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FITNESS

The Effect of Music- and Video-Distraction on High School Physical Education Student Exercise Intensity

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Abstract

This study investigated the relationship between use of distractions during exercise and (a) heart rate (HR), (b) rating of perceived exertion (RPE), and (c) enjoyment during exercise. Quasi-experimental design with six intact, single-gender high school classes was used. A control group experienced no distraction, while a treatment group first experienced no distraction, followed by 2 days each of listening to music and of watching a movie. HR was collected continuously in real time and RPE and enjoyment at 5-min intervals. In the treatment group, HR and RPE were not different between no distraction and music conditions but decreased while watching a film. The control group also decreased in the same measures during the third condition. No differences were seen in enjoyment. While various distractions may work in fitness settings, in the PE setting distractions in and of themselves are insufficient and cannot replace quality pedagogy and an engaging teacher. One cannot simply turn on the music or video and leave students to their own devices. Future research needs to investigate distraction use in combination with good pedagogy, engaging instruction, and the impact of sociality in physical education.

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The prevalence of obesity and type 2 diabetes, among other comorbidities, has increased in youth and adults in the United States (Go et al., 2013). These diseases increase the risk of mortality and morbidity and are tied to lifestyle choices such as eating healthy and getting regular physical exercise (Centers for Disease Control and Prevention [CDC], 2015b). Physical activity can help improve a variety of health problems by, for example, lowering blood pressure, promoting weight loss, and reducing risk of some cancers (CDC, 2015a). Despite these facts, only about 50% of adults meet the physical activity recommendations for aerobic activity and about 20% for both aerobic and muscle-strengthening activity (CDC, 2017). American youth also fail to accumulate enough activity with only 24.8% of youth aged 12 to 15 meeting the physical activity guidelines of 60 min of moderate to vigorous activity daily (Fakhouri et al., 2014). In addition, the number of overweight and obese children and adolescents in the United States tripled from 1980 to 2000 (Daniels et al., 2005). Exercise habits formed in childhood and adolescence often last into adulthood (Telama et al., 2005), and the rise of lifestyle diseases and obesity in children and adolescents could be the sign of an even bigger rise of these diseases in American adults in the near future. Finding ways to help people perform and maintain exercise habits is a key to combating the rising tide of these lifestyle diseases and improving quality of life.

One possible way to change people's motivation for exercise is through the use of distractions during exercise. Rejeski (1985) postulated a model of parallel processing in exercise. It proposed that all stimuli are processed simultaneously in one's unconscious mind, but a person only gives conscious attention to those that are strongest. This has been interpreted by several researchers (e.g., Barwood, Weston, Thelwell, & Page, 2009; Nethery, 2002; Pennebaker & Lightner, 1980) to mean that if exercisers are given one of various types of distractions (e.g., listening to music, watching a video, looking at scenery or posters) they might pay more attention to the distraction and less to the sensations (pleasant or unpleasant) of exercise. Accordingly, many fitness centers have installed televisions near their cardio or weight equipment. Other exercisers use personal music players, use personal video players, or read books or newspapers as they exercise in fitness centers or at home. Distraction during exercise may help people focus more on the distraction than on ex-

ercise and may increase enjoyment, decrease unpleasantness of the activity, or prolong the duration of exercise.

For example, studies have been done with adults and youth using music as a distraction and have found that those exercising with music persisted for a longer period than those who heard no music (e.g., Annesi, 2001; De Bourdeaudhuij et al., 2002). Additional studies with adults (e.g., Boutcher & Trenske, 1990; Nethery, 2002; Nethery, Harmer, & Taaffe, 1991) found that exercising with music resulted in a lower rating of perceived exertion (RPE; a numeric value from 6 to 20 that exercisers assign to the level of exercise intensity at which they believe themselves to be working; Borg, 1982). Visual distraction in adults, as tested with a circular versus cross country course through trees and new scenery, resulted in increased intensity (i.e., faster times) with the distraction of running through different scenery (Pennebaker & Lightner, 1980). Participants of various ages exercising with music also reported increased level of enjoyment (Barney, Gust, & Liguori, 2012; Benham, 2014; Boutcher & Trenske, 1990; Dyrlund & Wininger, 2008). Using television viewing as distraction (news; Kukuwich, 1997), sport stunts without sound (Nethery, 2002), or a health video (Russell et al., 2003), some adult participants rated the exercise as more enjoyable (Barwood et al., 2009), whereas others showed no change in enjoyment (Kukuwich, 1997; Nethery, 2002; Russell et al., 2003; Viteri, 1994).

