensify the demands of the training above that

which is normally experienced; consequently different training responses can be emphasised. Common approaches in soccer are 4 v 4 or 2 v 2 games, however, there are an infinite number of protocols that can be developed. Careful modification of variables in small sided games can produce a consistent aerobic training stimulus which results in improvements in aerobic capacity <sup>(2)</sup>.

**Competition Simulations:** Simulated competitive encounters are repeated circuits of sports-specific movements that replicate over their duration the exercise demands of the event. Although predominantly used in scientific research to ensure experimental control and overcome the variability that exists between consecutive events, evidence does exist to suggest that simulated competition can provide a stimulus for aerobic conditioning.

### **Additional Reading**

1. Londeree, B. R. (1997). "Effect of training on lactate/ventilatory thresholds: A meta-analysis." Medicine and Science in Sports and Exercise **29**: 837-843.
2. Hill-Haas, S., G. Roswell, A. J. Coutts and B. Dawson (2008). "The reproducibility of physiological responses and performance profiles of youth soccer players in small sided games." International Journal of Sports Physiology and Performance **3**: 393-396.