minutes after completing the submaximal test. Predicted VO_2 was calculated from a submaximal treadmill test. An SVR exercise response coefficient (ERC) was derived and subjects were then categorized as normal response (NR) to exercise or abnormal response (AR) to exercise. Comparisons between groups were determined using ANOVA.
RESULTS: The AR group indicated a significant blunted or even elevated SVR coefficient (1.092±.09 p<.05) compared to the NR group (.853±.098). The LAEI was significantly different between the groups (16.25 ±3.68 mL/mm Hg x 10 vs 13.58±3.34 mL/mm Hg x 10).There were also significant differences (p.<05) in the post exercise responses of ejection time (284.06±19.5 ms vs 314.06±24.93 ms), systolic BP (120.58±10.73 mmHg vs 114.43±10.70mmHg), and diastolic BP (70.65±7.38 mmHg vs 66.24±7.3 mmHg).
CONCLUSIONS: The lack of response may be due to the poor fitness level. Although fitness was not found to be significant between the groups the fitness levels were poor. Poor fitness due to inactivity decreases vasodilator function in the smooth muscles associated with the smaller arterioles at the tissue level. The results of the lack of vasodilation may be the cause for the reduced ejection time due to the increased afterload.

C-25 Free Communication/Poster - Cardiovascular Responses, Training and Testing

Thursday, May 29, 2014, 7:30 AM - 12:30 PM
Room: WB1

1300 Board #40 May 29, 9:00 AM - 10:30 AM

Activation Of Akt/mtor Pathway In Response To Acute Exercise In Rats Of Different Trained Status

Yunhong Wang, Hao Wu, Shoufu Yan, Yuan Yao, Lei Liang, Chengcheng Fu, Kun Lang, Dongdong Li, Meiyue Hao. *Capital University Physical Education and Sports, Beijing, China.*
(No relationships reported)

IGF-I coupled to the phosphatidylinositol 3-kinase (PI3K)/ Akt signaling pathway has been proved to be critical in exercise-induced cardiac hypertrophy. However, the activation pattern of Akt/mTOR signaling pathway in the process of development of exercise-induced cardiac hypertrophy is not well documented.
PURPOSE: To characterize the activation pattern of Akt/mTOR signal pathway induced by exercise training so as to understanding the role of Akt/mTOR signaling pathway in the exercise induced cardiac adaptation.
METHODS: Male 8-week-old Sprague-Dawley rats were randomly divided into either exercise training or control groups. The exercise training groups were subjected to a single bout of exercise, 4-week or 10-week exercise training respectively according to our previously exercise training protocols, and then rats were decapitated at the designated time points(0 hour, 3 hour, 24 hour) after last exercise. The heart was weighed, and then tissues of left ventricle were frozen for determination of the proteins by Western blotting analysis.
RESULTS: The results showed that a single moderate endurance exercise could not induce significant increase in the activation of Akt/mTOR signaling pathway($p>0.05$), however, after 4-week training, the basal activation level of Akt/mTOR signaling pathway significantly elevated (p-Akt/Akt ratio increased by 2.46 fold: 0.3891±0.0127 vs 0.9566±0.0394, $p<0.05$; p-TOR/mTOR ratio increased by 1.20 fold: 0.4076±0.0253 vs 0.4937±0.0148, $p<0.05$), but the heart weight to body weight ratio did not significantly increase (2.89±0.23 vs 3.22±0.19, $p<0.05$); in contrast, with the exercise training continuesly increased in intensity and duration, the basal activation level of Akt/mTOR signaling pathway reversed to the sedentary level, but the heart weight to body weight ratio was significantly increased(2.61±0.16 vs 3.02±0.26, $p<0.05$).
CONCLUSIONS: The activation of Akt/mTOR signaling pathway changed dependently on the training status, and the sustained activation of Akt/mTOR signaling pathway was observed only at the development stage of cardiac hypertrophy.

1301 Board #41 May 29, 9:00 AM - 10:30 AM

Individual Variability In Cardiac Biomarker Release After High Intensity Rowing In Elite And Amateur Athletes

Luis E. Carranza-García[1], Alejandro Legaz-Arrese[2], Fernando A. Ochoa-Ahmed[1], César Vinacua-Salvo[2], Patricia Muñoz-Iriarte[2], Oswaldo Ceballos-Gurrola[1]. *[1]Autonomous University of Nuevo Leon, San Nicolás de los Garza, Mexico. [2]University of Zaragoza, Zaragoza, Spain.*
(No relationships reported)

The release of cardiac biomarkers with exercise has been previously suggested, however the influence of training level in continuous strenuous efforts in rowing is currently unknown.
PURPOSE: This study had two specific objectives; 1) to examine the individual release of cardiac troponin I (cTnI) and N-terminal pro-brain natriuretic peptide (NT-proBNP) to high intensity rowing exercise, and 2) to establish the influence of training level on cTnI and NT-proBNP release.
METHODS: We examined cTnI and NT-proBNP in 18 elite and 14 amateur rowers before and 5 min, 1, 3, 6, 12, and 24 h after a 30 min maximal rowing test.
RESULTS: Peak post-exercise cTnI (pre: 0.015 ± 0.030, peak post: 0.058 ± 0.091 μg L^{-1}, p = 0.000) and NT-proBNP (pre: 15 ± 11, peak post: 31 ± 19 ng L^{-1}, p = 0.000) were significantly elevated although considerable heterogeneity in peak cTnI concentration and time-course of release were noted. Peak cTnI exceeded the upper reference limit in 8 elite and 3 amateur rowers. Less heterogeneity was noted in NT-proBNP data with no rower exceeding the URL. There were no significant differences in peak post-exercise cTnI or NT-proBNP between the elite and amateur rowers.
CONCLUSION: In summary, marked individuality in cTnI response was noted to a short but high intensity exercise test. Training status did not seem to mediate cardiac biomarker response to such and exercise stimulus.

cTnI (μg L-1) and NT-proBNP (ng L-1) before and after 30 min of high-intensity rowing exercise

		Pre-exercise	5 min post	1 h post	3 h post	6 h post	12 h post	24 h post	p value
cTnI	Elite rowers	0.019 ± 0.038	0.022 ± 0.048	0.030 ± 0.051	0.069 ± 0.095*	0.079 ± 0.116*	0.045 ± 0.073	0.023 ± 0.046	0.000
	Amateur rowers	0.010 ± 0.017	0.008 ± 0.013	0.011 ± 0.018	0.025 ± 0.028*	0.028 ± 0.029*	0.020 ± 0.019	0.007 ± 0.007	0.000
NT-proBNP	Elite rowers	14 ± 11	25 ± 18*	21 ± 16*	19 ± 14	18 ± 12	18 ± 11	19 ± 14	0.000
	Amateur rowers	17 ± 12	25 ± 19	25 ± 17	26 ± 18	26 ± 18*	28 ± 18*	27 ± 17*	0.006

* Significantly different from the baseline

1302 Board #42 May 29, 9:00 AM - 10:30 AM

Release of Cardiac Troponin in Basketball Players is Independent of Training Level and Maturation Status

Ricardo Navarro-Orocio[1], Alejandro Legaz-Arrese[2], César Vinacua-Salvo[2], Patricia Muñoz-Iriarte[2], Iñigo Lacuey-Burguete[2], Luis E. Carranza-García[1]. [1]*Autonomous University of Nuevo Leon, San Nicolás de los Garza, Mexico*. [2]*University of Zaragoza, Zaragoza, Spain*.

(No relationships reported)

The impact of intermittent exercise on the release of cardiac troponins is controversial, and the influence of several factors, such as training level and maturation status, has not been analysed.

PURPOSE: This study examines the influence of training level and maturation status on the release of cardiac troponin I (cTnI) in basketball players.

METHODS: Thirty-six basketball players (12 professional, 12 amateur, and 12 junior)(Table 1) participated in a simulated basketball match with serial assessment of cTnI from blood samples collected at rest, immediately post- and at 1, 3, 6, 12, and 24 h post-exercise.

RESULTS: The basketball match increased cTnI levels (pre: 0.008 ± 0.006, peak post: 0.041 ± 0.057 μg L^{-1}; p = 0.000) (Table 2). There were no differences on the increase of cTnI levels between professionals (0.040 ± 0.066 μg L^{-1}), amateurs (0.012 ± 0.009 μg L^{-1}) and juniors (0.049 ± 0.071 μg L^{-1}) (p = 0.179). 3 professionals and 5 juniors (23%) exceeded the URL of cTnI.

CONCLUSION: The results suggest that basketball match promote a limited release of cTnI not related with training level neither maturation status.

Table 1. Characteristics of the study population by training status

	Age (years)	Weigh t (kg)	Height (cm)	VO_{2max} ($ml.kg^{-1}.min^{-1}$)	Basketball training history (years)	Basketball training frequency (sessions/ week)	Basketball training volume (hours/wee k)
Professional basketball players	27.3 ± 4.1	98.3 ± 12.9	199 ± 7	58 ± 3	17 ± 5	6 ± 0	16 ± 0
Amateur basketball players	29.6 ± 2.9*	83.8 ± 12.9*	184 ± 6*	56 ± 7	13 ± 3*	4.1 ± 1.2*	7.5 ± 3.6*
Junior basketball players	16.6 ± 0.9*&	82.8 ± 10.3*	192 ± 8*&	58 ± 3	8 ± 4*&	4 ± 0*	8.0 ± 0*

* Significant differences between professional and amateur or junior basketball players.
& Significant differences between amateur and junior basketball players.

Table 2. cTnI (μg L^{-1}) before and after the simulated basketball match

Pre-exercise	5 min post	1 h post	3 h post	6 h post	12 h post	24 h post	*p* value
0.008 ± 0.006	0.011 ± 0.011	0.018 ± 0.024	0.029 ± 0.043 *	0.032 ± 0.044 *	0.026 ± 0.038 *	0.016 ± 0.026	0.000

* Significant differences compared with the baseline value.

