BONE DENSITY IN COMPETITIVE CYCLISTS AT THE START OF THE SEASON

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Physical activity is typically a treatment for low bone mineral density (BMD). However, non-weight bearing sports tend to have a negative impact on BMD. More specifically, elite cyclists have been shown to have decreased whole body BMD that may put them at risk for osteoporotic fractures. **PURPOSE:** The goal of this examination was to assess BMD in competitive cyclists at the start of the season and to identify possible correlates with age, sex, body composition, experience, and competition level. **METHODS:** Forty five competitive USA Cycling Category 4 or better men (n=24) and women (n=21) volunteered for a Dual-energy X-ray absorptiometry bone scan in February at the start of the spring/summer season. Information was also collected regarding the participant's personal training habits and cycling history. Cyclists included road racers only (N=16: 7 men, 9 women), road and mountain or cyclocross racers (N=28: 17 men, 12 women) and non-road racers (N=7: 3 men, 4 women). Relationships were assessed at $p < 0.05$. **RESULTS:** The men and women were similar in Category (2.4 ± 1.4 (mean $\pm$ SD)), age (30.4 ± 8.1 yrs), BMI (21.9 ± 1.7 kg/m2), total cycling experience (8.4 ± 6.1 yrs), and years racing (5.4 ± 5.0 yrs). However, the men were taller (1.82 ± 0.06 vs 1.70 ± 0.03 m), heavier (71.9 ± 5.3 vs 63.4 ± 6.6 kg), leaner (16.4 ± 3.4 vs 26.0 ± 5.2 % body fat), and had lower BMD T-scores (-0.71 ± 0.93 vs -0.05 ± 0.71) than the women. When stratifying further within competitive category, lumping 1 & 2 and 3 & 4 together, the lower category women (3&4) weighed less than the men in general. The lower category women (3&4) also had less racing experience and higher BMD T-scores compared to the higher category men (1&2). When examining relationships to BMD T-score, none of our variables were significantly correlated in the whole group. However, in the men, BMD T-scores were significantly correlated with BMI ($r=0.521$) and body mass ($r=0.459$). **CONCLUSION:** While both male and female cyclists may be at risk for low BMD, it appears that elite men are at the greatest risk. Within the male cyclists it appears that body mass may be protective of BMD. However, the level of association suggests that other factors may be more meaningful. Additional reasons for reduced BMI, such as diet, and how BMI may change throughout the season remain unclear.

Category A
Mentor: RF Reiser II,PhD

AEROBIC AND COGNITIVE TRAINING IMPROVES PSYCHOSOCIAL VARIABLES IN CANCER SURVIVORS FOLLOWING RADIATION THERAPY

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Cancer patients often experience a multitude of different types of side effects during and following radiation therapy including cognitive, physical, and psychosocial impairments. Patients that have undergone radiation therapy often experience these declines during, immediately following, and months to years after cessation of radiation treatment. Research has indicated that radiation therapy often inhibits neurogenesis, increases apoptosis, and decreases neuronal proliferation in the hippocampus. The benefits of exercise on the cancer population as well as the promotion of angiogenesis and neurogenesis have been well established in the literature. In addition, the benefits of computer-based cognitive training interventions on cognitive functioning as well as improvement in psychosocial measures have been indicated in various populations. To our knowledge, there are no studies examining the effects of aerobic and cognitive training on psychosocial measures specifically with cancer survivors. **PURPOSE:** To examine the effects of 12-weeks of aerobic and cognitive training on psychosocial variables of individuals who have undergone radiation therapy for cancer. **METHODS:** A total of six participants were eligible for this study. Four participants had undergone radiation treatment for cancer and two had not previously been diagnosed for cancer. Each participant completed an initial comprehensive

physical assessment, cognitive assessment, Piper fatigue inventory, Beck depression inventory, and Quality of Life assessment. Following the assessments, each participant was randomized into a 12-week intervention consisting of cognitive training, flexibility training, and aerobic training, or a combination. Upon completion, the participants again performed each assessment. **RESULTS:** Following the 12-week intervention a significant improvement ($p<.05$) on the measures of the Beck depression inventory and Quality of Life assessment was observed. **CONCLUSION:** These preliminary results imply that levels of depression and ultimately quality of life were improved with this intervention. This study demonstrates the importance of inclusion of additional rehabilitative modalities with exercise to attenuate the deleterious effects of radiation therapy on psychosocial well-being.

Category A
Mentor: Reid Hayward, PhD

INCREASED BONE GLUCOSE METABOLISM IN PATIENTS WITH MULTIPLE SCLEROSIS COMPARED TO HEALTHY CONTROLS AFTER WALKING

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Abstract
Multiple Sclerosis (MS) is a progressive neurodegenerative disease often leading to a decrease in somatic control. Studies have shown high co-morbidity between MS and osteoporosis, a disease classified by low bone mineral density (BMD). Osteoporosis can lead to bone fractures, especially after falls, and patients with MS are also known to be at an increased risk for falling. It is important to identify changes in BMD in patients with MS, especially in areas where increased fractures are seen, such as the femoral head (FH) and the 7th and 8th thoracic vertebrae (T_7 and T_8). Using Positron Emission Tomography (PET)/Computed Tomography (CT) we can quantify the glucose metabolism of bones and measure BMD based on Hounsfield Units (HU). *Purpose:* To determine differences in BMD and glucose metabolism of common fracture sites between patients with MS and healthy controls (CON). *Methods:* 8 patients with MS and 8 health controls (CON) walked on a treadmill for 15 minutes at a self-selected speed. During walking participants were injected with the PET glucose analog tracer [^{18}F]-FDG. After completion of the walking a full body PET/CT scan was performed. Regions of interest (ROI) for the FH, T_7, and T_8 vertebrae were then identified on CT images and fused with the corresponding PET images for quantification of FDG standard uptake values (SUV). *Results:* Mean HU of the MS FH was 9% lower than CON (356 ± 44, 391 ± 29, $P = 0.01$). Differences were also detected between the MS and CON groups in the T_7 and T_8 vertebral bodies (T7: 196 ± 34, 249 ± 34, $P = 0.008$; T8: 184 ± 36, 242 ± 38 $P=0.009$), showing ≈23% lower mean HU. SUV in the FH of MS was greater than CON (1.05 ± 0.22, 0.73, ± 0.32, $P = 0.004$). No differences in SUV were detected between MS and CON vertebral bodies (1.72 ± 0.44, 1.87 ± 0.23, $P = 0.24$) *Discussion:* Our findings indicated lower BMD in patients with MS in each ROI when compared to CON. The difference in the FH was less than the difference in the vertebrae. After walking, patients with MS had higher FH SUVs than CON. This suggests the increased activity may be leading to increased BMD in the FH in patients with MS versus their vertebrae. Physical activity may help to prevent lower BMD in areas that are loaded. Rehabilitation strategies that increase loading to bones of all common fracture sites may improve BMD in patients with MS.

