The Effect of Music Tempo on Heart Rate and Rating of Perceived Exertion During Submaximal Exercise

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ABSTRACT

Many people listen to music during exercise, possibly attempting to dissociate from the activity. **PURPOSE:** To examine the effect of music tempo on time-to-target heart rate (THR) and rating of perceived exertion (RPE) during submaximal exercise. **METHODS:** Eighteen college-age subjects were recruited (*n*=18). Prior to participation in the experimental trials, subjects were measured for mass, stature, and resting heart rate. Subjects then performed the Bruce Treadmill protocol on three different days to a target heart rate of 85% of predicted maximal heart rate (HR_{max}=220-age). Using a balanced crossover design over the three experimental trials, subjects performed one bout with fast tempo music (FST, ≥140 beats·min^{-1}), one bout with slow tempo music (SLO, ≤85 beats·min^{-1}), and one bout with no music (CON). THR was compared across music tempo (FST, SLO, CON) using an ANOVA with repeated measures, α=0.05. RPE at target heart rate was compared across music tempo using Friedman ANOVA by ranks, α=0.05. Adjustments to *post-hoc* analyses were made to maintain the experimentwise error rate at 0.05) **RESULTS:** THR did not differ between the experimental trials (FST=9.2±2.6 min; SLO=9.6±2.3min; CON=9.3±2.2min)(*p*=0.4820). RPE did differ significantly between the three experimental trials (*p*=0.041). *Post-hoc* analysis revealed specific differences between RPE at SLO (14.9±2.1) and FST (13.9±2.3), but neither SLO nor FST differed significantly from COM (14.5±2.5). **CONCLUSION:** The use of fast tempo music as a dissociative device while exercising does decrease RPE compared to slow tempo music, but does not change THR (i.e., submaximal heart rate). These findings are consistent with most previous research. However, the data suggest that exercising with no music at all yields a similar RPE response as exercising with fast tempo music.

INTRODUCTION

Many people listen to music during their aerobic exercise, possibly as either a distraction or motivation tool. The distraction effect of music has been termed “dissociation in exercise research” [1]. Some studies have examined the effects of this form of dissociation. Studies measuring the effect of music tempo on the rating of perceived exertion (RPE) during exercise have not had consistent results and findings. Concerning the effect of dissociation on RPE, Szmedra & Bacharach, found that the dissociation effect of music can decrease RPE by 10% during vigorous intensity (70% of VO_{2max}) treadmill running [2]. Likewise, Potteiger et al. found that the control group of no music had a statistically significant higher RPE than the other trials with various music [3]. In contrast, Schwartz et al. found no significant effect on the psychological perception of effort [4]. They found that music does not alter exercise performance and subsequently does not seem to be an ergogenic aid for exercise training or competition [4]. There are not conclusive findings on the effect of music tempo on heart rate during exercise. Edworthy and Waring found that heart rate increased significantly when listening to fast, loud music in contrast to slow music during exercise [5]. Dissimilarly, Scwartz at al. and Potteiger et al. saw no difference between heart rate when listening to slow or fast music at a submaximal exercise rate [3-4]. Interestingly, a 2003 study found that plasma norepinephrine was significantly lower while listening to slow tempo music than before listening [6]. They also found that plasma epinephrine was significantly higher while listening to fast tempo music than before listening [6].

PURPOSE

To examine the effect of music tempo on time-to-target heart rate and rating of perceived exertion (RPE) during submaximal exercise

METHODS

IRB Approval: The study was approved by the Institutional Review Board (Human Subjects) at Texas A&M University-Kingsville.

Subjects: All subjects provided informed consent prior to participation. Eighteen (*n*=18) college-age volunteers were recruited from the student population at Texas A&M University-Kingsville.

METHODS, cont.

Pre-participation Screening/Testing: All subjects underwent a health screening according to guidelines set forth by the American College of Sports Medicine. Only subjects classified as low or moderate risk for untoward events during exercise based on these guidelines were allowed to participate. The following measurements were also made pre-participation: body mass utilizing a standard physicians scale, body stature utilizing a stadiometer, and resting heart rate via telemetry.

Bruce Treadmill Test: The Bruce treadmill test is a standardized progressive treadmill test used to assess cardiovascular fitness. There are six stages with a duration of three minutes each. As the test progresses, each level increases in both grade and speed. This is typically a maximal exercise test, but was utilized for its standardized procedure in this research project. In order to remain a submaximal exercise test, subjects exercised up to eighty-five percent of their maximal heart rate. Maximal heart rate was calculated using the equation: HR_{max} = 220-age.