1303 Board #43 May 29, 9:00 AM - 10:30 AM

Acute and Chronic High-intensity Endurance Training Increases Anabolic Response in Left Ventricular Muscle in Aged Rats

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(No relationships reported)

PURPOSE: Aging is characterized by a progressive loss of muscle mass. The present study was performed to investigate the effect of acute and chronic high-intensity endurance exercise on left ventricular muscle protein synthesis in aged rats.

METHODS: Male Sprague-Dawley rats (100 wk) were randomly assigned into control (n=28) and training (n=28) groups. Training group ran on the rodent treadmill for 1 hour at the level of 15m/min on a 15% incline (75~ 80% VO2max) for 12 weeks (5d/w). Muscle samples were obtained from left ventricular muscle before and during the recovery period (immediately, 1hr, and 3hr after running) of the single bout of intense running (1hr). Phosphorylations of anabolic signaling related proteins were analyzed by SDS-PAGE and western blotting.

RESULTS: The HW/BW ratio, indicator of cardiac hypertrophy, in training group was increased by 9.4 % (3.66±0.4 mg/g, p<.05) than control group. We also confirmed Akt(30%, p<.05), mTOR(64%, p<.05) and p70S6K(82%, p<.05) in control group were significantly increased with the intensive acute running. The mean changes of Akt(87%, p<.05), mTOR(32%, p<.05), p70S6K(25%, p<.05), and 4E-BP1(35%, p<.05) phosphorylation with the training during the recovery period were higher in training group than control group. The changes of resting Akt(156%, p<.05), mTOR(58%, p<.05), p70S6K(98%, p<.05), 4E-BP1(103%, p<.05) and AMPK(51%, p<.05) phosphorylation were higher in training group than control group.

CONCLUSIONS: This study demonstrates that acute and chronic high-intensity aerobic exercise increases the Akt/mTOR signaling pathway and the chronic exercise induces physiological growth of cardiac muscle in aged rats.

1304 Board #44 May 29, 9:00 AM - 10:30 AM

The Effects of Salamba Sirsasana on Heart Rate Variability in Advanced Yoga Practitioners

Steven D. Munassi, Silvie Grote. *Loyola Marymount University, Los Angeles, CA.*

(No relationships reported)

The effects of yoga practice have shown increased vagal modulation but there is limited information on which specific parts of yoga practice enhance autonomic control of the heart.
PURPOSE: The goal of this study was to evaluate effect of acute inversion, salamba sirsasana (supported headstand), on heart rate variability (HRV).
METHODS: Advanced yoga practitioners (n = 16; 14 female and 2 male, ages 44.4 + 13.6 years) completed 3 trials consisting of 5-minute phases of shavasana (resting pose), salamba sirsasana, and shavasana. Breathing was paced during both trials of shavasana at 5 breaths per minute, but not during salamba sirsasana. The trials were divided between two days within a one-week period. Each trial was carried out in the most comfortable environment for the individual (i.e. yoga studio, office, house etc.) or if unable to utilize those areas, in the Human Performance Lab at Loyola Marymount University. Heart Rate Variability measurements were assessed using the Polar RS800CX G5.
RESULTS: Paired t-test revealed statistically significant difference in HRV in the very low frequency component (VLF) of trial 1 ($p = 0.022$) and trial 2 ($p = 0.021$). Statistical significance was also found in the high frequency (HF) component of post phases of 2 trials performed on the same day ($p = 0.043$). No trends were seen in low-frequency (LF) components.
CONCLUSIONS: Salamba sirsasana results in significant increases in VLF component of HRV in advanced yoga practitioners as seen in pre and post assessments of trial 1 and trial 2. Significant increase of HF component in post phases of 2 trials repeated in one day suggests a clinically desirable increase in vagal tone with repeated inversions. Future studies should examine the duration of the effect of inversions on HRV, the result of utilizing different inversions, and the outcome of these trials on non-practitioners.

1305 Board #45 May 29, 9:00 AM - 10:30 AM

The Akt/FoxO3a/Atrogin-1 Signaling Pathways Underlying Cardiac Regression after Detraining in a Mouse Heart.

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(No relationships reported)

Exercise-induced cardiac hypertrophy reverses after cessation of exercise training. The Akt/FoxO3a/Atrogin-1 pathways have been implicated as important players in skeletal and cardiac muscle atrophy. However, little is known about the role of these pathways in cardiac muscle regression after exercise cessation.
PURPOSE: The purpose of this study was to determine the activities of Akt, FoxO, and to measure the levels of the muscle-specific E3 ligase, Atrogin-1 in cardiac muscle which has undergone regression of mass after cessation of exercise training.
METHODS: Three to four month old male C57Bl/6 mice were randomly divided into six groups: sedentary controls, 21 days of exercise, and 4 different time points of detraining after 21 days of voluntary wheel running (ie. 3 days, 5 days, 14 days, and 21 days).
RESULTS: Body weight was not significantly different among groups. Exercise training significantly increased the heart weight/body weight ratio compared to sedentary controls (13% increase in HW/BW), but this growth was regressed after 21 days of detraining. We found that phosphorylation of Akt normalized to total Akt was significantly increased in the exercise group, and also in the 3-, 5-, and 14 days of detraining groups, but was significantly decreased in the 21 days of detraining group compared to the sedentary control group. However, the phospho-FoxO3a to total FoxO3a ratio was not different among groups. Interestingly, the level of Atrogin-1 was significantly decreased in 14-, and 21 days of detraining groups. Our results suggest that cardiac regression following exercise cessation is not mediated by up-regulation of Atrogin-1.
CONCLUSION: Taken together, this study demonstrates that cardiac regression occurs after 21 days of exercise cessation and it may be partially mediated by inactivation of Akt.

1306 Board #46 May 29, 9:00 AM - 10:30 AM

Racial Differences In Pressure Wave Separation Responses Following An 8 Week Endurance Training Program

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(No relationships reported)

African Americans (AA) have an increased prevalence of hypertension and greater levels of cardiovascular disease morbidity and mortality when compared with Caucasians (CA). Untrained AA do not experience exercise-induced hypotension. It is unknown if exercise training can alter this response.
PURPOSE: To compare the training induced differences in the BP response following a peak bout of aerobic exercise (VO_2peak), after 8 weeks of endurance training between AA and CA.
METHODS: Young, healthy sedentary (~25yr) AA (n=21, BMI=29.1 kg/m^2) and CA (n=24, BMI=24.7 kg/m^2) subjects participated in 40-60 min, 3 times per week for 8 weeks, of aerobic exercise training at 70-80% of peak HR. Individuals had brachial (bSBP, bPP), and aortic (aSBP, aPP) measurements obtained in the supine position at rest, 15 min following a peak bout of aerobic exercise. Applanation tonometry was used to obtain aSBP pressure waveforms. Wave separation analyses were used to produce forward and reflected wave pressures height (FPH, RPH). Repeated measure Analysis of variance (ANOVA) was performed to investigate ethnic differences in post training status.
RESULTS: Resting blood pressure was not changed with training for either group (AA: bSBP 118 vs. 116, aSBP 103 vs. 101 and CA: bSBP 119 vs. 119, aSBP 100 vs. 101). (See table) Exercise training reduced the change from rest to 15 min after acute maximal exercise for bPP, aPP and FPH (*$p<0.05$), in both groups. However, there was an interaction for RPH (**$p<0.05$) and the reduced change was significant from baseline only in the AA (‡$p<0.05$)

CONCLUSION: Exercise training appears to attenuate the changes in blood pressure following acute maximal exercise. This suggests that exercise training reduces post exercise hypotension.

	AA change from rest 15 min post acute exercise		**CA change from rest 15 min post acute exercise**	
	Pre- training	**post-training**	**Pre-training**	**post -training**
Aortic PP (mm Hg)*	-6.8±1.3	-2.4±1.3	-3.4 ±1.1	-2.3±1.1
Brachial PP (mm Hg)*	-5.6±1.6	-0.2±1.7	-1.6±1.3	-0.2±1.5
FPH (mm Hg)*	-5.0±1.2	-0.7±1.1	-4.0±1.1	-2.0±1.0
RPH (mmHg)**	-5.0±0.7	-2.8±0.6‡	-3.4 ±0.7	-4.4±0.6

1307 Board #47 May 29, 9:00 AM - 10:30 AM

Influence Of Regular Aerobic Exercise On Post-exercise Hypotension: A Systematic Review And Metanalysis

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(No relationships reported)

Many studies have identified the occurrence of post-exercise hypotension, however the determinants of blood pressure reduction after a single exercise session remains unclear.
PURPOSE: To combine the studies results and apply the meta-analytic model to identify the influences of regular aerobic exercise on post-exercise hypotension in normotensive and hypertensive subjects and to verify the effect of other possible modulators such as clinical condition, duration/volume and intensity.
METHODS: A systematic review with meta-analysis. The outcomes compared were: Systolic and diastolic blood pressure, considering the differences between regular practice of aerobic exercise, clinical status, duration and intensity. We evaluated the standardized mean difference given the size of the hypotensive effect. Searches were conducted in *Medline, Scientific Electronic Library Online (SciELO), Lilacs, EMBASE, SPORTDiscus and EBSCO* until September 2013.
RESULTS: Eighty-eight studies were included in the present systematic review, nine were included in the meta-analytic model. The post-exercise hypotensive effect (systolic blood pressure reduction) was identified at 60 min for active (-0.78, 95%CI -1.28 to -0.27 [*P*=0.003]) and sedentary (-0.33, 95% CI -0.55 to -0.10 [*P*=0.004]) and 90 min for active (-1.36, 95%CI -2.44 to -0.28 [*P*=0.013]). The effect size of hypotension was not different according to the regular practice of aerobic exercises. Hypertensive subjects had greater hypotensive effect compared to normotensive (-1.24, 95%CI -1.61 to -0.87 vs -0.33, 95% CI -0.52 to -0.15 - for diastolic blood pressure, respectively). The magnitude of hypotension was not modulated by duration and intensity of the workout.
CONCLUSION: The magnitude of post-exercise hypotension is not modulated by regular aerobic exercise. However, hypertensive subjects have higher postexercise hypotensive effect when compared with their normotensive peers.