Category: A
Mentor: T Rudroff, PhD

THE EFFECTS OF CREATINE INCUBATION ON DOXORUBUICIN-INDUCED MUSCLE DYSFUNCTION.

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Doxorubicin (DOX) is an effective chemotherapy treatment that has been associated with a number of deleterious side effects including skeletal muscle dysfunction. In addition to DOX being associated with increased oxidative stress, it also places a significant burden on the mitochondria which compromises the cell's ability to produce ATP. Creatine (Cr), however, has been shown to have antioxidant properties as well as the potential to provide an increased rate of ATP production. Together, these benefits of Cr supplementation could potentially provide some relief to the detrimental skeletal muscle side effects of DOX treatment. **PURPOSE**: To investigate the effects of Cr pretreatment on DOX-induced skeletal muscle fatigue. **METHODS**: Soleus (SOL) and extensor digitorum longus (EDL) from male Sprague-Dawley rats were excised from and incubated *ex vivo* with either Krebs buffer (K) or Krebs buffer containing Cr (25 mM) for 30 minutes. The buffers were then refreshed with either new K or Krebs buffer containing DOX (25 μM) for 30 minutes. Muscles were supplied with new Krebs buffer and subjected to a 100 second fatigue protocol. Force production was recorded every 10 seconds throughout the protocol in order to analyze fatigue. **RESULTS**: In the SOL, a significant decline in force production from baseline (0 s) was observed at 70 s for K+K, 70 s for Cr+K, 30 s for K+DOX, and 30 s for Cr+DOX($p<0.05$) suggesting that Cr pretreatment did not protect against DOX-induced muscle fatigue. However, in the EDL, a significant decline in force production from baseline (0 s) was observed at 60 s for K+K, 80 s for Cr+K, 20 s for K+DOX, and 40 s for Cr+DOX ($p<0.05$) indicating some form of Cr-induced protection against DOX fatigue. **CONCLUSION**: *Ex vivo* Cr pretreatment prior to DOX incubation attenuated DOX-induced fatigue in the EDL but not the SOL suggesting that Cr administration may play a role in managing DOX-induced skeletal muscle dysfunction by providing protection in type II skeletal muscle.

Category A
Mentor: D Hydock, PhD

THE EFFECTS OF AEROBIC TRAINING ON COGNITIVE FUNCTION IN A BRAIN CANCER SURVIVOR: A CASE STUDY

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INTRODUCTION: As many as 75% of cancer survivors have reported experiencing chemotherapy-related cognitive impairment (CRCI) which may negatively affect multiple aspects of cognitive function. Some side effects of CRCI may include: cognitive inability, linguistic difficulty, decreased reaction times, impaired memory and concentration, and decreased ability to maintain activities of daily living. Most unsettling is that CRCI has been reported to persist long after completion of treatment and may affect patients with brain cancer more severely. Independently, interventions of cognitive and exercise training have resulted in increases in functional capacity and improvements in various measures of cognitive function. However, to our knowledge there are no studies being conducted that have examined the effects of an aerobic training intervention on cognitive function in brain cancer survivors. **PURPOSE:** To examine the effects of a 12-week aerobic intervention on cognitive function in a brain cancer survivor. **METHODS:**A 44 year old female diagnosed with anaplastic oligodendroglioma presenting with a left-frontal craniotomy, chemotherapy, and radiation was included in this case study. A comprehensive physical assessment and cognitive assessment were completed pre and post 12-week intervention. **RESULTS:** Pre to post improvements were observed in 11 of the 15 (73%) cognitive assessment variables. **CONCLUSION:** Cancer treatment-related side effects can lead to decreases in cognitive function for survivors having undergone surgery, chemotherapy, and radiation therapy for brain cancer. The results of this case study demonstrate the importance of aerobic exercise in attenuating decrements in cognitive function in cancer survivors following adjuvant treatment.

Category A
Mentor: R Hayward, PhD

HOW ACTIVE ARE ADULTS? AN APPLICATION OF PUBLISHED GENEACTIV ACCELEROMETER CUTPOINTS.

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Although adult-specific cut points for the GENEActiv accelerometer (ACC) have been established in a laboratory setting, these cut points have yet to be applied to free-living datasets. **PURPOSE:** To apply published laboratory-based cut points for the wrist-mounted GENEActiv ACC to a multi-day sample of adult data. **METHODS:** We recorded seven-days of free-living ACC data (75 Hz) from parents of fourth grade children who were participating in the USDA-funded Fuel for Fun study. Fuel for Fun is a school- and family-based obesity prevention effort that utilizes experiential cooking and tasting curricula as well as active recess lessons within the school environment. For the present analyses, we considered baseline data from a sample of 37 parents. Using a customized Matlab program, parent data were summed over 60 seconds to create a single acceleration value for each minute. We then applied published GENEActiv cut points to determine the amount of time parents spent in moderate-vigorous physical activity (MVPA) during the sampled weekdays and weekend days (5am-12am) as well as during discrete intervals of the weekday, including morning (5am-8am), day (8am-5pm), evening (5pm-10pm), and late evening (10pm-12am). **RESULTS:** Parents spent a mean of 10.27% (117.0 min, SEM=10.4 min) of the weekday and 9.96% (113.4 min, SEM=10.1 min) of weekend days engaged in MVPA, but little of this activity was vigorous in nature on either weekdays (4.7 min, SEM=1.3 min) or weekend days (3.3 min, SEM=1.4 min).During the weekday, 11.5%, 60.0%, 25.5%, and 3.0% of total MVPA was accumulated during the morning, day, evening, and late evening, respectively. Mean rate of MVPA accumulation (min/hr) was 4.5, 7.8, 6.0, and 1.8 for morning, day, evening, late evening, respectively. **CONCLUSION:** These results suggest that when applying laboratory-derived GENEActiv cut points, adults are engaged in a greater amount of daily MVPA than previously reported, with a majority accumulated during traditional working hours. However, very little of this activity is vigorous in nature. Future work should explore other intensity classification techniques to determine if laboratory-based cut points provide the best representation of adult physical activity.