While almost all of the studies with exercise distractors have been done with adult populations, only a few have been done with youth or in a physical education (PE) setting. De Bourdeaudhuij et al. (2002) found that obese youth in a treatment center persisted in treadmill running for longer periods when they listened to music than with no distraction. Only three studies in a PE setting (Barney & Prusak, 2015; Barney, Prusak, & Benham, 2015; Benham, 2014) found that students (a) achieved higher step counts and activity time during the lesson with music than without and that (b) students rated the lesson as more enjoyable when music was played (Benham, 2014). Currently, little is known about the isolated effects (i.e., in absence of teacher influence) of distraction (via music or video) on student RPE and perceptions of enjoyment in the PE setting.

This baseline study examined the effects of (a) listening to popular music or (b) watching a popular film on RPE or enjoyment for high school students during an indoor cycling (spin) unit while con-

trolling heart rate (HR) and in absence of instructor influence. It was hypothesized that with both forms of distraction (a) RPE would decrease, and (b) levels of enjoyment would increase.

Method

Participants and Setting

This study took place at a public high school, Grades 10 to 12, in a state in the Intermountain West. School district, principal, and university institutional review board approval was gained before this study began, along with parent and student assent and consent. A convenience sample of six intact classes that were able to use the spin room were used in this study. The convenience sample led to a larger number of female classes participating in the study than male classes. After attrition (due to absenteeism or failure to complete procedures correctly; $n = 90$), 81 students (58 females in four intact classes and 23 males in two intact classes; $r_{age} = 15–18$ years), participated in this study. For the assessment of student perception in absence of teacher influence, the instructors were not present, though student teachers were present but not instructing during testing. The high school functioned on an A/B block schedule, meaning that 70- to 85-min PE classes were taught every other day. The data were collected during the 6-day, 3-week spin unit of a 16-week PE class.

The cycling unit took place in the school's indoor spin room. There were 37 bicycles (Sunlite F5 Trainer Cycle) arranged to face the instructor's bike at the front of the classroom. On days when a movie was being shown, it was projected onto the front wall to the side of the instructor. Sound for the movie or the music playlist was played over a classroom sound system. For easy reference, posters of the modified RPE and the enjoyment scales were displayed at the front of the room on either side of the movie screen. HR data, in a grid of 36 individual boxes, and question prompts were projected on the left, adjacent sidewall.

Instruments

iClickers. Handheld devices called iClickers were used in the collection of student responses for several dependent variables (i.e., RPE, level of enjoyment). iClickers are individually recognized answering devices that wirelessly register a student's answers (A, B,

C, D, or E) with a software program installed on an accompanying computer. When prompted with a question (in this case, displayed next to the movie screen), students pushed the button on their own device that corresponded to the answer they chose. Student answers could be changed as long as the question was open for answering. Once the question closed, answers could no longer be selected or changed. iClickers allowed for data collection frequently throughout the exercise bout, as opposed to a summary rating at the end of the exercise session.

Polar H7 Bluetooth monitors. HR was continuously monitored via Polar H7 Bluetooth monitors. This model sent the information via Bluetooth from the transmitter of every student to the Polar GoFit app (Polar, 2015) installed on an instructor's iPad (acting as the receiver). Seventy to 79% max HR was chosen as a target range for students to maintain, because the textbook used in these PE classes, *Fitness for Life* by Corbin and Lindsey (2007), listed a target HR zone for achievement of moderate and vigorous physical activity as 65% to 90% of their max HR (Corbin & Lindsey, 2007 pp. 110-115), depending on fitness levels. Seventy to 79% is in that zone and should allow more students of varying fitness levels to reach a moderate-intensity level of activity during these cycling sessions. This HR range also was shown as one color, green, on the Polar GoFit app (Polar, 2015), so students were able to check if they had the correct HR quickly and easily. Students had calculated their maximum HR at the beginning of the course and input that into the Polar GoFit app so all HR ranges would be individually accurate.