1308 Board #48 May 29, 9:00 AM - 10:30 AM

Exercise recovers Mitochondrial Function in Left Ventricle of Rats Inbred for Low Intrinsic Running Capacity

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(No relationships reported)

BACKGROUND: The mechanistically relation between low oxygen metabolism and poor health remains unresolved.
PURPOSE: To measure mitochondrial oxygen consumption in the left ventricle (LV) of 24 female rats artificially inbred for low- and high running capacity (LCR; HCR, respectively) and randomized to either sedate (LCRsed; HCRsed) or exercise training.
METHODS: Oxidative phosphorylation (OXPHOS) capacity was assessed in chemically permeabilized fibres using high-resolution respirometry and corrected for wet-weight. Activity of the TCA cycle enzyme citrate synthase (CS) was measured to indicate mitochondrial density. Exercise training consisted of aerobic interval training (AIT) sessions 5 times a week for 1 month and then 2 times a week for 8 months (LCRext; HCRext). Statistical analyses were performed using a two-way ANOVA.
RESULTS: Baseline results for LV in LCRsed compared to HCRsed showed reduced complex II linked respiration (102.45±8.77 vs. 126.44±6.45 pmol O2*min-1*mgww-1; $p<0.05$), maximal OXPHOS (132.00±5.32 vs. 161.53±12.46 pmol O2*min-1*mgww-1; $p<0.05$).
AIT improved maximal OXPHOS such that there was no difference between LCRext and HCRext (160.62±16.55 vs. 152.56±17.42 pmol O2*min-1*mgww-1; $p>0.05$). AIT had no effect on CS-activity in neither LCR nor HCR (1.05±0.35 and 1.18±0.13 µmol*mg-1*min-1, respectively; $p>0.05$), suggesting primarily qualitative adjustments to exercise training in LV. Expressing mass-specific respiration relative to maximal observed flux indicated that fat oxidation (29±8 vs. 37±8% in LCR; 26±3 vs. 42±10% in HCR; $p<0.01$) and complex I linked respiration (46±6 vs. 53±13% in LCR; 40±5 vs. 52±11% in HCR; $p<0.05$) increased as a result of AIT, independent of mitochondrial density and inbreeding.
CONCLUSIONS: Sedentary rats that contrast in intrinsic low- and high aerobic capacity differ significantly in maximal OXPHOS in LV. Nine months of AIT was able to reverse this initial impairment in mitochondrial function in the heart, mainly through qualitative adjustments. These findings might explain some of the poor health features of low capacity rats and suggest training-induced plasticity within LV.

1309 Board #49 May 29, 9:00 AM - 10:30 AM

P38mapk/redd1/14-3-3 Pathways Is Involved In mTOR Phosphorylation Induced By Physical Exercise In The Myocardium Of Obese Rats

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(No relationships reported)

PURPOSE: Obesity-induced cardiovascular disease is also associated with myocardial insulin resistance and impaired on the Mammalian Target of Rapamycin (mTOR) pathway signaling. Exercise activating the mTOR signaling pathway has been largely shown in skeletal muscle, but insufficiently in myocardial tissue. Actually, it is known that mTOR modulation can occur by many molecules that converge at the level of the Tuberous Sclerosis Tumor Suppressor Proteins 1/2 (TSC1/2). With this in mind, we evaluated P38 Mitogen-Activated Protein Kinases (P38MAPK) phosphorylation and REDD1 (or RTP801, regulated in development and DNA damage responses 1) and 14-3-3 protein levels in the myocardial tissue of obese rats submitted to physical exercise.
METHODS: After installation/achievement of diet-induced obesity and insulin resistance, Wistar rats were divided in two groups: obese rats sedentary; obese rats performed a treadmill running (50-min/day, 5 days per week velocity of 1.0 km/h for 2-months). Lean rats of the same age were used as control group. Forty eight hours after the final physical exercise, the rats were death and myocardial tissue removed for western blot analysis.
RESULTS: Diet-induced obesity increased REDD1 and TSC protein levels and reduced mTOR, P70S6k (p70 ribosomal S6 protein kinase) and 4EBP1 (4E-binding protein-1) phosphorylation. Interestingly, physical exercise reduced REDD1 and TSC protein levels and increased 14-3-3 protein levels and P38MAPK, mTOR, P70S6k and 4EBP1 phosphorylation.
CONCLUSION: Our results showed that P38MAPK/REDD1/14-3-3 via may be involved in the mTOR activation induced by physical exercise in myocardium of obese rats.

1310 Board #50 May 29, 9:00 AM - 10:30 AM

Blood Lactate Dynamics and Heart Rate Variability during Ultra-Distance Relay Running

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(No relationships reported)

Metabolic responses, such as blood lactate (BL) dynamics, and heart electrical activity, such as heart rate variability (HRV), have not been studied during ultra-distance relay run. It was documented that BL as a product of anaerobic glycolysis does not increase after marathon run; however, BL dynamics are unclear during ultra-distance relay run. Beat-to-beat variation in the R-R interval on the electrocardiogram is known as HRV. HRV represents the autonomic balance between the sympathetic and parasympathetic pathways. HRV change might be used as an indication of the central fatigue.
PURPOSE: To analyze BL levels and monitor HRV in male runners before, during and after ultra-long distance relay run.
METHODS: Six experienced runners (31± 5.5 yrs) were monitored during 317 km relay run. Participants were rotating and each completed 6 legs during the race. Average distance of the race leg was 8.8±4.1 km. Capillary blood samples were taken and BL analyzed: Pre; Post; and Post- 1 min; 3 min; 5 min; 10 min; 15 min. HRV was monitored with Actiheart 24 h before, during, and 24 h after the race. HRV evaluated using root mean square of successive differences (rMSSD).
RESULTS: BL levels immediately after each race leg were (3.08±0.84 mmol/L) significantly higher (p=0.03) than before (2.23±0.52 mmol/L) the each leg race, however, within 15min BL cleared (p=0.016). BL levels decreased as race legs progressed. rMSSD pre-race (109.1±18.3) was higher than rMSSD post-race (95.4±20.1). Although post-race HRV was lower, it wasn't significant (p=0.067) probably because due to the small sample size (n=6). HRV does not decline from stage 1 to 6, though, it declined from pre-stage to post-stage recovery.
CONCLUSION: BL increases during the race legs and is observed after each leg, however, BL levels decrease as race legs progress. This might be due to increased Lactate Dehydrogenase enzyme activity. The load experienced from the ultra-distance relay run doesn't have a great effect on HRV during the race but may suggest accumulative fatigue when comparing pre- and post-race day HRV.

1311 Board #51 May 29, 9:00 AM - 10:30 AM

Exercise Training Effects on Brachial Artery Flow-mediated Dilation: A Meta-analysis

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(No relationships reported)

Over the last decade, many studies have examined the influence of exercise training on vascular function.
PURPOSE: To conduct a meta-analysis on existing studies which have examined the impact of exercise training on brachial artery flow-mediated dilation (BAFMD).
METHODS: Data used in the analysis were obtained via a literature search of PubMed. Search terms included: "flow-mediated dilation (FMD)", "vasodilation" and "exercise". Inclusion criteria were: (1) exercise training ≥1 week; (2) FMD conducted on the brachial artery with pre- and post-training values reported; and (3) the use of human subjects.
RESULTS: The final dataset consisted of 64 individual studies, totaling 1,803 intervention and 644 control subjects. The subject pool was composed of men (N=1365) and women (N=1048), range 8-81y, and "healthy" and "diseased" participants. The overall training effect size (ES) was 1.57 (range: -0.16 to 10.02) with 70 of the 85 intervention groups showing a significant improvement in BAFMD (CI≠0). Of the 15 training intervention groups that did not reach statistical significance, 6 had a negative ES. Studies examining "at risk/diseased" subjects demonstrated a greater ES compared to healthy subjects (1.92 and 0.51, respectively; P=0.005). The ES for combined aerobic and resistance training had the largest effect on BAFMD (N=10; ES=1.91; P=0.005), followed by aerobic training (N=58; ES=1.53; P=0.001), and resistance training (N=18; ES=1.47; P=0.005) compared to controls (N=34; ES=-0.19). Training intensity significantly predicted BAMFD ES (β=0.407, P-trend=0.001) as Low-Moderate (ES=1.18; P=0.005) and High+ (ES=1.91; P=0.001) intensity exercise resulted in greater alterations in BAFMD in relation to control (ES=-0.19). Modest relationships were found between BAFMD ES and the effect of age (r=0.375; P=0.001), training intensity (r=0.407; P=0.001) and exercise training duration (r=0.311; P=0.005).
CONCLUSION: On the basis of these data, exercise training produces a large change in BAFMD, a biomarker of vascular health. Moderators to the magnitude of the change in BAFMD with exercise training include health status and training modality.

