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Distraction, Enjoyment, and Motivation During an Indoor Cycling Unit of High School Physical Education

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ABSTRACT

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With the increased rate of overweight and obese youth in the United States many people began looking for ways to increase youth exercise quality and habits; one such way was by using an external distraction during exercise to increase personal motives toward exercise. This study involved 81 high school aged students enrolled in a required physical education class. Students rode an indoor cycling bike for 20 minutes while wearing a heart rate monitor. They were told to maintain a heart rate between their 70 and 79% maximum heart rate. Every 5 minutes students were asked to rate how hard they thought they were working, using a modified rating of perceived exertion scale, and how much they were enjoying the activity. At the end of each day, students were asked if they would continue to cycle if given the option. The first two days had no distraction, days 3 and 4 had class selected music playing, and days 5 and 6 had a class selected movie showing at the front of the room. There is no significant difference in heart rate or rating of perceived exertion between no distraction and adding music, but when a movie is played, both heart rate and rating of perceived exertion decrease significantly. However, a similar decrease in heart rate and rating of perceived exertion is also seen in the control group on the same days of data collection. Including a distraction while exercising has no significant effect on enjoyment of the activity or intention to persist in the activity. Females have significantly higher intrinsic motivation levels throughout the course of data collection, and males' intrinsic motivation significantly declines with each progressive condition. As the decline in heart rate and rating of perceived exertion is seen in both control and treatment groups the decline is possibly influenced by unaccounted for factors such as hard bike seats, boredom, or teacher pedagogy. These factors could potentially account for the decrease in intrinsic motivation during the last two days of data collection.

Key Words: physical education, music, movie, high school, self-determination, heart rate monitors

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Chapter 1

Introduction

The health of people in the United States has been decreasing in recent years for several reasons. There has been an increased prevalence of obesity and type II diabetes, among other comorbidities in youth and adults (Go et al., 2013). These diseases shorten life and increase the years of life that are spent dealing with poor health. Each of these diseases has a tie to lifestyle choices, the biggest of which are diet and physical activity. Physical activity can help people to lose and then maintain weight; decrease blood pressure; reduce the risk of type II diabetes, heart attacks, strokes, and several forms of cancer; reduce arthritic pain; reduce the risk of osteoporosis; and reduce the symptoms of depression and anxiety (Centers for Disease Control and Prevention, 2011). Despite these facts, only 48% of adult Americans get the recommended amount of physical activity each week (Centers for Disease Control and Prevention, 2014a; at least 150 minutes moderate intensity or 75 minutes vigorous intensity per week, plus two days of strength training per week).

In 2012, only 24.8% of youth aged 12 to 15 met the physical activity guidelines of 60 minutes of moderate to vigorous activity daily (Fakhouri et al., 2014), and the number of overweight and obese children and adolescents in the United States tripled from 1980 to 2000 (Daniels et al., 2005). Exercise habits we form as children and youth often last into adulthood (Telama et al., 2005), and the rise of lifestyle diseases and obesity in children and youth 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 help people exercise longer and more often is to increase their motivation for exercise. Deci and Ryan’s self-determination theory (Deci, 1985) provides a useful framework to examine motivational processes in exercise.

Self-Determination Theory

Self-determination theory states that motivation moves along a continuum from amotivation (no desire to participate in an activity), through extrinsic motivation (reasons to participate in an activity come from external sources or from self-imposed rewards), to intrinsic motivation. Intrinsic motivation has the highest level of self-determination in that people choose for themselves whether to do an activity for enjoyment or self-satisfaction. A person's level of motivation has been found to be influenced by the satisfaction of three needs: competence (the belief that a person has the skills to perform a task), relatedness (the ability of a person to form secure and satisfying relationships in their social context), and autonomy (the belief that an individual gets to choose what tasks they engage in). Each of these factors is important, but autonomy and choice may be the most influential in moving a person's motivational level closer to being self-determined (Deci et al., 1991).

A person's level of motivation is also influenced by where a person perceives the locus of control to be. Amotivated people behave as if they have no control of the outcomes in a situation and have no motivation to do the activity. Extrinsically motivated people are regulated by different factors due to different levels of internalization. Internalization is an inherently motivated process, which comes from satisfaction of the three needs, to internally regulate activities that were once uninteresting but are now seen as useful; the extent that activities are internalized is a result of the social context in which the activity takes place (Deci et al., 1991). Different levels of internalization result in the four regulatory levels of extrinsic motivation. Those who are externally regulated, or through self-imposed introjected rules, see the control as being outside of themselves because they do not fully accept the values behind each task. External regulation involves a reward or punishment given by someone outside the individual. Introjected regulation is when an individual places rules, rewards, and punishments on themselves. Those who use identified and integrated regulation still have external motivators, but they accept and internalize the values of a task (identified) eventually viewing them as a part of who they are (integrated). Intrinsic motivation comes solely from within a person when an activity is done for personal interest, enjoyment, and satisfaction.

In public schools, studies discussed in a meta-analysis by Deci et al. (1991) have shown that students with more intrinsic motivation were more likely to stay in school, achieve more, have better conceptual understanding, and be well-adjusted (Deci et al.). If this were applied to exercise, it is likely that those with higher levels of intrinsic motivation for exercise would continue to exercise over longer periods of time, exercise with more intensity, understand the reasons for exercise, and enjoy exercise more.

Music and Video as Exercise Distraction

Rejeski (1985) postulated a model of parallel processing in exercise. It proposes that all stimuli are being 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. Pursuing this idea, many fitness centers have installed televisions near their cardio or weight equipment. Other people use personal music players, personal video players, or bring something to read as they exercise in fitness centers or in their own home. If using a distraction during exercise may help people concentrate on the distraction more than on exercise, perhaps this distraction may increase enjoyment of the activity, prolong the duration of exercise, and increase people's self-determination to exercise.

One proposed barrier to people participating in physical activity and exercise are the uncomfortable sensations that come with exercise, like muscle pain, shortness of breath, sweating, and perceived exertion. A rating of perceived exertion (RPE) is a numeric value from 6 to 20 that exercisers assign to the level of exercise intensity at which they believe themselves to be working, and is based on an exerciser's evaluation of their own bodily sensations, such as heart rate (HR), sweating, shortness of breath, or pain, and if the exerciser believes that the sensations are light or heavy (Borg, 1982). Numbers close to 6 represent light workloads; while numbers close to 20 represent work close to maximal effort. Numbers were also meant to correlate with HR; an RPE of 6 should be roughly a HR of 60 beats per minute, an RPE of 13 should be close to a HR of 130. It is often uncomfortable for people to maintain high RPEs because the feelings of vigorous exercise are perceived as unpleasant and strenuous, while lower RPEs are more easily maintained for amounts of time equal to those recommended for health benefits. Some studies (Barwood et al., 2009; Boutcher & Trenske, 1990; Nethery, 2002) evaluating RPE during a distraction (e.g., listening to music, watching video) are promising because often participants were exercising at the same intensity as those without a distraction but with lower perception of exertion as shown by lower RPEs. These studies suggest that a person who, due to distraction, does not feel uncomfortable while exercising or perceives less effort while still exercising at a moderate or vigorous intensity is more likely to continue to exercise.

This could help people accumulate the levels of moderate to vigorous physical activity that many are not doing now.

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 of time 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 perception of exertion as measured by RPE. Visual distraction in adults, as tested with a circular versus cross country course through trees and new scenery, resulted in faster times with the distraction of running through different scenery (Pennebaker & Lightner, 1980). Participants of various ages exercising with music also rated their enjoyment level higher than when there was no music (Barney, Gust, & Liguori, 2012; Benham, 2014; Boutcher & Trenske, 1990; Dyrlund & Wininger, 2008). Using television viewing as a distraction, some adult participants rated the exercise as more enjoyable (Barwood et al., 2009), but others showed no change in enjoyment levels between treatment groups (Kukuwich, 1997; Nethery, 2002; Russell et al., 2003; Viteri, 1994). This could be because the video shown was often the news (Kukuwich, 1997), sport stunts without sound (Nethery, 2002), or a health video (Russell et al., 2003).

Highlighting the importance of choice in exercise, Annesi (2001) conducted a 14-week trial of exercise adherence with different types of distractions and found that the group of adults able to choose from 62 television channels and listening to the radio, CD, or a cassette tape showed significantly higher levels of (a) enjoyment, (b) persistence with the exercise program, and (c) lower dropout rates than those with no distraction or even those who were able to listen to music or watch four television channels set by the researchers. The research suggests if exercise or its distractions are enjoyed in themselves it may increase the probability that people would be intrinsically motivated, and therefore more self-determined, to participate in exercise.

Statement of the Problem

While almost all of the studies done with exercise distractors have been done with adult populations, only a few have been done with youth (e.g., De Bourdeaudhuij et al., 2002) or in a PE setting (e.g., Barney & Prusak, 2015; Barney, Prusak, & Benham, in press; Benham, 2014). De Bourdeaudhuij et al. studied 30 youth, aged 9-17, who were residents at an obesity treatment center. These youth completed two exercise treadmill tests to volitional exhaustion at the beginning and end of their 10-month treatment. In pre- and post-treatment treadmill tests, youth ran longer during the trials with self-selected music as a distraction. Interestingly, the participants' peak volume of oxygen uptake (VO_2), peak HR, and oxygen exchange ratios were lower with the music distraction (De Bourdeaudhuij et al., 2002); supporting the probability that music distraction may also improve exercise performance in youth as well.

Perhaps due to the many constraints such as school approval, class structure, teacher cooperation, and appropriateness of distraction choices, only a few recent studies of distraction in exercise have been conducted in the public school setting. Benham (2014) examined the effects of music on the physical activity rates and level of enjoyment in junior high school physical education (PE) students finding step counts, time in activity, and enjoyment level increased in the presence of music. Increased activity, as measured by pedometer step counts, in the presence of music also holds true for elementary-aged children (Barney & Prusak, 2015) and college-aged PE students (Barney et al., 2015 in press). The effects of music as a distraction with youth exercisers are becoming clearer, but what remains unclear is if video distraction (e.g., watching a movie) would result in similar outcomes.

Statement of the Purpose and Hypothesis

The purpose of this study was to assess if the distraction of (a) listening to popular music or (b) watching a popular film during a high school PE class indoor cycling unit would impact the levels of enjoyment, motivation, RPE, HR, or intentions to persist for high school-age students during exercise. The hypothesis was that with distraction (a) motivational profiles would move along the continuum toward a more intrinsic level of motivation, (b) levels of enjoyment would increase and (c) intentions to persist would increase, and (d) RPE would decrease for high school-age students independent of HR.

