Visual Feedback Monitoring During Exercise in Individuals with Obesity

NCT #: NCT04685707

10/11/2021

Protocol

Participants visited the laboratory on two occasions at least one day apart. An exercise modality, experimental or control, was randomly assigned to each visit. During the experimental exercise, participants were instructed to walk on the treadmill following the movement targets displayed on the screen. During the control session, participants were instructed to control treadmill speed (*ad libitum*) to meet a specific target heart rate. Each exercise session involved a baseline measurement at preferred walking speed (5 minutes) and two seven-minute trials at 60% HRR (HRR 60_1 HRR 60_2, respectively). HRR was calculated as the difference between the estimated maximal heart rate and the resting heart rate. Maximal heart rate was estimated using the 220-age formula (Fox III and Naughton 1972), and resting heart rate was measured using the heart rate monitor after at least four minutes of seated rest at the beginning of the visit. A 3-minute recovery period, during which the participant was sitting, followed each exercise trial and baseline trial. In the first visit, testing commenced with the familiarization of walking on the treadmill while selecting a preferred walking speed (PWS) which was used for all testing.

Before starting the exercise, a static calibration step was used to determine the zero position for hip flexion, and a dynamic calibration was used to determine the maximum hip flexion at PWS for each participant. During dynamic calibration, participants walked on the treadmill at PWS and were instructed to 'lift their knees as high as possible while walking' to achieve maximum hip flexion. This step was used to set the upper and lower limits for the hip flexion target display during the experimental condition. The feedback interface was then introduced and explained. Participants were introduced to the visual display and were told what movement related information was being given by each indicator. After this introduction, participants were allowed to practice with the device until the association between the feedback cues and the corresponding

movement features was sufficiently clear. Energy expenditure was evaluated from oxygen consumption measured during the exercise and recovery using a breath-by-breath portable metabolic analyzer (K5, COSMED, Rome, Italy).

Data Analysis

Average heart rate (HR) was calculated as the average heart rate during the exercise. Heart rate error (HR_{err}) was calculated as the absolute error between the target heart rate (HR_{target}) and the actual heart rate. Vo_2, HR_{err}, and HR were calculated during steady-state exercise (i.e., 4 – 7 minutes of the trial). The means across the two trials ($HRR\ 60_1$, $HRR\ 60_2$) were used. The percentage of strides that resulted in tibia peak accelerations above 3g during each exercise trial was calculated ($T_{PPA\%}$). The mean peak positive acceleration (T_{PPA}) was calculated as the mean tibia PPA across all recorded strides for both sides for each trial above 3g.

Statistical Analysis

A paired sample t-test was used to test for differences between exercise modality (experimental and control) at each intensity (baseline, HRR 60) for T_{PPA}, $T_{PPA\%}$, HR, HR_{err}, and VO_2. The Shapiro-Wilk Test was used to test the normality of the samples. For the tests where normality was violated, Wilcoxon Signed Ranks tests were used. Values that were more than 1.5 times the interquartile range away from the upper quartile were considered outliers. Cohen's d was used to calculate effect sizes for parametric tests. Z divided by the square root of the sample size (r) was used to calculate effect sizes from the Wilcoxon Signed Ranks tests (Fritz et al. 2012). A significance level of 0.05 was used for all statistical testing.