Blood flow restricted (BFR) resistance training leads to increased muscle mass and strength but the time course of adaptations may be different as they are often to a lesser magnitude than high-load (HL) training.

**PURPOSE:** To evaluate the impact of resistance training loads and repetitions on older adults’ muscle mass and strength following BFR or HL training.

**METHODS:** Twenty-one older adults (67-90 years) were randomly assigned to HL (n=11) or BFR (n=10) training on the knee extensors and flexors twice per week for 12 weeks. Muscle strength was measured with 10-repetition maximum (10-RM) loads and muscle mass was assessed via magnetic resonance imaging and quantified as cross-sectional area (CSA). The measurements were performed before and after 12 weeks of training.

**RESULTS:** After 12 weeks of resistance training, the HL and BFR interventions increased 10-RM knee flexion strength by 36.9±25.4% and 18.9±25.5%, respectively, but there was not a significant time x group interaction (P=0.16). CSA of the knee flexors increased an average of 4.8±5.9% among the HL and BFR training interventions (time main effect P=0.01) but was not different between the training groups (time x group interaction P=0.89). There were similar rates of progression of knee flexion training load and repetitions (time x group interactions of each variable P<0.05) as the groups combined averaged an increase of 28±1 kg•session⁻¹ and 39±2.8 repetitions•session⁻¹ of training (time main effects P<0.05). Participants in the HL training group experienced greater improvements in knee extension 10-RM strength than the BFR group (60.7±36.0% vs 35.3±25.5%; P<0.03). The growth in quadriceps CSA was significant (time main effect P<0.01) and to similar magnitudes (time x group interaction P=0.62) following HL training (6.5±3.1%) and BFR training (7.8±5.2%). The HL group experienced a faster progression of load when compared to BFR training (46±3.0 kg•session⁻¹ vs 15±2 kg•session⁻¹; P=0.006). The BFR training group progressed at a rate of 1.8±0.3 repetitions•session⁻¹ while the HL group progressed at 1.1±0.21 repetitions•session⁻¹ (P=0.003).

**CONCLUSIONS:** HL resistance training may result in better strength gains than BFR resistance training because of distinctive rates of progressive overload.

Supported by NIH grant 1R15 A6040700-01A1

---

**Board #221**

**June 1 9:30 AM - 11:00 AM**

**B.F.R. For Proximal Benefit: Blood Flow Restriction Therapy For The Shoulder?**

Bradley Lambert¹, Corbin Hedt¹, Eden Epner¹, Kalyan Chaliki², Christine Wang², Joshua Lee², Aya Rossano², Michael Moreno², Patrick McCulloch¹.  
¹Houston Methodist Hospital, Houston, TX. ²Rice University, Houston, TX. ³Texas A&M University, College Station, TX.  
Email: bslambert@houstonmethodist.org

(No relationships reported)

Blood flow restriction (BFR) therapy has been observed to improve post-operative recovery in the limbs when combined with low intensity resistance exercise (LIX). Little data exists regarding use of BFR for proximal benefit of the upper limbs (shoulder).

**PURPOSE:** (1) Determine if rotator cuff (RC) exercises combined with BFR (BFR-Rx) promote greater increases in strength, muscular endurance, and lean mass compared to exercise alone (NoBFR-Rx); (2) Determine if BFR applied to the arm during acute LIX increases activation of RC muscles.

**METHODS:** Eighteen healthy adults (¹ 11, 32±5yr, 92±15.2kg | ² 7, 34±7yr, 81±16.3kg) were recruited and randomized into 2 groups (BFR-Rx, NoBFR-Rx). Each performed 8weeks of LIX (2wk) using 4 RC exercises: cable external rotation (ER), cable internal rotation (IR), dumbbell scaption, and side-lying dumbbell ER; 20%1RM; 1set/30repes followed by 3sets/15repes (30s rest between sets, 2min rest between exercises. ¹lb resistance each week all repetitions achieved). For the BFR-Rx group, BFR was applied to using a tourniquet system (Defil®) that maintained 50% limb occlusion pressure during each exercise with pressure released between exercises. A group x time ANCOVA (co-varied on baseline) followed by a tukey’s post hoc test was used to detect absolute & relative changes in strength (pre/post training), lean mass (pre/post training; DEXA, GE®), and achieved weekly exercise volume (sets x reps x resistance). A two-tailed paired samples t-test was used to detect differences in RC muscle activation (EMG, Delays®) recorded during acute ER and IR fatigue tests in all subjects. Type I error was set at α=0.05.

**CONCLUSIONS:** Combined BFR-Rx using RC exercises may yield greater increases in shoulder/arm lean mass, strength, and muscular endurance compared to exercise alone. These findings may be partially due to a greater activation of shoulder musculature while using BFR. Data collection is ongoing and will be completed prior to conference.
The Perceived Tightness Scale Does Not Provide Reliable Estimates Of Blood Flow Restriction Pressure

Zachary W. Bell, Scott J. Dankel, Robert W. Spitz, Raksha N. Chatakondi, Takashi Abe, Jeremy P. Loenneke. The University of Mississippi, University, MS.

(No relationships reported)

When completing blood flow restriction, use of a perceived tightness scale is recommended as a method for setting sub-occlusive pressures. However, whether or not participants can consistently rate a similar pressure using this scale is unknown.

**PURPOSE:** To determine the reliability of a perceived pressure when asking participants to rate a 7 out of 10, considered a moderate pressure with no pain, during blood flow restriction.

**METHODOLOGY:** Participants (12 men, 12 women) were tested over 3 visits, involving measurements for arterial occlusion and the relative pressure at which participants deemed a 7 out of 10.

Participants arrived to the lab and proceeded to lie supine for a 10-minute rest period. Measurements were completed in one limb for the upper and lower body. A repeated measures analysis with a between subject factor of sex was used to compare relative arterial occlusion pressures across days and sex with a default prior of 0.5 for the fixed effects and 1 for the random effects. An independent samples t-test was used to determine if there were sex differences in %CV with a default prior of 0.707. A Bayes factor (BF$_{10}$) of 3 and 0.33 was considered evidence for the alternative and null hypotheses, respectively.

**RESULTS:** The %CV for the measurement in the upper body was 12%, with no effect of sex (men: 12.3% vs. women 12.2%; BF$_{10}$: .403; median δ (95% credible interval): -0.04 (0.74, 0.752)). The %CV for relative arterial occlusion pressure in the lower body also did not differ between sexes (men: 13.7% vs. women 13.4%; BF$_{10}$: .509; median δ (95% credible interval): -0.06 (1.39, 1.37)). Participants’ rated a 7/10 pressure above the arterial occlusion pressure for the upper body and below for the lower body. At the group level, participants rated a 7 out of 10 at a higher relative pressure on day 1 compared to days 2 (BF$_{10}$: 4.482, median δ (95% credible interval): -0.694 (-1.307, -1.30)) and 3 (BF$_{10}$: 10.2, median δ (95% credible interval): -1.383 (-1.468, -1.189)) for the lower body but no differences in the upper body. There was no effect of sex.

**CONCLUSIONS:** The use of a perceived tightness scale does not appear to provide a reliable method for the prescription of blood flow restriction pressure. Future work should consider alternative methods or modifications to the scale for improving reliability when setting sub-occlusive pressures.