Limitations

A limitation to this study is that it is not a true experimental design; students were chosen because of their enrollment in a PE class the researcher has access to and classes were assigned conditions as a group. This makes it a quasi-experimental design. Because this study will take place in a public school setting, the films and music played during class will be limited to those approved by the school. The need for school approval does not allow for each student to truly choose their own distraction, as some choices may be inappropriate in this setting. Choice has been shown to impact motivation levels and the impact of distractions; not letting each participant choose their own film or music may have had some impact on the results.

Chapter 2

Review of Literature

The current study was based on two separate theories, one to explain distraction in exercise and another to explain motivation. While these two theories are not initially related, it is the belief of the researcher that changes in distraction may also bring about changes in motivation levels. This belief is based on the existing body of literature that examines self-determination theory, Rejeski's parallel processing model (1985), and distraction during exercise. In this study, the researcher purposefully changed distraction levels during exercise (based on Rejeski's theory) to examine the effects of these changes on participants' motivation level, as explained by self-determination theory. Rejeski's theory informs work within the framework of self-determination theory.

Self-Determination Theory

Self-determination theory was chosen as a theoretical framework because its definition of motivation was consistent with what the researcher hoped to explore. Other motivational theories were also available for use but none of their definitions fit this study as well as self-determination theory. For example, the study did not involve predicting future exercise sessions so the theory of planned behavior was not used (Ajzen, 1991). The study did not necessarily teach new skills or help participants increase their belief in their own ability to complete a given task; self-efficacy theory was therefore not chosen as a framework (Bandura, 1997). The goal of this research was to see if participants' level of motivation would increase in the presence of a distraction during exercise. Self-determination theory explains motivation as existing along a continuum from amotivation to intrinsic motivation; which continuum and progression along this continuum best explain how motivation was to be looked at in the present research.

Self-determination theory has been widely used to examine motivation level, and its behavioral, cognitive, and affective outcomes in exercise and PE settings. A few studies have looked at motivation level along the self-determination continuum as linked to persistence. Pelletier, Fortier, Vallerand, and Briere (2001) studied 369 youth competitive swimmers (ages 13 to 22), some who were ranked regionally, some provincially, and some nationally in Canada, and discovered that their level of self-determination positively predicted whether they still participated 10 and 22 months later. Initially, all swimmers completed a survey about their coaches' level of autonomy support and their own level of motivation. At 10 and 22 months the swim teams and national swimming organization were contacted to assess if swimmers had dropped out or were continuing to swim. At 10 months, 22.5% dropped out, another 24.9% dropped out by 22 months, dropouts were equally distributed across all levels of ability. Intrinsic motivation was positively correlated with continuing to swim at both 10 and 22 months; amotivated participants had the lowest level of persistence at both times, while introjected regulation was positively related to persistence at 10 months but not at 22 months. This supported the idea of the self-determination continuum—that self-determination increased from amotivation, through introjected motivation, to intrinsic motivation. Pelletier et al. also found that swimmers with more autonomy-supportive coaches had higher levels of self-determination, supporting the idea that autonomy is a powerful determinant of self-determination level.

One study of self-determination theory in PE found that students who enrolled in optional PE class showed higher levels of self-determination during the previous school year's PE class than those who chose not to enroll in PE the next school year (Ntoumanis, 2005). Ntoumanis' sample consisted of 302 15-year-old students in England because this was the last year in school they had required PE. They were given a survey with questions about their PE learning environment, need satisfaction, motivational climate, their concentration in PE, and intention to take a PE class the following year. The next school year, schools were contacted to assess if students had enrolled in a PE class. Those who had enrolled in optional PE classes reported higher levels of need satisfaction (autonomy, relatedness, competence) the year before (Ntoumanis). Higher levels of need satisfaction helped explain why students also had higher levels of self-determination. These studies provided evidence that levels of self-determination were linked to persistence in exercise settings. Therefore, finding a method to increase students' motivation and level of self-determination in PE settings could lead to future persistence with PE or other exercise.

Distraction in Exercise

People have tried numerous ways to improve participants' motivation for exercise. One way is based on Rejeski's theory (1985) of parallel or active processing of stimulation. This theory stated that all stimuli were perceived automatically and simultaneously, but an individual then consciously chose which stimuli to give attention to. Rejeski's theory proposed that perception was an active process, a change from previous models of thinking that all stimuli were taken in and perceived with little to no selection of what was perceived consciously. Another part of this theory was a preconscious informational and emotional elaboration of sensory cues—that a person's schema affected how a person was going to give weight to and how they chose to perceive different sensory cues. A person's previous experience with an activity was going to affect how they perceived it a second time. If they disliked an activity, or thought it painful, cues of boredom and pain may be more readily chosen for conscious perception. This could also be true for stimuli used as distractions; if a person greatly enjoys a certain style of music and associated it with positive emotions, they might have more readily chosen the music and positive emotions to consciously perceive over the exercise sensations.

Rejeski's theory (1985) provided a possible explanation as to why distraction was helpful in exercise, in that painful or uncomfortable stimuli may be blocked from conscious attention by more powerful or appealing distracting stimuli. This has been tried in physical performance in many situations. One of the early studies discovered that college-age male walkers on a treadmill who listened to street noises through headphones reported significantly fewer symptoms (e.g., sweat, shortness of breath, fatigue, or dizziness) than those who listened to their own breathing through headphones or nothing at all (Pennebaker & Lightner, 1980). Those who listened to their own breathing reported more exercise symptoms than the control group. At the end of the 10-minute trial, those that listened to street sounds reported that they listened to the sound more than those who listened to their own breathing. This potentially suggested that those listening to their own breathing may have been trying to ignore the sound of their breathing, and instead tried to focus on other things.

In a second study, Pennebaker and Lightner (1980) had 24 college students run the same 1800 meter distance 10 times alternately on either a circular track or cross country course with varied scenery over the course of 10 days. They found that the times run on the cross country course were significantly faster than those run on the circular course despite being the same distance with equivalent turns and elevation. Even though the cross country course was faster, the RPE and exercise symptoms reported were the same for both courses (Pennebaker & Lightner). These studies showed that visual and auditory stimuli had an impact on perceived exertion and perception of exercise symptoms.

Music as exercise distraction. Boutcher and Trenske (1990) also used sound as a distraction in their study involving different levels of intensity. Twenty-four female college students rode a stationary bike for three successive six-minute trials, one at 60% (low intensity), one at 75% (moderate intensity), and one at 85% (high intensity) of their max HR, calculated in a benchmark trial before beginning data collection. Each of the three trials was then repeated under three conditions: listening to music while cycling, control with no distraction or deprivation, and deprived of sound with earplugs. At high intensity, RPE with music was lower than the deprived condition but not significantly so; at low intensity, music was significantly lower than deprived. At both intensities, music lowered participant's perception of exertion compared to those who wore earplugs. Affective state was also significantly higher with music than deprived conditions at high intensity. The effect was less so at lower intensities. This was in agreement with Rejeski's theory (1985) that stronger stimuli would be given more attention; at lower intensities the symptoms of exercise were more easily ignored by those with earplugs and music was more of a distraction, while exercise symptoms were not as easily ignored in all conditions at higher intensities when the symptoms were stronger as shown by RPE.

Dyrlund and Wininger (2008) also found differing effects of music distraction for different exercise intensities. Two hundred adult participants rated their preference of different styles of music and were then randomly assigned to one of nine groups, either with low (30% VO_2 max), moderate (50% VO_2 max), or high intensity (70% VO_2 max), and either no music, least preferred music, or most preferred music. At moderate and high intensities, those who listened to preferred music during the 20-minute treadmill run had higher levels of enjoyment as compared to those who listened to non-preferred music. This effect was not seen at low intensities of exercise. The researchers believed that this could be due to boredom at low intensities. Boredom could have become a stronger stimulus than music at the lower intensity. This also supported Rejeski's theory (1985) that previous schema and experiences would affect how a stimuli was perceived, and therefore affect the situation where the stimuli was being used.

Few of the studies with music as a distraction have been done with populations other than adults. One example of a study with youth was by De Bourdeaudhuij et al. (2002). The 30 youth (aged nine to 17), living in an obesity treatment center, did two graded exercise tests on a treadmill to volitional exhaustion at the beginning and then at the end of their treatment program. One of each of the tests was done with the youth listening to music they self-selected. In these music distraction trials the participants ran significantly longer and thought of their bodily sensations less (e.g., respiration, cardiac symptoms, gastrointestinal symptoms, dizziness, or pain). Peak HR and peak VO_2 were also lower with a music distraction. This is surprising because participants ran for a longer time yet their HRs stayed lower. Researchers proposed that music could be a way to help obese youth complete prescribed exercise sessions in the future.

Priest, Karageorghis, and Sharp (2004) and Karageorghis, Jones, and Low (2006) reported that the tempo of music affects the motivational level of music during exercise more than the other factors of music: cultural impact (a song's prevalence in society), musicality (melody, harmony, pitch), and association (associations with the song pertaining to things other than the music). Karageorghis et al. used songs from participants' polled preferred artist with tempo of 80 (slow tempo), 120 (medium tempo), or 140 (fast tempo) beats per minute during treadmill walking at 40, 60, and 75% max HR. The higher the intensity of exercise, the faster tempo music was preferred over medium tempo or slow tempo music; slow tempo music was not preferred even at the lowest intensity. Priest et al. gave a survey to 532 members of health clubs (ages 12 to 79) that asked the importance of music when they went to the gym and their music preferences while at the gym. Almost a quarter of the sample reported some sort of psychophysical response to music, 17.1% increased motivation, 2.4% stimulating effects, 3.6% enhanced mood, and 2.1% distraction from physical sensations. The motivation of music was indicated to increase when music was played at a loud volume. The mean rating for music importance during exercise was 5.84 out of 7. Younger participants reported a preference for currently popular music (Priest, Karageorghis, & Sharp). Music used as a distraction during exercise should follow the guidelines from these two studies and be of a fast tempo (at least 120 beats per minute) (Karageorghis, Jones, & Low), be played at a louder volume (Priest et al.), and be current music if intended for those under 26 years of age (Priest et al.).

Video as exercise distraction. While there have been numerous studies with sound or music as a distraction, few have been done with visual distractions, and often those studies involved an auditory component as well. One of the earliest studies with video distraction was by Nethery, Harmer, and Taaffe in 1991. Eight adult male participants were told to maintain 65 revolutions per minute while cycling under four conditions: control with no distraction or deprivation, video (ski stunts) while wearing ear plugs, self-selected music, or deprived with earplugs and a blindfold. Trials were 20 minutes long and at 75% of participants' max HR. RPE was taken every five minutes during the trial and significant differences were only found between the control and audio conditions, and between control and deprived conditions. Researchers suggested that this means audio stimuli were stronger than visual ones, but this result could have been found because the music was self-selected and the video was not. Not being able to choose both the music and the video introduced choice and autonomy as a variable in the study. Nethery (2002) performed a similar study, with the same control, deprived, video, and music conditions, but at two different exercise intensities. RPEs were higher in every condition at 80% of participants' maximum VO_2 than at 50%. At both intensities music had significantly lower levels of perceived exertion compared to control and video, with deprived being significantly higher.