Experimental Design: Each subject participated in three experimental trials on three different days. For each experimental trial, subjects performed the Bruce treadmill test until they reached 85% of HR_{max}. Across three trials, the treadmill test was performed with subjects listening to slow tempo music (SLO), fast tempo music (FST), or no music (CON). A balanced crossover design was used to assign the order in which the subjects experienced the music tempo treatments across their three trials.

Measurements: Heart rate was measured via telemetry throughout the treadmill tests. Time to target heart rate (min) was recorded for analysis purposes. RPE (Borg Category Scale, 6-20) was measured at the end of each stage of the treadmill test and recorded for analysis at the end of the stage where subjects reached 85% of HR_{max}.

Statistical Analysis: Time to target heart rate was compared across music tempo (SLO, FST, CON) using an ANOVA with repeated measures, α=0.05. Rating of perceived exertion at target heart rate was compared across music tempo using Friedman ANOVA by ranks, α=0.05. Adjustment to *post-hoc* analyses were made to maintain the experimentwise error rate at 0.05.

RESULTS

Table 1: Subject characteristics.

Variable	Mean ± SD
Age (yr)	21.6 ± 1.5
Body Mass (kg)	76.5 ± 10.8
Body Stature (cm)	178.3 ± 7.2
BMI (kg·m^{-2})	24.0 ± 2.4
Resting Heart Rate (beats·min^{-1})	78.1 ± 10.1

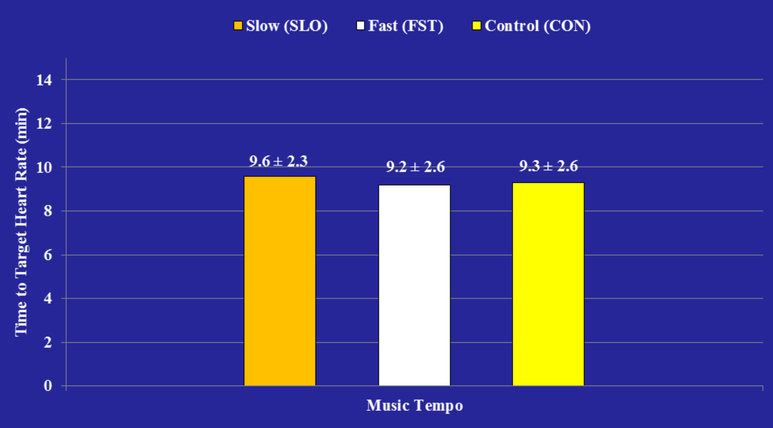

Figure 1: Time to target heart rate across music tempos. Time to target heart rate did not differ significantly across music tempo (*p*>0.05).

RESULTS, cont.

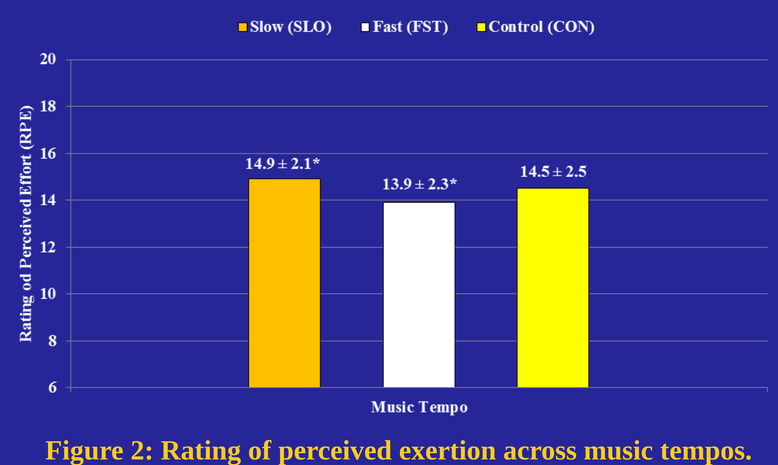

Figure 2: Rating of perceived exertion across music tempos. The RPE at FST was significantly lower than that of SLO (**p*=0.041) , but neither were significantly different than the RPE at CON (*p*>0.05).

CONCLUSIONS

The use of fast tempo music as a dissociative device while exercising, may decrease RPE, but does not change submaximal heart rate. This finding is consistent with the past research that has shown that motivational music can decrease RPE by 15%, but that level of decrease was not seen here. While statistically significant results were found, the difference between RPE at SLO and RPE at FST was arguably of no significance from a practical standpoint (i.e., one point difference on the Borg 6-20 RPE scale) especially given the subjective nature of this measurement. Also, there was not a significant difference between either SLO or FST and CON (no music). Music selection may play a role in these results. While the selected tracks were at standardized tempos, they may not be everyone’s preference. Further research with participant selected music should be done to see if personal preference plays a larger role in the effect of music on RPE and heart rate.

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