1312 Board #52 May 29, 9:00 AM - 10:30 AM

Heart Rate Recovery Correlates To Resting Heart Rate Variability In Healthy Young Men

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(No relationships reported)

BACKGROUND: The autonomic modulation of post-exercise heart rate recovery (HRR) is an incompletely explored issue regarding cardiovascular adaptation and prognosis.
OBJECTIVE: To correlate the HRR with autonomic modulation both at rest and on standing up.
METHODS: HRR at 1, 3 and 5 min following maximal treadmill exercise and 5-min time- and frequency-domain heart rate variability (HRV) in resting supine and standing positions were correlated in 31 healthy young males using Spearman's correlation, which was considered significant at a $p<0.05$.
RESULTS: Predominantly parasympathetic modulation was observed in the resting supine position. In the orthostatic position, both prominent parasympathetic withdrawal and sympathetic enhancement was observed. The median (quartiles) HRR at 1 min (26; 20.2-32.5 bpm) showed no correlation with HRV in both postures (p=0.15-0.98) or with the changes on standing up (p=0.07-0.88). HRR at 3 min (61; 56-64.7 bpm) and 5 min (68; 62-73 bpm) also no correlated with the supine HRV (p=0.05-0.98). With the orthostatic HRV, the 3 and 5 min HRR inversely correlated with the parasympathetic (p=0.01-0.04) and directly with the sympathetic indices at 5 min only (p=0.04). A direct correlation of HRR with the orthostatic decrease in parasympathetic indices occurred at 3 min and 5 min (p=0.0009-0.05), but no correlation with the change in sympathetic indices was found (p=0.28-0.99).
CONCLUSION: HRR at 3 and 5 min only was inversely correlated with resting orthostatic parasympathetic modulation and directly correlated with the decrease in parasympathetic activity associated with standing up, while opposite correlations were found between HRR and the sympathetic modulation.

1313 Board #53 May 29, 9:00 AM - 10:30 AM

Myocardial Blood Flow Heterogeneity In Highly Endurance-trained Athletes And Untrained Control Subjects

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(No relationships reported)

PURPOSE: The effects of acute exercise and endurance training on human myocardial blood flow heterogeneity are largely unknown.
METHODS: In the present study we measured myocardial blood flow in 17 different segments of the left ventricle in highly endurance-trained male athletes and matched untrained control subjects at rest, during exercise (n=13+13), and adenosine-induced vasodilatation (n=10+10). Myocardial blood flow was measured by positron emission tomography, regional myocardial blood flow analyzed by a novel Carimas image analysis software, and heterogeneity calculated as coefficient of variation of the segments.
RESULTS: Myocardial blood flow was lower in endurance athletes compared to untrained control subjects in every condition studied. Blood flow was in general the highest in apex, and lowered towards the base. In response to acute exercise (100 watts supine cycling), myocardial blood flow heterogeneity did not change in endurance athletes (23±11% at rest and 19±8% during exercise), but was increased in untrained subjects (18±6% at rest and 30±4% during exercise, p=0.0005). Myocardial blood flow was also more homogenous during exercise in endurance athletes compared to untrained controls, p=0.01). However, blood flow heterogeneity did not change from rest to adenosine-induced vasodilatation, and was not different between the groups at rest or during adenosine infusion.
CONCLUSIONS: Myocardial blood flow heterogeneity increases from rest to exercise in normal healthy untrained men. Additionally, blood flow heterogeneity is more homogenous in highly endurance-trained athletes during exercise at the same absolute external workload, but does not change in response to pharmacologically-induced vasodilatation.

1314 Board #54 May 29, 9:00 AM - 10:30 AM

The Effect Of An Increase In Skeletal Muscle Capillarization On O2 Extraction And Blood Flow In The Exercising Leg

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(No relationships reported)

A higher capillary density is thought to be a primary mechanism underlying the increase in skeletal muscle O2 extraction in the trained state.
PURPOSE: To investigate the role of capillary density on skeletal muscle O2 extraction and blood flow.
METHODS: We measured leg hemodynamics at rest and during one-legged knee-extensor exercise (12 and 24W) and obtained muscle biopsies in 10 healthy young men before and after 4 weeks of treatment with a α1-antagonist (Terazosin, 0.5-1 mg/day) to increase capillarization. Data were analysed by repeated measures two-way ANOVA and Tukey´s honestly significant difference (HSD) post hoc procedure. Statistical significance was accepted at P<0.05.
RESULTS: Resting leg blood flow was increased throughout the 4 weeks of Terazosin treatment (P<0.05). The capillary to fibre ratio was 1.68±0.07 before Terazosin treatment and it increased to 1.89±0.08 after Terazosin treatment (P<0.05). Resting leg blood flow was lower after the Terazosin period (P<0.05), whereas arterial blood pressure was unchanged. After Terazosin treatment, leg blood flow during exercise was lower (12W and 24W, P<0.05), O2 extraction higher (12W, P<0.05) and femoral venous lactate levels lower (24W, P<0.05).
CONCLUSIONS: These results demonstrate that a 4 week increase in vascular wall shear stress induces capillary growth in humans. An increase in capillarization increases O2 extraction in exercising leg and lowers blood flow.
Supported by the Danish Ministry of Culture.

1315 Board #55 May 29, 9:00 AM - 10:30 AM

Aortic Size in National Football League Scouting Combine Participants

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(No relationships reported)

Aortic rupture is an uncommon, but feared, cause of sudden death in athletes. A goal of pre-participation screening programs is to identify athletes at risk for aortic rupture. Normative aortic size data currently exist for the general population based on sex, height, age and other factors. However, there is a lack of normative data for individuals of the age, size and activity level similar to NFL players.
PURPOSE: To examine the distribution of aortic size among NFL Scouting Combine participants and identify the prevalence of aortic size greater than 4.0 cm.
METHODS: We systematically screened draft-eligible college football players at the NFL Scouting Combine over three years (2011-2013) for aortic size prior to participation. Each player underwent a resting echocardiogram as part of a thorough physical examination. Aortic size was measured from the two dimensional parasternal long axis view according to the criteria of the American Society of Echocardiography. Measurements were performed by two expert technicians and confirmed by an expert echocardiographer from the Indiana University Health System.
RESULTS: 983 draft-eligible Combine players were screened over the three years. On average, players were 23.5 years of age (SD=1.3), 244.3 pounds (SD=46.0), 74.0 inches tall (SD=2.7), and had a BMI of 31.4 kg/m2 (SD=4.5). Two-thirds (66.7%) of players were black and 25% were white. One-third (34.3%) were linemen and 30.7% were receivers/defensive backs. There were no players with inadequate images to measure aortic size. The 75th percentile for aortic size was 2.99 cm; the 90th percentile was 3.22 cm; the 95th percentile was 3.37 cm; and the 99th percentile was 3.63 cm. Only one player had an aorta greater than 4.0 cm (0.1%), which was confirmed by MRI.
CONCLUSION: An aorta greater than 4.0 cm is uncommon even in very large, elite athletes. Athletes of any size whose aorta exceeds 4.0 cm may be at risk for aortic rupture and their participation in sports must be carefully considered.
This research was sponsored by the National Football League.

1316 Board #56 May 29, 9:00 AM - 10:30 AM

Comparison of Cardiac Vagal Modulation From the Orthostatic Stress Test Between Untrained Individuals and Athletes.

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(No relationships reported)

Heart rate variability (HRV) and global cardiac vagal modulation are associated with physical capacity in healthy individuals. However adjustments in the cardiac vagal modulation caused by orthostatic (ORT) test between individuals of low physical capacity (non-athletes) and athletes are still unclear.
PURPOSE: To investigate the variation (Δ) of cardiac vagal modulation from supine (SUP) to ORT positions between healthy individuals with low and high physical capacity (athletes).
METHODS: Participated of the present study 18 individuals, divided in two groups: 9 athletes (20 ± 4 years; $\dot{V}O_{2max}$ = 48.7 ± 6.7 ml·kg^{-1}min^{-1}) and 9 non-athletes (25 ± 5 years; $\dot{V}O_{2max}$ = 34.0 ± 3.4 ml·kg^{-1}min^{-1}). Heart rate (HR) was recorded beat-by-beat during 20min at SUP position and 20min at ORT position. High-frequency component (HF, 0.15- 0.40Hz) was presented in normalized unit (n.u.), and also were observed the RR intervals (RR) and the square root of the differences of successive RR squared (RMSSD) as indexes of HRV. We utilized for statistical analysis mean ±SD and Student t-test unpaired ($p \leq 0.05$).

RESULTS: ΔHFn showed significant difference between athletes and non-athletes (-32.3 ± 16.6 vs. -19.5 ± 10.4, p=0.02) respectively. However, there was no significant difference to HF-SUP between the groups (51.4 ± 17.1 vs. 45.37 ± 14.37, p=0.43), as well as to HF-ORT (16.1 ± 10.4 vs. 25.8 ± 20.3, p=0.21). The ΔRR was significantly higher in athletes (-280.5 ± 130.0 ms) than in non-athletes (148.0 ± 124.7 ms, p = 0.04), but not at RR-SUP (1036.5 ± 153.5 vs. 885.9 ± 97.5 ms, p = 0.57) and RR-ORT (756.0 ± 105.0 vs. 737.9 ± 89.6 ms, p = 0.45). RMSSD not demonstrated significant differences between groups at SUP (53.8 ± 31.0 vs. 62.8 ± 35.3 ms, p = 0.57), and ORT (26.8 ± 10.6 vs. 31.4 ± 14.7 ms, p = 0.45) positions. ΔRMSSD also not presented significant difference (-27.0 ± 32.4 vs -31.4 ± 35.5 ms, p = 0.78) between athletes and non-athletes, respectively.
CONCLUSION: The variation of cardiac vagal modulation from SUP to ORT position is higher in athletes than in individuals of low physical capacity.
Supported by CAPES,CNPq and FAPERJ.