In their theses, Kukuwich (1997) and Viteri (1994) both looked at the use of video as distraction during exercise. Viteri allowed participants, 12 adult female members of a health club, to self-select their own intensity while riding a stationary bike with no distraction and again with control of a television remote. They were able to change channels at will. Results showed that participants voluntarily chose a lower intensity with television distraction, but HRs reached the same level. It was thought that television provided an arousing stimulus that increased HR in addition to that from exercise. Kukuwich had 20 adult males walk on a treadmill at an RPE of 13 with no distraction and then while watching the news. Only three participants were able to match their HR while watching the news to the one they had with no distraction. Those who reported preferring exercising with distraction exercised at a higher intensity with distraction, while others found it annoying and therefore exercised at a lower intensity, but both groups were unable to match their intensity from before. Both of these studies showed that watching a video distraction affected people's ability to regulate their own exercise intensity.

During a l4-week study by Annesi (2001), 56 adult, new health club members were randomly assigned to exercise under four conditions and were given the exercise prescription to attend at least three times per week for 20 to 30 minutes of moderate to high levels of activity. One group was the control with no distractions; one group listened to self-selected music; one group watched four television stations chosen by the researchers; and the last group (entertainment) chose from the radio, brought in their own music, or chose to watch any of 62 available television channels throughout their exercise sessions. All participants could choose to use stationary bikes, treadmills, stair stepping machines, or an elliptical during their exercise sessions. The entertainment group chose to watch television 99% of the time. Adherence to the prescribed exercise program over the 14-week study was higher in the entertainment group over all other groups but not significantly so. The entertainment group had significantly less dropout from the study, exercised in longer sessions, and had more VO_2 max improvements. This study gave more power to the importance of choice in distractions during exercise. It may not have proved that visual stimuli were weaker than auditory stimuli but did show that when visual and auditory stimuli were combined, as in a television program, there were significant differences from music only.

As a different form of video distraction, Mestre, Maiano, Dagonneau, and Mercier (2011) examined the impact of a virtual reality system with a stationary bike. Twelve undergraduate students rode a bike attached to a virtual reality program showing part of an Italian cycling race; speed and resistance on the bike were linked to how fast the video played and the elevation of the course. Half of participants also listened to self-selected music in addition to the virtual reality. With both music and virtual reality, the course was completed in a faster time for each of the three trials with distraction; this was not true for virtual reality only. Time spent looking at the screen was also reduced in each progressive trial with music and virtual reality but not in virtual reality alone. Importantly, enjoyment levels decreased more with each trial of virtual reality compared to when music was included as well, even though the decrease was not significant. Researchers suggested that with virtual reality alone, participants learned the course quickly and it became less of a distraction with this familiarity while the addition of music could possibly keep the course more interesting as new songs were played. They also noted that when participants listened to music, visual stimuli were used at strategic moments during a course

(Mestre et al.). This look into virtual reality provided an interesting point that in order for visual distraction to continue to be a distraction it may need to change frequently, reducing repetition and boredom. This perhaps, could be solved with television or video viewing, offering the chance for continually choosing a new program to watch as a distraction.

Distraction in Physical Education

In a PE setting, little research has been done on the topic of distraction. Deustch (2008) studied 69 fourth- and fifth-grade students during the Progressive Aerobic Cardiovascular Endurance Run (PACER) test in their normal PE class. The students completed the test three times, once without music, once with mild-tempo music, and once with faster-tempo music. Deutsch discovered that the students were able to progress further in the test when music was playing. The students also enjoyed the PACER test more when music was playing than when there was no music. Interestingly, girls performed better on the PACER with faster-tempo music while boys performed better with mild-tempo music (Deutsch).

Barney and Prusak (2015) took this idea one step further and studied the effects of music throughout PE classes on activity rates and activity time. With 115 students in grades three through five, it was found that music significantly increased activity rates (measured by step counts on a pedometer) and time in activity. This was true for both low intensity (walking) and high intensity (Frisbee) lessons but the effect was significantly greater in the higher intensity activity than the lower intensity activity (Barney and Prusak). In an unpublished thesis, Benham (2014) found similar results with junior high students taking part in volleyball and basketball activities. Eight PE classes at a public junior high school (four male classes n = 151, four female classes n = 154) took part in the study. Two male and two female classes were taught a basketball lesson with music while the other classes were taught the same lessons without music.

Then the classes that had no music in basketball were taught a volleyball lesson with music while those with music during basketball received the same volleyball lesson with no music. For both basketball and volleyball, the presence of music increased student step counts (as measured by pedometer), time in activity, and level of enjoyment. Barney, Prusak, and Benham (2015 in press) found similar results once again in college PE basketball classes. Music with 120 to160 beats per minute was played during game play of two out of four intermediate basketball classes having 106 participants (102 male, 4 female). Students in classes with music took significantly more steps and spent more time in activity as measured by pedometers (Barney et al.). The only age group that had not been studied for a change in activity levels with the distraction of music was high school aged students. No studies had been done using video as a distraction in the school PE setting.

Borg's RPE scale

A common way to measure a participant's perception of their own exercise intensity is by using the RPE scale. Gunnar Borg developed the RPE scale in 1962 while working at Lund University in Sweden. Borg noted that there was no good way to compare exercise perceptions between different individuals; a person could be compared to themselves but there was no standard to help compare one person's perceived intensity to another (Borg, 1962). It was also noted that people's own perception of their working capacity often differed from their objective working capacity (Borg, 1973). As a result Borg developed a rating scale with 21 numbers with every odd number grounded with a word description (e.g., extremely laborious, rather light) and asked participants to rate their level of exertion on this scale. Borg found that participants' perception of their own exertion was positively correlated with their maximal working capacity ($r = .42$) and strongly correlated with HR ($r = .85$) (Borg, 1962). Through further studies, the scale was reduced to 15 numbers (6 to 20) with similar grounding words (e.g., light, very hard). It was designed so that intensity increased linearly and factored in the ratio-scaling expansion of perceived intensity by a 1.6 exponent (Borg, 1982). Borg also compared his 6 to 20 rating scale with other perceived exertion scales (i.e., one to 21 scale, line scale, one to nine scale) and found that the 6 to 20 scale had the strongest correlation with participants' HR (Borg, 1973). RPE ratings could also be used to specify a specific HR range; an RPE of 6 was roughly equivalent to a HR of 60 beats per minute, an RPE of 17 was roughly equivalent to a HR of 170. While the original RPE scale was developed some time ago, it has continued to be used widely since that time and is viewed as the standard measurement of perceived exertion, as seen in studies referenced previously in this paper (i.e., Barwood, et al., 2009; Boutcher & Trenske, 1990; Dyrlund & Wininger, 2008; Kukuwich, 1997; Nethery, 2002; Nethery et al., 1991; Russell, et al., 2003; Viteri, 1994).

Summary

The activity rates of many Americans are below recommended levels for health benefits (Centers for Disease Control and Prevention, 2014b). These rates could potentially be improved by increasing a person's motivation and self-determination for participation in exercise activities. Self-determination theory proposes that those who are more intrinsically motivated persist longer in that activity (Deci et al., 1991; Pelletier et al., 2001). One possible way to increase a person's motivation for exercise is giving them a distraction to lessen the person's conscious attention to the uncomfortable or unpleasant symptoms associated with exercise. Music has often been used as an exercise distraction, and has been shown to increase enjoyment (Dyrlund & Wininger, 2008) and lower participants' perception of exertion, as measured by RPE, at the same intensity (Boutcher & Trenske, 1990). Video has also been used in a few cases as a distraction during exercise with various results; those without sound during videos showed no significant difference from control groups (Nethery, 2002; Nethery et al., 1991), yet those with the choice of television stations had longer exercise sessions and greater persistence over the course of 14 weeks (Annesi, 2001). A hole in the current body of research was that few studies with distraction, video in particular, had been done with youth populations or in public school settings.

Chapter 3

Methods

This study took place at a public high school, grades 10 through 12, in a state in the Intermountain west. School district, principal and university approval was gained before beginning this study (see Appendix A for consent and assent forms and Appendix B for the letter to the principal). The classes participating in the study followed a script provided by the researcher (see Appendix C for a copy of the lesson script); all data collection portions of the lesson were directed and given by the researcher while student teachers were present. The remaining portion of female classes were all taught by the same female student teacher under the supervision of a teacher with more than 15 years of experience teaching PE in the public schools. Male classes were taught by the same male student teacher under the supervision of a teacher with more than 15 years of experience. The researcher was present during each session and was the voice for the lesson script. The high school functioned on an A/B block schedule, meaning that 70 to 85 minute PE classes were taught every other day. The data were collected during the six-day, three-week indoor cycling unit of a 16-week PE class. The cycling unit was made up of a 25-minute cycling segment followed by a segment of different physical activity for the rest of class time. Twenty-five minutes was chosen to allow the teacher time at the beginning and end of class for dress time, regular class announcements, and procedures while still being able to have students participate in two activities of similar length during the class. Twenty-five minutes also gave participants a 5-minute warm-up period followed by 20 minutes of cycling. 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.

Cycling lessons (5-minute warm up and 20-minute ride) were intentionally created with no change in speed or resistance. There was no instruction given about the ride once the 20 minutes had begun. This was done in order to isolate the effects of the distractions from changes due to workout structure. It was also thought to be similar to the setup of many fitness centers frequented by adults that use televisions or personal music players near cardio and weight lifting equipment with no instruction given to patrons about how they exercise.

The cycling unit took place in the school's indoor bicycle classroom with the alternate activity in a neighboring gymnasium. There were 37 bicycles (Sunlite F5 Trainer Cycle) arranged to face the instructor's bike, which was off to one side 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 and the music playlist was played over a sound system. A paper copy of the modified RPE scale was posted at the front of the room, to the left side of where the movie was projected. A copy of the enjoyment Likert scale was displayed at the front of the room, to the right side of where the movie was projected. HR monitor data and question prompts were projected at a 90 degree angle from the front of the room on a blank classroom sidewall. This enabled the researcher to see when students turned their heads to the side to look at the HR data and were not focused on the treatment condition they were experiencing.

