ACSM President’s Cup
2018 Regional Chapter Abstract Award Winners

Acute Effects of Resistance Exercise in Depressed Black/African American People Living with HIV

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In the US, Blacks/African Americans (AA) comprise the largest proportion of People Living with HIV (PLWH). Depressive symptoms and fatigue are highly prevalent among PLWH. Depressive symptoms are linked to progression of HIV disease, and fatigue is linked to severity of depressive symptoms. Resistance exercise (RE) is shown to have psychological benefits in non-HIV depressed populations, and these benefits are hypothesized to be intensity-dependent. To date, no study has examined the use of a single bout of RE for management of affect and fatigue with depressed PLWH. PURPOSE: To test the acute effects of RE intensity on affect, arousal, and distress among sedentary AA PLWH who screen positive for depression.

METHODS: Twenty-five men and 17 women ages 24-66 (47.5±11.2) with a Center for Epidemiologic Studies Depression Scale score of ≥10 completed a battery of questionnaires and 10 repetition maximum (10RM) muscular strength tests. Participants were randomized into: moderate intensity RE (MRE) (i.e., 70% of 10RM), n=21, or vigorous intensity RE (VRE) (i.e., 100% of 10RM), n=21. They had to complete 3 sets of 10 repetitions for 5 exercises. Affect, arousal, and distress were measured with the Feeling Scale, Felt Arousal Scale, and Subjective Units of Distress Scale, respectively. Measures were administered at PRE, MID, POST, at 15-minute DELAY, and at 30-minute DELAY. Changes were analyzed using ANOVAs, with Bonferroni adjustments.

RESULTS: There were significant group x time interactions for affect (p<.05), and distress (p<.01), and main effect of time for arousal (p<.01). With MRE, affect improved PRE to POST (p<.01), PRE to DELAY15 (p<.01), and PRE to DELAY30 (p<.01), and arousal increased PRE to MID, and PRE to POST (p’s<.01). In addition, distress reduced PRE to all time points (p’s<.01). With VRE, affect decreased PRE to MID (p<.01), while arousal increased PRE to MID, and PRE to POST (p’s<.01). In addition, distress reduced PRE to Delay15 (p<.01), and PRE to DELAY30 (p<.01).

CONCLUSIONS: Results suggest that an acute bout of MRE is more effective than VRE in improving affect, increasing energy, and reducing distress in depressed AA PLWH. However, VRE also appears to have distress-reducing benefits. These findings should be considered when prescribing exercise for symptom management in this population.

Augmented Mechanoreflex in Type 2 Diabetic Rats: Piezo channels, an Important Part of the Puzzle?

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A recent study demonstrated that type 2 diabetic (T2D) patients have augmented sympathetic activity and metaboreflex to exercise. However, whether the mechanoreflex is also impaired in T2D is not known. PURPOSE: The purpose of the study was to test whether the mechanoreflex is exaggerated in T2D rats at different time points of the disease. Furthermore, we tested the
contribution of mechano-gated Piezo1 and 2 channels to the mechanoreflex in T2D.