Rating of perceived exertion scale. RPE was reported via a modified Borg's scale of 1 to 5 condensed from the original 6 to 20 (Borg, 1982). Student answers were collected on a 1 to 5 scale because there are 15 RPE numbers and only 5 options to answer with on an iClicker. Participants were asked, "Right now, what is your current level of RPE?" with the option of selecting A (1): very, very light; B (2): light; C (3): somewhat hard; D (4): hard; and E (5): very, very hard.

Enjoyment questionnaire. Levels of enjoyment were collected via a Likert scale question also through the iClickers. The question was, "On a scale of 1–5, how much are you enjoying the activity right now?" (where 1 = *I hate it*, 2 = *I don't like it*, 3 = *I don't care either way*, 4 = *I like it*, and 5 = *I love it*; Benham, 2014).

Procedures

The classes participating in the study followed a script directed and given by the lead researcher while student teachers were present. The script consisted of a welcome to class, a statement of what type of treatment they would be experiencing that day, and instruction that they had 5 min to warm up on the bikes. At the end of the 5-min warm-up students were told the warm-up was over and that they should maintain a HR of 70–79% of their maximum for 20 min. Students were not told how to ride (e.g., sitting, standing, how much resistance) and were not hindered from riding as desired as long as they remained in the target HR zone and were not unsafe. At 5-min intervals during each cycling session, students were prompted to record RPE and level of enjoyment via iClickers. Specifically, the researcher would ask the question aloud and point to the visual prompt on the wall. Periodic reminders about maintaining the target HR were given. On the second, fourth, and sixth days, students were asked to complete the Situational Motivation Scale before transitioning to a new class activity, directed by the student teacher, for the second half of the period. The researcher recorded spontaneous student utterances overheard during each session, but no thorough qualitative analysis was conducted.

Cycling lessons (5-min warm-up and 20-min ride) were intentionally created with no change in speed or resistance. To isolate the effects of the distraction from changes due to workout structure or influence from the teachers, the researcher gave no instruction about the ride once the 20 min had begun. This format was chosen to be similar to that of many fitness centers frequented by adults that provide televisions or personal music players near cardio and weight lifting equipment with no instruction given to patrons about how they exercise. Twenty minutes of cycling was chosen because it had been used in similar studies (Dyrlund & Wininger, 2008; Nethery et al., 1991) and fit within the constraints of these PE classes.

The six intact classes were randomly assigned such that two all-female and one all-male classes were in each of the two groups (control and treatment). During the 6-day cycling unit, the treatment group received three conditions: 2 days of no distraction, 2 days of music, and 2 days of video. The control group experienced no distraction for all 6 days of the study; see Table 1. Data from each source

Table 1
Daily Distraction for Treatment and Control Groups

	Condition 1		Condition 2		Condition 3	
Group	**Day 1**	**Day 2**	**Day 3**	**Day 4**	**Day 5**	**Day 6**
Control	No Distraction	No Distraction	No Distraction	No Distraction	No Distraction	No Distraction
Treatment	No Distraction	No Distraction	Music	Music	Video	Video

were matched to the participant, and the same HR transmitter and iClicker were used by the same participant during each session. After the data were matched, the names of participants were removed.

Music and movie selection criteria and procedures. Music selection consisted of a variety of popular songs that had a tempo of 120 to 160 beats per minute (Karageorghis, Jones, & Low, 2006; Priest, Karageorghis, & Sharp, 2004). The researcher compiled a list of songs from the Billboard top 100 songs from the week the survey was distributed and the previous 2 years and also some older songs that had been suggested by youth of the same age as those who would participate in the study. The list of songs and five popular videos already approved, and used previously, by the PE teachers for use in school were placed on a survey. Students were instructed to mark the top five songs they would prefer to listen to and the top two movies to watch while exercising. From the results of this survey the researcher created a playlist of songs that would shuffle while students were riding the bikes.

