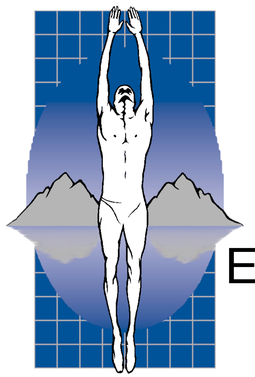


The effects of reading distraction during steady-state exercise on exercise intensity

Megan Holt*, Megan Tracy, Mitchel Samels, Dr. Wilson, Dr. Keller

Environmental Research Laboratory, Department of Kinesiology, University of Texas at Arlington, Arlington, TX 76019

ABSTRACT

INTRODUCTION: The consequence of reading during exercise on the cardiovascular response to exercise (e.g., heart rate response) and the intensity of the performed exercise remains incompletely understood through existing publications. Therefore, the aim of this study is to examine the effect of reading during exercise on heart rate responses to exercise and exercise intensity performance.

PURPOSE: The purpose of this investigation was to identify the effect of exercise intensity on individuals who engage in a reading distraction task during steady-state exercise and to indicate whether heart rate remains an accurate marker of exercise intensity during the reading phase.

METHODS: Eight healthy participants were asked to perform steady-state workload exercise on a recumbent cycle ergometer at a fixed workload with a randomly assigned reading phase to determine whether there are physiological effects that compensate for the additional task. A 4-lead ECG monitored resting heart rate and the application of a blood pressure cuff measured mean arterial pressure. Also, volume of consumed oxygen was taken prior to the 20-minute resting period. The participants self-selected from three general topics during the reading period: bacteria and food borne illness, time management strategies, and alcohol consumption and college students. A 5-minute warm-up was performed followed by 3 phases of 7-minute intervals of steady-state exercise (one being the reading interval) and a 5-minute recovery phase. At the end of exercise, a questionnaire corresponding to each reading topic was conducted to ensure participant engagement during reading phase.

RESULTS: The means for the demographics were: age (yrs.) 23 ± 3, height (cm) 166 ± 9, weight (kg) 69 ± 11, mean arterial pressure (mmHg) 94 ± 9, and heart rate (bpm) 70 ± 11. The following variables did not undergo significant responses: heart rate (p=0.51), acute heart rate response (p=0.64), systolic blood pressure (p=0.57), diastolic blood pressure (p=0.63), mean arterial pressure (p=0.13), and rate pressure product (p=0.64). However, volume of oxygen consumed (VO_2) did show a statistically significant increase during the reading phase (p=0.01).

CONCLUSION: Future investigation should incorporate the examination of rate of perceived exertion (RPE) on a 20-point Borg scale.

PURPOSE

The purpose of this investigation was to identify the effect of exercise intensity on individuals who engage in a reading distraction task during steady-state exercise and to indicate whether heart rate maintains an accurate marker of exercise intensity during the reading phase.

INTRODUCTION

While reading during exercise is commonplace, the understanding of reading during exercise on cardiovascular responses and the maintenance of exercise intensity has not yet been assessed. Considering that the cardiovascular response to exercise (e.g., heart rate) is often used as a determinant of exercise intensity, it is important to understand the consequence of this interaction.

The primary cause for targeting such research is due to the influence that higher brain activation has on modulating heart rate (1). An elevated cardiovascular response was found when there was an increase in effort sense during constant-load exercise (1). In the same study, decreases in effort sense do not reduce cardiovascular responses below the level required to sustain metabolic needs (1). Thereby, the addition of a distraction task (e.g., reading) may have an important impact on this variable during exercise that warrants investigation.

Previous studies have evaluated the relationship between distraction tasks and the physiological effect on exercise. Research reveals that music has been shown to increase the duration of exercise in some individuals (2). Also, the combination of music and television as entertainment distractions increase duration and result in cardiorespiratory improvements (3).

Several studies have examined reading as a secondary task during exercise. However, these studies have focused on factors related to psychological state (6, 7), cognitive motor skills (5), and psychological well-being (4). At yet, there is no study that directly addresses an interaction between a reading distraction and the cardiovascular response.

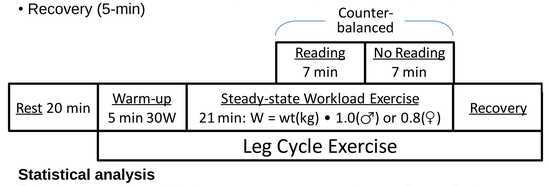
Evaluating the physiological response to exercise when a reading distraction is incorporated will allow for clinicians and other health-fitness professionals to adequately adjust exercise prescriptions to account for any possible physiological differences that may occur when exercise is combined with reading as compared to exercise performed without a distraction task.

