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Research Review: Getting high for fitness

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RESEARCH REVIEW: GETTING HIGH FOR FITNESS

No longer only for elite athletes, altitude training has gone mainstream. So, how effective is it?

Title: Effects of High Intensity Interval Training in Normobaric Hypoxia on Aerobic Capacity

Authors: Dr's Czuba et al. (Jerzy Kukuczka Academy, POLAND)

Source: Journal of Human Kinetics, Dec 2013 (ePub before print). Available free online at ncbi.nlm.nih.gov/pmc/articles/PMC3916912/

Introduction:

Every endurance fitness enthusiast is interested in the next ‘new’ supplement or training technique that will further increase their maximal aerobic power, aka ‘VO2 max’ (maximal oxygen consumption). We are devoting this issue’s Research Review to altitude training, which although not new in professional sport has now entered the fitness enthusiasts’ commercial market for both health and fitness benefits. Yes, we said health benefits. We recently published a review paper on the health benefits of altitude training and found that it was associated with improvements in body weight, body composition (>1,700 metres altitude), improved fasting blood glucose (1,500 to 3,000 metres for > 21 days), improved resting blood pressure in hypertensive individuals (1,285 to 2,650 metres) and improved total cholesterol and low density lipoprotein cholesterol. There is still plenty more work to be done in this area.

As we mentioned, altitude training for improved aerobic performance is not a new
concept, and according to altitude expert at the Australian Institute of Sport, Professor Chris Gore: ‘there is a 1-2 per cent increase in performance, which mightn’t sound like much, but can be the difference between a medal and failing to qualify’. Altitude training refers to the use of normobaric or hypobaric hypoxia (i.e. reduced oxygen concentration, <20.93 per cent) in an attempt to emulate altitude acclimatisation to attain improved endurance performance. Normobaric hypoxic training incorporates the use of masks, tents and chambers, whereas hypobaric hypoxic training involves ascending to elevated environments. Clearly, it is more cost effective to utilise chambers and the like when you are geographically disadvantaged to elevated environments.

Interestingly, altitude training originated as a result of noticeable decrements in performance that were associated with competition at altitude. However, Professor Burt in 1943 was the first scientist to notice that there were highly favourable alterations which occurred in muscle as a result of exposure to altitude. It took some 40 years to realise that environmental hypoxia could compound the normal physiological adaptations to endurance training, and in the mid-1980s the scientific literature exploded with studies investigating the advantages and adaptations associated with altitude training. Today, altitude training in professional sport in Australia is considered an integral aspect of training.

### THE 30-SECOND ARTICLE

- Altitude training involves training at reduced oxygen atmospheres – real or simulated – in order to improve endurance performance
- It has been associated with a number of both health and fitness benefits
- It has become widely used by many sporting disciplines and football codes and is gaining mainstream popularity
- This athlete study linked altitude training to increased power output and VO2 max, and reduced HR max and peak lactate levels.

Most professional sporting disciplines now use altitude chambers, and a number of AFL footy teams travel to the US (Arizona or Utah) to live and train at altitude in order to derive an additional physiological benefit. Additionally, a number of rugby league teams have utilised altitude training systems to gain a drug-free advantage over competitors. It's not surprising that altitude training has filtered down to fitness enthusiasts: here on the Gold Coast we have two commercial altitude training centres and business is booming.

Method: Dr Czuba and his colleagues recruited 12 fit and healthy male basketball players to participate in their study. Participants were divided into two groups, hypoxia (H) and control (C). The hypoxia training group completed their training in a hypoxic chamber which was set at a simulated altitude of 2,500 metres, which had an oxygen concentration of only 15.2 per cent. At sea level for example, the normal oxygen concentration is 20.93 per cent. The control group also completed its training in the hypoxic chamber but at normal, sea level conditions. Both groups trained six days per week for three weeks with each training session lasting 90 to 120 minutes with the intensity at ~90 per cent of VO2 max (five, four minute bouts). A warm up (60 per cent VO2 max x 5 mins, then 70 per cent VO2 max x 5 mins) and cool down (60 per cent VO2 max x 10 mins) was provided to both groups for each training session. All participants were tested on a treadmill prior to initiating the training and immediately upon completion of three weeks of
training.

Results: Following the three weeks of high intensity interval training there were no significant differences between the two groups in terms of body weight, lean muscle mass or percentage body fat. However, there was a significant improvement in the total distance ridden during the bike test (+10.0 per cent) as well as power output (+4.5 per cent) and VO2 max (+7.8 per cent) in the hypoxia group. This group also experienced a decrease in HR max (-1.6 per cent) and in peak lactate levels (9.6 per cent).

Pros: These are promising results and lend support to the use of simulated short term altitude training combined with high intensity interval training for improved endurance performance, specifically VO2 max.

Cons: Now that more commercial training facilities are installing altitude chambers, it will be interesting to see the improvements in endurance capacity by non-athletes. It would have been beneficial if the researchers had also measured haemoglobin, haematocrit and erythropoietin. Individuals considering trialling hypoxic training should first speak with their GP, and if deemed safe should ensure they use a pulse oximeter during all hypoxic training sessions to monitor their degree of desaturation (i.e. a decrease in blood oxygen levels) in a professionally supervised environment, with suitably qualified individuals.

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