Blood Flow Restriction and Cycling continued.

(VO2, Time to exhaustion, and Hypertrophy in 15 minutes?)

We previously addressed the application of BFR and low intensity intervals on the bike. What happens when we keep the intensity low and perform steady state exercise? This second paper in our series by Abe et al, demonstrated improvements in VO2, time to exhaustion, and muscle volume with low intensity BFR cycling compared to a work-matched control. Find out how this can be applied clinically.
Effects of low-intensity cycle training with restricted leg blood flow on thigh muscle volume and VO$_{2\text{max}}$ in young men.

This study aimed to assess improvements in VO2 Max, muscle size, and strength via low-intensity with or without vascular occlusion. The subjects were randomized into two groups, a BFR and a free-flow control group. Both groups cycled at 40% of VO2 Max. The BFR group cycled for 15 minutes, while the control group cycled 3x as long (45 minutes). The BFR group wore tourniquets on both upper thighs. Tourniquet pressure ranged from 160-210 mmHg. The study was carried out 3x week for 8 weeks.

### Results

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<th>VO2</th>
<th>Time to Exhaustion</th>
<th>Hypertrophy</th>
<th>Strength</th>
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<tr>
<td>BFR Cycling</td>
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<td>Control</td>
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This study demonstrated that a low-intensity exercise (40% VO2 Max cycling), done for a short duration (15 minutes), combined with BFR, can improve muscle size and aerobic capacity in healthy young males. Fifteen minutes within a rehab session is still a big commitment of time, but this protocol may be a more feasible way to apply BFR with endurance training in a clinical setting.

This study again used cuffs on both legs for the intervention. Limb occlusion pressure was progressed through a range (160 initially -210 in the final week). Most personalized pressures fall within this range and using an 80% of LOP may be the optimal way to keep it personalized to the patient.
This protocol of 15 minutes, 3 days a week, low intensity cycling with BFR can be used as a powerful rehab tool to improve hypertrophy and endurance for a wide range of patients. This can also be used as a short duration, low-intensity day for endurance progression or maintenance within a competitive season.

Anyone that has tried this him or herself will tell you that 15 minutes of BFR on the bike is very difficult. We recommend starting with 5-8 minutes to determine tolerance, and progress accordingly.

Bibliography


Abstract

Concurrent improvements in aerobic capacity and muscle hypertrophy in response to a single mode of training have not been reported. We examined the effects of low-intensity cycle exercise training with and without blood flow restriction (BFR) on muscle size and maximum oxygen uptake (VO2max). A group of 19 young men (mean age ± SD: 23.0 ± 1.7 years) were allocated randomly into either a BFR-training group (n=9, BFR-training) or a non-BFR control training group (n=10, CON-training), both of which trained 3 days/wk for 8 wk. Training intensity and duration were 40% of VO2max and 15 min for the BFR-training group and 40% of VO2max and 45 min for the CON-training group. MRI-measured thigh and quadriceps muscle cross-sectional area and muscle volume increased by 3.4–5.1% (P < 0.01) and isometric knee extension strength tended to increase by 7.7% (p < 0.10) in the BFR-training group. There was no change in muscle size (~0.6%) and strength (~1.4%) in the CON-training group. Significant improvements in VO2max (6.4%) and exercise time until exhaustion (15.4%) were observed in the BFR-training group (p < 0.05) but not in the CON-training group (~0.1 and 3.9%, respectively). The results suggest that low-intensity, short-duration cycling exercise combined with BFR improves both muscle hypertrophy and aerobic capacity concurrently in young men.
Key words: Muscle hypertrophy, Aerobic exercise, Occlusion, Muscle strength.