Category A
Mentor: R Browning, PhD

EFFICACY OF SELF-MYOFASCIAL RELEASE INTERVENTION ON RECOVERY BETWEEN ACUTE, MAXIMAL BOUTS OF EXERCISE: A PILOT STUDY

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Myofascial release (MFR) interventions, such as massage or foam roller (FR) use, have been shown to be effective or better vs. standard, active recovery when observing blood lactate (BLa) removal or maintenance of power output (PO). This is important to athletes (e.g., track and field, triathlon) who may compete or train multiple times per day. **PURPOSE:** To determine the efficacy of MFR interventions [FR and the newer Roll Recovery 8 (R8) devises]on the maintenance of a subsequent high-intensity exercise bout. **METHODS:** Participants (n = 9) were randomized to one of three,20-min recovery groups – FR, R8, and low-intensity spinning on a cycle ergometer (SPIN) – in between two, 7-min cycling time trials (TT_1 and TT_2) to volitional fatigue. Note, to mimic a realistic recovery, FR and R8 groups cycled for 4-min immediate post TT_1 (IPE_1) prior to undergoing 12-min of modality use (standardized by viewing a video) followed by 4-min of gentle cycling just prior to TT_2. To clarify, SPIN served as an active control with no modality use. Participant characteristics (mean ± SD) were: age = 27.1 ± 6.8 yrs, ht = 142.3 ±60.0 cm, wt = 56.9 ± 22.4 kg, BMI = 20.2 ± 8.1 kg · m^{2-1} and VO_{2max} = 43.7 ± 18.0ml · kg^{-1} · min^{-1}.PO (total KJ's), heart rate (HR, bpm), and rating of perceived exertion (RPE, Borg Scale)were assessed during TT_1 and TT_2. BLa was measured from IPE_1 to the end of recovery. A one-way ANOVA with p< 0.05 for significance was utilized. **RESULTS:** No significant percent change differences (from T_1 to T_2)

between groups were observed on PO, HR, and RPE. However, R8 and SPIN were significantly different vs. FR (from IPE$_1$ to the end of recovery) on BLa (-0.62 ± 12.84, -9.32 ± 6.02, and 13.82 ± 13.71 %, respectively). **CONCLUSION:** R8 showed probable efficaciousness in conjunction with specific, dynamic exercise to remove BLa during recovery and could help enhance athlete performance during interval training or multiple one-day competitions. However, this pilot project was limited by a low participant pool and additional research is warranted.

Category A
Mentor: SN Drum, Ph.D.

CHANGES IN COGNITIVE FUNCTIONAND SPORT-SPECIFIC REACTION TIMEAFTER ACTIVE ANDPASSIVE DEHYDRATION

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Dehydration has been shown to decrease sports performance. However, the exact cause of the decreased performance due to dehydration is still unclear. **PURPOSE**: To compare seated cognitive function performance to sport-specific reaction time values after a dehydrating protocol to approximately 2% body mass loss. **METHODS**: Seven women and thirteen men between the ages of eighteen and thirty-five participated in the study (27 +/- 4yr, 78.7 +/- 14.8 kg, 174.0 +/- 7.5 cm). Subjects reported to the lab in a fasted and normally hydrated state and completed a set of cognitive function tests followed by multiple sport-specific reaction time tests. Subjects then ran on a treadmill at 80% estimated max HR for 30 minutes, followed by multiple 15 minute sessions in a dry sauna at approximately 150 degrees F. After reaching a 2% (+/- 0.4%) reduction in dry body weight subjects completed the same procedures as pre-dehydration. **RESULTS**: Seven of the twenty-one cognitive function tests resulted in significant improvements after dehydration (p < 0.029). A multi-direction choice reaction time test where subjects selected targets with the upper body while moving the lower body was the only significant sport-specific test out of five that resulted in significantly decreased performance (p = 0.026). However, performance decreased in every sport-specific test, as demonstrated by an increase in reaction time (0.002 to 0.083 seconds). **CONCLUSIONS**: Sport-specific, total body reaction time performance and pure cognitive function appear to be influenced independently when athletic men and women are in a dehydrated state. The data suggest that pure cognitive performance is enhanced and the brain is functioning faster when dehydrated while total body sport-specific reaction time performance is decreased and the body reacts slower in a dehydrated state. The relationship between enhanced cognitive function and decreased sport-specific reaction time performance needs further investigation, but the current data suggest a peripheral mechanism may be the cause of decreased total body reaction time in athletic men and women.
Category C

PHOSPHATIDIC ACID SUPPLEMENTATION DOES NOT ALTER BODY COMPOSITION OR STRENGTH IN SEDENTARY, MIDDLE AGED INDIVIDUALS

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Abstract

Phosphatidic Acid (PA) has recently emerged as a potent signaling molecule in the mammalian target of rapamycin (mTOR) anabolic pathway. Via mTOR, PA increases protein synthesis in a dose dependent manner. Current data indicate that PA levels increase in response to eccentric loading, possibly in response to muscle damaging exercise. PA consumed as an ergogenic aid coupled with resistance training has shown to be beneficial in increasing muscle hypertrophy, lean body mass, and strength. However, the effects of PA in a sedentary, middle-aged model are yet to be investigated. **Purpose:** Thus, the purpose of this investigation was to examine the effects of PA on muscle size and strength in aging individuals in the absence of an exercise intervention. **Methods:** Thirty male and female participants aged 43.5 ± 3.8 years participated in this study. Subjects were given either 750mg daily of PA or an equal volume, visually identical placebo in a double blind manner for 8 weeks. A known number of capsules were given to participants, and participants were required to return with leftover capsules, which were counted again to ensure compliance. During participation, participants were instructed not to alter their diets or activity levels. However, they were required to record each of these variables. Body composition was analyzed by DEXA along with ultrasound determined cross sectional area (CSA) of the rectus femoris. Muscular performance was assessed via handgrip and knee extensor isometric dynamometer tests. All measures were taken prior to and at the conclusion of the supplementation period. **Results:** No differences existed at baseline for diet, activity, or any dependent or descriptive variables. Diet and activity levels remained consistent throughout the study. No group x time interactions were present for body fat percentage, fat mass, lean body mass, CSA, handgrip strength, or knee extensor strength for men or women. **Conclusion:** Phosphatidic Acid dosed at 750 mg daily does not appear to be a potent stimulus for lean mass accretion in sedentary, ageing populations. Future research in this population should investigate larger doses, PA coupled with an exercise and/or diet intervention, and a more significant atrophic stimulus, such as muscle wasting due to malnutrition.