Males and females had different preferences for the songs and movies given on the survey, so two playlists were created, and different movies were shown to each gender as choice has been shown to impact motivation (Deci, Vallerand, Pelletier, & Ryan, 1991). Movies were shown in the order of student choice; on Day 5, 25 min of the most preferred movies (males: *Shrek*, Katzenberg, Warner, & Williams, 2001; females: *High School Musical*, Schain & Ortega, 2006) was shown, and on Day 6, the second most preferred movies (males: *Remember the Titans*, Bruckheimer, Oman, & Boaz, 2000; females: *Tangled*, Conli, Greno, & Howard 2010) were shown.

Data Analysis

IBM SPSS Statistical Package 22.0 (2013) was used for all statistical analyses. Descriptive statistics (means, standard deviations, and effect sizes) were calculated and examined. Missing RPE and level of enjoyment data were imputed if no more than two of the four scores were missing. Specifically, if on a day of data collection, the participant responded with his or her RPE or level of enjoyment at three of the times but not all four (5, 10, 15, and 20 min), the three responses

were averaged and the average was used in place of the one missing data point. Likewise, if two data points were missing from the four times (5, 10, 15, and 20 min) of data collection on one day, the two data points were averaged and the average was used in place of the two missing data points for that day. If more than two data points were missing, then the participant was not included in that analysis. As is common, listwise deletion was used during omnibus analyses, so participants included in each analysis were different.

Conditional averages were computed for HR, RPE, and level of enjoyment; all eight data points for each variable during that condition (Day 1: 5, 10, 15, and 20 min; Day 2: 5, 10, 15, and 20 min) were used in the average. A repeated-measures ANOVA omnibus test was performed for male and female, control and treatment groups on all response variables. Post hoc Tukey's Honestly Significant Difference (HSD_{Tukey}) follow-up tests were then conducted when indicated. Last, independent-samples *t* tests for demographic and response variables were conducted between groups and across gender and conditions.

Results

Participant mean age was 15.86 (*SD* .839), mean self-reported height was 66.59 in. (*SD* 4.22), and mean self-reported weight was 139.46 lb (*SD* 33.83). An independent-samples *t* test found that mean age, weight, and height were not significantly different between control and treatment groups; see Table 2 for the results of the *t* test between treatment groups. Independent-samples *t* tests also showed that during Condition 1, when both groups received no distraction, there were no significant differences between control and treatment groups in HR, RPE, or level of enjoyment, indicating that no initial differences existed. However, *t* tests indicated a significant difference between genders during Condition 1 when females had significantly higher RPE, $t(77) = 2.24$, $p = .028$, and significantly higher HR, $t(78) = 2.35$, $p = .022$; see Table 3 for results of the *t* test between genders. Due to attrition, there was, perhaps, not enough power to see these differences in the ANOVA omnibus tests and the potential for type II errors increased but could not be controlled for in gender analyses.

Table 2
Independent t Test by Treatment Group During Condition 1

	Control			Treatment			
Variable	***N***	***M***	***SD***	***N***	***M***	***SD***	***ES*(*d*)**
RPE	44	3.22	0.79	35	3.52	0.68	0.40†
HR	44	72.46	4.97	33	72.78	3.94	0.07
Level of enjoyment	45	2.44	1.01	35	2.42	0.96	0.02

Note. Effect size is Cohen's *d* with formula, $d = (M_1 - M_2) / SD_{Pooled}$.
† = small effect, †† = medium effect, ††† = large effect (Cohen, 1988).

Table 3
Independent t Test by Gender During Condition 1

	Female			Male			
Variable	***N***	***M***	***SD***	***N***	***M***	***SD***	***ES*(*d*)**
RPE	57	3.47*	0.75	22	3.06	0.69	0.55††
HR	56	73.32*	4.18	21	70.68	4.97	0.60††
Level of enjoyment	58	2.44	1.00	22	2.41	0.95	0.03

Note. Effect size is Cohen's *d* with formula, $d = (M_1 - M_2) / SD_{Pooled}$. † = small effect, †† = medium effect, ††† = large effect (Cohen, 1988).
*$p < 0.05$ between compared groups (Male and Female).