1317 Board #57 May 29, 9:00 AM - 10:30 AM

Central Hemodynamic Response To Various Maximal Exercise Protocols

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(No relationships reported)

During incremental exercise to volitional exhaustion, it is evident that stroke volume (SV) increases and plateaus at submaximal work rates, although a linear increase in SV has been revealed in trained athletes progressively to maximal oxygen uptake (VO_{2max}). However, some data show that at near-maximal intensities, SV declines before attainment of VO_{2max}. This phenomenon has been observed in trained individuals completing traditional incremental protocols (RAMP) and supramaximal constant-load exercise. The effect of exercise structure, such as the self-paced and decremental protocols which have been shown to augment VO_{2max}, on central hemodynamics remains unknown. Furthermore, the influence of fitness level on the SV response to maximal exercise tests has not been examined.
PURPOSE: To observe hemodynamic responses to completion of traditional RAMP and two novel maximal exercise protocols in individuals of various fitness level.
METHODS: Thirty men and women (age and %BF = 26.0 ± 5.0 yr and 15.7 ± 7.1%) initially completed RAMP followed by a decremental test (DEC) on a subsequent day. Over the next two sessions, which were randomized and separated by 48 h, participants performed a self-paced (SP) and an additional DEC test. During exercise, gas exchange data were measured via indirect calorimetry and hemodynamic function was assessed via thoracic impedance. Repeated measures ANOVA was used to examine differences in VO_2, HR, SV, and cardiac output (CO) during exercise and across protocol.
RESULTS: The SP protocol elicited a significantly higher ($p < 0.05$) CO_{max} (21.6 ± 3.7 L/min), and HR_{max} (188.2 ± 11.2 b/min) versus RAMP (20.4 ± 3.4 L/min and 185.6 ± 11.2 b/min). Although there was no effect of protocol on SV_{max}, participants with $VO_2max > 45$ mL/kg/min displayed a significant ($p < 0.05$) decline in SV (9 - 17 mL/beat) prior to attainment of VO_{2max} across all protocols. Increased CO_{max} in SP trial mediated a significantly greater ($p < 0.001$) VO_{2max} compared to RAMP (52.7 ± 9.6 vs. 49.7 ± 10.2 mL/kg/min, respectively).
CONCLUSION: Data confirm that SV declines suddenly prior to attainment of VO_{2max} in persons of moderate to high fitness. Protocol-induced increases in CO augmenting VO_{2max} suggest that O_2 delivery is a key limitation to maximal exercise.

1318 Board #58 May 29, 9:00 AM - 10:30 AM

Traditional Ramp Protocol Underestimates VO_2max Compared To Self-paced Exercise

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(No relationships reported)

Recently, a self-paced (SP) and decremental protocol (DEC) demonstrated higher values for VO_2max versus the traditional ramp protocol (RAMP).
PURPOSE: The primary aim of the current study was to examine potential differences in VO_2max between the RAMP and SP and DEC protocols.
METHODS: Thirty men and women (mean age and body fat = 26.0 ± 5.0 yr and 15.7 ± 7.1 %) with divergent fitness level (low, moderate, and high fitness = VO_2max from 35 – 45, 45 – 55, and > 55 mL/kg/min, n = 10 per group) initially completed a RAMP protocol to volitional exhaustion to determine VO_2max, with work rate beginning at 50 – 80 W and increasing by 25 – 40 W/min. On a subsequent day, they performed DEC consisting of 60 s of cycling at 105 %Wmax followed by 10 % reductions in power output during subsequent stages lasting 45, 60, 75 s, and then to exhaustion. Over the next two sessions, which were randomized and separated by 48 h, they performed SP (2 min of cycling at RPE = 11, 13, 15, 17, and 20) and an additional DEC protocol which were followed by a final RAMP 48 h later. During exercise, gas exchange data were obtained using indirect calorimetry, and thoracic impedance was utilized to assess hemodynamic function. Repeated measures analysis of variance was used to examine differences in maximal determinations of VO_2, HR, and cardiac output (CO) across protocol.
RESULTS: Results demonstrated significantly lower ($p < 0.001$) VO_2max in RAMP (49.7 ± 10.2 mL/kg/min) compared to SP (52.7 ± 9.6 mL/kg/min) and DEC (51.2 ± 9.8 and 51.2 ± 9.0 mL/kg/min, respectively), with a significant interaction ($p = 0.047$) seen for fitness level. Eighty percent of participants revealed higher VO_2max in SP versus RAMP, with this difference ranging from -1.3 - 11.0 %. Maximal HR and CO ($p = 0.02$) were higher in response to SP versus other protocols.
CONCLUSIONS: These data show that the traditional ramp protocol may underestimate VO_2max compared to two newly-developed protocols in men and women of varying fitness level, with a greater cardiac output potentially responsible for this outcome.

1319 Board #59 May 29, 9:00 AM - 10:30 AM

Inactivation of AT1a Receptor Attenuates Lactate Accumulation and Enhances Cardiac Performance during Exercise Endurance

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(No relationships reported)

Renin Angiotensin System (RAS) is involved in cardiovascular pathology. Losartan, the AT1 receptor blocker, in combination with regular physical activity has been shown to be effective in improving cardiac function.
OBJECTIVE: The purpose was to study the role of AT1a receptors on heart function, and exercise tolerance in response to chronic exercise using AT1a receptor deletion (AT1aKO) mice.
METHOD: An exercise wheel system was used for the exercise paradigm. Male (C57BL/6) wild type (WT) and AT1aKO mice were randomly assigned to four groups: WT control (n=6), WT exercise (WTEX, n=8), AT1a KO (KO) control (n=5), and AT1a KO exercise (KOEX, n=8). Mice were forced to run at a velocity of 8 m/min for 1 hour, 3d/wk, for 7 wks. Echocardiography was conducted at baseline and 7 wks. Lactate was measured during several exercise sessions. Electrolytes, blood pH, and cardiac histology were assessed post-sacrifice. Results showed a significant increase in ejection fraction (EF%) in KOEX (72.5±1.5%) vs. WTEX and KO control (64.3±1.2% and 63.2±2.2%, respectively). Mitral valve assessment revealed a marked decrease in E-wave velocity in WTEX compared to WT control at baseline (74±1.9 vs.90±3.5 cm/s, $p<0.05$), while E/A wave ratio remained unchanged. Cardiomyocyte diameter was larger in WTEX compared to KOEX (29.5±0.7 vs. 25.8±0.5 µm, $p<0.05$). Heart to body weight ratio was significantly higher in WTEX vs. KOEX (5.5±0.2 vs. 4.3±0.1 mg/g, $p<0.001$). Masson's Trichrome staining revealed higher collagen levels in WTEX myocardium compared to WT control and KOEX (16% vs. 5%). Blood lactate accumulation values were greater at 5 and 60 min of wheel running in WTEX (4.2±0.4 and 3.9±0.5 mmol/l) vs. KOEX (3.0±0.2 and 2.9±0.2 mmol/l). A basic metabolic panel revealed higher [HCO3-] in KOEX vs. WTEX (21.7±0.6 vs. 13.7±1.8 mmol/l). Blood pH was significantly lower in WTEX as compared to KOEX (7.28 vs. 7.41, $p<0.05$). In conclusion, mice lacking AT1a receptor exhibited improved cardiac function without myocardium hypertrophy, higher exercise endurance, and enhanced metabolic response under chronic exercise stimulation. Findings indicate that the AT1a receptor is an important mediator of exercise induced cardiac dysfunction and acid-base imbalance during exercise training.

1320 Board #60 May 29, 9:00 AM - 10:30 AM

Acute Oxygen Consumption And Heart Rate Responses During A Stationary Running Game

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(No relationships reported)

Recently, a new class of video games called exergames (EXG) has used virtual reality to provide to the user the possibility of perceptual and performance emulation with potential for sensory and motor abilities development. To date there are insufficient scientific descriptions about acute cardiovascular responses during physical exertion imposed by EXG.
PURPOSE: To analyze the differences of relative (%) VO_2 max and HR max using stationary running game of Nintendo Wii in the following experimental situations: (A) with the volunteers running on Wii Balance Board, and (B) with the volunteers running on jump platform.
METHODS: Nine healthy male (age: 20±2 yrs) with no prior experience with Wii were recruited. Firstly, the VO_2max and HR max were determined on a treadmill test by measuring respiratory gases coupled with a heart frequency meter. After 24 hours, the subjects were randomly submitted the experimental protocols A and B with 30 minutes of rest between them. During both protocols the VO_2 and HR were monitored during the entire test (6 minutes). Mean and standard deviation of % VO_2 max and % HR max were compared using T-Student test considering significant $p<0.05$.
RESULTS: Both variables analyzed had increase over baseline. Comparing the A and B protocols, it was show that while in A situation the % VO_2 max and % HR max achieve 47,0 and 64,3, respectively, during B situation these values were significantly higher, 65,1% and 76,8%, respectively ($p<0.05$).
CONCLUSION: The data analyzed show that the proposed intervention generated a significant increase in VO2 and HR variables, reaching levels close to indices of moderate and vigorous exercises. Thus, the running game of Wii may be modulating with use of accessories to reach levels according to the ACSM recommendation for health promotion.