METHODS: We measured the mechanoreflex in unanesthetized, decerebrated male UC Davis T2D rats and non-diabetic Sprague Dawley rats by stretching the Achilles tendon for 30 s while mean arterial pressure (MAP) and heart rate (HR) were continuously measured. Young (4 mo old) adult T2D rats (BW=592±21 g, glucose=335±104 mg/dl, HbA1c=7.4±0.4%), adult (8 mo old) T2D rats (BW=559±47 g, glucose=567±34 mg/dl, HbA1c=13.0%), and older (12 mo old) T2D rats (BW=546±26 g, glucose=549±28 mg/dl, HbA1c=12.8±0.2%) were compared to non-diabetic male rats (non-diabetic: BW=451±33 g, glucose=217±21 mg/dl, HbA1c=4.6±0.1%). To test the contribution of Piezo channels, we injected GsMTx-4 (10 μg), a known antagonist of Piezo1 and 2 channels, into the arterial supply of the hindlimb and repeated the stretch maneuver. RESULTS: We found that the pressor (young T2D: ΔMAP=38±6 mmHg, n=3; adult T2D: ΔMAP=45±2 mmHg, n=2; older T2D: ΔMAP=69±6 mmHg, n=5; non-diabetic: ΔMAP=14±2 mmHg, n=9) responses to tendon stretch were significantly greater in T2D rats at each time point compared to non-diabetic rats; p<0.05. The cardioaccelerator response to tendon stretch was significantly greater in the older T2D rats compared to non-diabetic rats (older T2D: ΔHR=28±4 bpm, n=5; non-diabetic: ΔHR=4±2 bpm, n=9; p<0.05). Injecting GsMTx-4 into the arterial supply of the hindlimb in older T2D rats reduced the pressor response to tendon stretch by approximately 30% (before GsMTx-4; ΔMAP: 80±7 mmHg; after GsMTx-4; ΔMAP: 55±9 mmHg, n=2; p<0.05). Likewise, GsMTx-4 lowered the cardioaccelerator response by approximately 60% (before GsMTx-4; HR: Δ31±9 bpm; after GsMTx-4; HR: Δ12±2 bpm, n=2; p<0.05). CONCLUSION: We conclude that T2D significantly exaggerates the pressor and cardioaccelerator response to tendon stretch and that Piezo channels play an important role in evoking this exaggerated response in T2D rats.

AEROBIC FITNESS IS NOT PROTECTIVE OF ENDOTHELIAL FUNCTION WITH MENOPAUSE

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Endothelial dysfunction is a pre-clinical marker for cardiovascular disease (CVD). In most populations, aerobic fitness is protective of endothelial function. Whether this protection remains during and after menopause is unclear. PURPOSE: To evaluate differences in endothelial function before and after acute exercise in women at different menopausal stages with disparate levels of aerobic fitness. METHODS: Brachial artery flow-mediated dilation (FMD) was evaluated before and after 30min of treadmill exercise (60-64% VO2peak) in healthy high (HIGH) and low (LOW) fit perimenopausal (PERI: HIGH, n=12, 50.8± 1.0 yr, 49.1±2.5 ml/kg/min; LOW, n=7, 47.3±1.5 yr, 30.1±1.6 ml/kg/min) and postmenopausal (POST: HIGH, n=13, 60.5±1.0 yr, 43.8±1.8 ml/kg/min; LOW, n=8, 58.9±1.4 yr, 28.3± 1.1 ml/kg/min) women. High fit premenopausal (PRE: n=6, 44.6±1.3 yr, 50.5±3.6 ml/kg/min) women were included as a reference group. Data were evaluated with repeated measure ANOVAs and post hoc testing, where appropriate, and are presented as mean±SEM. FMD data in LOW were previously published (Serviente et al., 2016). RESULTS: Overall, there was a main effect of menopause on FMD (p=0.024), with lower FMD in POST compared to PERI (p=0.007). There was a main effect of fitness (p=0.031) with lower FMD in HIGH compared to LOW. Within HIGH, PRE had higher FMD than POST (p=0.018), but not PERI (p=0.737). FMD was lower in HIGH vs. LOW POST (4.2±0.8% vs. 6.51±0.5%, p=0.047) before, but not after acute exercise (4.31±0.6% vs.
6.2±1.0%, p=0.103). After acute exercise, FMD was lower in HIGH POST compared to PRE (6.2±1.0% vs. 7.7±1.1%, p=0.011). There was no difference in FMD in HIGH vs. LOW PERI before exercise (7.1±1.5% vs. 6.5±0.5%, p=0.73); however, FMD was higher in LOW after exercise (5.7±0.6 % vs. 8.5±1.1%, p=0.029). CONCLUSIONS: While endothelial function does not appear to decline until postmenopause, the protective effect of aerobic fitness is not apparent in perimenopausal or postmenopausal women; although, fitness appears to modulate the response to acute exercise. These data suggest that targets other than aerobic fitness may be important for improving endothelial function, and therefore CVD risk, in menopausal women. Funding: ACSM Foundation Doctoral Student Research Grant (Serviente) & UMass Amherst Faculty Research Grant (Witkowski)