Participants

All participants were informed of the procedures of this study and of their right to stop participating in this study at any time without incurring negative consequences of any kind. Consent and assent forms were collected from students in the classes included in this study and from their parents (see Appendix A). Those students who did not volunteer to participate were still riding a stationary bike during this time as part of their normal participation in PE class but no data were collected. Of the six classes included in the study, four consisted of entirely females, ages 15 to18, and two were entirely males, ages 15 to 18. PE class sizes averaged 25 students with one teacher, for a sample size of 171 students, 46 male and 125 female. The school was 79.8% White, 15.6% Hispanic, and 4.6% other ethnicities (Asian, Black, Indian, and Pacific Islander) (USA school info, 2013). Thirty percent (30.12) of students at the school received free or reduced price lunch (Utah State Office of Education, 2013).

Data Sources

Handheld devices called iClickers™ were used to collect student responses for several dependent variables (i.e., RPE, level of enjoyment, intention to persist, level of distraction). 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. Questions were put into the software beforehand. When the person running the software made the question available for answering, students were able to push 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 the collection of data in real time as opposed to a summary rating at the end of the exercise session. Real time responses gave more data and information about how participants perceived the exercise at different points during the exercise session. It was also believed that intermittent responses would be a more holistic representation of student responses than a single summative score at the end of a cycling session. Several other studies have also been done using intermittent RPE collection at every 1.5 minutes (Boutcher &Trenske, 1990), every 2 minutes (Barwood et al., 2009), every 5 minutes (Nethery et al., 1991; Nethery, 2002, Russell et al. 2003), or every 10 minutes (Dyrlund and Wininger, 2008); enjoyment has not yet been collected intermittently.

Heart rate. Heart rate (HR) telemetry was monitored using Polar H7 Bluetooth monitors. This model sent the information from the chest band of every student to the Polar Go Fit app (Polar, 2015) installed on an instructor's iPad via Bluetooth. HR monitors have been validated as an accurate way to measure HR in children (Treiber et al., 1989). The specific model used in this study had no validation in youth but a similar model made by the same company had been validated as an accurate measure of HR in adult males aged 22 to 31 years (Weippert et al., 2010); the difference being that the HR for this study was transmitted via Bluetooth to a smart device instead of being transmitted to a wristwatch display.

Rating of perceived exertion. Rating of perceived exertion (RPE) was reported using a modified Borg's scale of one to five condensed from the original 6-20 (Borg, 1982). The original scale has been used in a variety of age groups and settings (e.g., Barwood et al., 2009; Boutcher & Trenske, 1990; Dyrlund & Wininger, 2008; Nethery, 2002; Russell et al., 2003) and validated with high correlations to HR (Borg, 1982). The scale has words such as "very light" or "very, very hard" to help users choose at which level of intensity they are working. 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, E (5): very, very hard. Researchers felt that this modification of the scale was possible because while each number on the original scale is different, the differences are of equal ratio between numbers (Borg, 1982) and differences should be small between consecutive rating numbers. Also, each individual number on the original scale is not given its own word clarification. These clarifications come every two or three rating numbers, which led the researchers to believe that the numbers could be compressed and retain similar word clarifications. See Appendix E for the original Borg scale and the modified scale used for reporting in this study.

Enjoyment. Levels of enjoyment were collected using a Likert scale question also using the iClickers™. The question was, “On a scale of 1-5, 1 (A) I hate it, 2 (B) I don’t like it, 3 (C) I don’t care either way, 4 (D) I like it, 5 (E) I love it, how much are you enjoying the activity right now?” (Benham, 2014).

Level of distraction. Level of distraction was measured using a Likert scale question, with responses collected by iClickers™. The questions was, “On a scale of 1-5, 1 (A) not at all, 2 (B) a small amount, 3 (C) a medium amount, 4 (D) a large amount, 5 (E) completely, how much did the video/music take your mind off the exercise today?”

Intention to persist. To assess participants’ intention to persist in the activity, at the end of each cycling segment students were asked a yes or no question, “If you had the option to continue cycling would you choose to keep cycling today?” and responded (A) yes, (B) no, with the iClickers™.

Motivation. Students completed a situational motivation scale (SIMS; see Appendix D). This scale consists of 16 questions, four items for each of four subscales: amotivation, external regulation, identified regulation, intrinsic motivation. This scale has been validated and shown to be reliable with youth populations across grades, actions, and under experimental conditions (Standage, Treasure, Duda, & Prusak, 2003). The survey consists of the stem “Why are you currently engaged in this cycling activity?” and asks students to rate their level of agreement on a scale of one to seven with each reason listed (e.g., “Because I think that this cycling activity is interesting”, “I don’t know. I don’t see what this cycling activity brings me.”). The mean of the four questions pertaining to each category were the subscale scores for each person. The subscale scores were then put into a weighted equation to find an overall Self-Determination Index (SDI, SDI = -2 (amotivation) + -1 (external regulation) +1 (identified regulation) +2 (intrinsic motivation)).

Design

Since students were members of intact classes, this study used a quasi-experimental design. However, individual classes were randomly assigned to either the control (no distraction) or treatment (music/video distraction) group. Thus, this was a two groups (distraction and no distraction) by two genders (male or female) by three conditions (no distraction, music-, and video-distraction) design.

Procedures

A pilot test with 10 students was conducted while students wore HR monitors and rode stationary bikes. The purpose of the test was to discover how easy it was for students to locate their HR data when they were projected on the side wall, and how long this process took. This information helped inform the amount of instructional time needed for how to find individual HR data with the whole class during the study.

Six intact classes were randomly assigned to two groups, control and treatment, such that two all-female and one all-male classes were in each of the two groups. The cycling unit was every other day, either Tuesday and Thursday or Wednesday and Friday for three weeks, or a total of six days. The treatment group received two days of no distraction, two days of music, and two days of video. The control group experienced no distraction for all six days of the study.

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 two years. All lyrics for songs put on the list were read by the researcher to ensure they were school appropriate. The list of songs and five popular videos already approved, and used previously, by the classroom teachers for use in school were placed on a survey. Students were instructed to mark their top five songs they would prefer to listen to and their top two movies 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 from the songs and movies given on the survey, so two playlists were created and different movies were shown to each gender. Movies were shown in the order of student choice; on Day 5, 25 minutes of the most preferred movies (males: *Shrek* (Katzenberg, 2001), females: *High School Musical* (Schain, 2006)) were shown and on Day 6 the second most preferred movies (males: *Remember the Titans* (Bruckheimer, 2000), females: *Tangled* (Conli, 2010)) were shown.

The classroom teacher was already familiar with Borg's RPE scale, and had taught her students to use the scale regularly during class. The researcher also instructed the students on how to use the modified scale to ensure proper procedures were being followed. The students had been previously taught by their teacher how to properly put on HR monitors, and had worn them during a variety of activities throughout the semester-long class. Students had also calculated their individual max HR in class, and had put their own information into the HR monitor software so that the software could display the HR ranges. The researcher reviewed the proper techniques of wearing the HR monitors before beginning the study.

Data from each source was matched to the participant, and the same HR monitor and iClicker™ were used by the same participant during each session. After the data were matched, the names of participants were removed. Only the researcher and classroom teacher knew the participant name associated with each set of data to protect confidentiality.

Daily procedures. At the beginning of each class, students dressed out and put on their assigned HR monitor; they also collected their assigned iClicker™. At the beginning of the cycling segment of class, students were told which treatment condition they would experience that day and instructed to maintain a HR of 70 to 79% of their max HR. They were not given further instruction on what speed to pedal, how much resistance to use, or whether to sit or stand; only to ride how they desired in order to maintain the specified HR. Seventy to 79% max HR was chosen because the text-book used by these PE classes, *Fitness for Life* by Corbin and Lindsey (2007), teaches students that their target HR zone for achieving moderate and vigorous physical activity is 65 to 90% of their max HR (Corbin and Lindsey, 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 on the Polar Go Fit app (Polar, 2015) so students were able to check if they had the correct HR quickly, and easily. When student HRs were below 60% of their max HR the background color of their HR display boxes were shown as gray, 60 to 69% were shown as blue, 70 to 79% were shown as green, 80 to 89% were shown as yellow, and above 90% were magenta.

During each 25-minute cycling session, level of enjoyment and RPE were measured every five minutes. The visual prompts for questions were made into posters that were hung on the front wall to either side of the where the movie was projected. Students used their iClicker™

to select a response to each question; responses were collected on a laptop. Students 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, E (5): very, very hard. Similarly, students were also asked, “On a scale of 1-5, 1 (A) I hate it, 2 (B) I don’t like it, 3 (C) I don’t care either way, 4 (D) I like it, 5 (E) I love it, how much are you enjoying the activity right now?” HR monitor data were shown on the side wall at a 90 degree angle to the front of the bikes and the movie projection.

Through use of the Polar GoFit app (Polar, 2015) installed on an iPad connected to a projector, students were able to see their HR data at all times but were instructed to glance at it only occasionally while paying attention to the music or films. The app showed a grid of HRs, in order by student number, so that 36 student HRs could be seen at the same time (see Figure 1). All student information was displayed at once, so it was possible if students knew their classmate’s student number they would know how their classmate was riding at the moment. There were also two classes where the classroom teacher decided to display information by student name instead of by number. This identification of other students could potentially have impacted how students rode. Data shown in each student’s box were student number or name and accumulated seconds spent with a HR of 70% or higher during the session, and each student box also changed color based on the percent HR. A circle on the left side of each student’s box changed from a stop watch to a circled green check mark when student’s HR was above 70% of their max HR.

The researcher took field notes and recorded student comments during the session. As a manipulation check to see if students understood which treatment they had experienced that day, at the end of each cycling session, students were asked, “Which treatment condition did you experience today: (A) no distraction, (B) listening to music, or (C) watching a movie?" At the end of each cycling session students were asked two questions; "On a scale of 1-5, 1 (A) not at all, 2 (B) a small amount, 3 (C) a medium amount, 4 (D) a large amount, 5 (E) completely, how much did the video/music take your mind off the exercise today?" and "If you had the option to continue cycling today would you continue cycling?, (A) yes, (B) no" and responded with their iClickers^{TM}.

At the end of each condition, after the second cycling segment of the week, participants completed a paper copy of the SIMS survey. Students completed this survey a total of three times, at the end of the second, fourth, and sixth day of cycling. This survey was passed out and collected by the researcher or student teacher before students moved on to the other segment of their class.

Figure 1. Student HR monitor display.

Data Analysis

Descriptive statistics (e.g., means, standard deviation) were calculated for all response variables. A correlational analysis was run to discover the association of HR telemetry with RPE. The SIMS survey was analyzed to find subscale means of respective questions and an overall SDI. A correlational analysis to assess the simplex pattern to check that the theoretically predicted relationships hold true for our data, namely that intrinsic motivation and amotivation are negatively related and that amotivation and external regulation are more closely positively correlated with each other than they are with the other two subcategories. Cronbach's alpha was also calculated to make sure that each question loaded correctly onto the subcategory it was designed to measure with $\alpha \geq .7$ (Nunnally, 1978). Correlational analysis also examined for strength and direction of correlations between all variables of interest. A Repeated Measures Analysis of Variance (RM ANOVA) was run to analyze the data in 2(groups) by 2(genders) by 3(conditions). Post hoc comparisons were conducted in areas where there was a significant omnibus test using Tukey's honestly significant difference to check any differences found during a RM ANOVA.