Table 4 shows the results of the repeated-measures ANOVA. It has the mean HR, RPE, and enjoyment for each group (gender and treatment) during every condition; significant differences are noted in the table. Repeated-measures ANOVA and HSD_{Tukey} show a significant decrease in average HR for both treatment groups and both genders between Conditions 1 and 3 (Treatment: $HSD_{Tukey} = 8.68$, $p < .05$; Control: $HSD_{Tukey} = 7.27$, $p < .05$; Female: $HSD_{Tukey} = 6.36$, $p < .05$; Male: $HSD_{Tukey} = 12.37$, $p < .05$) and between Conditions 2 and 3 (Treatment: $HSD_{Tukey} = 9.32$, $p < .05$; Control: $HSD_{Tukey} = 6.06$, $p < .05$; Female: $HSD_{Tukey} = 5.82$, $p < .05$; Male: $HSD_{Tukey} = 12.22$, $p < .05$); see Table 4. In Condition 3, watching a movie, participants had significantly lower HRs than when they had no distraction or were listening to music. There was no difference in HR between no distraction and listening to music for any group. These differences are true for control and treatment groups and for females and males.

Males had a significantly lower HR than females during Condition 3 while watching a movie ($HSD_{Tukey} = 8.52$, $p < .05$); see Table 4.

RPE followed a similar pattern to HR in that Condition 3 was significantly lower for both treatment groups than Condition 1 (Control: $HSD_{Tukey} = .29$, $p < .05$; Treatment: $HSD_{Tukey} = .54$, $p < .05$) and Condition 2 (Control: $HSD_{Tukey} = .23$, $p < .05$; Treatment: $HSD_{Tukey} = .33$, $p < .05$), see Table 4. When males and females were compared, it was found that males had a significantly lower RPE than females for all three conditions (Condition 1: $HSD_{Tukey} = .43$, $p < .05$; Condition 2: $HSD_{Tukey} = .73$, $p < .05$; Condition 3: $HSD_{Tukey} = .89$, $p < .05$). Additionally, male's RPE significantly decreased with each condition; Condition 2 was lower than Condition 1 ($HSD_{Tukey} = .34$, $p < .05$), and Condition 3 was significantly lower than Condition 1($HSD_{Tukey} = .72$, $p < .05$) and Condition 2 ($HSD_{Tukey} = .38$, $p < .05$). Female's Condition 3 was significantly lower than Condition 1 ($HSD_{Tukey} = .26$, $p < .05$) and Condition 2 ($HSD_{Tukey} = .22$, $p < .05$), but Condition 2, music, was not significantly different than Condition 1, no distraction; see Table 4. A repeated-measures ANOVA omnibus test showed no significant difference in level of enjoyment between any conditions for either control or treatment groups or for females and males; see Table 4. No further analysis was conducted.

Discussion

This study assessed if distraction (music or video) during a spin unit in a high school PE class would affect the levels of enjoyment, RPE, or HR for high school–aged students during exercise, specifically an indoor cycling unit. For both control and treatment groups, there was no significant difference in HR, RPE, or enjoyment between Condition 1 (when treatment had no distraction) and Condition 2 (when treatment had music). The design of the study constrained the students' HR as they rode; they were told to maintain a specified HR range every day of data collection. However, when a movie was played while cycling, differences were seen in HR. What is interesting, however, is that while HR and RPE went down when a movie was played for the treatment group, this was also true for the control group, who did not have any distractions; see Table 4. This led the researchers to believe that the decrease in HR and RPE was not due entirely to the movie distraction but to an outside or unaccounted-for factor. The lead researcher observed and heard many complaints

Table 4

N, Means, and Standard Deviations for Percent of HR Max, RPE, and Level of Enjoyment for Females, Males, Control, and Treatment Groups During each Condition