Parent Support and Child Enjoyment Mediate the Association between Child Coordination and Physical Activity Participation

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The purpose of this study was to examine the mediation effects of parent support and child enjoyment on the association between child athletic coordination and physical activity (PA) participation. We collected data from 374 parents of children enrolled in the 2017 Youth Sport Camps at Colorado State University in Fort Collins, CO. Parents provided informed consent and completed a survey using Qualtrics. The survey included questions about children’s PA and related correlates during the 2016-17 school year. The outcome variable is PA participation, the independent variable is child athletic coordination, and hypothesized mediators are parent support and child enjoyment. We tested mediation and multiple mediation models using hierarchical linear regressions, controlling for child age and sex, with non-significant control variables (race and body mass index) removed for parsimony. Parent support of child PA and child PA enjoyment fully mediated the relationship between child athletic coordination and PA participation. Child athletic coordination significantly associated with PA participation before (c: b=0.36, 95%CI 0.22, 0.51), but not after (c': b= 0.08, 95%CI -0.08, 0.23) the inclusion of parent support and child PA enjoyment. The mediators accounted for 76% of the observed effect of child coordination on PA participation. These findings present a potential causal pathway indicating that child PA participation is associated with child coordination completely via parent support and child PA enjoyment. The illustrated pathway suggests that interventions focused on increasing children’s PA participation should target parent support of child PA and child PA enjoyment, along with child athletic coordination.

The Use of an Experimental, Topical Foam to Enhance Skin Cooling and Sodium Retention

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Integrity of the stratum corneum has important applications for maintaining skin pH levels and transepidermal water loss. Therefore, products that enhance stratum corneum integrity may have important applications for mitigating sodium (Na) loss and increasing body temperature
during exercise. **PURPOSE:** To examine the effects of an experimental, topical foam on Na retention and skin temperature during exercise. **METHODS:** 6 men and 6 women (Age = 28.3 ± 5.0, Height (cm) = 172.7 ± 10.3, Mass (kg) = 73.3 ± 19.0) completed a thirty-five minute exercise protocol on a treadmill. The protocol included a 5-minute warm-up and 30 minutes of exercising at a moderate intensity. Subjects were weighed before and after exercise to determine total sweat loss. Before exercising, subjects were treated with the experimental foam on one side of the body on the forearm (FA), thigh (TH), chest and scapula. Sweat patches were applied to the same sites on both the treated (T) and untreated (UT) sides of the body. Skin temperature on UT and T sides was assessed every 10 minutes during and 5 minutes post exercise with an infrared thermometer at the FA and TH. After exercise, sweat patches were removed and analyzed for Na content using direct measurement by an ion selective electrode. Paired t-tests were used to compare sweat Na concentrations and repeated measures ANOVA (2 x 5) was used to compared skin temperature across time between T and UT sides (α < .05) **RESULTS:** No significant differences in Na concentration were found between T (Mean Na (mmol) = 31.68 - 54.06) and UT (Mean Na (mmol) = 29.22 - 50.24) sites. A main effect of time on skin temperature was found for both the FA (Mean Temperature (°C) = 32.13 ± .43) and TH (Mean Temperature (°C) = 31.68 ± .29). This effect was quadratic in nature, whereby skin temperature dropped through the warm-up, and then rose steadily through recovery. However, no effect of treatment was found across any of the time points for the FA or TH. **CONCLUSION:** Although based on a small sample size, these results point towards the conclusion that the experimental foam did not have a statistically significant effect on skin temperature or sodium retention during exercise.

Supported by Avadim Technologies Inc.