Chapter 4

Results

The purpose of this study was to measure the effects of distractions on high school students' HR, RPE, enjoyment, and level of motivation while they rode an indoor stationary bike. The original sample of 171 participants was reduced to 81 (58 female, 23 male; 46 control, 35 treatment) due to attrition (participant school absences, non-participation because of not wearing proper clothing to class, failure to turn in a survey though present, or medical conditions – e.g., walking pneumonia, knee injury). The remaining 81 were those who were present on all days of data collection and had less than five percent of their responses missing. Missing RPE and level of enjoyment data were imputed. If, on a day of data collection, the participant responded with their RPE or level of enjoyment at three of the times but not all four (5, 10, 15, and 20 minutes), 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 minutes) 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. The same procedure was used for missing data points on the SIMS survey. If one point of data was missing from a subscale (amotivation, external regulation, identified regulation, or intrinsic motivation) the other three data points of the subscale were averaged and the average was used in place of the missing data point. If students were missing more than two of the four data points in any category they were not included in that analysis.

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 minutes; Day 2: 5, 10, 15, and 20 minutes) were used in the average. Condition 1 consisted of Days 1 and 2, Condition 2 consisted of Days 3 and 4, and Condition 3 consisted of Days 5 and 6.

Cronbach's alpha ($\alpha \geq .7$, Nunnally, 1978) was used to test that all questions that were intended to measure each subscale item of the SIMS survey were related to the desired subscale. All questions measured as they were designed (see Table 1). The responses to the four questions in a subscale were then averaged to get an overall subscale score. A correlation table also showed that the SIMS subscale scores followed a simplex pattern; such that intrinsic motivation and identified regulation were positively correlated with one another but negatively correlated with amotivation and external regulation, and amotivation and external regulation were positively correlated with one another but negatively with identified regulation and intrinsic motivation (see Table 2). Resultant subscale scores were used to compute a self-determination index (SDI) score for each time the SIMS survey was administered (SDI = -2 (amotivation) + -1 (external regulation) +1 (identified regulation) +2 (intrinsic motivation)).

Table 1

Cronbach's Alpha Levels of Each Subscale for Each Time the SIMS Survey was Administered

Subscale	SIMS at time 1	SIMS at time 2	SIMS at time 3
Intrinsic Motivation	.872	.876	.908
Identified Regulation	.819	.861	.889
External Regulation	.828	.890	.920
Amotivation	.762	.760	.840

IBM SPSS Statistical Package 22.0 (2013) was used for statistical analyses. Participant mean age was 15.86 (*SD* .839), mean self-reported height was 66.59 inches (*SD* 4.22), and mean self-reported weight was 139.46 pounds (*SD* 33.83). An independent samples *t* test found that mean age, weight, and height were not significantly different between control and treatment groups.

Table 2

Correlations Between SIMS Surveys Given at the End of Each Condition

		SIMS at time 1				SIMS at time 2				SIMS at time 3		
SIMS		IM	IR	ER	AM	IM	IR	ER	AM	IM	IR	ER
Time 1	IR	.793										
	ER	-.569	-.491									
	AM	-.390	-.437	.566								
Time 2	IM	.750	.741	-.570	-.494							
	IR	.581	.783	-.480	-.464	.846						
	ER	-.706	-.541	.773	.534	-.673	-.570					
	AM	-.465	-.459	.534	.742	-.518	-.503	.621				
Time 3	IM	.671	.688	-.563	-.351	.843	.772	-.669	-.520			
	IR	.532	.683	-.374	-.357	.739	.807	-.466	-.527	.862		
	ER	-.536	-.412	.677	.386	-.630	-.509	.763	.578	-.574	-.407	
	AM	-.223	-.167	.381	.533	-.355	-.334	.489	.623	-.393	-.372	.613

Note. IM = intrinsic motivation, IR = identified regulation, ER = external regulation, AM = amotivation. All correlations were significant at the .01 level.

Independent sample *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, level of enjoyment, intrinsic motivation, identified regulation, external regulation, or amotivation (see Table 3); indicating that no initial differences existed nor needed to be controlled for. 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), and significantly lower amotivation scores ($t(78)$= -2.29, p = .025) (see Table 4). Due to small numbers in each group after attrition there was 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 3

Independent t-test Between Control and Treatment Groups During Condition 1

Variable	Control			Treatment					
	N	*M*	*SD*	N	*M*	*SD*	*t*	*df*	*p*
RPE	44	3.22	.79	35	3.52	.68	-1.75	77	.084
HR	44	72.46	4.97	33	72.78	3.94	-.31	75	.761
Level of enjoyment	45	2.44	1.01	35	2.42	.96	.10	78	.918
Intrinsic motivation	44	3.35	1.48	35	3.27	1.34	.25	77	.806
Identified regulation	45	3.94	1.34	35	4.21	1.26	-.92	78	.361
External regulation	45	4.57	1.62	35	4.85	1.39	-.81	78	.421
Amotivation	45	2.88	1.14	35	3.07	1.21	-.71	78	.479

Table 4

Independent t-test Between Genders During Condition 1

Variable	Female			Male					
	N	*M*	*SD*	N	*M*	*SD*	*t*	*df*	*p*
RPE	57	3.47	.76	22	3.06	.69	2.24	77	.028*
HR	56	73.32	4.18	21	70.68	4.97	2.35	78	.022*
Level of enjoyment	58	2.44	1.00	22	2.41	.96	.11	75	.913
Intrinsic motivation	57	3.45	1.43	22	3.00	1.36	1.27	77	.210
Identified regulation	57	4.17	1.30	23	3.79	1.30	1.18	78	.242
External regulation	57	4.58	1.59	23	1.33	1.33	-1.06	78	.291
Amotivation	57	2.78	1.10	23	3.42	1.23	-2.29	78	.025*

* $p < .05$

Heart Rate

Repeated Measures ANOVA and post-hoc test Tukey's Honestly Significant Difference (HSD_{Tukey}) show a significant decrease in average HR for both treatment groups and both genders between Conditions 1 and 3 (Treatment: $HSD_{\text{Tukey}} = 8.68$, $p < .05$; Control: $HSD_{\text{Tukey}} = 7.27$, $p < .05$; Female: $HSD_{\text{Tukey}} = 6.36$, $p < .05$; Male: $HSD_{\text{Tukey}} = 12.37$, $p < .05$), and between

Conditions 2 and 3 (Treatment: $HSD_{\text{Tukey}} = 9.32$, $p < .05$; Control: $HSD_{\text{Tukey}} = 6.06$, $p < .05$; Female: $HSD_{\text{Tukey}} = 5.82$, $p < .05$; Male: $HSD_{\text{Tukey}} = 12.22$, $p < .05$). Condition 3, when participants were watching a movie, had significantly lower HRs than when students had no distraction or were listening to music (see Figure 2). There was no difference in HR between no distraction and listening to music for any group. These differences are true for both control and treatment groups, and females and males. Males had a significantly lower HR than females during Condition 3 while watching a movie ($HSD_{\text{Tukey}} = 8.52$, $p < .05$) (see Figure 3).

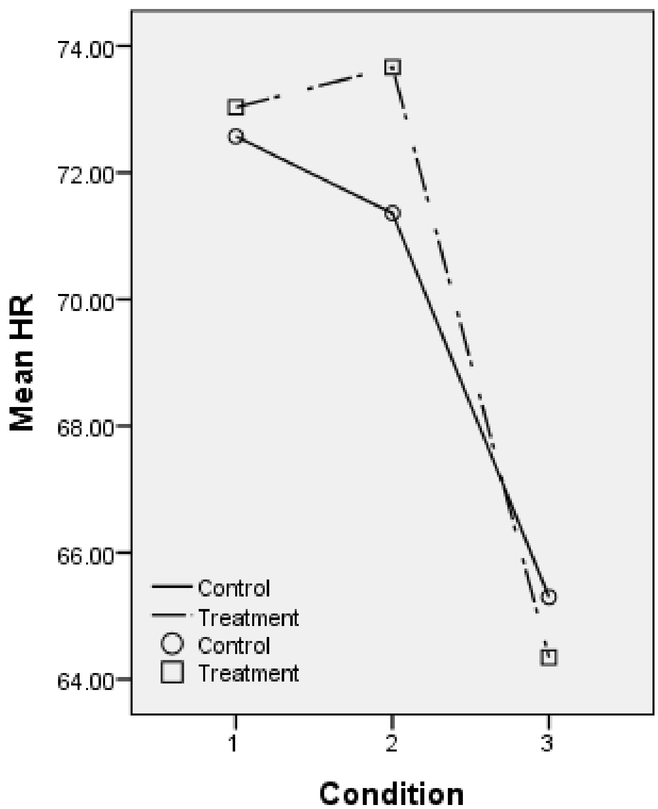

Figure 2. Mean HR for each condition by treatment groups.
Both control and treatment groups were significantly different, at the $p < .05$ level, between Condition 1 and 3, and Condition 2 and 3.

Rating of Perceived Exertion

RPE followed a similar pattern to HR in that Condition 3 was significantly lower for both treatment groups than Condition 1 (Control: $HSD_{\text{Tukey}} = .29$, $p < .05$; Treatment: $HSD_{\text{Tukey}} = .54$, $p < .05$) and Condition 2 (Control: $HSD_{\text{Tukey}} = .23$, $p < .05$; Treatment: $HSD_{\text{Tukey}} = .33$, $p < .05$) (see Figure 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: $HSD_{\text{Tukey}} = .43$, $p < .05$; Condition 2: $HSD_{\text{Tukey}} = .73$, $p < .05$; Condition 3: $HSD_{\text{Tukey}} = .89$, $p < .05$). Additionally, male's RPE significantly decreased with each condition; Condition 2 was lower than Condition 1 ($HSD_{\text{Tukey}} = .34$, $p < .05$) and Condition 3 was significantly lower than both Condition 1($HSD_{\text{Tukey}} = .72$, $p < .05$) and Condition 2 ($HSD_{\text{Tukey}} = .38$, $p < .05$). Female's Condition 3 was significantly lower than both Condition 1 ($HSD_{\text{Tukey}} = .26$, $p < .05$) and Condition 2 ($HSD_{\text{Tukey}} = .22$, $p < .05$), but Condition 2, music, was not significantly different than Condition 1, no distraction (see Figure 5).

Level of Enjoyment

A RM ANOVA omnibus test showed no significant difference in level of enjoyment between any conditions for either control or treatment groups, or females and males. No further analysis was completed.

