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FINAL PROGRAM

3119 Board #84 June 1 2:00 PM - 3:30 PM
The Association Between Incidental Physical Activity and Cardiorespiratory Fitness
 Trevor O'Neill, Morgan Craig-Broadwith, Robert Ross, FACSM.
Queen's University, Kingston, ON, Canada.
 (No relationships reported)

Cardiorespiratory fitness (CRF) is a strong predictor of cardiovascular disease and mortality. The association between structured physical activity (activity that meets consensus guidelines) and CRF is well established. Yet, the association between incidental physical activity (IPA; sporadic, unstructured physical activity that does not meet consensus guidelines) and CRF remains less clear.

PURPOSE: The primary objective of this study was to determine whether the duration and the expenditure of objectively measured IPA were associated with CRF in abdominally obese, adult men and women. A secondary objective was to determine whether sporadic moderate physical activity (MPA; accrued in bouts less than 10 min) was associated with CRF.

METHODS: Participants were abdominally obese (waist circumference >102 cm in men and >88 cm in women), self-reported inactive and weight-stable men (n=26) and women (n=62). IPA encompassed light physical activity (LPA; 1-2.99 METs), sporadic MPA (3-5.99 METs) and sporadic vigorous physical activity (VPA; ≥6 METs). IPA was measured using the SenseWear Pro Armband (SWA) collected over a period of 7 days, and was categorized into duration (min/day) and expenditure (MET-min/day). CRF, measured as peak oxygen consumption per unit of time (peak $\dot{V}O_2$), was assessed using a graded treadmill test.

RESULTS: Participants accumulated an average of 318.6 ± 125.2 min of IPA per day, which was composed of 277.3 ± 117.3 min of LPA and 40.8 ± 16.8 min of MPA. Both duration ($r^2=0.45$, $p<0.05$) and expenditure ($r^2=0.44$, $p<0.05$) of IPA were significantly associated with CRF independent of sex, however upon further control for body mass index (BMI) and age neither association remained significant ($p>0.10$). Both duration ($r^2=0.65$, $p<0.05$) and expenditure ($r^2=0.66$, $p<0.05$) of sporadic MPA were significantly associated with CRF after control for covariates.

CONCLUSIONS: The principle finding is that IPA is not associated with CRF after control for BMI; however, sporadic MPA remains an independent predictor of CRF in abdominally obese adults. This finding suggests that while intensity of physical activity is important for improvement in CRF, benefits are not restricted to MPA that conforms to consensus guidelines. These initial findings have important public health implications.

3120 Board #85 June 1 2:00 PM - 3:30 PM
Functional Outcomes of Exercise Progression Models in the Elderly

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 (No relationships reported)

A challenge for our aging nation is to define interventions that can abate the decline in functional capacity and prevent a loss of independence.

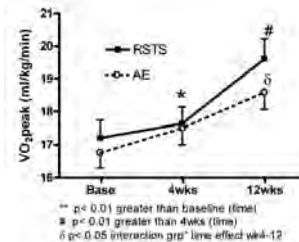
PURPOSE: To determine differences between; (A) 4 weeks of a regionally specific training stimulus (RSTS) versus standard aerobic exercise training (AET); and (B) the effects of subsequent 8 weeks of progressive whole-body training protocol; on $\dot{V}O_{2peak}$ and combined 1RM strength (C1RM); and (2).

METHODS: Subjects over 70yr, who scored between 218-490yards on a 6MWT were randomized to AET or RSTS for the first 4 weeks (Phase 1). AET consisted of walking/biking at 40-60% of HRR. RSTS consisted of specific muscle group exercises focused on the calf, thigh, buttocks, arms, shoulders, and torso. Each exercise was performed for 3 to 5mins, at ~40-70% of the MVC of the primary muscle group of interest. Subjects in both groups exercised for 60mins 3days per week and were progressed as tolerated. Subsequently, all subjects were advanced to a well-rounded, whole-body exercise program using established ACSM guidelines (Phase 2).

RESULTS: Both groups included 54 subjects, age =76±5yrs. After adjustment for baseline, there was a group by time effect in favor of RSTS for $\dot{V}O_{2peak}$ following phase 2 (see fig). Additionally, RSTS showed greater gains than AET in C1RM following both phase 1 (+40lbs vs. +17lbs, $p<0.01$) and phase 2 (+35lbs vs. +19lbs, $p<0.01$).

CONCLUSION: The gains in aerobic capacity and maximal strength at the end of phase 2 were superior in those who used RSTS during phase 1. These results suggest RSTS may serve as a physiological primer able to remove peripheral barriers that limit functional capacity, in the elderly.

