

[Eur J Appl Physiol](#). 2007 Oct 2; [Epub ahead of print]

Hyperoxia improves 20 km cycling time trial performance by increasing muscle activation levels while perceived exertion stays the same.

[Tucker R](#), [Kayser B](#), [Rae E](#), [Rauch L](#), [Bosch A](#), [Noakes T](#).

MRC/UCT Research Unit for Exercise Science and Sports Medicine, Department of Human Biology, University of Cape Town, Sports Science Institute of South Africa, P.O. Box 115, Newlands, 7725, South Africa, rtucker@sports.uct.ac.za.

Increasing inspiratory oxygen tension improves exercise performance. We tested the hypothesis that this is partly due to changes in muscle activation levels while perception of exertion remains unaltered. Eleven male subjects performed two 20-km cycling time-trials, one in hyperoxia (HI, F(i)O₂ 40%) and one in normoxia (NORM, F(i)O₂ 21%). Every 2 km we measured power output, heart rate, blood lactate, integrated vastus lateralis EMG activity (iEMG) and ratings of perceived exertion (RPE). Performance was improved on average by 5% in HI compared to NORM ($P < 0.01$). Changes in heart rate, plasma lactate concentration and RPE during the trials were similar. For the majority of the time-trials, power output was maintained in HI, but decreased progressively in NORM ($P < 0.01$) while it increased in both trials for the last kilometre ($P < 0.0001$). iEMG was proportional to power output and was significantly greater in HI than in NORM. iEMG activity increased significantly in the final kilometre of both trials ($P < 0.001$). This suggests that improved exercise performance in hyperoxia may be the result of increased muscle activation leading to greater power outputs. The finding of identical RPE, lactate and heart rate in both trials suggests that pacing strategies are altered to keep the actual and perceived exercise stress at a similar level between conditions. We suggest that a complex, intelligent system regulates exercise performance through the control of muscle activation levels in an integrative manner under conditions of normoxia and hyperoxia.