Level of Distraction

When participants were given music (Condition 2) or a movie (Condition 3) as an attentional distraction, students in the treatment group were asked how much of their attention was taken from their exercise and given to the distraction. An RM ANOVA reported that participants found movies significantly more distracting than music (Wilk's Lamda = .438, $p < .01$, Cohen's d = -1.01). This was true for males ($HSD_{\text{Tukey}} = .83$, $p < .05$) and females (HSD_{Tukey}

= .65, $p < .05$) (see Table 5). There was no significant difference between the amount students were distracted between the first or second days of each type of distraction, music or movies. However, the results indicate that females were more distracted by music the second day, though not significantly, while the males' level of distraction did not significantly change during music. When movies were played as a distraction, females were more distracted during the first day and males more distracted the second day, though neither difference was significant (see Table 5).

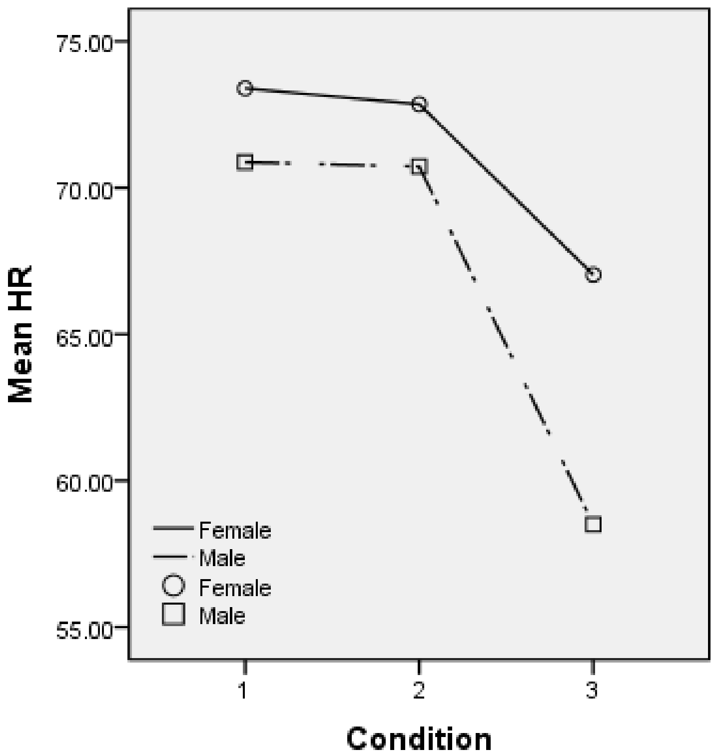

Figure 3. Mean HR for each condition by gender.
Both females and males were significantly different, at the $p < .05$ level, between Condition 1 and 3, and Condition 2 and 3. Females were significantly different from males at the $p < .05$ level during Condition 3.

Intention to Persist

McNemar Chi Square tests were used to evaluate if the percentage of students who indicated they would continue cycling if given the option changed from day to day (see Appendix F for the macro used in this calculation). It was found that for the control group there was no significant difference between any of the six days data were collected. For the treatment group, Day 3, the first day with music, had a significantly greater percentage of students indicate yes they would continue than on Days 2 (Chi square = 7.0, $p < .01$) or 4 (Chi Square = 4.5, $p = .03$). There was no other significant difference found between Day 3 and Days 1, 5, or 6; or between any other days. A male and female comparison was not made because males and females were part of both control and treatment groups and differences between treatment groups were the focus of this question (see Table 6).

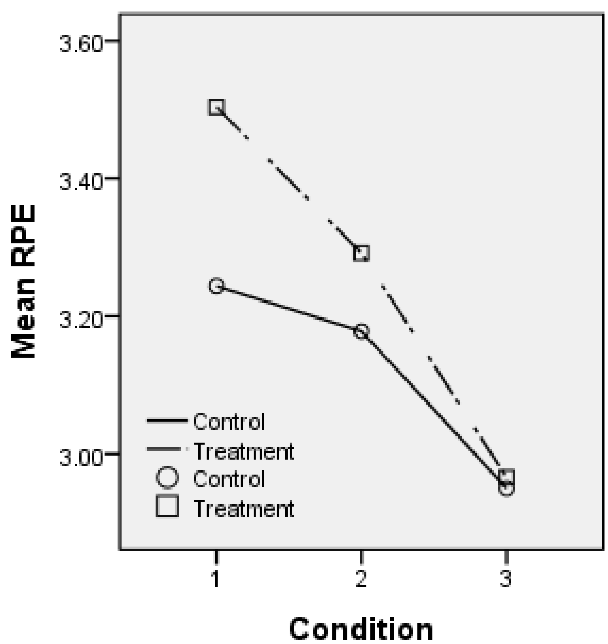

Figure 4. Mean RPE for each condition by treatment groups.
The control and treatment groups were significantly different, at the $p < .05$ level, between Condition 1 and 3, and Condition 2 and 3.

Self-Determination Index and Subscale Scores

An RM ANOVA and post hoc tests showed no significant difference between SDI scores for control and treatment groups (see Table 7). However, a gender effect was noted with males exhibiting a significantly lower SDI score during both Condition 2 ($HSD_{\text{Tukey}} = 7.5$, $p < .05$) and Condition 3 ($HSD_{\text{Tukey}} = 7.89$, $p < .05$). Males also had significantly lower SDI scores during

Condition 2 ($HSD_{Tukey} = 2$, $p < .05$) and 3 ($HSD_{Tukey} = 3.37$, $p < .05$) than they had in Condition 1. Females scored significantly higher in intrinsic motivation during all three conditions than males (Condition 1: $HSD_{Tukey} = .66$, $p < .05$; Condition 2: $HSD_{Tukey} = 1.22$, $p < .05$; Condition 3: $HSD_{Tukey} = 1.32$, $p < .05$). Males had significantly higher intrinsic motivation during Condition 1 than Condition 2 ($HSD_{Tukey} = .4$, $p < .05$) or 3 ($HSD_{Tukey} = .78$, $p < .05$), and in Condition 2 than Condition 3 ($HSD_{Tukey} = .38$, $p < .05$) (see Figure 6). The control group was significantly less intrinsically motivated during Condition 3 than Condition 1 ($HSD_{Tukey} = .38$, $p < .05$). The treatment group was significantly more intrinsically motivated during Condition 2, with music, then during Condition 3, with movies ($HSD_{Tukey} = .33$, $p < .05$). There was no significant difference in intrinsic motivation between control and treatment groups (see Figure 7).

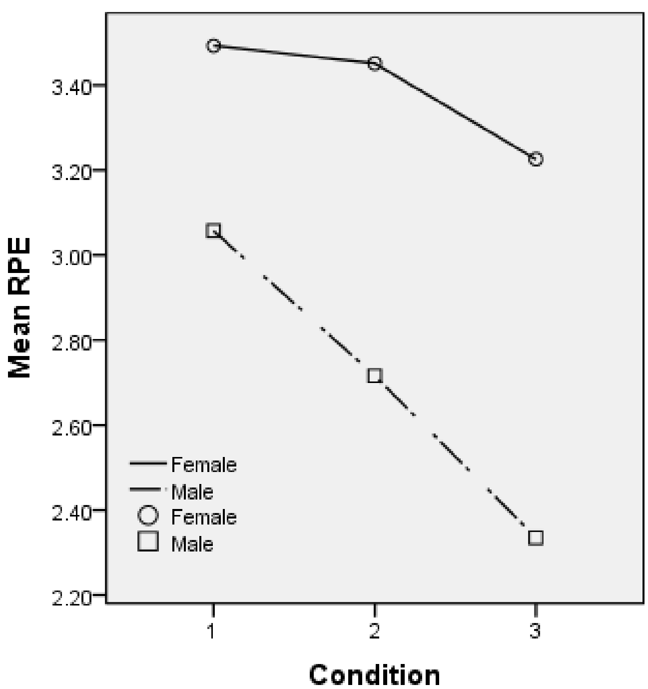

Figure 5. Mean RPE for each condition by gender.
All between gender differences were significant at the $p < .05$ level. All within gender differences were significant at the $p < .05$ level, with the exception of females between Condition 1 and 2.

Table 5

Level of Distraction During Conditions Two (music) and Three (movies) for Males and Females

	Female			Male			Wilk's		Observed
	N	*M*	*SD*	N	*M*	*SD*	Lambda	*p*	Power
Day 3	20	2.90	.718	13	3.31	.751			
Day 4	20	3.10	.718	13	3.31	.751	.992	.626	.106
Day 5	20	3.75	.967	13	4.00	1.155			
Day 6	20	3.55	.826	13	4.38	.768	.992	.626	.077
Condition 2	20	3.00	.628	12	3.29	.620			
Condition 3	20	3.65	.823	12	4.17	.718	.438	.000*	1.00

* $p < .01$

Table 6

Number of Students who Responded "Yes, I would continue to cycle," or "No, I would not continue" for each Day of Data Collection

	Control				Treatment				Total			
Day	Yes		No		Yes		No		Yes		No	
1	14	31.1	31	68.9	12	34.3	23	65.7	26	32.5	54	67.5
2	12	30.0	28	70.0	6	17.6	28	82.4	18	24.3	56	75.7
3	7	16.7	35	83.3	13*	37.1*	22*	62.9*	20	26.0	57	74
4	11	24.4	33	73.3	6	17.6	26	76.5	17	21.5	59	74.7
5	9	20.9	33	76.7	14	41.2	19	55.9	23	29.9	52	67.5
6	12	27.9	31	72.1	11	32.4	21	67.6	23	29.9	54	70.1

Note. The first number represents the number of students who responded, the second number is the valid percent for each response, yes or no. The valid percent for each day will not always add to 100 as some participants responded with C, D, or E that were not intended as possible responses. * denotes the day that was significantly different ($p < .05$) in the percent that answered "yes" from the day before and after.

Females had significantly higher identified regulation during Conditions 2 ($HSD_{\text{Tukey}} = 1.23$, $p < .05$) and 3 ($HSD_{\text{Tukey}} = 1.31$, $p < .05$) than males. Males' identified regulation was significantly lower during Condition 3 than either Condition 1 ($HSD_{\text{Tukey}} = .88$, $p < .05$) or 2

(HSD_{Tukey} = .46, $p < .05$); females' Condition 3 identified regulation was significantly lower than only Condition 2 (HSD_{Tukey} = .38, $p < .05$) (see Figure 8). Both control (HSD_{Tukey} = .35, $p < .05$) and treatment (HSD_{Tukey} = .45, $p < .05$) groups showed significantly lower levels of identified regulation during Condition 3 than Condition 1. The treatment group Condition 3 was also significantly lower than Condition 2 (HSD_{Tukey} = .45, $p < .05$) (see Figure 9). For all groups, control, treatment, female and male, there were no significant differences between conditions in external regulation or amotivation.