1321 Board #61 May 29, 9:00 AM - 10:30 AM

Increase in Exercising Leg Blood Flow Improves Endurance Performance during Dynamic Planter Flexion Exercise

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(No relationships reported)

The reduction of blood flow to active skeletal muscles during dynamic exercise decreases oxygen supply and enhances accumulation of metabolites in the active muscles and diminishes endurance exercise performance. However, it is unknown whether active muscle blood flow is a limiting factor of the endurance performance under normal blood flow conditions.
PURPOSE: To investigate this point, we examined the effects of the increase in exercising leg blood flow (LBF) on endurance performance, cardiovascular and respiratory responses during dynamic plantar flexion exercise.
METHODS: 8 healthy subjects performed dynamic planter flexion exercise at 80% of peak workload with the lower thigh enclosed in a negative pressure box. In control conditions (CON), the box pressure was kept at ambient pressure. In negative pressure conditions (NP), beginning 1 min before the start of the exercise, the box pressure was decreased to -70 mmHg. The exercise was continued until voluntary exhaustion, or terminated if subjects could continue the exercise for 30 min.
RESULTS: In CON, all of the subjects reached exhaustion within 15 min and average exercise tolerance time was 599 ± 78 sec. In NP, all subjects could tolerate the exercise longer periods than CON and 5 subjects could continue the exercise for 30 min. In CON, exercising LBF, heart rate (HR), mean arterial blood pressure (MAP), cardiac output (CO) and oxygen consumption (VO2) gradually increased with exercise duration. Application of negative pressure significantly increased exercising LBF (at 1st min of exercise: 902 ± 95 vs. 1183 ± 103, at last 1 min in CON vs. corresponding time in NP: 1244 ± 64 vs. 1392 ± 45 ml/min, $p < 0.05$). In addition, the cardiovascular and respiratory responses were significantly diminished in NP compared to CON (HR: 82 ± 4 vs. 69 ± 4 beats/min, MAP: 102 ± 3 vs. 84 ± 2 mmHg, CO: 7.6 ± 0.3 vs. 7.0 ± 0.3 L/min, VO2: 437 ± 19 vs. 346 ± 11 ml/min, $p < 0.05$).
CONCLUSIONS: Our results demonstrated that the increase in exercising LBF improves endurance performance and attenuates cardiovascular and respiratory responses during dynamic planter flexion exercise. These results indicate that active muscle blood flow is a limiting factor of the endurance performance as well as an important determinant of the cardiovascular and respiratory responses under normal blood flow conditions.

1322 Board #62 May 29, 9:00 AM - 10:30 AM

The Acute Cardiovascular and Inflammatory Responses to Ultramarathon and Marathon

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(No relationships reported)

Central arterial stiffness (AS) is shown to be increased during the first hour post ultramarathon (ULT), but it is presently unknown if AS remains elevated 24 hours after an ULT or marathon (MAR).
PURPOSE: To determine the effects of ULT and MAR on C-reactive protein (CRP), brachial blood pressure (BP), aortic BP, central AS and aortic augmentation index (AIx). We hypothesized that CRP, central AS and AIx would be elevated 24 hours post-race.
METHODS: Non-invasive estimates of central AS, aortic BP, and AIx were measured via applanation tonometry in 12 endurance athletes (8 men and 4 women) approximately 24 hours before and after an ULT or MAR. Plasma CRP, resting BP, and heart rate variability (HRV) were also assessed during the same times. Runners were 36 ± 2 years, 172 ± 3 cm, 66 ± 3 kg, and had a mean body mass index of 22 ± 1 kg/m^2. Data for the ULT and MAR were pooled because there were no time × distance interactions when distance was entered as a between subjects factor in a repeated measures ANOVA statistical analysis. Because there were no time × distance interactions, we compared all major variables pre vs. post with paired t-tests.
RESULTS: CRP was significantly ($p < 0.05$) elevated (0.5 ± 0.1 vs. 6.8 ± 1.1 mg/L), while resting aortic systolic BP (111 ± 3 vs. 101 ± 3 mmHg) and aortic diastolic BP (73 ± 3 vs. 64 ± 3 mmHg) were significantly lower 24 hours post-race compared to 24 hours pre-race. Likewise, brachial systolic BP (128 ± 4 vs. 121 ± 4 mmHg) and diastolic BP (83 ± 14 vs. 73 ± 11 mmHg) were lower 24 hours post-race. Resting HR and low-frequency to high-frequency HRV were similar the day before and the day after the race. Finally, central AS (via pulse wave velocity) was similar 24 hours post-race compared to 24 hours pre-race, while AIx was lower ($p = 0.05$) 24 hours post-race (13 ± 4 vs. 6 ± 3%).
CONCLUSION: Our findings reveal that systemic inflammation was increased 24 hours post-race, while at the same time brachial BP and aortic BP were decreased. Reductions in AIx and increases in CRP may contribute to the acute exercise-induced central and peripheral hypotension in long-distance runners 24 hours post-race.
This project was funded by an Excellence in Education Research Grant from Northern Michigan University to Bridget Durocher.

1323 Board #63 May 29, 9:00 AM - 10:30 AM

Hemodynamic and Energy Expenditure Responses to Low-Intensity Walking Exercise with Different Blood Flow Restriction Pressures

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(No relationships reported)

PURPOSE: The purpose of the study was to examine the acute effects of walking exercise with varying blood flow restriction (BFR) on oxygen consumption (O_2CON), heart rate (HR), and systolic (SBP) and diastolic blood pressure (DBP).
METHODS: Eleven sedentary but healthy females (age= 22.7±2.8) participated in this study. On the first day, initial screening, anthropometric measures, and familiarization with testing procedures were completed. Subjects returned to the lab after an overnight fast of at least 8 hours to complete five randomized testing sessions on five different days. Each subject's resting HR, BP, and O_2CON were measured before, during, and after testing using HR monitor, stethoscope and manometer, and metabolic cart, respectively. Subjects

exercised for 15 minutes on a treadmill at 3.5 mph and 0% incline. During BFR testing days, elastic cuffs were placed at the upper thighs and the initial restrictive pressure (IRP, pressure created by the tightness of cuffs before inflation with air) was set at ~40 mmHg or ~60 mmHg IRP, and then was inflated with air to reach the final restrictive pressure (FRP; 160 or 200 mmHg). The pressures for four BFR testing days were as follows: IRP-40&FRP-160, IRP-40&FRP-200, IRP-60&FRP-160, and IRP-60&FRP-200 mmHg. During the control day, subjects performed the walking exercise with no BFR (CON).
RESULTS: There were significant main effects for condition and time ($p \leq 0.02$) for total caloric expenditure, HR, and SBP. Significant condition*time interactions ($p < 0.01$) were detected for total energy expenditure, HR, and SBP. Post-hoc comparisons showed significantly higher caloric expenditure for IRP-60&FRP-160 mmHg compared to CON and IRP-40&FRP-200 and SBP for IRP-60&FRP-160 mmHg compared to CON ($p < 0.02$). HR was significantly lower for the CON session compared to the other conditions ($p < 0.04$) except for the condition using IRP-40+FRP-160 mmHg.
CONCLUSIONS: Results suggest that IRP may be an independent factor producing variations in peripheral resistance and venous return. It is likely that varying IRPs cause different demands on the cardiorespiratory system generating changes in the level of activity of the heart and perhaps respiratory muscles. These variations may ultimately result in changes in caloric expenditure and hemodynamic responses.

1324 Board #64 May 29, 9:00 AM - 10:30 AM

Carotid-Femoral Pulse Wave Velocity Does Not Change 24 Hours After A Single Bout Of Exercise

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(No relationships reported)

Assessment protocols for vascular testing, including arterial stiffness measured by carotid-femoral pulse wave velocity (cfPWV), often instruct subjects to avoid exercise 24-48 hours prior to testing due to potential acute but transient changes in vascular compliance. However, whether a moderate exercise bout influences cfPWV 24 hours later has not been studied.
PURPOSE: To determine the effect of a moderate bout of exercise on cfPWV 24 hours later.
METHODS: Sixteen recreationally active adults (age 24 ± 3 years, BMI 23 ± 2 kg/m) completed a supervised, 30-minute treadmill run at 70% age-predicted maximal heart rate (MHR). Treadmill speed was predetermined by a workload estimation session and adjusted as needed to maintain 70-75% MHR. cfPWV was measured in a fasted state after 10 minutes of supine rest by tonometry using the Complior Analyse (Alam Medical, Vincennes, France) immediately before and 24 hours after exercise. Systolic (SBP) and diastolic blood pressure (DBP) were also assessed immediately before cfPWV testing using an automated Dinamap system (GE Healthcare, Pittsburgh, PA). Paired t-tests were used to compare cfPWV, SBP, and DBP pre- and post-exercise. Spearman's correlations between changes in cfPWV and blood pressure (SBP, DBP) were calculated.
RESULTS: A slight decrease in cfPWV was observed 24 hours after the exercise bout, however these results were not statistically significant (5.91 ± 0.78 to 5.74 ± 0.88, p=0.22) and the effect size was small (0.23). Compared to the pre-exercise cfPWV, 8 (50%) subjects had a lower cfPWV 24 hours after exercise, 5 (31%) had no change, and 3 (19%) had a higher cfPWV. Non-significant decreases were also observed for SBP (117 ± 15 to 115 ± 13, p=0.12) and DBP (65 ± 7 to 64 ± 8, p=0.16). Although exercise did not influence cfPWV, significant correlations were observed between 24-hour changes in cfPWV with changes in SBP (r=0.52, p=0.04) and changes in DBP (r=0.53, p=0.04).
CONCLUSIONS: We found that moderate exercise does not influence cfPWV 24-hours later, suggesting a 24-hour restriction prior to testing is adequate and that any acute benefit of exercise on arterial stiffness lasts <24 hours. Future studies should investigate the influence of more proximal (e.g. <12 hours) or more intense exercise bouts on cfPWV.