**CROSSING THE THRESHOLD: EFFECT OF MILD HYPERCAPNIC BED REST ON VENTILATORY CHEMOSensitivity TO CARBON DIOXIDE**

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**PURPOSE:** To investigate whether prolonged hypercapnic bed rest increases ventilatory chemosensitivity to carbon dioxide (CO₂). **METHODS:** Eleven (5 female) healthy subjects were studied prior to, during, and after 30 days of 6° head-down tilt bed rest combined with 0.5% ambient CO₂. Ventilation (Ve) and end-tidal CO₂ (PETCO₂) were measured on a breath-by-breath basis (BreezeSuite, MGC Diagnostics) to determine ventilatory chemosensitivity as quantified by the ventilatory recruitment threshold (VRT) and sensitivity (Ves). Subjects were studied in the 6° head-down tilt position at all time points. After 10 min of quiet breathing, subjects were coached to hyperventilate for 1 min with the target of maintaining PETCO₂ ~20-25 mmHg. Then, a two-way valve was switched to a 6L rebreathing bag containing 100% O₂ where subjects were instructed to resume normal breathing until PETCO₂ reached 60 mmHg, subjects depleted the bag volume, or signaled to return to breathing room air. Two, 2-way mixed analyses of variance were used to analyze the effect of time point and sex on VRT and Ves. Pairwise comparisons were conducted using a Bonferroni correction factor, and significance was set at p < .05. Descriptive statistics are reported as means ± standard deviations. **RESULTS:** There was a significant effect of time point on VRT such that even after 13 days of recovery from hypercapnic bed rest, mean onset of the VRT occurred at a lower PETCO₂ (M = 45.8 ± 3.7 mmHg) compared to the control time point (M = 50.2 ± 5.3 mmHg) F(6, 54) = 11.81, p < .001.
Additionally, there was a significant effect of sex on VRT such that females ($M = 45.6 \pm 1.3$ mmHg) had a lower VRT when compared to males ($M = 50.5 \pm 1.2$ mmHg) $F(1, 9) = 8.28, p < .05$. The $V_{ES}$ was significantly decreased after 30 days of hypercapnic bed rest ($M = 1.17 \pm 0.71$ L/min/mmHg) compared to the control time point ($M = 1.62 \pm 0.77$ L/min/mmHg) $F(1, 9) = 8.38, p < .05$, yet was no longer blunted after 13 days of recovery ($M = 1.47 \pm 1.03$ L/min/mmHg) $F(1, 9) = .61, p > .05$. **CONCLUSION:** Intriguingly, we found that VRT onset occurred at a lower $P_{ET}CO_2$ even after 13 days of recovery, while $V_{ES}$ was blunted at 30 days, yet was restored to resting levels during the recovery period. These data suggest that exposure to chronic, mild increases in ambient $CO_2$ during head-down tilt bed rest may augment ventilatory chemosensitivity in as few as 30 days. Support: NASA Human Research Program NNJ14ZSA001N