Table 7

N, Means, and Standard Deviations for SIMS Survey Scores for Females, Males, Control, and Treatment Groups During each Condition

	Female			Male			Control			Treatment		
	N	*M*	*SD*	N	*M*	*SD*	N	*M*	*SD*	N	*M*	*SD*
						Condition 1						
SDI	47	1.45	6.68	18	-3.14	5.21	33	.64	7.09	32	-.30	6.14
IM	47	3.52	1.44	18	2.86	1.34	33	3.42	1.52	32	3.25	1.36
IR	47	4.26	1.28	20	3.63	1.29	35	3.99	1.34	32	4.16	1.28
ER	47	4.44	1.58	20	5.04	1.42	35	4.34	1.63	32	4.93	1.41
AM	47	2.71	1.09	20	3.41	1.25	35	2.83	1.14	32	3.02	1.23
						Condition 2						
SDI	47	2.36	6.45	18	-5.14	5.42	33	.91	7.03	32	-.37	7.03
IM	47	3.68	1.19	18	2.46	1.22	33	3.32	1.37	32	3.36	1.27
IR	47	4.44	1.35	20	3.21	1.29	35	3.99	1.43	32	4.16	1.46
ER	47	4.16	1.74	20	5.09	1.64	35	4.03	1.67	32	4.89	1.74
AM	47	2.63	1.17	20	3.74	.99	35	2.76	1.18	32	3.18	1.25
						Condition 3						
SDI	47	1.38	6.57	18	-6.51	6.82	33	-.70	8.14	32	-.91	6.88
IM	47	3.40	1.34	18	2.08	1.19	33	3.04	1.44	32	3.03	1.42
IR	47	4.06	1.37	20	2.75	1.69	35	3.64	1.55	32	3.71	1.64
ER	47	4.30	1.94	20	5.44	1.83	35	4.57	2.09	32	4.71	1.86
AM	47	2.59	1.19	20	3.59	1.69	35	2.80	1.43	32	2.98	1.42

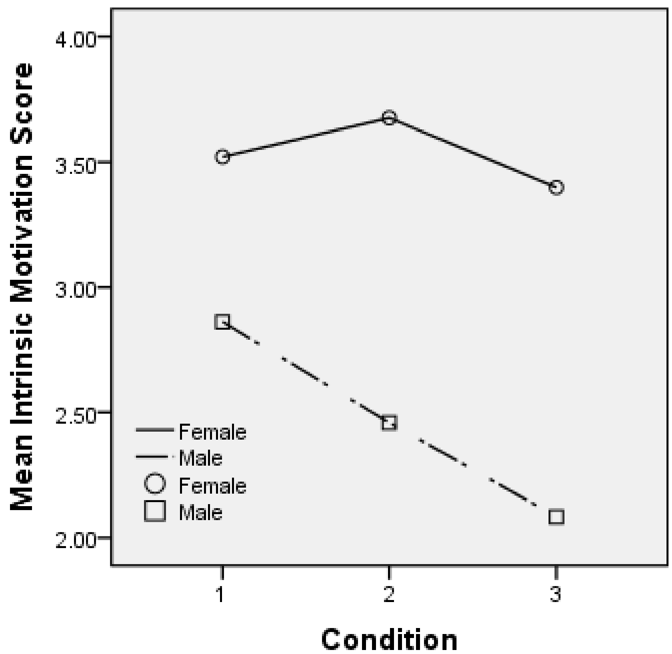

Figure 6. Mean intrinsic motivation scores for each condition by gender.
Males were significantly different from females, at the $p < .05$ level, during each condition. Males were also significantly different between Conditions 1, 2, and 3 at the $p < .05$ level.

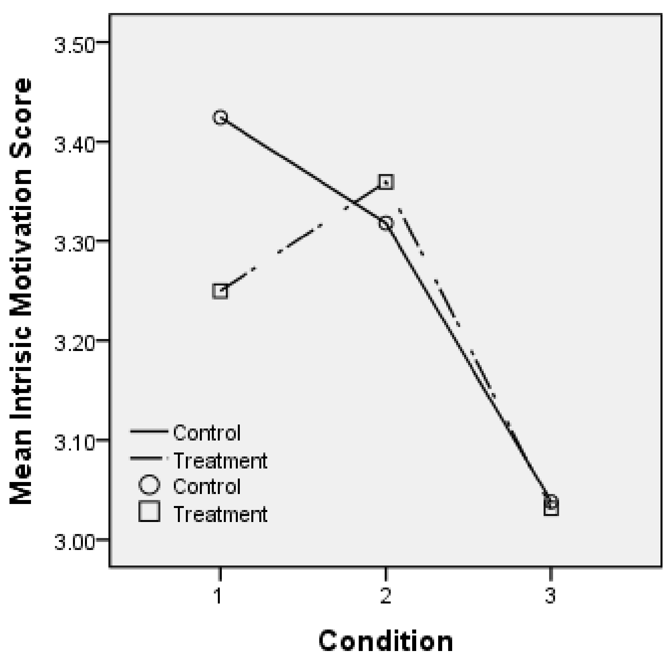

Figure 7. Mean intrinsic motivation scores by treatment group.
The control group was significantly different, at the $p < .05$ level, between Condition 1 and 3. The treatment group was significantly different, at the $p < .05$ level, between Condition 2 and 3.

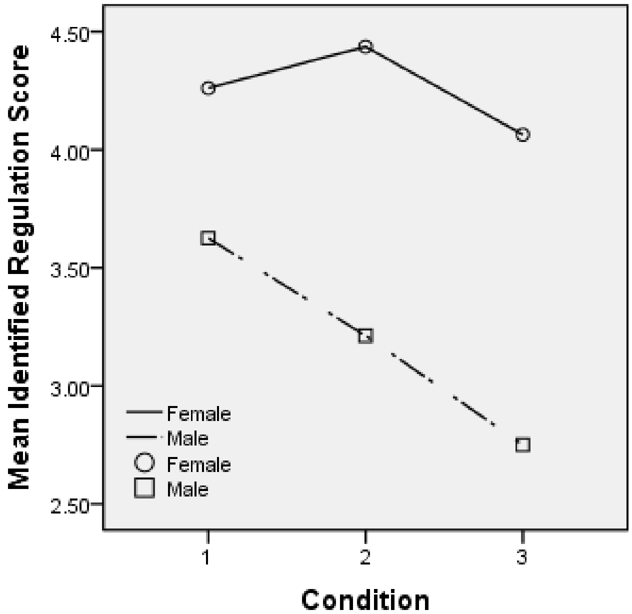

Figure 8. Mean identified regulation scores by gender.
Females were significantly different, at the $p < .05$ level, between Condition 2 and 3. Males were significantly different, at the $p < .05$ level, between Conditions 1, 2, and 3. Females and males were significantly different during Condition 2 and 3 at the $p <.05$ level.

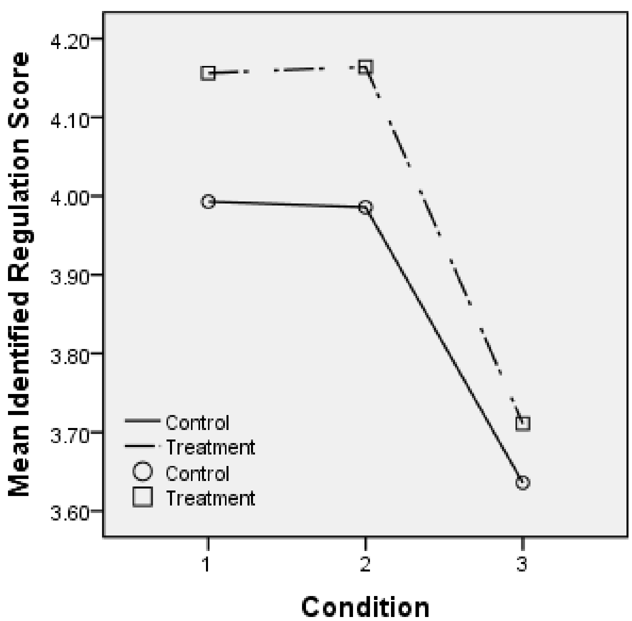

Figure 9. Mean identified regulation scores by treatment group.
The treatment group was significantly different, at the $p < .05$ level, between Condition 1 and 3, and Condition 2 and 3. The control group was significantly different, at the $p < .05$ level, between Condition 1 and 3.

Chapter 5

Discussion

The purpose of this study was to assess if the distraction of (a) listening to popular music or (b) watching a popular film during a high school PE class indoor cycling unit would impact the levels of enjoyment, motivation, RPE, HR, or intention to persist for high school aged students during exercise, specifically an indoor cycling unit. For both males and females, there was no significant difference in HR, RPE, or enjoyment between Condition 1 (no distraction) or Condition 2 (with music). The design of the study constrained the students' HR as they rode; they were told to maintain a specified HR every day of data collection. However, when a movie was played while cycling, differences were seen in HR. Yet, only HR and RPE decreased without change in other measured variables, supporting previous findings that there was no effect on enjoyment (Kukuwich, 1997), and additionally in this study, intention to persist. What is interesting to note, 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. Once again this is surprising; students were to maintain a certain HR throughout the study. This led the researcher to believe that the decrease in HR and RPE may not be due entirely to the movie distraction but to an outside or unaccounted for factor. A 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. As the researcher observed and collected data she heard many complaints about the uncomfortableness of the bicycle seats. The researcher also heard many questions of, "Do we really have to do this again?" and, "When will this be over?" The researcher believes 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.

Need for Good Pedagogy

The school where the study took place often does short, hybrid units during which two or three different activities are done on alternating days for typically two to three weeks. Alternating the activity means that each activity may only be done three or four times during the course of the unit, while in this study it was done six days in a row. The duration of the study may have been too long to keep the students interested because the same cycling activity was done each day, a departure from their normal routine. This was supported by the researcher's observations 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 indoor cycling class will include different intensities and levels of resistance on the bike. This study intentionally left those elements out so that they would not be an additional variable influencing HR, RPE, and enjoyment. Students were told that they could do anything on 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 and once students had found an intensity to reach their target HR zone they rarely changed their bike resistance. Boredom potentially influencing the effect of distractions on performance was also reported by Dyrlund and Wininger (2008). Dyrlund and Wininger reported the difference in enjoyment between preferred and non-preferred music listeners became greater when the data collected during low intensity exercise was not included. There were differences in enjoyment between treatment groups during medium and high intensity exercise but level of enjoyment was similar between different treatment groups at low intensity. They proposed that this could have been due to boredom occurring with too low an exercise intensity. While the exercise intensity in this study was not too low, the style of workout for indoor cycling might have been too bland, also leading to boredom similar to that seen by Dyrlund and Wininger. 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 this is due to boredom, as suspected, future research should include design elements to avoid its occurrence: such as variety in pace or position, challenges, or teacher instruction and encouragement.