	Female			Male				Control			Treatment			
Variable	***N***	***M***	***SD***	***N***	***M***	***SD***	***ES(d)***	***N***	***M***	***SD***	***N***	***M***	***SD***	***ES(d)***
							Condition 1							
HR	54	73.39^	4.23	18	70.88^	4.95	0.57††	42	72.57^	5.04	30	73.03^	3.74	0.10
RPE	51	3.49^	0.77	22	3.06*^	0.69	0.58††	40	3.24^	0.83	33	3.50^	0.68	0.34†
Enjoyment	51	2.43	0.98	21	2.33	0.90	0.10	38	2.34	0.98	34	2.46	0.94	0.12
							Condition 2							
HR	54	72.85^	4.73	18	70.73^	7.41	0.39†	42	71.36^	6.33	30	73.67^	3.92	0.42†
RPE	51	3.45^	0.69	22	2.72*^	0.88	0.97†††	40	3.18^	0.73	33	3.29^	0.92	0.13
Enjoyment	51	2.44	0.99	21	2.10	0.98	0.34†	38	2.13	0.99	34	2.57	0.95	0.45†
							Condition 3							
HR	54	67.03^	7.50	18	58.51*^	11.42	0.99†††	42	65.30^	9.38	30	64.35^	9.40	0.10
RPE	51	3.23^	0.86	22	2.33*^	0.97	1.01†††	40	2.95^	0.91	33	2.97^	1.07	0.02
Enjoyment	51	2.45	0.88	21	2.21	0.99	0.26†	38	2.17	0.89	34	2.61	0.90	0.49†

Note. Effect size is Cohen's *d* with formula, $d = (M_1 - M_2) / SD_{Pooled}$. † = small effect, †† = medium effect, ††† = large effect (Cohen, 1988).

*$p < 0.05$ between compared groups (Male and Female, or Control and Treatment). ^$p < 0.05$ between conditions within a single group, Male, Female, Control, or Treatment.

about the uncomfortableness of the bicycle seats. The lead researcher also heard many questions of "Do we really have to do this again?" and "When will this be over?" The researchers believe that the drop during the third condition for both control and treatment groups may be due to simple boredom with and dislike of the activity.

This conclusion was further supported as many students voiced the opinion that they wanted to do a different activity after only a few days. This may have been due to the hardness of the bike seats or the workout design intentionally leaving out changes in pedaling speed and bike resistance. A typical spin class would include different intensities and levels of resistance on the bike. This baseline study intentionally left those elements out to isolate the effects of the provided distractions influencing HR, RPE, and enjoyment. Students were not restricted in how they rode the bike (e.g., stand and pedal, increase pedal rate, or increase resistance) as long as they stayed within the target HR zone. As observed, only a few students ever stood on the bike as they pedaled, and once students had found an intensity to reach the target HR zone, they rarely changed their bike resistance. This lack of resistance and pedaling changes while riding, or the hardness of the bicycle seats, could be one reason for student boredom and drop off of HR and RPE during the final two days of data collection.

The lack of enjoyment and drop in HR and RPE over the unit, potentially due to boredom, illustrates that simply using a distraction during exercise cannot replace good pedagogy for motivating students; having music and/or a video playing while students rode was not enough to hold students' interest in the activity. While the female teacher, whose classes were used in this study, normally does use music and a movie during her spin unit, she uses them as cues for speed or resistance change and encouragement. Also, she is typically riding at the front of the class along with her students. She shows them how to ride, instructs changes in pace and resistance, and calls encouragement as the students copy her. When she shows a movie, she uses it as a tool in the workout. Examples she gave to the lead researcher were that when watching *Tangled* (Conli, 2010) riders increase bike resistance whenever the main character sings, or the riders all do a sprint when they play football in the movie *Remember the Titans* (Bruckheimer & Oman, 2000). Typically, the

music and movies add to the teacher's instruction; they never replace them. Using distraction as another tool in combination with good pedagogy has been helpful to this teacher in the past. One possible replication of this study would be to measure the effect on the same variables with distraction *and* good pedagogy as described.