Category A
Mentor: JM Wilson, PhD

MUSCLE VOLUME DIFFERENCES EXPLAIN STRENGTH ASYMMETRIES IN PATIENTS WITH MULTIPLE SCLEROSIS

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Abstract
Muscle weakness and fatigue are common symptoms in patients with multiple sclerosis (MS) and are often accompanied by strength asymmetries between legs. These asymmetries have been associated with impaired variables of the gait cycle. The reasons for these strength asymmetries are not understood at this time. *Purpose:* To investigate if differences in muscle volume exist between the legs of patients with MS and if these differences are associated with asymmetries in strength. *Methods:* Seven mildly disabled patients with MS (4 women) and 7 healthy controls (4 women) underwent knee extensor and flexor maximal isometric voluntary contraction testing. Computed tomography images were obtained and regions of interest were drawn to quantify the volumes of the muscle groups. *Results:* Patients with MS had strength asymmetries of 32% ($P = 0.02$) between the knee flexors of the stronger and weaker legs. These patients also displayed volume asymmetries of 7.2% ($P = 0.04$) between the knee flexors of the stronger and weaker legs. A Pearson's correlation between those variables showed a strong positive association (r = 0.81, $P = 0.03$). Neither strength nor volume asymmetries were detected in the healthy controls ($P > 0.09$). *Conclusions:* Knee flexor strength asymmetries in patients with MS may in part be explained by muscle volume asymmetries. A possible explanation for these asymmetries could be due to compensation mechanisms in these patients, with a constant training effect occurring because of the over reliance/use of one leg. This data suggests that central and peripheral factors governing muscle volume may play a prominent role in the progression of strength asymmetries in patients with MS. These factors should be targeted in rehabilitation strategies to improve walking ability and independence in this population.

Category: A
Mentor: T Rudroff, PhD

EFFECT OF AEROBIC FITNESS AND PHYSICAL ACITVITY ON BONE MINERAL DENSITY IN LACTATING POSTPARTUM WOMEN

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Bone mineral density (BMD) of the maternal skeleton is expected to decrease during lactation due to a high demand for calcium, and rebound following weaning. How postpartum physical activity influences changes in BMD as well as body weight/composition is not fully understood. **PURPOSE:** To evaluate body composition and BMD in lactating postpartum women compared to age- and body mass index (BMI)-matched, never-pregnant controls. **METHODS:** Fifteen lactating women (26.2±5.3yrs; 70.5 ±9.7kg; BMI=25.3±3.4 kg/m^2; 38.9±6% body fat) and 15 never-pregnant controls (26.1±5.7yrs; 68.63 ±8.4 kg; BMI=24.4±3.2 kg/m^2; 35.3±5.7% body fat) were followed for one year. Bone density and body composition were measured using DXA scan at baseline (1 month postpartum), and at6and 12 months. Physical activity was estimated by Baecky questionnaire at these same time points. Maximal oxygen uptake (V0$_{2\ Max}$) was measured while walking/running on a treadmill at 12 months, and records of lactation status were kept throughout. **RESULTS:** At baseline, body weight, body composition and BMD were not different(p>0.05) between lactating and

never-pregnant controls. Similarly, $V0_{2\ Max}$ at 12 months averaged 37.6 ± 7.0ml/kg/min and was not different (p>0.05) between groups. In lactating women, body mass, fat mass and body fat percentage decreased from baseline to 12 months postpartum (time effect, p≤0.03) but fat free mass did not change (p>0.05). The change in percent body fat in lactating women was influenced by aerobic fitness (time x $V0_{2\ Max}$, p=0.04) such that women with increased fitness at 12 months lost more body fat. BMD in the lumbar spine decreased over time (time effect, p=0.03) with no signs of rebound at 12 months. Lactation did not influence BMD in the hip or total body (p>0.05). The change in BMD in the lumbar spine was not influenced by $V0_{2\ Max}$ or reported physical activity, however, bone loss was influenced by a longer duration/greater frequency of lactation (time x lactation, p=0.007). Reported physical activity correlated (p<0.05) with $V0_{2\ Max}$ at 6 (r=0.59) and 12 months (r=0.65) but not at baseline (r=-0.16), such that increased exercise during the 12 month period resulted in a higher $V0_{2\ Max}$, and greater body fat loss. **CONCLUSION:** Fitness in the postpartum period promotes a more favorable body composition, but does not appear to influence BMD.

Class: A
Mentor: DE Larson-Meyer, PhD, RD, FACSM

ASSOCIATIONS BETWEEN PARTICIPATION IN MODERATE PHYSICAL ACTIVITY AND ILLNESS PERCEPTIONS AMONG ADULTS WITH HIV

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Participation in moderate physical activity (MPA)is one non-pharmacological strategy to help individuals self-manage their human immunodeficiency virus (HIV) and achieve health benefits (e.g., improved physical functioning and quality of life). Although participation in MPA results in health benefits, up to 71% of adults with HIV are not moderately physically active at recommended levels (i.e., 150 minutes/week). Thus, a need exists to examine factors associated with participation in MPA, such as HIV illness perceptions (i.e., timeline of HIV, consequences associated with having HIV, personal control over HIV, and control over HIV treatment). **PURPOSE:** The purpose of the study was to examine the associations between illness perceptions and participation in MPA among adults with HIV. **METHODS:** Adults with HIV were recruited from university and private medical clinics in a southeastern state to participate in a 30-minute interviewer administered survey assessing MPA, illness perceptions, and demographics. Participant inclusion criteria were: (1) diagnosis of HIV; (2) aged 21-64 years; (3) English speaking; (4) not pregnant; (5) residing in the local southeastern state area; and (6) being ambulatory. A multiple regression analysis was used to examine the associations between MPA and illness perceptions. **RESULTS:** Participants [(n = 73 total; male (n = 61); female (n=12); transgender (n = 1)]were24-61 years ($M = 44.08 \pm 9.61$ years). The majority of participants were Caucasian (n = 53, 95.9%), gay (n = 45, 61.6%), single (n = 31, 41.9%), had an income of < \$30,000/year (n =49, 66.2%), and did not complete a college degree (n = 50, 67.6%). The average body mass index of the participants was 25.56 ± 5.14 kg/m^2. The overall regression model predicting MPA was significant ($F[4,73] = 2.70$, $p < 0.05$) accounting for 8.5% of the variance. Consequences associated with having HIV was the only independent illness perception significantly associated with MPA ($p = 0.02$). **CONCLUSION:** This study expands the understanding of how illness perceptions, particularly consequences, are associated with participation in MPA among adults with HIV. Future research should include a larger sample size to further identify associations between illness perceptions and MPA.

