Exercise Heat Exposure Induced Changes In Genetic Expression Before And After Heat Acclimation In Humans

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PURPOSE: To evaluate changes in genetic expression of proteins that are implicated in physiological adaptation to exercise heat exposure (Hypoxia Inducible Factor -1α [HIF-1α], Erythropoietin [EPO], and Vascular Endothelial Growth Factor [VEGF]) during systemic adaptation related to Heat Acclimation (HA) in humans.

METHODS: Participants (n=18, 13 males, 5 females: 30 ± 3.4 y; 173.1 ± 7.673 cm; 76.25 ±14.17 kg) underwent two Heat Tolerance Tests (HTT 1 & 2; 120 min walking, 5 km/h, 2.0% grade, 40 °C, 40% rh) with 12-14 days between tests. Participants in experimental group (HA) underwent six heat acclimation days between tests, while the control group (CON) avoided exercise heat exposure between HTT’s. Blood was drawn pre- and post- each HTT and isolated into Peripheral Blood Mononuclear Cells, then further isolated into RNA. Then, cDNA was synthesized for Quantitative Real-Time Polymerase Chain Reaction to quantify gene expression. The data was then analyzed using the ΔΔCt to acquire fold change.

RESULTS: No statistical difference in resting rectal temperature was observed before HTT2 in HA (-0.13±0.36 °C) vs. CON (-0.08±0.47 °C; P=0.80). No significant changes were observed between HTT1 and HTT2 in the control group for HIF-1α, EPO, or VEGF. However, it was observed that acute EPO fold change increased 10.6x; (P=0.14) from pre- to post-in HTT1 for each group. An increased fold change was also observed in both HIF-1α and EPO between HTT1 and HTT2 (3.24x; P=0.04) & (7.19x; P=0.03) respectively in the HA group. No significant changes in VEGF were found in either group.

CONCLUSION: Although the HA protocol utilized in this investigation was not stressful enough to induce observable rectal temperature changes, genetic expression of HIF-1α and EPO was significantly upregulated in response to chronic exercise heat stress.

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D-41 Thematic Poster - Step Right Up! New Insights into Stepping and Health

Thursday, May 28, 2020, 3:45 PM - 5:45 PM
Room: CC-2011

2000 Chair: Janet Fulton, FACSM. CDC, Atlanta, GA. (No relationships reported)

2001 Board #1 May 28 3:45 PM - 5:45 PM
Step By Step: Association Of Device-measured Daily Steps With All-cause Mortality - A Prospective Cohort Study
Bjørge H. Hansen, Knut E. Dalene, Ulf Ekeland, FACSM, Morten W. Fagerland, Elin Kolle, Jostein Steene-Johannessen, Jakob Tarp, Sigmund A. Andersen. Norwegian School of Sport Sciences, Oslo, Norway. (Sponsor: Ulf Ekeland, FACSM)
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Walking - a basic unit of locomotion - is free, does not require special training, and can be done almost everywhere. Therefore, walking might be a feasible behavior on which to tailor public health messages. There is however insufficient evidence available to determine the magnitude and shape of the relationship between steps taken per day and all-cause mortality, giving current step-based guidelines limited scientific basis.

PURPOSE: To assess the prospective association and dose-response relationship between device-measured daily walking steps and all-cause mortality in a large population-based cohort of women and men aged 40-85 years.

METHODS: Daily steps were measured by a wrist-mounted accelerometer in 2,180 individuals (53% women) for seven consecutive days at baseline (2008-09). Participants were grouped into quartiles (Q) based on their average number of steps per day and followed over a median period of 9.1 years for all-cause mortality determined by linkage with death certificates from the Norwegian Cause of Death Registry.

RESULTS: Mean (SD) baseline age was 56 (11) years. Median (IQR) steps per day were 4651 (3495, 5325), 6862 (6388, 7350), 8670 (8215, 9186), and 11467 (10556, 13110) in Q1 to Q4, respectively. During follow-up, 119 individuals died (68% men). Higher number of steps per day was associated with lower risk of all-cause mortality with hazard ratios (95% CI) of 0.52 (0.29 to 0.93), 0.50 (0.27 to 0.94), and 0.43 (0.21 to 0.88) across ascending quarters of steps per day compared with Q1 (referent) in the multivariable model (p<0.001). The dose-response association modelled using restricted cubic splines demonstrated a non-linear, inverse association between daily steps taken and all-cause mortality, with no apparent plateauing of risk-reduction within the observed variation in the exposure.

CONCLUSIONS: We observed a 48% risk reduction for all-cause mortality between the least active and the second quartile, with an absolute difference between Q1 and Q2 of 2200 steps per day. To exemplify, given an average stride length of 0.67 cm for women and 0.76 cm for men, 2200 steps translates to a 1.4 to 1.6 km walk for women and men, respectively. If confirmed, this large gain with modest effort may serve as encouragement to many sedentary individuals.

2002 Board #2 May 28 3:45 PM - 5:45 PM
Cadence (steps/min) Associated With Moderate Intensity Walking In Older Adults: The CADENCE-Adults Study
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Cadence (steps/min) is an accessible and understandable metric for communicating physical activity intensity. Studies in younger and middle-aged adults consistently report ≥100 steps/min associated with walking at an absolutely-defined moderate intensity (i.e., 3 metabolic equivalents [METs]) or higher. However, few studies have quantified the cadence-intensity relationship in older adults.

PURPOSE: To identify a reasonable heuristic (i.e., evidence-based, practical, rounded) cadence threshold associated with absolutely-defined moderate intensity in ambulatory older adults.

METHODS: Ninety-eight older adults 61-85 years of age (49% women; age=72.6±6.9 years; BMI=25.9±3.5 kg/m²) completed a series of 5-minute treadmill walking bouts. Bouts began at 0.5 mph and increased in 0.5 mph increments until participants: 1) naturally selected to run, 2) reached >75% of their age-predicted maximum heart rate (220 - age), or 3) reported a Borg scale rating of perceived exertion (RPE) ≥13. Oxygen uptake (VO2; ml kg⁻¹ min⁻¹) was measured using indirect calorimetry and cadence was derived by dividing directly-observed steps by bout duration. VO2 was averaged over the last two minutes of each bout and divided by 3.5 ml kg⁻¹ min⁻¹ to determine METs. Moderate intensity (3 METs) cadence thresholds were identified with

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