1325 Board #65 May 29, 9:00 AM - 10:30 AM

Acute Vascular Effects of Aquatic and Land Treadmill Exercise

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(No relationships reported)

Aquatic treadmill (ATM) training has been shown to reduce blood pressure reactivity to exercise to a greater extent than land treadmill (LTM) training in an older, overweight, and sedentary population (Greene, MSSE 2013). Less is known regarding the mechanisms or the acute effects.
PURPOSE: Determine the acute vascular effects of ATM and LTM exercise in healthy, recreationally active college males.
METHODS: Seven male subjects (21 ± 1 years; 175 ± 8 cm; 73.7 ± 9.5 kg; 24 ± 3 kg/m^2) performed two, 30-minute acute exercise bouts (ATM and LTM) at ~75% MHR in a randomized fashion, matched for VO_2 (ATM: 33.3 ± 6.1, LTM: 34.7 ± 6.0 ml·kg^{-1}·min^{-1}). Flow mediated dilation (FMD) and carotid-femoral pulse wave velocity (PWV) were recorded by ultrasound using standard procedures prior to and two hours after each session. Blood pressure was recorded following supine rest before exercise and averaged from post exercise recordings taken every 15 minutes from 30-120 minutes post. Changes in each variable were calculated pre and post exercise for each mode and compared between modes by a dependent sample t-test.
RESULTS:

		FMD	PWV	SBP	DBP	MAP	HR
ATM	Pre-Ex	9.5 ± 4.2	7.1 ± 1.7	116 ± 7	62 ± 7	80 ± 7	59 ± 10
	Post-Ex	6.5 ± 1.7	7.6 ± 2.0	113 ± 9	62 ± 7	79 ± 7	61 ± 6
	Change	-3.0 ± 4.6	0.6 ± 1.0	-2.9 ± 5.2	0.1 ± 1.1	-0.9 ± 2.0	2.3 ± 6.9
LTM	Pre-Ex	6.4 ± 2.7	7.1 ± 0.8	116 ± 8	62 ± 7	80 ± 7	58 ± 8
	Post-Ex	7.1 ± 3.3	6.5 ± 1.1	116 ± 7	60 ± 8	79 ± 8	62 ± 8
	Change	0.7 ± 4.2	-0.6 ± 0.8	-0.3 ± 7.4	-1.9 ± 4.6	-1.4 ± 4.9	3.7 ± 4.3
	P-Value	0.237	0.078	0.581	0.239	0.821	0.535

Values represent mean ± SD; P-Value from dependent sample T-Test on Change variables.
FMD (% change from baseline); PWV (m/s).

CONCLUSION: No significant changes found pre and post exercise between modes. While exercise modes were matched for VO_2, RPE was higher for ATM (14.2 ± 1.7) than LTM (12.7 ± 1.5), potentially indicating varying degrees of sympathetic stimulation. While this could potentially explain the slight reduction in FMD, in the present population of young, recreationally active men studied, no differences can be substantiated between ATM and LTM. Lack of significant findings may have also been due to the small sample size and reduced statistical power. Future research should focus on less active, older populations in response to ATM and LTM exercise.

1326 Board #66 May 29, 9:00 AM - 10:30 AM

The Influence of Sleep Restriction on Physical Performance in Healthy Young Men

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(No relationships reported)

Depending on the life style imposed by work, new technologies and the availability of various 24h services, the total sleep time has been decreasing and exposing the subject to sleep debt that accumulated during the week can result in impairment in organism's physiology
PURPOSE: To determine the impact of sleep restriction (SR) on cardiorespiratory performance in physically active individuals
METHODS: Fifteen young men (24.47 ± 3.50 years, BMI: 23.47 ± 3.07 kg/m^2) without sleep-related complaints, underwent a SR protocol of 25% of polysomnography length (PSG-L) in the early evening for five consecutive nights, in attempt to mimetize the sleep debt of a week's routine. All nights were monitored by PSG of entire night in the sleep laboratory. At the end of the PSG, the subjects were released to their habitual activities and returned to laboratory between 8 and 9h PM. The PSG-L was defined by the constant use of a wrist actigraphy for ten days prior starting the protocol. Before SR protocol (A) the subjects had one night with 100% of PSG-L. Three hours after awakening, were performed a cardiopulmonary exercise test on a treadmill to exhaustion. This assessment was repeated on the last day of SR protocol (B). The A/B conditions were separated from seven to ten days. The variables ratings of perceived exertion (RPE), heart rate (HR_{bpm}), relative oxygen consumption ($VO_{2ml.kg\text{-}1.min\text{-}1}$) at three times: ventilatory thresholds 1 and 2 (VT1 / VT2) and $VO_{2\ peak}$. Also the area under the curve was calculated from the behavior of each variable in the total test time. Comparisons were performed using the *t* test for paired samples
RESULTS: The PSG-L mean was A: 432.49±1.42min vs. B: 321.58±1.29min. The variables analyzed showed no significant difference between A and B conditions, for VT1, VT2 and $VO_{2\ peak}$ moments. However were found a significant difference in the values of area under the curve to HR (A: 14939.5 ± 831.6 vs. B: 14678.9 ± 926.2, p=0.20) and a tendency to significance about RPE (A: 1301.5±185.2 vs. B: 1240.8 ± 145.8, p=0.06)
CONCLUSION: The SR protocol used did not altered the RPE, HR and VO_2 at the specific three time points assessed, however showed some impact on the total volume of HR and RPE. It shows the importance of evaluating the overall behavior of these parameters, emphasizing not only specific points of the cardiopulmonary exercise test.

1327 Board #67 May 29, 9:00 AM - 10:30 AM

Effects of Dietary Nitrate Supplementation on Cardiovascular Responses during dynamic Exercise

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(No relationships reported)

It was recently reported that dietary nitrate supplementation (NS) via beetroot juice (BJ) decreased blood pressure and oxygen consumption during exercise. Despite these observations, the effects of NS on cardiovascular responses during dynamic exercise have not been investigated in humans.
PURPOSE: To investigate the roles of cardiac output (CO) and peripheral vasoconstriction in eliciting the blood pressure response to NS at rest and during cycling exercise ranging from mild to heavy workloads (30%, 60%, and 80% of VO_{2peak}) in healthy persons.
METHODS: In a double-blind, randomized, crossover study, 13 subjects, aged 21-25, supplemented their diet for 15 days with either high-rich concentrated BJ (70 ml/day, 0.4 mg/day NO(3)(-)) or a nitrate-depleted BJ placebo (70 ml/day, 0 mg/day NO(3)(-)). The subjects were continuously instrumented to measure CO and mean arterial blood pressure (MAP), and the responses to graded exercise were observed before and after BJ and placebo (PL) in the same subjects.
RESULTS: After intaking BJ, plasma nitrite concentration was significantly higher at rest and during exercise compared to the PL. NS significantly decreased total vascular conductances (TVC, calculated as CO/MAP) and MAP at rest and these differences continued during dynamic exercise. There were no differences CO responses in before and after BJ and PL.

Event	Condition	MAP (mmHg)	CO (L/min)	TVC (ml/min/mmHg)
Rest	BJ	90±1 vs. 84±2*	4.7±0.1 vs. 5.1±0.1	53.0±1.4 vs. 60.4±2.3*
	PL	89±1 vs. 89±2	4.8±0.2 vs. 4.9±0.2	53.8±2.6 vs. 55.7±3.1
30%	BJ	103±1 vs. 96±2*	9.5±0.3 vs. 9.7±0.3	92.5±3.1 vs. 100.8±2.7*
	PL	100±2 vs. 102±2	9.8±0.3 vs. 9.2±0.4	98.0±3.2 vs. 90.4±3.6
60%	BJ	119±1 vs. 111±2*	14.4±0.4 vs. 14.4±0.4	121.3±3.0 vs 129.8±2.7*
	PL	114±2 vs. 118±2	14.7±0.4 vs. 14.2±0.5	128.9±3.8 vs. 120.2±4.2
80%	BJ	122±1 vs. 115±2*	16.0±0.4 vs. 15.8±0.5	130.7±3.4 vs. 137.2±3.0*
	PL	119±2 vs. 119±2	16.5±0.5 vs. 16.2±0.5	138.2±3.4 vs. 135.4±4.4

*p<0.05 vs. PL.

CONCLUSIONS: NS alters the cardiovascular responses at rest and dynamic exercise and as workload increased, more dilation occurred in peripheral vasculature causing less increases in MAP. These results suggest that NS may enhance vasoprotection and prevent an exaggerated blood pressure response during exercise in humans.

1328 Board #68 May 29, 9:00 AM - 10:30 AM

Differences In Vagal-rebound Following Crossfit Compared To Treadmill Exercise

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(No relationships reported)

CrossFit (CF) is rapidly becoming a popular form of exercise training throughout the world. Despite this, basic empirical evidence to describe physiological responses from CF, such as autonomic modulation of the heart, is lacking.
PURPOSE: The purpose of this study was to compare post-exercise vagal-rebound between CF and treadmill (TM) exercise.
METHODS: Ten men (age = 26.4 yrs ± 2.7yrs) with at least three months of CF experience participated. Aerobic power was determined with a maximal graded TM test (GXT). On two separate occasions, each participant completed either the CF workout "Cindy" (20min of as many rounds of 5 pull-ups, 10 push-ups, and 15 squats as possible) or a 20 min bout of TM exercise at 90% of GXT determined maximal heart rate. Exercise bouts were performed in a randomized crossover fashion. Electrocardiography (ECG) was analyzed for 10-minutes before and 60-minutes after each bout. Vagal activity was quantified through changes in the heart rate variability index of log-transformed square root of the mean sum of the squared R-R (lnRMSSD), which was analyzed 5 minute segments at 5-10min pre-exercise period (PRE), and during the post-exercise period at 15-20min (POST1), 20-25min (POST2), 25-30min (POST3), and 1hour (POST4).
RESULTS: Means ±SD of lnRMSSD are shown in Table 1. Significant time dependent decreases occurred following both CF and TM ($p < 0.05$*). Trial dependent differences occurred in post-exercise lnRMSSD measures ($p < 0.05$#). lnRMSSD at TM POST4 was not significantly different compared to pre ($p = 0.17$). lnRMSSD at CF POST4 remained significantly lower compared to PRE ($p < 0.05$).
CONCLUSION: The results of this investigation demonstrated a delayed vagal-rebound following CF compared to TM exercise.