**MATCH-PLAY ANALYSIS OF PHYSIOLOGICAL AND MOVEMENT VARIABLES IN MEN’S AND WOMEN’S DIVISION I SOCCER PLAYERS**

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HR monitoring, accelerometers, and GPS tracking have become popular tools to quantify activity intensity during soccer matches. Limited research has examined differences between men and women collegiate players using these tracking modalities. **PURPOSE:** To quantify the activity profile of Division I collegiate soccer players during games using HR response and GPS and to examine differences based on gender and position. **METHODS:** A team HR monitoring system was used to evaluate in-game HR response and quantify match-play movement patterns of 21 men and 21 women NCAA Division I soccer players who played >70 min in each of 3 games. Players were divided into 3 groups based on position (defender, midfielder, forward). Percentage of playing time spent above 80% of HR max and average %Hrmax was calculated. Total distance/playing time and number of sprints above sprint threshold (men: accelerations >2.8m/s², women: accelerations >2.4m/s²) were also calculated. ANOVA and student’s t-test were used to determine differences. **RESULTS:** Forwards and midfielders had significantly greater distance/playing time and sprints/playing time than defenders (F: 115.2m/min, M: 115.7m/min, D: 103.0m/min) (F: 0.38sprints/min, M: 0.33sprints/min, D: 0.26sprints/min) (p<0.05). No positional differences were observed in average %Hrmax or % of game time >80% of HRmax. Men had a greater average distance/playing time than women (113.0m/min vs 105.6m/min) (p<0.05). Men had significantly fewer average sprints/min above threshold than women (0.18/min vs 0.42/min) (p<0.05). No differences were observed in average %Hrmax (M: 85.6%Hrmax, W: 87.7%Hrmax) or % of game >80% of Hrmax (M: 80.6%, W: 88.3%) between genders. **CONCLUSIONS:** HR data illustrate that elite level soccer is a highly aerobic sport. Differences in distance/playing time and sprints based on position may be explained by positional requirements, with more constant movement required for midfielders and explosiveness for forwards. Men’s soccer moves at a faster pace, explaining the difference in distance/playing time by gender; however, relative activity intensity (%Hrmax) was similar between positions and gender. The gender difference in number of game sprints may be at least partially related to the threshold differences determined by the GPS system.

**Amino Acid Transport and Metabolism Alterations Following 12 Weeks of Resistance Training with Supplementation**

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**PURPOSE:** Amino acid transporters within skeletal muscle have gained attention for their potential role in stimulating muscle protein synthesis (MPS). The purpose of this study was to determine if amino acid transporters and proteins involved in amino acid metabolism are related to skeletal muscle hypertrophy following resistance training with different nutritional supplementation strategies. **METHODS:** 43 untrained, college-aged males were separated into a Maltodextrin Placebo (PLA, n=12), Leucine (LEU, n=14), or Whey Protein Concentrate (WPC, n=17) group and underwent 12 weeks of total-body resistance training performed 3 days per week while supplementing twice daily. Each group’s supplement was standardized for total energy, fat, and LEU and WPC groups were standardized for total Leucine (6 g/d). Skeletal muscle biopsies were obtained prior to training (PRE) and ~72 h following subjects’ last training session (POST). **RESULTS:** LAT1 protein levels demonstrated a time (p<0.001; 3.01-fold increase) and group effect (p=0.043), whereby PLA increased significantly more than LEU and WPC (p<0.05; 5.01-fold vs. ~2-fold increase). A time effect was observed for PAT1 (p=0.047; 1.36-fold increase) and BCKDHA (p=0.001; 1.81-fold increase) protein levels, while SNAT2, BCAT2, and ATF4 protein levels were unaltered (p>0.05). Changes in muscle fiber cross sectional area (CSA) demonstrated a time effect for Type I fibers (p=0.045; +370 µm) and Type II fibers (p<0.001; +1061 µm). No strong, significant correlations existed for changes in assayed proteins with changes in Type I or II fiber CSA, nor were PRE protein values indicative of alterations in muscle CSA. **CONCLUSIONS:** LAT1 protein levels increase in response to resistance training, and LEU and WPC supplementation reduced training-induced increases in this protein. Furthermore, proteins related to amino acid transport and metabolism do not appear to dictate skeletal muscle hypertrophy.

