Previous works assessing the impact of high intensity interval training on VO2max have offered varying results

**PURPOSE:** To determine the meaningful effects of a short-term high-intensity interval training (HIIT) or continuous training (CET) intervention on $\dot{V}$O2max and the anaerobic capacity through quantification of both the respiratory and haemodynamic responses. **METHOD:** Following local institutional ethical approval, 37 physically active participants undertook 4-weeks of either cycling-based HIIT (age, 17.0 ± 0.5 yrs; height, 173.1 ± 9.2 cm; mass, 62.4 ± 6.9 kg). (8 x 20 s at 170% p$\dot{V}$O2max with 10 s recovery) or CET (age, 17.0 ± 0 yrs; height, 173.6 ± 8.7 cm; mass, 69.3 ± 17.0 kg) (30 min at 70% $\dot{V}$O2max) 3 times per week. $\dot{V}$O2max, anaerobic capacity as determined through the maximally accumulated oxygen deficit (MAOD), blood-based markers and haemodynamic responses were assessed pre and post the intervention period. $\dot{V}$O2max and MAOD were evaluated using breath-by-breath open circuit spirometry while haemodynamic responses were monitored using thoracic impedance cardiography. Analysis conducted using both inferential analysis as well as magnitude-based inferences (MBI) and effects sizes (ES). **RESULTS:** $\dot{V}$O2max exhibited a non-significant 4.1% increase (P> 0.05) (ES= 0.24) for HIIT with 7.0% p= 0.007 (ES= 0.40, MBI= likely trivial) increase for CET. Haemodynamic responses ($\dot{Q}$max, SVmax) displayed non-significant responses for CET and HIIT (P> 0.05) while a-vO2dif-max increased from 15.8 ± 4.8 to 18.3 ± 2.9 ml.100 ml-1) (p= 0.02) (ES= 0.63, MBI= possibly beneficial) following HIIT. MAOD increased by 7.3 ml.kg-1 for HIIT (p= 0.001) (ES= 0.72, MBI= likely beneficial), with CET showing no change (p >0.05). **CONCLUSIONS:** $\dot{V}$O2max is a function of $\dot{Q}$max and a-vO2dif-max, so for a meaningful change to occur in cardiorespiratory fitness there must be a concomitant increase in O2 delivery. This study demonstrates that a short-term HIIT intervention evokes peripherally mediated responses (a-vO2dif) and anaerobic substrate utilisation rather than O2 delivery components. The increase in $\dot{V}$O2max for CET in the absence of haemodynamic responses lends further support to the need for valid quantification of $\dot{V}$O2max.