lnRMSSD means ±SD

Variable	CINDY	Treadmill
lnRMSSD PRE	4.06 ± 0.48	4.09 ± 0.42
lnRMSSD POST1	1.92 ± 0.35*#	2.76 ± 0.55*
lnRMSSD POST2	2.1 ± 0.43*#	2.96 ± 0.59*
lnRMSSD POST3	2.25 ± 0.41*#	3.06 ± 0.49*
lnRMSSD POST4	3.34 ± 0.59*#	3.84 ± 0.62

1329 Board #69 May 29, 9:00 AM - 10:30 AM

Alterations in Cardiorespiratory and Perceptual Responses During Graded Submaximal Exercise Following Exercise-Induced Muscle Damage

Alexander R. Gonglach, Kristin Casagrand, Luke Burnett, Christopher D. Black. *The University of Oklahoma, Norman, OK*. (Sponsor: Patrick O'Connor, FACSM)

(No relationships reported)

Exercise-induced muscle damage (EIMD) has been shown reduce VO2 peak and ventilatory threshold, and to alter cardiorespiratory and perceptual responses (muscle pain and RPE) during submaximal exercise. It is unclear whether cardiorespiratory and perceptual responses following a similar time-course of recovery to traditional markers of EIMD.
PURPOSE: To examine the changes in oxygen consumption (VO2), ventilation (VE), heart rate (HR), RER, and ratings of muscle pain and sense of effort (RPE) over the course of a week following EIMD.
METHODS: Data were collected on 5 male and 3 female participants. Participants performed a bout of high-intensity lower body eccentric exercise to induce muscle damage. A graded, maximal exercise test was performed prior to (Pre), immediately following (iPost), and 2 (D2), 4 (D4), and 7 days (D7) after the eccentric exercise protocol. Cardiorespiratory measures were taken throughout the test and rating of quadriceps muscle pain and RPE were taken at the end of each minute of exercise. Data from the first 3 stages (6 minutes) are presented.
RESULTS: Immediately following eccentric exercise isometric maximal voluntary contraction was decreased (MVC, -20.6 ±11.9%;$p<0.05$) and ratings of muscle soreness in the quadriceps were increased (37.5 ± 22.2 mm; $p<0.05$). MVC returned to baseline by D4 ($p=0.35$) while soreness persisted through D7 ($p=0.005$). Mean VO2 across the 3 submaximal stages was lower ($p<0.001$) after EIMD with values falling from 45.7±3.6 ml•kg-1•min-1 to 43.9±4.0, 42.7±3.6, 42.4±3.8, and 41.7±4.3, ml•kg-1•min-1 at iPost, D2, D4, and D7 after eccentric exercise. Ratings of muscle pain were increased ($p<0.05$) compared to Pre (5.1±1.4 and 5.8±0.9 compared to 2.4±0.7 for iPost and D2, respectively) for 48 hours following EIMD. A similar response was also seen for RPE with elevations found at iPost and D2 compared to Pre (15.6±2.5 and 15.0±1.6 compared to 13.4±1.7; $p<0.05$).

CONCLUSIONS: EIMD resulted in a prolonged improvement in movement economy during submaximal exercise. Muscle damage lead to heightened ratings of muscle pain and a heightened sense of effort for the initial 48 hours of recovery. Perceptual values had returned to Pre levels by 4 days post, likely consequent to decreased muscle soreness.

C-26 Free Communication/Poster - **Control of Muscle Mass: Anabolic and Atrophic Effects**

Thursday, May 29, 2014, 7:30 AM - 12:30 PM

Room: WB1

1330 Board #70 May 29, 8:00 AM - 9:30 AM

Comparison Of Different Leg Press Exercise Volumes On The Akt/mtor Signaling Pathway

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(No relationships reported)

PURPOSE: To better understand the types of resistance training protocols that are most beneficial to stimulate muscle hypertrophy, we examined the difference between a single set (SS) of resistance exercise to multiple sets (MS) of resistance exercise on the Akt/mTOR signaling pathway and on the expression of insulin-like growth factor-1 (IGF-1) and the receptor for IGF-1 (IGF-1R).
METHODS: For this study, sixteen healthy males were divided in to two groups of eight. Subjects in each group received three biopsies: 1) baseline, prior to exercise; 2) 15-minutes post exercise; and 3) 180 minutes post exercise. Subjects in the SS group performed one set of leg press exercise at 80% of their predetermined 1RM to volitional fatigue. Subjects in the MS group performed 2 sets of 10 repetitions and one set to volitional fatigue at 80% of their predetermined 1RM, with 3 minutes of rest between each set.
RESULTS: There were no differences between groups in the concentration of Akt signaling proteins. Furthermore, there was no difference in IGF-1 expression. However, there was a greater increase in IGF-1R expression in the SS group compared to the MS group 180 minutes post-exercise.
CONCLUSIONS: These data indicate that exercise volume may not alter signals associated protein synthesis in recreationally trained individuals.

1331 Board #71 May 29, 8:00 AM - 9:30 AM

Nutritional Supplementation Enhances Upstream Anabolic Signals Without Impacting Downstream Effectors During a Concurrent Exercise Bout

Jenna M. Apicella, Brooke L. Bailey, Colleen X. Munoz, Catherine Saenz, Elaine C. Lee, Jeffrey M. Anderson, FACSM, Jeff S. Volek, William J. Kraemer, FACSM, Carl M. Maresh, FACSM. *University of Connecticut, Storrs, CT*.

(No relationships reported)

Concurrent anaerobic and aerobic exercise (*CE)* yields competing metabolic signals, particularly when executed in close proximity. Nutritional supplementation may complement the anabolic, protein-synthesis enhancing signals.
PURPOSE: We examined strategic nutritional supplementation on anabolic-catabolic balance during *CE*.
METHODS: Highly trained men (*n=8*; (meanSD) 27.4±5.4yr, 15.06±5.09% body fat) completed two randomized *CE* trials (*S* and *P*, 7d apart). Each trial comprised a bout of resistance exercise (*RE;* 5x5 front squat, 80% 1RM, 2 min rest), 15 min rest, and repeated sprints (*RS*; 8x10s maximal running sprints, 45s rest). Subjects consumed a nutritional supplement (Trial *S;* 178kcal, 28g whey protein isolate, 16g CHO, 0g fat) or placebo (Trial *P*; water) immediately post (IP) *RE*. We measured blood glucose, insulin, testosterone, and cortisol at 8 time points (*pre-exercise*, *IP-RE*, *pre-RS*, *IP-RS*, and 5, 30, 60, and 180 min post *RS* (*IP+5*, *IP+30*, *IP+60*, and *IP+180*, respectively)). In *vastus lateralis* samples we measured Akt, P70S6K, AMPK, and 4E-BP1 at 3 time points (*pre-exercise*, 10 and 180 min post *RS* (*IP+10*, *IP+180*)).
RESULTS: Nutritional supplementation increased circulating insulin ($\mu IU \cdot mL^{-1}$) shortly after consumption at *pre-RS* (*S>P* (*p=0.036)*: 13.06±4.65 > 8.26±3.67). Supplementation did not affect *IP-RS* insulin (*p>0.2)*, but elevated insulin concentrations at *IP+5* (*S>P(p=0.01):* 26.80±9.95 > 13.80±1.49), *IP+30* (*S>P(p=0.036):* 19.70±11.84 > 10.34±4.56), and *IP+60* (*S>P(p<0.001):* 9.42±4.66 > 4.10±3.33). Supplementation did not affect glucose, testosterone, and cortisol. In muscle tissue, Akt(Ser^{473}) phosphorylation was ~1.85 fold higher with supplementation (*S>P(p=0.017), Arbitrary Units:* 5677033.90 ± 2264390.74 > 3074092.38 ± 1367573.20) at *IP+10*, but there were no differences (*p>0.05*) at any other time point. Likewise, supplementation did not affect total Akt, total P70S6K, P70S6K(Thr^{389}), 4E-BP1(Ser^{65}), and AMPK(Thr^{172}).
CONCLUSION: Nutritional supplementation may increase upstream anabolic signals, like insulin and Akt(Ser^{473}) phosphorylation, without impacting downstream effectors of protein synthesis during *CE*. Defining optimal nutritional supplementation may promote anabolic signaling during training despite concurrent exercise-induced signaling inhibition.

1332 Board #72 May 29, 8:00 AM - 9:30 AM

Anabolic Responses To Acute And Chronic Resistance Exercise Are Enhanced When Combined With Aquatic Treadmill Exercise

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(No relationships reported)

PURPOSE: To examine acute and chronic anabolic and general physiological responses to resistance training (RT), concurrent RT + land treadmill training (RT-LTM), and concurrent RT + aquatic treadmill training (RT-ATM).
METHODS: Forty-seven untrained volunteers (♂n=23, 37±11yr, 29.6±4.6 $kg \cdot m^2$| ♀ n=24, 38±12yr, 27.53±6.4 $kg \cdot m^2$) were tested for $VO_{2max,}$ body comp (DEXA), and strength (7 exercises: 3 lower body, 4 upper body) prior to being randomized into 3 groups: RT, RT-LTM, & RT-ATM. All groups performed 12wks of RT (2/wk, 3 x 8-12 @ 60à~80% 1RM). The RT-LTM & RT-ATM groups also performed 12wks of aerobic LTM or ATM training [2/wk (immediately post RT), 1/wk (in isolation), 60à85%VO_{2max}, 250à500 kcal/session]. Baseline tests were repeated after training. Additionally, 25 subjects volunteered for muscle biopsy prior to, and 24h-post acute exercise before and after training. Stable isotope labeling (^2H_2O, 70%, 3ml·kg) was utilized to quantify 24h-post exercise myofibrillar fractional synthesis rates. Western blot analysis was used to analyze basal content of Akt and mTOR before and after training. A mixed model ANOVA was used to examine all independent variables with analysis of Akt and mTOR content repeated across training.