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F-26 Free Communication/Poster - Exercise Immunology (General)

JUNE 1, 2012 1:00 PM - 6:00 PM
 ROOM: Exhibit Hall

3121 Board #86 June 1 3:30 PM - 5:00 PM
Effects of Acute Exercise on Expressions of Natural Killer Cell Receptors

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 (No relationships reported)

PURPOSE: Mobilization and cytotoxicity of natural killer (NK) cells are regulated by cell surface receptors such as adhesion molecules, chemokine receptors and activating/inhibitory receptors. In this study, we examined the effects of acute exercise on the expression of these various cell surface molecules and receptors.

METHODS: Six healthy male college students (20.7 ± 1.2 yrs olds) exercised on the cycle ergometer for 30 min at intensities depending on individual onset of blood lactate accumulation level (70-85% $\dot{V}O_{2max}$). Venous blood samples were collected at rest (PRE), just before the end of exercise (END) and 30 (POST 30), 60 (POST 60), 120 (POST 120) and 180 (POST 180) min after exercise. The phenotype and density of CD16, CD56, CD44, CD62L, CD159a, CD197, CD212, CD226, CD314, CD335 and CX₃CR₁ on CD56^{dim} NK cells were determined by flow cytometry. Cytotoxicity was measured using a ⁵¹Cr release assay.

RESULTS: With regard to adhesion molecules, the percentage of CD62L (L-selectin) negative cells in total CD56^{dim} NK cells significantly increased at END ($p=0.0217$) and returned to PRE values at POST 30. These changes induced a decreased expression of CD62L at END. We also observed decreased expression of CD44 (HCAM, $p=0.0002$) and CX₃CR₁ (Fractalkine Receptor, $p=0.0167$) at END. On the other hand, regarding to the NK cell activating receptors, the expressions of CD335 (NKp46) increased at END ($p=0.0073$), and then decreased to below PRE values at POST 120 ($p=0.0362$) and POST 180 ($p=0.0019$). The expressions of CD226 (DNAM-1, $p=0.0495$) and CD212 (IL-12R, $p=0.0063$) were also decreased at POST. Expression of CD16 (Fc gamma-RIII) decreased at END ($p=0.0146$) but returned to PRE levels at POST 30. Total cytotoxicity (E/T=20/1) increased at END ($p=0.046$) and decreased during the recovery period ($p=0.0006-0.0153$), but lytic units per NK cell remained unchanged throughout the experiment.

CONCLUSION: These results suggest that changes in adhesion molecules expression contribute to NK cell mobilization. Acute exercise also influenced the expression of other NK cell activating receptors but these changes do not directly related to per cell cytotoxicity.

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3122 Board #87 June 1 3:30 PM - 5:00 PM
The Effect Of The Training-competition Phases In Immune Response In Triathlon

Blanca R. Rangel-Colmenero¹, Germán Hernández-Cruz¹, Fernando Ochoa-Ahmed¹, Adrián J. Rosas-Taraco², Jeanette M. Lopez-Walle¹, Oscar Salas-Fraire². ¹Facultad de Organización Deportiva UANL, Monterrey, Mexico. ²Facultad de Medicina, UANL, Monterrey, Mexico.
 (No relationships reported)

PURPOSE: The immune response was analyzed during the pre-competition and competition training periods for Master triathlon athletes of Monterrey, Mexico to establish the physiological bases for Mexican athletes as the main objective and as result, to apply personalized training programs.

METHODS: The sample was composed of 12 male triathlon athletes, with ages between 28 to 45 years, all signed an informed consent, blood samples were taken, for the quantification of the immune response cells, through spectrophotometric techniques in

reference laboratory. The blood samples were taken weekly early in the morning before the athlete begun their physical activity during a five week training phase, during the competition phase, the blood samples were taken: immediately after competition, two hours after competition, forty eight hours and seven days after competition. During the week after competition the athletes performed light physical activity for recovery.

RESULTS: All the analyzed variables presented a high significance difference ($P < 0.01$) between takes, the leucocytes and neutrophils showed a normal level behavior during the pre competition phase, immediately after they finished their competition and two hours after competition, a high significance increment was observed (takes 6 and 7) to return to normal levels during the one week post competition recovery phase. The eosinophils, basophils, lymphocytes and monocytes, showed a contrary behavior to the phenomena described before, during the pre competition phase they did not show significant changes, but right after the competition was over, the cell concentration diminished in high significance way and they acquire their normal level after the one week post competition recovery phase.

CONCLUSIONS: The immune response reflected a change in the number of blood cells of the athletes after performing exhausting physical activity, these cells acquire their normal levels after a week recovery period. It is important to emphasize that in an individual way each athlete showed a different response to training. The results presented in this study were an average, in some cases the athletes showed higher or lower values concluding that integral physical personalized training is strictly necessary for triathlon as a sport and also to avoid over training.

