CONCLUSIONS: All groups increased muscle size; however, this response was lower in all very low training conditions compared to high load training. 1RM strength increased in the 70% condition only, with no other changes in strength observed. These results suggest that loads as low as 15% 1RM do not provide adaptations comparable to high load resistance training. Further, BFR cannot be used to compensate for an insufficient external load regarding muscle size and strength adaptations.

3522 Board #210  June 1 9:30 AM - 11:00 AM
Nitric Oxide-dependent Myogenic Satellite Cell Activation In Human Skeletal Muscle Following Blood-flow Restricted Exercise
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(No relationships reported)

PURPOSE: Skeletal muscle contractions performed under concurrent blood-flow restriction (BFR) have been shown to elicit myogenic satellite cell (MSC) proliferation and differentiation; however, the upstream signaling events governing MSC activation with BFR exercise remains unknown. A potential important upstream regulator of MSC activation initiated by BFR exercise may be nitric oxide (NO). Thus, the aim of the present study was to investigate the effect of endogenous nitric oxide (NO) synthesis on MSC activation in human skeletal muscle in response to BFR exercise.

METHODS: Eight male subjects (20.9 ± 2.7 (SD) years) performed five sets of low-load knee extensor exercise (20% 1RM) with concurrent BFR applied with a pressure cuff (100 mmHg) positioned at the proximal thigh. Concurrently, local arterial infusion of the NO synthase (NOS) inhibitor, NG-monomethyl-L-arginine (L-NMMA) or Placebo was applied in a within-subject cross-over design. Arterio-venous blood samples were obtained before and after exercise (30min) for assessment of leg blood-flow and oxygen extraction. Muscle biopsies were obtained at Baseline as well as 1, 3, 24 and 48h post exercise (Post1-48) for assessment of myogenic satellite cell (Pa77) content using immuno-fluorescence techniques.

RESULTS: Resting leg blood flow decreased 37 % (0.57 ± 0.14 L/min to 0.36 ± 0.12 L/min) and oxygen extraction increased 98 % (26.8 ± 9.2 to 53.1 ± 4.7 %) with NOS inhibition (P<0.001), while remaining unchanged in the Placebo condition. MSC counts increased (47-94 %) with Placebo infusion from baseline (9.7 ± 3.3 MSC per 100 myofiber) to Post1 (15.0 ± 4.1), Post3 (15.3 ± 4.2) and Post24 (18.8 ± 7.0) and Post48 (14.2 ± 5.3) (P<0.05-0.001), while remaining unchanged with NOS inhibition.

CONCLUSIONS: This study is the first to show that inhibition of endogenous NO synthesis blunts MSC activation in response to muscle contractions performed during conditions of partial-blood flow restriction in human skeletal muscle. In conclusion, the present data suggest that NO is a key signaling molecule activating MSC in human skeletal muscle in vivo.

3523 Board #211  June 1 9:30 AM - 11:00 AM
Endurance is Augmented By Greater Blood Flow Restriction Pressures: Muscle Size and Strength Are Not
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(No relationships reported)

PURPOSE: The importance of training to failure, especially when using low-loads (i.e., 30% 1RM) is well established. However, it remains unknown if lifting 15% 1RM can disrupt muscular blood flow enough to induce failure and stimulate adaptation. This study was designed to compare muscular adaptations between training with 15% 1RM and 70% 1RM, to determine if blood flow restriction (BFR) could augment the response to 15% 1RM, and if the effect of BFR is pressure dependent [40% versus 80% arterial occlusion pressure (AOP)].

METHODS: Sixty untrained participants performed 4 sets of unilateral knee extension exercise [2x/week for 8 weeks, with two conditions, one per leg. Conditions (label) were: 15% 1RM 0% AOP (15/0), 15% 1RM 40% AOP (15/40), 15% 1RM 80% AOP (15/80), 70% 1RM 0% AOP (70/0). Sets were stopped at 90 repetitions or volitional failure using 30% of 1RM. Isokinetic MVC at 60°/s did not change [2.45 (1.97, 2.93) Nm, p<0.001]. There were main effects of condition for each site (70/0 was greater, all p<0.001) except 30% lateral (p=0.059).

RESULTS: Muscle cell swelling is a purported mechanism for the muscle hypertrophy following muscle contractions performed during conditions of partial-blood flow restriction in human skeletal muscle. In conclusion, the present data suggest that NO is a key signaling molecule activating MSC in human skeletal muscle in vivo.

3524 Board #212  June 1 9:30 AM - 11:00 AM
The Acute Muscle Swelling Response: The Influence Of Sex And Cuff Size
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(No relationships reported)

Muscle cell swelling is a purported mechanism for the hypertrophy following blood flow restriction (BFR) training. There are numerous cuff widths used in literature in BFR. It is presently unknown if cuff width impacts the swelling response and whether this differs between sexes.

PURPOSE: To examine whether the acute muscle swelling response differs based on cuff size and sex.

METHODS: Forty-nine (25 men, 24 women) participants completed two conditions in a random order (one each arm). Participants completed four sets of unilateral elbow flexion exercise to failure using 30% of their one repetition maximum with BFR applied with either a narrow (5cm) or a wide (12 cm) cuff. The average difference in cuff [mean difference (95% confidence interval)] was 0.06 (−0.06, 0.18) cm. There was no evidence of a difference within the narrow [0.06 (−0.01, 0.14) cm] cuff compared to the wide [0.49 (0.14) cm] cuff [median δ (95% credible interval) .602 (.071, 1.52); BF10: 38.57]; but there was no evidence of a difference within the wide cuff [median δ (95% credible interval) .903 (.324, 1.52); BF10: .439]. However, there was no evidence for the null in women [Narrow: 0.39 (.15) vs. Wide: 0.43 (.12) cm; BF10: .302].

CONCLUSIONS: Acute muscle swelling occurs in both men and women, even when using a wide cuff. There is evidence, however, that the change in swelling is greater in men, particularly with the narrow cuff. Whether these acute changes translate to differences in chronic adaptations is currently unknown.