METHODS

Participants
- Eight subjects participated (4 male and 4 female)

Measurements
- MAP Mean arterial blood pressure (Tango$^+$)
- Heart Rate – 4 lead ECG (Quinton 710)

Protocol
Supine Rest for ~20 minutes
- Subjects positioned semi-recumbent (~60 upright)
- Baseline blood pressure, heart rate, and VO_2 measures (5-min)
- Warm up at 30 W (5-min)
- Steady-state workload; W = wt(kg)* 0.8; M = wt(kg)*1.0 (7-min)
- Steady-state workload; reading/not reading randomized (7-min)
- Steady-state workload; reading/not reading randomized (7-min)
- Recovery (5-min)



Statistical analysis
Paired *t-test* was used for between group comparisons. (Sigma Stat)

RESULTS

Table 1. Group averaged characteristics.

	N = 8 (4 m, 4 f)
Age, yr	23 ± 3
Height, cm	166 ± 9
Weight, kg	69 ± 11
MAP, mm Hg	94 ± 9
HR, bpm	70 ± 11

MAP, mean arterial pressure; HR, Heart Rate.

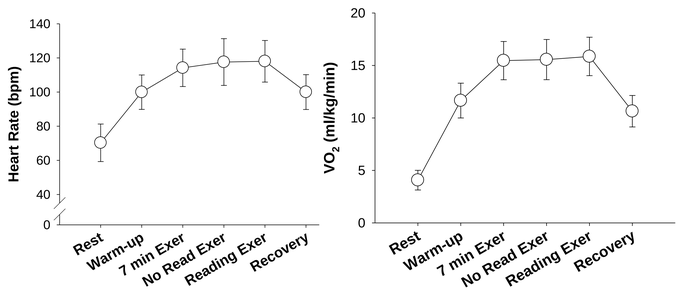


Figure 1. (A) Heart rate means protocol (B) Volume of oxygen consumption means protocol.

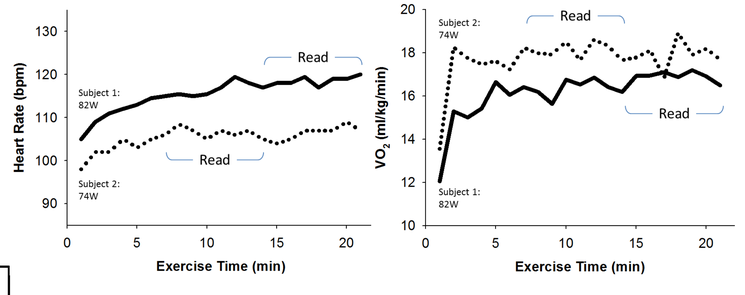


Figure 2. (A) Heart rate individual tracings (B) Volume of oxygen consumption individual tracings.

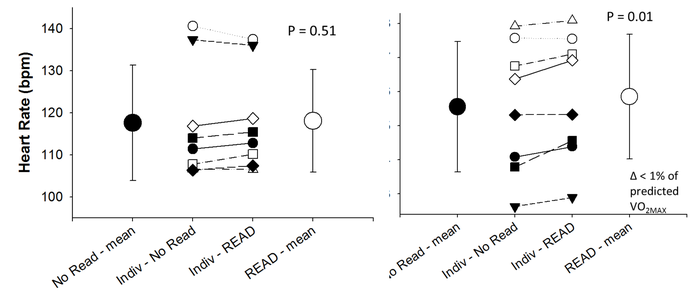


Figure 3. (A) Heart rate means in relation to individual responses during the reading and non-reading phases (B) Volume of oxygen consumption means in relation to individual responses during the reading and non-reading phases.

CONCLUSION

The following variables did not undergo significant responses: heart rate (p=0.51), acute heart rate response (p=0.64), systolic blood pressure (p=0.57), diastolic blood pressure (p=0.63), mean arterial pressure (p=0.13), and rate pressure product (p=0.64). However, volume of oxygen consumed (VO_2) did show a statistically significant increase during the reading phase (p=0.01). This response is indicative that heart rate maintains an adequate marker of exercise intensity when reading is added to steady-state workload. It is suggested that increases in oxygen consumption are related to the increase metabolic demand of the brain when reading is added to the steady-state workload. However, the statistically significant response (less than 1% predicted VO_{2max}) could be due to the working skeletal muscle requiring more oxygen to tissues to hold the reading material.

Future investigation should incorporate the examination of rate of perceived exertion (RPE) on a 20-point Borg scale in addition to a higher increase in workload. It would be interesting to investigate a self-paced protocol to determine if there is a rate-response effect with the incorporation of a reading distraction.

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