3123 Board #88 June 1 3:30 PM - 5:00 PM
Effect Of Ultra-Endurance Exercise On Markers Of Inflammation, Hemolysis, And Haptoglobin

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 (No relationships reported)

Endurance exercise such as marathon running has been shown to induce immunological responses similar to those seen in inflammation. It has also been identified as potentially leading to hemolysis. Haptoglobin, recently recognized as a key regulator of systemic iron metabolism, has been found to be increased following a marathon race possibly induced by an exercise related increase in interleukin-6 (IL-6), a marker known to induce an acute phase response. It remains unknown whether ultra-endurance exercise leads to a more pronounced haptoglobin response due to a cumulative effect of hemolysis and acute phase response.

PURPOSE: To investigate the effect of a 216-km run on leukocyte count and hemoglobin (hb), plasma concentrations of IL-6, C-reactive protein (CRP), haptoglobin and hepcidin in experienced endurance runners.

METHODS: Venous blood samples were obtained from seven highly-trained male athletes (mean (SD): 52.0 (10.6) yrs, 176.6 (9.4) cm, 75.9 (7.8) kg) before the start of the race, after 42 km and after termination of the race for the analysis of the above listed markers.

RESULTS: Hb did not change significantly during the race (g/dl: 14.3 (0.6); 14.8 (1.0); 14.0 (1.2), $p > 0.05$). Leukocytes and CRP at test termination (11.7 (2.1) $\times 10^9/l$ and 33.2 (22.4) mg/l) were higher ($p < 0.05$) compared to pre-run (6.0 (1.3) $\times 10^9/l$ and 1.0 (0.6) mg/l) and 42 km (8.4 (2.4) $\times 10^9/l$ and 1.0 (0.5) mg/l). Haptoglobin was decreased at 42 km (g/l: 0.60 (0.16) vs. 0.83 (0.22) pre-run, $p < 0.001$) with no significant change thereafter (0.68 (0.29) g/l). IL-6, below detection level (< 2 ng/l) at km0, showed a significant increase at 42 km (8.8 (3.9) ng/l, $p < 0.001$). The further increase at test termination (17.2 (16.7) ng/l) did not reach statistical significance. Haptoglobin levels did not change significantly during the race ($\mu g/l$: 183.4 (59.7); 182.6 (70.2); 167.4 (49.0), $p > 0.05$).

CONCLUSIONS: The clear increases in leukocytes and CRP throughout the race indicate inflammation probably induced by the increase of IL-6 in the early phase of the race. The haptoglobin decrease after 42 km demonstrates some hemolysis during the same period. Although inflammation has been described previously to stimulate haptoglobin production, haptoglobin remained unchanged during this ultramarathon in non-anemic males.

Supported by Limbach Laboratory, Heidelberg, Germany

3124 Board #89 June 1 3:30 PM - 5:00 PM
Chronic Changes In Serum IL-6 And TNF- α Following 12 Weeks Of Concurrent Resistance And Aerobic Exercise Are Dependent On Exercise Mode And May Affect Adaptation.

Brad S. Lambert, Justin P. Dobson, Dr. Stephen F. Crouse, FACSM. Texas A&M University, College Station, TX.
 (No relationships reported)

PURPOSE: To examine physiological responses to concurrent resistance and land treadmill training (RT-LTM) compared to concurrent resistance and aquatic treadmill training (RT-ATM) and the chronic effect of each on serum TNF- α and IL-6 (cytokines

associated with chronic inflammation, CVD, and skeletal muscle metabolism).

METHODS: Twenty-six untrained subjects (M: $n=13$, 98.6 ± 17.1 kg, 182.2 ± 6.2 cm, 34 ± 11 yrs, F: $n=13$, 78.9 ± 14.0 kg, 165.1 ± 5.1 cm, 38 ± 11 yrs) were screened to assess VO_{2max} , Bcomp (DEXA), and strength (Lifts: leg press, chest press, leg curl, lat pull, leg ext, triceps push-down, biceps curl). Subjects were then randomized into 2 groups (RT-LTM^{m=6, f=7} | RT-ATM^{m=7, f=6}). Each performed progressive RT (2/wk, 3 x 8-12 @ 60%-->80% 1RM) for 12 wks. Both groups also performed 12 wks of aerobic LTM or ATM (60-->85% VO_{2max}) respectively. ATM or LTM occurred immediately following RT sessions and in isolation on a 3rd day during the wk. Kcal/session: Wk 1-6 = 250-->500 kcal/session, Wk 6-12 = 500 kcal/session. Baseline tests were re-performed at wk 6 and after training. Blood samples were obtained in the rested state before and after training. Serum TNF- α and IL-6 was analyzed using a multiplex assay kit (Luminex®, Millipore®). A 2x2 Mixed Model ANOVA w/ repeated measures was used to examine absolute and relative changes in the independent variables listed in the table.

