Blood Flow Restriction and Cycling
(Possibly the most efficient way to increase strength & endurance?)

We have all come to understand that performing BFR with low load resistance training has positive effects on muscle size and function. However, the combination of BFR and endurance activities, such as low load cycling, has become increasingly popular in the clinical and performance settings. We will present the current published studies in the literature assessing BFR and cycling. The first in this series is a recent paper by Oliveira et al (Epub ahead of print), which demonstrated that only low intensity cycling under BFR significantly increased VO2 and muscle strength. Read more...
Short-term low-intensity blood flow restricted interval training improves both aerobic fitness and muscle strength.¹

This study aimed to analyze and compare the effects of four different interval-training protocols on aerobic fitness and muscle strength. Thirty-seven subjects were assigned to one of four groups: low-intensity interval training with or without BFR, high-intensity interval training, and combined HIT and BFR. The study was carried out over 4 weeks, 3 days per week. Training consisted of 2 sets of 5 intervals week 1, and increased by 1 interval each week (week 4: 2 sets of 8 intervals). The intervals consisted of 2 minutes of effort followed by 1-minute passive rest. The rest interval between sets was 5 minutes (3 minutes active recovery, 2 minutes passive rest). The BFR groups wore cuffs on both proximal thighs with cuffs being inflated during the interval and deflated during the rest period. Low-intensity and low-intensity with BFR trained at 30% (Max Power Output). This is considered a low work rate close to 66 W or around 40% VO2max. The HIT group started each interval at 110% (Max Power Output) and decrease by 5% every 30 seconds [110, 105, 100, 95]. Combined HIT and BFR did 1 set of HIT and 1 set of BFR, alternating order on training days.

### Results

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<th>VO2max</th>
<th>Power</th>
<th>Onset of Lactate Accumulation</th>
<th>Strength</th>
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<td>HIT+ BFR</td>
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(LIT=Low Intensity/HIT=High Intensity)

This study demonstrated improved aerobic capacity, strength, max power, and lactate accumulation with low-intensity intervals combined with BFR. The application of this protocol on the clinical side would require a large time commitment (week 1: 33 minutes per session; week 4: 51 minutes per session). However, the total active time cycling is only 20 minutes week 1 progressing to 32 minutes by week 4.

The subjects wore cuffs on both legs for the training intervention. Although the limb occlusion pressure (LOP) was not personalized they progressed pressure over each week beginning at 140 mmHg up to a final pressure of 200 mmHg. Most personalized tourniquet pressures (PTP) fall within this range and using the 80% PTP measurement may be the easiest way to apply this protocol.

This type of interval training may not be the most feasible in the clinical rehabilitation setting. However, it could be used to create a low-intensity training split of 3 days endurance (BFR+cycling) and 2 days strengthening (BFR+low load resistance) for optimizing performance. The ability to achieve increased endurance and strength gains with a single modality, at a low intensity, in a relatively short amount of time is very intriguing for our patients, athletes and the elderly.
Bibliography


**ABSTRACT**

The present study aimed to analyze and compare the effects of four different interval-training protocols on aerobic fitness and muscle strength. Thirty-seven subjects (23.8 ± 4 years; 171.7 ± 9.5 cm; 70 ± 11 kg) were assigned to one of four groups: low-intensity interval training with [BFR, n = 10] or without [LOW, n = 7] blood flow restriction, high-intensity interval training [HIT, n = 10], and combined HIT and BFR [BFR + HIT, n = 10, every session performed 50% as BFR and 50% as HIT]. Before and after 4 weeks training [3 days a week], the maximal oxygen uptake [VO₂max], maximal power output [Pmax], onset blood lactate accumulation [OBLA], and muscle strength were measured for all subjects. All training groups were able to improve OBLA [BFR, 16%; HIT, 25%; HIT + BFR, 22%; LOW, 6%], with no difference between groups. However, VO₂max and Pmax improved only for BFR [6%, 12%], HIT [9%, 15%] and HIT + BFR [6%, 11%], with no difference between groups. Muscle strength gains were only observed after BFR training [11%]. This study demonstrates the advantage of short-term low-intensity interval BFR training as the single mode of training able to simultaneously improve aerobic fitness and muscular strength.

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**KEYWORDS:**

Short-term interval training; VO₂max; blood flow restriction; cycling; high-intensity exercise; isometric knee extension torque

We would like to thank Kyle Kimbrell for his help with this post. We would also like to thank Jon Hernandez for allowing us to use his photo [his expression sums up BFR and cycling quite well!]