Category A
Mentor: DR Brittain, PhD

THE EFFECTS OF PHYSICAL ACTIVITY THROUGH THE LIFESPAN ON BONE DENSITY IN POST-MENOPAUSAL WOMEN

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Bone health is an important factor affecting quality of life for people of all ages. Women begin to rapidly lose bone mass after menopause and continue to decline in a relatively linear fashion. Current research suggests that exercise during childhood and continued exercise throughout life can prevent large amounts of bone loss (Greene et al., 2006). **PURPOSE:** To determine if physical activity throughout the lifespan was related to bone mineral density in post-menopausal women. **METHODS:** In this experiment 17 post-menopausal women (71 ±7yrs) reported their physical activity during childhood, throughout adulthood and specific activity within the past 12 months using bone-specific physical activity questionnaire (BPAQ). These data were then given numeric values using a specialized calculator and were compared with results from a dual energy x-ray absorptiometry (DXA) scan. The DXA scans were performed on a Discovery QDR® Series, Hologic Scanner. The patient's left hip and lower spine were scanned and analyzed resulting in a BMD score, T-score, and Z-score. **RESULTS:** In comparing femoral neck and lumbar spine (l-spine) BMD, positive correlations were seen (R^2=0.7), with mean femoral neck BMD at 0.872 ±0.2, and l-spine BMD at 0.975 ±0.2. Mean values for femoral neck T-score was -0.476 ±1.4, and a mean l-spine T-score of -0.518 ±2. The results of the BPAQ test were not seen to have strong correlations with bone characteristics however the values did provide insight into each subject's history. The mean current BPAQ was 0.4 ±0.3, mean past BPAQ was 29 ±30, and mean total BPAQ was 16 ±0.3. No significant correlations were found between BPAQ scores and bone density with R squared values of 0.08 and below. **CONCLUSION:** The study found no relationship between physical activity as measured by BPAQ and bone mineral density. It is likely due to many extenuating factors that affect bone density and limitations of the BPAQ's ability to measure certain activities during specific times of the lifespan.

Category A
Mentor: Gerald A Smith, PhD

Physical Activity Intensity, Lesson Context, and Teacher Interactions During an Unstructured Afterschool Physical Activity Program

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PURPOSE: To evaluate the relationships between physical activity (PA), teacher interaction, and lesson context during an unstructured afterschool PA program. **METHODS:** Five elementary schools from a low-SES school district in southern Colorado offered the Keep It Moving! (KIM) afterschool PA program. A cross-sectional analysis of 3rd, 4th, and 5th grade children's (N= 136) PA levels was completed. During assessments at each school, 24-30 children were randomly chosen to wear an accelerometer during the KIM program. Accelerometer data were collected in 30-second epochs, with Evenson's (2008) cut-points utilized to determine PA intensity levels. Simultaneous System for Observing Fitness Instruction Time (SOFIT) observations was conducted to assess the activity level, lesson context, and teacher interaction among students. Standard SOFIT observation protocols were utilized. Descriptive statistics and correlations were calculated. **RESULTS:** Program participants wore the accelerometer 37.1 ± 5.4 min·session-1. Approximately half of the time (16.9 ± 5.9 min·session-1) was spent in light PA (LPA), with 15.7 ± 5.3 min.session-1 in moderate to vigorous PA (MVPA). SOFIT-derived student activity consisted primarily of standing (41.4%), with mostly no promotion (76.3%) of PA by teachers. Management time was positively associated (r = 0.5, p < 0.0001) with sedentary activity (SA) and negatively associated (r = -0.223, p < 0.0001) with moderate PA (MPA). Paradoxically, game play was positively associated with light PA (LPA) (r = 0.531, p < 0.0001) and negatively associated with MVPA (r = -0.424, p < 0.0001). When teachers did not promote PA with students there was a positive association with SA (r = 0.545, p < 0.0001) and a negative association with MVPA (r = -0.377, p < 0.0001). **CONCLUSION:** Lesson context and teacher interactions may be important factors associated with PA intensity of afterschool PA programming. Future research should address whether structured PA curricula may improve quality of afterschool PA programming.

Category A   Mentor: TK Behrens, FACSM

TRACKING ACUTE CHANGES IN HYDRATION USING URINALYSIS AND BIOIMPEDANCE TECHNIQUES

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Tracking changes in hydration is important for coaches, trainers, and physicians in order to provide optimal re-hydration and care for athletes. However, there are several methods that may be used to track acute changes in hydration yet limited research is available as to the agreement between methods. **PURPOSE**: Compare multiple-frequency bioimpedance (MFBIA), bioimpedance spectroscopy (BIS), urine color (UC), urine specific gravity (USG), and dry body mass (BM), in athletic men and women after dehydrating to around 2% BM loss. **METHODS**: Seven women and thirteen men between the ages of18 and 35 participated in the study (27 +/- 4yr, 77.3 +/- 14.3 kg, 174.0 +/- 7.5 cm). Subjects reported to the lab in a fasted and normally hydrated state and provided a urine sample and had their BM, MFBIA, BIS, UC, and USG measured. Subjects then ran on a treadmill for 30 minutes at 80% estimated max HR followed by multiple 15 minute sessions in a dry sauna at approximately 150 degrees F. After reaching the dehydrated body weight (2% +/- 0.4%) subjects provided a urine sample and BM, MFBIA, BIS, UC, and USG were measured again. **RESULTS**: BM, UC, and SG significantly detected the change in water loss ($p < 0.008$) while MFBIA detected no significant change in total body water (TBW) ($p = 0.245$) and BIS detected a significant increase (PRE: 46.5, POST: 47.6 L) in TBW after dehydration ($p < 0.001$). However, when delta values were analyzed only MFBIA and BM were significantly correlated ($r = 0.525$, $p = 0.017$). **CONCLUSION**: Urinary markers of dehydration appear to be independent of BM while MFBIA seems to be highly related to BM. MFBIA uses BM to estimate TBW along with bioimpedance variables and therefore is not and independent measurement of TBW changes when compared to BM alone. Furthermore, MFBIA did not detect a significant change in TBW and therefore is not acceptable for detecting changes in hydration status. Alternatively, BIS detected a significant change in TBW but in the opposite direction, suggesting the method is sensitive enough to track acute changes in hydration, but the model used to calculate TBW needs to be investigated. Therefore, urinary methods to track changes in hydration may be used along with or in place of BM, but further research is needed before BIS or MFBIA can be used to detect acute changes in TBW after physical dehydration in an athletic population.