RESULTS:

INDEP. VAR.	Lean Mass (kg)	Fat Mass (kg)	%Body Fat (%)	VO2max (ml/kg/min)	Total Strength (lbs)	IL-6 (pg/dl)	TNF- α (pg/dl)
BASELINE MEASUREMENTS							
RT-LTM	49.85 ± 3.65	35.91 ± 3.13	42.08 ± 2.48	29.90 ± 1.99	1457.42 ± 135.12	4.62 ± 1.57	7.07 ± 1.87
RT-ATM	53.12 ± 3.98	31.09 ± 2.78	37.04 ± 2.32	32.13 ± 1.63	1552.83 ± 145.91	4.64 ± 1.58	7.86 ± 1.48
POST TRAINING MEASUREMENTS							
RT-LTM	51.03 ± 4.67†	34.13 ± 2.68†	40.13 ± 3.6†	35.84 ± 2.94†	1843.42 ± 201.07†	7.12 ± 1.57†	6.80 ± 0.51
RT-ATM	55.75 ± 4.62†	30.32 ± 3.10†	35.60 ± 2.36†	35.79 ± 2.25†	2193.56 ± 251.28†	5.08 ± 2.66	6.65 ± 1.03†
% Δ = Calculated From Each Individual Subjects Change From Baseline							
RT-LTM	2.56% ± 1.39†,a	-6.49% ± 2.38†,a	-5.78% ± 1.80†,a	14.06% ± 2.34†,a	21.29% ± 1.13†,a	125.92% ± 36.56†,a	-1.82% ± 5.99a
RT-ATM	4.20% ± 0.93†,b	-2.14% ± 1.55b	-4.10% ± 1.49†,a	4.51% ± 3.04†,b	4.51% ± 1.74†,b	28.05% ± 34.69b	-13.04% ± 5.40†,b

Values are means ± SE. % Δ = Individual change from baseline. Like letters = not significantly different between groups, †=Significant change from baseline ($\alpha \leq 0.05$).

CONCLUSION: Chronic RT-LTM and RT-ATM training elicit different effects on markers of chronic inflammation which may be related to differing health and fitness outcomes observed between our groups.

3125 Board #90 June 1 3:30 PM - 5:00 PM
Effects of Exercise Training on Inflammatory and Hypoxic Gene Expression in White Adipose Tissue

Melissa A. Linden¹, Yair Pincus¹, Stephen A. Martin¹, Jeffrey A. Woods, FACSM¹, Tracy Baynard². ¹University of Illinois at Urbana-Champaign, Champaign, IL. ²University of Illinois at Chicago, Chicago, IL.
 (No relationships reported)

Obesity contributes to the development of inflammation and lifestyle related diseases, such as type II diabetes mellitus. Exercise training can have anti-inflammatory effects but it is unclear if it is a potent enough stimulus to positively affect white adipose tissue (WAT) and glucose regulation in the presence of an obesigenic diet.

PURPOSE: To determine the effect of 12 weeks of a very high fat (VHF) diet and/or exercise training (EX) on glucose regulation and inflammatory and hypoxic gene expression within white adipose tissue.

METHODS: Male C57Bl6/J mice ($n=39$) were randomized into four groups: low-fat (LF)/sedentary (SED), LF/EX, VHF/SED, and VHF/EX. The VHF and LF diets were 60% and 10% fat, respectively. The mice were placed on the diet and exercise intervention concomitantly. Exercise training consisted of treadmill running 5 d/wk at 12 m/min, 5% incline, 40 min/d for 12 weeks. A subset of mice had intraperitoneal glucose tolerance tests (IPGTT). Quantitative real-time PCR was used to determine gene expression of inflammatory and hypoxia markers within white adipose tissue.

RESULTS: Animals given the VHF diet gained more weight than mice on the LF diet ($p < 0.05$) but weight gain was partially attenuated by exercise training ($p < 0.05$). The VHF diet also increased epididymal fat pad weight relative to total body mass ($p < 0.05$). Animals on the VHF diet had impaired glucose tolerance as indicated by increased area under the glucose curve ($p < 0.05$), with exercise training having no effect ($p > 0.05$). The VHF diet increased gene expression markers of inflammation, tumor necrosis factor alpha, interleukin-1 receptor antagonist (IL-1ra), interleukin-6 (IL-6), and interleukin 10 (IL-10) ($p < 0.05$), within the WAT. Exercise was able to reduce the expression IL-1ra in animals on a VHF diet ($p < 0.05$). The VHF diet increased hypoxia inducible factor 1 (HIF-1) but exercise training did not attenuated HIF-1 gene expression in the VHF diet fed animals ($p > 0.05$).

CONCLUSION: Concomitant exposure to moderate exercise training for 12 weeks may help reduce body weight but does not show robust effects in stemming inflammation within the WAT.

Supported by University of Illinois Research Board seed grant.

FREE COMMUNICATION/POSTER

