

Relationship between preferred saddle height and pedalling kinematics in professional cyclists

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Purpose:

Training in conjunction with limb Blood flow restriction (BFR) is an increasingly popular method of producing increased physiological stress without the strain of high exercise loads. However little is known about the physiological responses to BFR with trained cyclists or how best to prescribe appropriate BFR training intensities.

In this study, we investigate the acute responses to different levels of BFR with trained cyclists to enable identification of specific training intensity criteria.

Methods:

Nine trained male cyclist (age 39.2 ± 8.1 years, height 179.1 ± 6.7 cm, weight 75.4 ± 6.7 kg, Max $\dot{V}O_2$ 4.4 ± 0.5 L.min⁻¹) completed a series of tests under conditions of no BFR (N-BFR; 0mmHg), moderate BFR (M-BFR; ~40mmHg) or high BFR (H-BFR; ~80mmHg). During BFR trials restriction was applied to the proximal thighs using 11cm wide pneumatic cuffs. Testing consisted of an incremental maximal cycle test and a self-paced 3-km time-trial. Measurement of Oxygen uptake ($\dot{V}O_2$), Muscle Oxygen saturation (MO_2) blood lactate concentration (Bla) and perceived exertion (RPE) were taken during the incremental test along with performance data from the time trial. Physiological responses from the three trials were examined across a range of comparable power outputs and at pre-determined blood lactate concentrations of 2 and 4 Mmol.

Results:

At comparable power outputs, heart rate and RPE was significantly higher ($p > 0.05$) in the H-BFR condition compared to all other conditions. However, there were no significant differences between conditions in $\dot{V}O_2$ and MO_2 at equivalent powers. Compared to the N-BFR condition power output was lower by ~9% and ~21% in the M-BFR and H-BFR condition respectively (fig 1) for fixed blood lactate concentration of 2 and 4mMol.

Conclusion:

Using moderate and high levels of BFR during cycling exercise leads to substantial reductions (left shift) in power output at fixed blood lactate values. The reduced power was associated with increases in heart rate and RPE, at equivalent power outputs. However, measures of O_2 and MO_2 were not significantly different at comparable exercise intensities between the conditions.

The decrease in attainable power output in BFR conditions appears predominately due to an increased reliance on anaerobic metabolism and an elevation in blood lactate concentration. Cardiovascular O_2 delivery and extraction does not appear to be significantly affected by BFR.



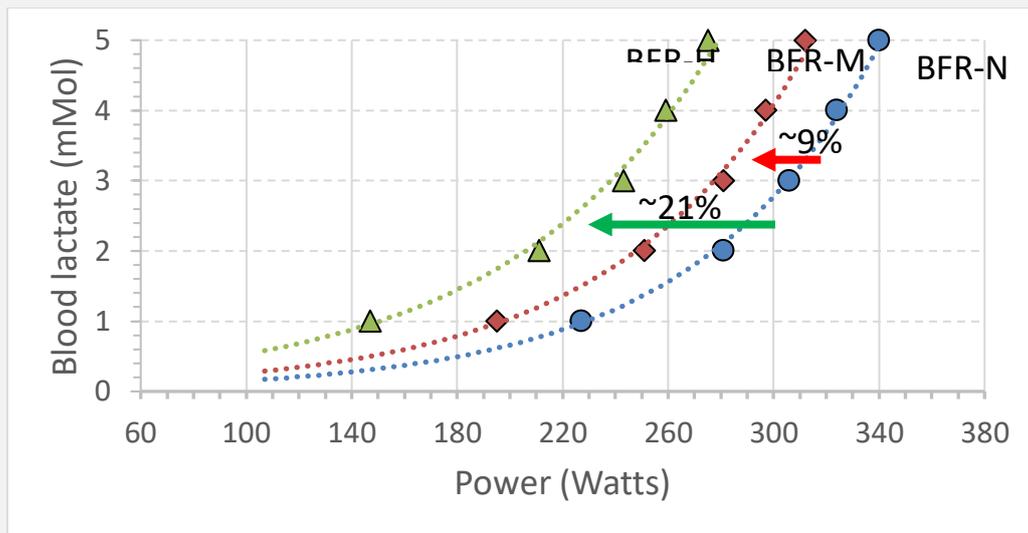


Figure 1. Change in the lactate/ power relationship at different levels of blood flow restriction.