Category C

EFFECTS OF A CORSET-STYLE FOOT AND ANKLE UNLOADING BRACE ON GAIT BIOMECHANICS

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Unloading the foot and ankle joint is often required for both injury prevention and recovery. An effective brace also needs to allow functional mobility. The Skywalker Unweighting Ankle-Foot Orthosis (Certified Orthopaedics, Fort Collins, CO) is a newly developed low profile corset-style brace designed to meet these needs. **PURPOSE:** The goal of this investigation was to examine the effects of brace usage on sagittal plane lower-extremity joint kinematics and kinetics during the stance phase of gait. **METHODS:** Ten men (age = 64.5 ± 18.1 yrs; height = 176.2 ± 11.5 cm; mass = 100.9 ± 19.7 kg (mean ± SD)) who had been previously prescribed this brace walked on a dual-belt force measuring treadmill with

and without the Skywalker brace donned at a speed comfortable to both conditions (0.73 ± 0.31 m/s). The same subject supplied shoes that were worn in both conditions. Coordinate data was collected simultaneously through optical capture. Inverse dynamics was performed to assess joint work. Assessment of pilot data concluded that the minimalistic design of the brace yielded accurate and reliable foot and ankle kinematic measures. However, inverse dynamics could not separate passive contributions from the brace from those of the musculature at the ankle joint. **RESULTS:** The most notable effects of brace usage were on ankle kinematics where dorsiflexion and range of motion were reduced on the ipsilateral side by 3° and 5°, respectively. Wearing the brace also affected ipsilateral knee motion, reducing its range by 3°. Contralateral to the brace, ankle joint range of motion was reduced by 1° when wearing the brace. Relative to kinetics, total work was not altered by wearing the brace at any of the joints. However, there were significant effects when examining positive and negative components of joint work. Positive work at the ankle was reduced by 0.03 J/kg on the ipsilateral side when wearing the brace. **CONCLUSION:** These results support cautious optimism for the Skywalker brace. On average the magnitude of the observed differences were quite small, smaller than those expected from bulkier braces that induce a leg-length discrepancy. However, given the relatively small sample it could not be determined if some individuals or groups may respond differently than the average of those examined here.

Category A
Mentor: RF Reiser II, PhD

PREVALENCE OF CARDIOVASCULAR DISEASE RISK FACTORS IN COLLEGIATE ATHLETES

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Cardiovascular disease (CVD) affects approximately 33% of American adults and is a leading cause of death (Go et al., 2013). Most research on CVD focuses on older adults, resulting in a lack of research regarding CVD risk in collegiate athletes. There is a misconception that athletes are healthy but collegiate athletes are exposed to the same environment as all college students, where alcohol, smoke, stress, and a poor diet are common. Previous research has shown that 27-42.5% of college-aged individuals have at least one CVD risk factor (Dalleck & Kjelland, 2012; Fernandes & Lofgren, 2011; Haung et al., 2004). PURPOSE: The purpose of this study was to quantify the prevalence of CVD risk factors in collegiate athletes and determine if there is a relationship between sports and CVD risk factors. METHODS: 50 NCAA DII student athletes from cross country/track, wrestling and women's basketball participated. Lifestyle factors were self-reported and direct measurements were obtained for CVD risk factors. Data was analyzed using a chi-squared analysis, t-tests, and ANOVA (p < 0.05). RESULTS: The most prevalent CVD risk factors in the cohort (n=50) included elevated total cholesterol (TC) (16%), elevated triglycerides (12%) and low high-density lipoprotein (HDL) (10%). The most prevalent risk factor in each sport included: elevated TC in 21.7% of men's cross country/track runners, low HDL in 40% of wrestlers, and elevated TCin 25% of women's basketball players. For women's cross country/track, multiple risk factors were present at 7.7% (elevated TC, elevated low-density lipoprotein, low HDL, elevated triglycerides and elevated fasting blood glucose levels). CONCLUSION: All sports displayed a prevalence of CVD risk factors. Previous research has shown that CVD risk factors present at 50 years of age are associated with a higher lifetime risk for developing CVD and lower survival rates (Lloyd-Jones et al., 2006). Therefore, early detection, education, and primary prevention are important for decreasing the risk of CVD development later in life for collegiate athletes.

Category A

EFFECT OF AEROBIC EXERCISE TRAINING ON CANCER INDUCED CARDIAC DYSFUNCTION

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Cancer has been shown to cause cachexia, which can significantly damage the myocardium and lead to cardiac dysfunction. Aerobic exercise has been shown to be cardioprotective; however, its effect on cardiac function in a tumor bearing model is not well understood. Additionally, the impact of exercise on tumor morphology and its influence over cardiac function is largely unknown.

PURPOSE: To determine the effect of aerobic exercise on tumor morphology and cardiac function in the MatBIII rat cancer model.

METHODS: Female Fisher 344 rats (8 weeks old) were randomly assigned to one of four groups: sedentary non tumor-bearing (SED.NT), SED tumor-bearing (SED.T), wheel run exercise non tumor-bearing (WR.NT), or WR tumor-bearing (WR.T). Animals were either SED or WR for six weeks. At week four, animals in T groups were inoculated with MatBIII tumor cells (1×10^6) in the left flank; the tumor-bearing phase lasted 14 days. On day 42, animals were sacrificed, cardiac function was measured *in vivo* (echocardiogram) and *ex vivo* (isolated perfused working heart), and tumor dimensions were measured with calipers.

RESULTS: SED.T exhibited a significantly lower left ventricular developed pressure when compared to SED.NT, WR.NT, and WR.T ($P < 0.05$). Additionally, SED.T exhibited a significantly lower rate of pressure development compared to SED.NT ($P < 0.001$) and WR.NT ($P < 0.01$), and a significantly impaired rate of pressure decline compared to SED.NT and WR.T ($P < 0.05$). SED.T's tumor mass and tumor volume were significantly larger ($P < 0.001$) when compared to WR.T.

