Abstract

To determine the physiological responses to walking on a small, curved non-motorized treadmill (CT) and to compare these responses to those of walking on a motorized treadmill.

Methods

• Subjects
  - 12 university aged participants (demographics in Table #1 below)
  - Male = 7  Female = 5

• Procedures
  - Each subject walked for 3 stages at speeds of: 1.5, 2.5 and 3.5 miles/hour
  - Exercises performed on two treadmills
    - NM curved treadmill (CT)
    - Motorized treadmill (MT)
  - 10 minute rest period between exercise sessions on each treadmill
  - Exercise order randomized

• Measurements
  - Heart Rate (HR) (Polar Electro, Finland)
  - Gastrocnemius oxygen saturation (StO2) (Hutchinson Technology, USA)
  - Oxygen uptake variables (VO2) by a mobile CPX system (MetaMax 3B, Cortex Biophysics GmbH, Germany)

• Statistical Analysis
  - HR, oxygen uptake (VO2, VE, RR, RER), StO2 and ratings of perceived exertion (RPE) during the last minute of each exercise bout were analyzed for significance. A two-way ANOVA with repeated measures was performed, followed by dependent t-tests where appropriate (p<0.05).

Results

• Significant differences were observed between the CT and MT for HR, VO2, StO2, and RPE (Figure 3). The MT produced higher HR, VO2, StO2, and RPE values compared to the CT. The CT produced higher StO2 values compared to the MT. The CT produced lower RPE values compared to the MT.

Discussion

All subjects easily performed all speeds on the CT without the assistance of a harness or holding on. All speeds were easily walked, except the CT3.5, which bordered on jogging, likely due to the momentum characteristics of the curved design. The increased physical effort, as indicated by higher VO2 and HR values, while walking on the CT is likely due to the greater frictional and force generation requirements and/or increased muscle activation inherent with the use of a NM treadmill. The increased energy expenditure at each of the given walking speeds on the CT could allow the attainment of HR values similar to those achieved during running. The current study utilized a healthy, active population, but the results should be applicable to the aforementioned populations that cannot generally maintain running speeds for desired durations.

The increased energy expenditure at each of the given walking speeds on the CT could have dramatic implications for general health and fitness populations. For individuals who cannot obtain desired energy expenditures through moderate to high levels of exercise intensity, such as overweight, diseased and rehabilitating individuals, exercise on newer CT could have dramatic implications. Walking on the CT could allow the attainment of HR values similar to those achieved during running. The current study utilized a healthy, active population, but the results should be applicable to the aforementioned populations that cannot generally maintain running speeds for desired durations.

Practical Applications

PRACTICAL APPLICATION: The increased energy expenditure at each of the CT speeds could allow those individuals who are unable to maintain running speeds for desired durations to achieve running speeds. For individuals whom are overweight, diseased or returning from injury, walking on the CT could be used as a means to improve cardiovascular fitness. The increased energy expenditure at each of the CT speeds could allow for those individuals who cannot achieve running speeds to achieve the same level of HR and VO2 values as those achieved during running.

References