Another reason that students in this study could have been bored is that this study was set up to gather baseline research data, not as a PE class. The study involved steady-state exercise where students were to maintain a moderate to vigorous energy output for a prolonged duration. Most activities done in high school PE classes are not steady-state, but involve short bursts of energy and short rest periods (e.g., sprinting to steal the ball in soccer and then resting after passing it on to a teammate); it could be that steady-state exercise is unappealing to youth. This is supported by the fact that the average response to how much students were enjoying the activity fell somewhere between "I don't like it" and "I don't care either way" with no significant difference between any groups or conditions on any day. It is also possible that asking students to respond to two prompts every 5 min of the cycling session made the ride feel more like a research lab and not like a PE class. The spin unit in this study was not presented or designed as it would normally be in a PE class.

While the data do not show a difference, positive or negative, in enjoyment when distractions were introduced, the researcher observed a difference in student attitude during cycling. A few females added hand dance motions to the music as they rode, and some males sang along and made fun of a popular song with loud shouts of "Oh" and mock pained expressions. Several students sang along with each song. When the male classes watched *Shrek* (Katzenberg et al., 2001), multiple students were quoting the movie almost line for line and many laughed frequently. Several females sang along and quoted *High School Musical* (Schain & Ortega, 2006) while it was shown during their ride. At the beginning of each day when told that they were going to have music or a movie, several students in each class exclaimed "Yes!" All of these observations tend to tell a slightly different story than the numeric data. Students reported that they did not enjoy the ride any more with distractions, but their comments before and during the ride seemed to be of a more positive nature when there were distractions. It could be that with more

comfortable bike seats, a shortened data collection period, or the presence of an instructor who leads a true spin workout, the data would more closely align with observations of student behavior and comments of enjoyment.

A social component could also have been affected student responses. For when no distraction was presented, many students turned to one another and talked almost the whole time. This indicates the potential that students were trying to create their own distraction by conversing with classmates. With no distraction and no direction to stay quiet during the ride, conversation may make cycling more enjoyable due to the element of sociality. Prusak and Darst (2002) found that seventh- and eighth-grade girls chose social walking activities over game-like, competitive, or fitness walking choices. They stated, "Most participants indicated that doing the activity with their friends was more important than which activity they chose" and suggested adding more social components to other activities to better meet more students' needs (Prusak & Darst, 2002, p. 238). The social part of this study could also have affected students' enjoyment during distractions, as it was more difficult to carry on a conversation when music, or more particularly a movie, was played; hardly any conversation was observed when a movie was played. This deterrent to holding a conversation as a movie was played could help to explain why participants' effort decreased when a movie was played. Students creating their own distraction by holding conversation also illustrates that while the researchers were intending to isolate the effects of distractions, in the end there were more distractions than could be accounted for. Student conversations were one additional distraction, but it is also possible that the directive to maintain a certain HR, while having every individual's HR displayed while riding, became another distraction from consciously thinking about riding. Given these results, teachers should think carefully and strategically about their use of distractions during exercise and not use them as a replacement for good pedagogy in a PE class. As many participants held their own conversations while cycling, teachers may also want to look at social opportunities offered in class and allow more time for conversation as students work together.

A future study with each group experiencing conditions in a random order would be better able to address if this change in both

treatment and control groups was due to time, order of treatment, or an unknown factor. The numerical data from this study found that both the control and treatment groups had a significant drop in HR and RPE during the third week of data collection. Future research could focus on open answers and short interviews of students to probe for deeper understanding of why this occurred. If, as suspected, this is due to boredom, future research should include design elements such as variety in pace or position, challenges, or teacher instruction and encouragement to avoid its occurrence.

This study had several limitations. First, all students involved came from a single school and were enrolled in a required PE class to which the researcher had access. Second, in some classes the teachers had set up the HR software so that student names were shown instead of student identification numbers. This identification of other students could have affected how students rode. Third, many participants needed to be dropped because of attrition, and limited data needed to be imputed for included participants. Fourth, despite efforts to oversample and account for attrition so common to such school-based studies, decreased numbers may have adversely affected statistical power.

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