**DIFFERENCE IN PHYSICAL ACTIVITY BETWEEN CHILDREN WITHOUT SIBLINGS AND WITH SIBLINGS**

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Children without siblings, singletons, have higher rates of obesity than children with siblings, non-singletons. Physical activity, such as increased moderate-to-vigorous physical activity (MVPA) and decreased sedentary behavior (SB), can curb excess weight gain early in life. **PURPOSE:** The purpose of this study is to examine the differences in physical activity and sedentary behavior between singleton and non-singleton children. **METHODS:** Mothers of singleton children ages 5.0-7.9 years old and mothers of non-singleton children ages 5.0-7.9 years old with a sibling between the ages of 2.0-4.9 years old in their primary household were recruited. Height, weight, and waist circumference (WC) of child were objectively measured. Mothers reported demographic characteristics of the child and self, and completed a questionnaire on their physical activity. Children wore an accelerometer at the ankle for at least 4 full days while parents recorded daily activities and time spent in away from home care (such as child care or kindergarten). Body mass index (BMI) was calculated, and BMI and WC percentiles were calculated for age and sex. MVPA, light physical activity (LPA), and SB per hour were calculated using accelerometer cut points and total wear time.
RESULTS: 57 mother-child dyads (23 singletons and 34 non-singletons) participated. On average mothers were 34.0 years old, employed full time (68%), married (80%), and the child's biological mothers (97%); while children were 5.7 years old and predominantly white (65%). Singletons had a higher BMI percentile (70.6±31.4) and waist circumference percentile (65.2±29.7) compared to non-singletons (53.2±28.8, p=0.03; 51.1±24.8, p=0.05). In individual models, singletons did not differ in time in away from home care (p=0.60) or their mother’s average MET minutes per week compared to non-singleton children (p=0.65). After adjusting for child BMI percentile and month of wear, singletons spent 3.23 less minutes per hour in LPA (p=0.004) and 3.36 more minutes per hour in SB compared to non-singletons (p=0.01).

CONCLUSION: In this sample, singletons had a higher BMI percentile and were less active compared to non-singletons. Investigation into differences in singleton/non-singleton families, including family health behaviors, may support understanding of the mechanism.

Quantifying Whole Body Compensations in Ground Reaction Forces During Gait in Individuals Post-ACLR

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Individuals 3 months post-ACLR reconstruction (ACLR) decrease vertical (vGRF) and posterior (pGRF) ground reaction forces during loading response (LR) of gait. At this time of double limb support (DLS), decreased loading may result from modifications by the trailing limb. PURPOSE: To compare GRFs between limbs during DLS in individuals post-ACLR and controls. METHODS: 17 individuals (11F, 24±11yrs) 114±17days post-ACLR and 17 healthy controls (CTRL; 11F, 23±8yrs) walked 1.4 m/s. DLS of stance was divided into initial (iDLS) and terminal (tDLS). Maximum vGRF and pGRF during iDLS and maximum vGRF and anterior GRF (aGRF) during tDLS were identified for ACLr, non-surgical (NS) and CTRL limbs. vGRF and anteroposterior (AP) GRF ratios were calculated: (Reference limb GRF in iDLS)/(Contralateral limb GRF in tDLS). One-way ANOVAs were used to compare variables among limbs; α=0.05, post hoc: paired and independent t-tests. RESULTS: Vertical (p=0.007, ACLr:0.92±0.2, NS:1.00±0.02; p=.02, CTRL:0.99±0.02) and AP GRF ratios (p<0.001, ACLr:0.83±0.03, NS:0.97±0.03; p=0.001, CTRL:1.00±0.04) were reduced in ACLr compared to NS and CTRL limbs. vGRF (p=0.02, ACLr:1.01±0.01, NS:1.06±0.01; p=0.04, CTRL:1.05±0.01BW) and pGRF (p=0.001, ACLr:0.19±0.01, NS:0.22±0.01; p=0.03, CTRL:0.22±0.01BW) during iDLS were reduced in ACLr compared to NS and CTRL limbs. vGRF of the contralateral limb in tDLS was greater when the ACLr limb was in iDLS compared to NS and CTRL (p=0.006, ACLr:1.10±0.01, NS:1.05±0.01; p=0.10, ES:0.56, CTRL:1.07±0.02BW). No differences were observed in aGRF between limbs (p=0.81, ACLr:0.23±0.01, NS:0.23±0.01, CTRL:0.22±0.01BW). CONCLUSIONS: Altered GRF ratios suggest differences among limbs in the distribution of forces between the leading and trailing limbs during LR. Reduced vGRF in the surgical limb during iDLS along with greater vGRF in the contralateral limb may reflect an interlimb compensation that shifts the load to the non-surgical limb. However, no alterations in aGRF were observed suggesting reduced pGRF in the surgical limb during LR is not compensated for by the trailing limb.