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Research article

Comparison of Live High: Train Low Altitude and Intermittent Hypoxic ExposureClare E. Humberstone-Gough^{1,2} , Philo U. Saunders^{1,2}, Darrell L. Bonetti¹, Shaun Stephens^{1,3}, Nicola Bullock¹, Judith M. Anson², Christopher J. Gore^{1,2,4}[Author Information](#)[Publish Date](#)[How to Cite](#)[Email link to this article](#)**ABSTRACT**

Live High:Train Low (LHTL) altitude training is a popular ergogenic aid amongst athletes. An alternative hypoxia protocol, acute (60-90 min daily) Intermittent Hypoxic Exposure (IHE), has shown potential for improving athletic performance. The aim of this study was to compare directly the effects of LHTL and IHE on the running and blood characteristics of elite triathletes. Changes in total haemoglobin mass (Hb_{mass}), maximal oxygen consumption (VO_{2max}), velocity at VO_{2max} (vVO_{2max}), time to exhaustion (TTE), running economy, maximal blood lactate concentration ([La]) and 3 mM [La] running speed were compared following 17 days of LHTL (240 h of hypoxia), IHE (10.2 h of hypoxia) or Placebo treatment in 24 Australian National Team triathletes (7 female, 17 male). There was a clear $3.2 \pm 4.8\%$ (mean \pm 90% confidence limits) increase in Hb_{mass} following LHTL compared with Placebo, whereas the corresponding change of $-1.4 \pm 4.5\%$ in IHE was unclear. Following LHTL, running economy was $2.8 \pm 4.4\%$ improved compared to IHE and 3mM [La] running speed was $4.4 \pm 4.5\%$ improved compared to Placebo. After IHE, there were no beneficial changes in running economy or 3mM [La] running speed compared to Placebo. There were no clear changes in VO_{2max} , vVO_{2max} and TTE following either method of hypoxia. The clear difference in Hb_{mass} response between LHTL and IHE indicated that the dose of hypoxia in IHE was insufficient to induce accelerated erythropoiesis. Improved running economy and 3mM [La] running speed following LHTL suggested that this method of hypoxic exposure may enhance performance at submaximal running speeds. Overall, there was no evidence to support the use of IHE in elite triathletes.

Key words: Red cell mass, HiLo altitude, blood volume

Key Points

- Despite a clear 3.2% increase in haemoglobin mass following 17 days of Live High: Train Low altitude training, no change in maximal aerobic capacity was observed.
- There were positive changes in running economy and the lactate-speed relationship at submaximal running speeds following Live High: Train Low altitude training.
- There was no evidence to support the use of daily 60-90 minute Intermittent Hypoxic Exposure in elite triathletes.

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