CONCLUSION: Inoculation with MatBIII tumor cells causes significant cardiac dysfunction in the rat. Six weeks of aerobic exercise (two of which were concurrent with the tumor-bearing phase) preserved cardiac function. This preservation may be related to the reduced tumor growth observed in aerobically exercise trained rats.

Category A
Mentor: Reid Hayward, Ph.D.

PEDALING ANGULAR VELOCITY PATTERNS DURING A WINGATE ANAEROBIC TEST
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Pedaling patterns in cycling have been qualitatively described with phrasing such as "circling," "pushing," and "pulling" but have rarely been measured for instantaneous angular velocity during pedal cycles. While a constant angular velocity of the cranks might be optimal in theory, in practice, riders generate crank rotation with fluctuations of the rotation rate.

Purpose: Determine pedaling angular velocity patterns throughout a 30 s Wingate anaerobic test and compare variability of rotation rate during individual cycles at 0, 10 and 20 s points of the test.

Methods: Three-dimensional motion of right and left pedals was recorded at 200 Hz using a 10 camera Vicon system. Five trained collegiate cyclists (males, 20.2 ± 1.6 yrs) performed a standard 30 s Wingate anaerobic test using an electronically braked cycle ergometer with associated software (Velotron). Pedal position data were filtered (10 Hz cutoff) and instantaneous angular velocity calculated in revolutions per min (rpm). At the start (0 s), after 10 s and after 20 s, mean angular velocity and variability (SD during a full rotation of the cranks) were determined for each rider. Comparisons of the variability within a cycle were made for the 0, 10 and 20 s points.

Results: Mean peak power near the beginning of the test was 1308 ± 123 watts (18.8 ± 1.3 watts/kg). As typical during a Wingate test, power decreased substantially from beginning to end ($p < .01$). Variability of crank rotation rate was greatest ($p < .05$) at 0 s (196.3 ± 4.2 rpm) with peak velocities in the down stroke of each pedal. At 10 s, angular velocity was 123.1 ± 1.4 rpm while at 20 s it was 97.1 ± 1.1 rpm. For most riders, pedaling patterns during the latter half of the test were more constant than near the beginning and there was no clear trend in pattern of peak angular velocities at points during the pedaling cycle.

Conclusion: Fluctuations of angular velocity during every pedaling cycle were observed for all subjects throughout a 30 s Wingate test. Variability of rotation rate was greatest at high power/high cadence near the start and decreased substantially throughout the test.

A COMMUNITY-BASED EXERCISE INTERVENTION TRANSITIONS METABOLICALLY ABNORMAL OBESE ADULTS TO A METABOLICALLY HEALTHY OBESE PHENOTYPE

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BACKGROUND: Lower habitual physical activity and poor cardiorespiratory fitness are common features of the metabolically abnormal obese (MAO) phenotype that contribute to increased cardiovascular disease risk. The aims of the present study were to determine 1) if community-based exercise training transitions MAO adults to metabolically healthy, and 2) if odds of transition to metabolically healthy were larger for obese individuals who performed higher volumes of exercise and/or experienced greater increases in fitness. **METHODS/RESULTS:** Metabolic syndrome components were measured in 332 adults (190 women, 142 men) before and after a supervised 14-week community-based exercise program designed to reduce cardiometabolic risk factors. Obese (BMI ≥ 30 kg·m2) adults with 2-4 metabolic syndrome components were classified as MAO while those with 0 or 1 components were classified as metabolically healthy but obese (MHO). After community exercise, 27/68 (40%) MAO individuals ($p<0.05$) transitioned to metabolically healthy, increasing the total number of MHO persons by 73% (from 37 to 64). Compared to the lowest quartiles of relative energy expenditure and change in fitness, participants in the highest quartiles were 21.8 (95%) confidence interval: 4.4–108.0; $p<0.05$) and 8.2 (95% confidence interval: 3.1–21.6; $p<0.05$) times more likely to transition from MAO to MHO, respectively. **CONCLUSIONS:** Community-based exercise transitions MAO adults to metabolically healthy. MAO adults who engaged in higher volumes of exercise and experienced the greatest increase in fitness were significantly more likely to become metabolically healthy. Community exercise may be an effective model for primary prevention of cardiovascular disease.

Key Words: exercise, obesity, prevention, risk factors

Category A

Mentor: LC Dalleck, PhD

ACCURACY OF ACTIVITY CLASSIFICATION AND ENERGY EXPENDITURE PREDICTION VIA A FOOTWEAR-BASED PHYSICAL ACTIVITY MONITOR

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Recent advances in physical activity monitors include the ability to identify specific activities (e.g. stand vs. walk), which has resulted in improved EE estimation accuracy. A multi-sensor, footwear, insole-based physical activity monitor was developed that uses data from both an embedded accelerometer and insole pressure sensors in an effort to better classify activity and estimate EE during free-living activities. This device communicates wirelessly with a smart phone to provide real-time feedback and tailored coaching to help individuals improve and sustain physical activity (PA) habits. **PURPOSE:** To determine the accuracy of activity classification and EE estimation of the footwear-based monitor. **METHODS:** Seventeen adults (13 female, 4male), mass: 81.39 (13.45) kg, BMI: 28.75 (4.43) kg·m^2 (mean (SD)), completed a five hour stay in a room calorimeter. Participants wore the activity monitor in place of the existing insole in their own athletic footwear. We used direct observation to record activity type and duration while each individual performed a series of randomly ordered postures/activities including sitting (quietly, watching TV, simulated eating, using a computer), standing (quietly, intermittent, folding laundry, washing dishes, and resistance exercises), walking (speeds 0.36-2.0 m·s^{-1}), stepping, cycling, sweeping, as well as a period of self-selected activities. We used the device algorithms to estimate EE and compared this estimate to the measured EE. **RESULTS:** The activity classification accuracy of the shoe-based device across all activities was 92.7(5.3)% with postural/ activity classification accuracies of 90.3(18.3), 92.6(15.8), 96.2(8.4), and 90.8(12.7)%(mean (SD)) for sitting, standing, walking, and cycling, respectively. Estimation of EE was not significantly different from the mean measured EE (668(32) vs. 670(38) kcal) (mean(SE)), respectively, and had a root mean square error (RMSE) of8.49 kcal (2.70%). **CONCLUSION:** The shoe based physical activity monitor was able to accurately classify activities and estimate EE. Paired with the real-time feedback, this device may be a promising tool for quantifying and improving individuals' PA behaviors.

