Training with Oxygen-Enriched Air (hyperoxia)

The first scientists to report the effects of oxygen-inhalation before exercise, on subsequent performance, were Hill and Just (1908). The subjects in this study were Mr Just himself and Mr Holding, two Cambridge University students who had competed in the Olympic games. The pair were studied on the Stanford Bridge track London on the 27th of July 1908. Mr Just inhaled 100% oxygen for two minutes, after which he ran 880yds in 1:55,5, a three second improvement on his Olympic qualifying time of 1:58,5. and equal to his previous best-ever performance. He reported ' an absence of distressful dyspnoea (the sensation of distressing and uncomfortable breathlessness) and of 'grogginess' of the legs and stiffness of the muscles, after this great effort'.

Twenty minutes later he again inhaled oxygen and ran 440yds in 52,6 seconds. Of his record-breaking run, Mr Just reported: 'I traveled so easily that the pace seemed much slower than it really was, and even sprinting, which tires me very much, seemed quite easy……'this performance further surprised Mr Just because he had been smoking heavily and had run three 800 yd races within seven days.

Mr Holding also inhaled oxygen for two minutes, and ran 440yds in 50,5 seconds, and to the astonishment of the officials, he was no more blown than after a 100yd race. The best time in which he had ever done the quarter was 51 seconds. At the trials for the Olympic Games, he did not do it in less then 52 seconds. Some 30 minutes later, Mr Holding ran a best 100yds time by 0.5 seconds, again after inhaling oxygen.

Earlier Studies

Since the early reports of Leonard Hill and Just (1908), and of AV.Hill (1925), a number of other studies have established that the inhalation of air with an increased oxygen percentage, improved exercise capacity. (Bannister and Cunningham 1954 and Peltonen et al 1995;1997; 2001.

Interestingly, Sir Roger Bannister, the world's first sub-4-minute miler was among the first to study the effect of this technique. These studies were published in 1954, the same year that he established his historic feat. Inhaling air enriched with oxygen at either 66 or 100 percent oxygen, Sir Roger ran about 100 percent longer to exhaustion on a treadmill. Sir Roger said that he noticed with surprise that he felt mentally elated when breathing 66 percent but not when breathing pure oxygen. Both Sir Roger and Cunningham said that they found breathing effortless and the exercise incomparably effortless. Another subject H.D.McW thought that there was a

definite elation besides an absence of discomfort. He would have been prepared to run indefinitely.

Practical Implications

The Central Governor Model predicts that it is the oxygen delivery to the heart that determines performance during high-intensity exercise.

Reduced oxygen delivery to the heart during maximum exercise, when air with a reduced oxygen percentage is inhaled, will prematurely activate the central governor, reducing the maximum amount of muscle that can be recruited. Hence lowering the peak workrate that can be achieved. As a result, cardiac output and peak EMG activity will be reduced, in line with the findings of Peltonen et al.

If this theory is correct, then training at either medium or high altitude or living high and training low, may be the wrong options.
It might then be better **either** to stay at sea-level and perform your high-intensity training while inhaling oxygen enriched air, **or** to live at very high altitude (above 2500m) and do all your training while inhaling oxygen-enriched air.

(Extracts from ***'Lore of Running'*** by **Prof Tim Noakes** OMS, MBChB, DSc, FACSM, Hon FFSEM (UK), Discovery Health Professor of Health and Sports Science at UCT.

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