Category A
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MAXIMUM PUSHUP FORCE AS ALTERNATIVE UPPER EXTREMITY STRENGTH ASSESSMENT

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Conventional strength assessment often relies on one repetition maximum (1RM) effort tests. The bench press 1RM is generally utilized in order to assess the maximum strength of the upper extremity. Due to the time-consuming, stressful, and dangerous nature of conventional bench press 1RM testing protocols, prediction equations from multiple repetition tests have been developed, but criticized in the literature. Isometric testing results have been correlated with 1RM results, but require large and cumbersome equipment similar to a traditional 1RM test. **PURPOSE**: To determine whether pushup maximum force can be used as an alternative test to assess upper extremity strength. **METHODS:** 57 adult volunteers (34 female, 23 male; 45.3±14.93 years; 1.70±0.09 m; 73.5±14.3 kg) free of injury performed two maximum isometric chest

presses(CP) and two maximum isometric core pull movements (CPM) on an instrumented bio Density device and three maximum force pushups (PU) on two Bertec force plates. If subjects could not perform a standard pushup, a modified (kneeling) pushup was performed. Pearson correlation tests were performed on average CP, CPM, and PU force, which were normalized to body weight. **RESULTS:** All correlations were found to be significant (p< 0.0001).PU correlated to CP resulting in r=0.87; normalized r=0.79. PU correlated to CPM resulting in r=0.85; normalized r=0.71.**CONCLUSIONS:** Results indicate a strong correlation of CP and CPM from PU max force when both normalized and not normalized. PU may be a possible tool in assessing upper extremity strength; more research is required in order to determine direct relationship with 1RM testing. R^2 values were all below 0.76, indicating PU did not predict all variance in performance.

Category A

Mentor: B Dai, PhD

THE EFFECTS OF AMBIENT TEMPERATURE ON OXYGEN UPTAKE IN SUBMAXIMAL CYCLING

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Previous studies suggest that both time to exhaustion and performance are reduced in environments with high ambient temperatures. What is less clear is how economy is affected by air temperature for endurance exercise. We hypothesized that oxygen uptake would be greater at elevated compared to room temperature when cycling at a constant resistance. **PURPOSE:** The purpose of this study was to determine if oxygen uptake during submaximal cycling was greater at elevated ambient temperature compared to room temperature. **METHODS:** Four male subjects with limited cycling experience each completed a VO_2 max test on a cycle ergometer. A Parvo Medics metabolic cart was used to measure heart rate,VO_2, and control power output on the ergometer. The intensity for subsequent submax trials was set at 60% of power output at VO_2 max. Each subject completed two 20-minute sub maximal trials, one at a high ambient temperature (approximately 35°C) and one at room temperature (21°C). Oxygen uptake values were compared for the two temperature conditions at three time points (5 and 10 minutes, and one minute prior to completion) using t-tests based on multiple VO_2 samples around each time for each subject. Rate of perceived exertion (RPE) and heart rate were recorded every 60 seconds for descriptive purposes. **RESULTS:** At elevated temperature, meanVO_2 was 15% greater than at room temperature. At 5 minutes, 10 minutes and near the end, mean VO_2 was 33 ± 6 vs 29 ± 10 ml/kg/min for elevated and room temperature, which were significantly different (p<.05). RPE and heart rate were found to be greater at elevated compared to room temperatures (13 ± 1 vs 14 ± 1),(170 ± 8 vs 165 ± 13) respectively. **CONCLUSION:** Cyclists consumed more oxygen when riding at elevated compared to room temperature. The higher cost may be due to the increased superficial blood flow and higher heart rate.

Category A

Mentor: G. Smith, PhD

THE DOSE-RESPONSE RELATIONSHIP BETWEEN ENERGY EXPENDITURE AND TRANSITIONING FROM UNFIT TO FIT IN CARDIAC REHABILITATION

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The greatest risk reduction in cardiovascular mortality occurs when an individual becomes 'fit' (cardiorespiratory fitness (CRF)>25th percentile based on age- and sex-based normative data)[1]. Furthermore, Martin et al (2013) recently reported a 30% reduction in long-term mortality in low fit people (<5 METs) with cardiovascular disease (CVD) for every 1 MET increase in CRF after 12 weeks of cardiac rehabilitation (CR) [2]. However, no threshold intensity for an improvement in CRF has been established in cardiac patients [3]. Additionally, to our knowledge, the relationship between exercise energy expenditure (EE) and the odds of transitioning from 'unfit' (CRF≤25th percentile)to 'fit' with CR has not been established the therapeutic dose of exercise needed to transition from 'unfit' to fit yield important clinical information needed for exercise prescriptions in CR.**PURPOSE:**1) To determine whether there is a dose-response relationship between quartile change in EE and odds of becoming fit in adults participating in 12 wk ofCR.2) Determine the threshold which improves the odds of transitioning from unfit to fit. **METHODS:** VO$_2$peak (determined from Bruce protocol equations [4]) and absolute (kcal/wk) (AEE) and relative (kcal/kg/wk) (REE) EE (metabolic calculations) was collected in 99 adults (89%male) between2001-2008.People were classified as fit (CRF>25th percentile) or unfit (CRF≤25th percentile) based on their age and VO$_2$peak using published tables in ACSM GETP9 [5]. Only data of unfit individuals (n=79) was included in the current analysis. Logistic regression was performed to model the odds ratio (OR) (± 95% CI) for reclassification of fitness (unfit to fit) on quartiles of changes in AEE and REE. **RESULTS:**A greater change in AEE or REE over 12 wk was associated with increased odds of becoming fit. The highest OR (12.4) was observed in the highest REE quartile (≥12kcal/kg/wk) compared to the lowest quartile (<6.5 kcal/kg/wk; p=0.004). Paradoxically, a higher AEE was associated with lower odds of becoming fit than in the intermediate quartiles–see figure. **CONCLUSION:** A dose-response relationship exists between quartile change in EE and odds of becoming fit in adults participating in 12 wk of CR. There is greater odds of transitioning from unfit to fit in people who improved their REE by ≥12kcal/kg/wk compared to changing REE <6.5 kcal/kg/wk. Furthermore, REE should be preferred for prescribing exercise intensity when establishing the appropriate dose of exercise to improve CRF for unfit adults in CR.

Category A
Mentor: LC Dalleck, PhD