This lack of enjoyment and drop in HR and RPE over the course of the unit, potentially due to boredom, points out 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. The female teacher, whose classes were used in this study, normally does use music and a movie during her indoor cycling unit. However, she uses them as cues for speed or resistance change and encouragement. The teacher 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 researcher were that when watching *Tangled* (Conli, 2010) riders increase resistance (to mimic riding uphill) whenever the main character sings, or the riders all do a sprint when they play football in the movie *Remember the Titans* (Bruckheimer, 2000). Typically the music and movies were used to add to the teacher's instruction, they never replaced 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 impact on the same variables with distraction and good pedagogy (e.g., teacher instruction and encouragement, changes in pedaling speed and resistance, using music or videos as workout cues and enhancement) to see if the same lack of enjoyment and drop in intensity still exists.

Another potential 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 present 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). While many adults who frequent fitness centers engage in steady-state exercise on stationary bikes, ellipticals, stair steppers, or treadmills, this type of exercise may be unappealing to youth. It is also possible that asking students to respond to two prompts every five minutes of the cycling session made the ride feel more like a research lab and not like a PE class. In reality, the present research was not much like a field-based study as the indoor cycling unit was not presented or designed as it would normally be in a PE class.

Stimuli Strength

Based on Rejeski's theory of parallel processing (1985), many researchers in the past have used music as a distraction during exercise to draw attention away from the uncomfortable sensations of exercise. Music has been reported to decrease exerciser's RPE as compared to working at the same intensity, or same HR, without music (Boutcher & Trenske, 2008; Nethery, 2002; Nethery et al., 1991). This was not supported by the results of the present study. For students in this study there was no significant difference in RPE between no distraction and listening to music while exercising. Participants also reported no difference in enjoyment between no distraction and listening to music. This contradicts results reported by Dyrlund and Wininger (2008). Several studies (e.g., Barwood et al., 2009; De Bourdeaudhuij et al., 2002; Deutsch, 2008; Pennebaker & Lightner, 1980) also reported that exercise intensity often increases in the presence of music as seen by faster completion of the same distance or continuing to go a farther distance with distractions. This increase in intensity was not evident in the present study. For participants in the present study there was no significant difference in HR when music was played compared to no music, and there was a significant drop in HR from both no distraction and listening to music when a movie was played. This contradictory result could be due to participants being asked and reminded to stay within a certain target HR zone, but it was possible that students could go higher than the target zone if they were distracted. The instruction to stay in a certain HR zone may have been a more powerful stimulus than listening to music and therefore the chosen conscious thought, while watching a movie seems to have been a more powerful stimulus than trying to maintain a target HR. This is in contrast to Nethery et al.'s (1991) proposal that audio stimuli are stronger than visual ones. Additionally, this brings up the question of whether some stimuli can be additive to a target behavior while other are detracting. It may be that audio and visual stimuli differ in their ability to be additive in an exercise setting. Nethery’s proposal that auditory stimuli are stronger than visual stimuli may be due to audio stimuli adding to exercise behaviors while visual stimuli are detracting, rather than one being stronger than the other. Further study is needed to consider and determine if there are additive or detracting stimuli to exercise performance. Visual distractions in this study included an audio component so further research may be needed to clarify the effects implied from each.

Enjoyment and Motivation

The decrease in HR and RPE during the final condition of the study was paralleled by a decrease in intrinsic motivation. As this was present in both control and treatment groups, this is not thought to be the result of distraction. This further supports that students, at this point in the study, were unhappy with the activity in general and wanted to do something else during their PE class. This is additionally 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.

While the data do not show a difference in enjoyment when distractions were introduced, the researcher observed a difference in student attitude while cycling. On the days when music was played, students were singing along and there seemed to be a different energy in the room. A few females added hand dance motions to the music as they rode, and some males sang along and made fun of a popular Taylor Swift song with loud shouts of “Oh” and mock pained expressions. Several students were seen to be singing along with each song. When the male classes watched *Shrek* it was observed that multiple students were quoting the movie almost line for line and many laughed frequently. Several females sang along and quoted *High School Musical* as it was shown during their ride. At the beginning of each day when they were told that they were going to have music or a movie there were often exclamations of “Yes!” from several students in each class. 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 were more positive when there were distractions. These comments and actions tend to agree with Dyrlund and Wininger’s (2008) findings that those listening to preferred music during exercise enjoyed the exercise more than those who had no music. It would be interesting to see the results of this study if the length of data collection were shortened and the bike seats were made more comfortable. It could be that without those two negative influences the data may more closely align with observations of student behavior and comments of enjoyment as seen in other studies.

Both the music and movies played during this study were the result of participant choice and preference, which is believed to increase self-determination (Deci et al., 1991), but this change in level of self-determination was not seen in the present study. In fact, along with RPE, HR, and level of enjoyment, intrinsic motivation decreased during the final condition. Choice was limited as the selections were not individual, but each individual did get to cast a vote as to what the class would listen to or watch. This group choice may have lessened the autonomy students felt they had in the activity. Autonomy was also greatly impacted by the fact that students did not get to choose to participate in the cycling unit, or any activity, during the semester long class. For students who did not enjoy cycling to begin with, the lack of ability to choose a different option may have been one reason why average intrinsic motivation scores declined during the study in both control and treatment groups.

However, the results of this study did indicate that females had a significantly higher level of intrinsic motivation during all conditions than males. They also had higher levels of identified regulation and overall SDI scores than males during Condition 2 and Condition 3. This contradicts the findings of several other studies. Digelidis, Karageorghis, Papapavlou, and Papaioannou (2014) also used SIMS and found no between gender differences in motivation levels with tenth-grade students doing a circuit training lesson in PE. Smith et al. (2015) studied motivation with 72 middle school students over the course of a PE unit and found no between gender differences in motivation at pre- or post-testing. Chatzipanteli, Digelidis, and

Papaioannou (2015) conducted a study with 601 seventh-grade students using different teaching styles. Half of the participants were taught using student-directed styles, while the other half were taught using a more direct, teacher-centered style. No gender difference was found in motivation level at the end of the unit; however, a motivational difference was found between teaching styles (Chatzipanteli, Digelidis, & Papaioannou, 2015). The fact that gender did not have a motivational impact but teaching style did further supports the idea that quality pedagogy is needed in PE.

The gender difference in the present study could also be due to a difference in teaching styles and pedagogy. While the teachers for each class were not teaching during the data collection portion of each PE class they were involved in supervising and teaching the rest of the class period and school year. The female class teacher was very energetic and held high expectations for her students. It could be that this was not true for the male classes, and therefore the reason behind the observed gender differences in motivation. In point of fact, when the female teacher happened to walk through the cycling room one time she shouted encouragement as she went across, when the male teacher came to observe all he did was observe without making comments to the students. Teacher style, energy, and encouragement may make more difference in student motivation than simply using distraction students selected. Difference in teacher style, energy and expectations may also help explain why females had a significantly higher RPE during all conditions and a significantly higher HR during Condition 3. All students in the present study were told to maintain the same percentage of their max HR and no gender difference was expected in each student achieving this individual percentage. It could be that the gender differences observed were due to the influence of each gender's differing teacher pedagogy. Once again, future research should be done on the impact of teachers and pedagogy in addition to using distractions during exercise in PE settings.

Sociality

Another observation made during research was that 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 state, "Most participants indicated that doing the activity with their friends was more important than which activity they chose", and suggest 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 impacted students' enjoyment during distractions, as it was more difficult to carry on a conversation when music, or more particularly a movie, was played; there was hardly any conversation when a movie was played. This deterrent to holding a conversation as a movie was played could help to explain why participants' intrinsic motivation decreased when a movie was played. Within self-determination theory, the ability to make safe and successful social ties in a given environment is referred to as relatedness, one of the factors that influence a person's level of self-determination (Deci et al., 1991). When relatedness was hindered by the increasing difficulty of holding a conversation, self-determination and intrinsic motivation may have decreased as a result. More studies on the impact of the ability to make and improve social ties while in a PE setting are needed to better understand this concept. Students creating their own distraction by holding conversation also points out that while the researcher was intending to control distractions, in the end there were more distractions than designed. 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 an another distraction from consciously thinking about riding.

Implications

The present study presents some results that contradict those found in the existing body of knowledge. However, given the data collected from the present study the researcher would not promote playing a movie with no instruction during a high school indoor cycling unit if the teacher's desire is an increase in intensity. Teachers should think carefully about how they use distractions during exercise and not use them as a replacement for good pedagogy in a PE class. High school PE teachers may also wish to reconsider the length of their activity units and add more variety and change. As many participants held their own conversations while cycling, teachers may also want to look at social opportunities offered in their class and allow more time for conversation as students work together.

Future research should look into the qualitative side of using music or movies as a distraction by collecting participant comments or interviews about the experience of using a distraction during exercise. Interviews may be able to add more depth to the current understanding of distraction use in exercise. Replications of this study could also be done using a lower exercise intensity as different intensities have been shown to impact enjoyment and effectiveness of distractions (Boutcher and Trenske, 1990; Dyrlund and Wininger, 2008). More research also needs to be done with children and youth using distractions during exercise to better understand how this affects their exercise session and habits. Further research also could examine the impact of distractions being used in combination with good pedagogy.

Limitations

The present study had several limitations. One was that all students involved came from a single school and were enrolled in a required PE class. Second, in some classes student names were shown instead of student identification numbers. Third, many participants needed to be dropped because of attrition, and limited data needed to be imputed for included participants. Fourth, the sample was not large enough to be able to have classes receive treatment in a random order.

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Appendix A: Consent Forms

Youth Assent (15-17 years old)

What is this study about?

My name is Kelsey Higginson. I am from Brigham Young University. I would like to invite you to take part in a research study. Your parent(s) know we are talking with you about the study. This form will tell you about the study to help you decide whether or not you want to be in it.

In this study, we want to learn about motivation during physical education classes.

What am I being asked to do?

If you decide to be in the study, we will ask you to answer some questions during your normal PE class and wear a heart rate monitor during PE class like you have done before. The entire study will take place during your regular PE class.

What are the benefits to me for taking part in the study?

You won't receive any direct benefits from being a part of this study. However, by being in this study you may help us to understand how to motivate students like you in future PE classes.

Can anything bad happen if I am in this study?

We think there are few risks to you by being in this study, but some kids might become worried because of some of the questions we ask. You don't have to answer any of the questions you don't want to answer. You will not be in danger of physical harm any more than you normally would be in a regular day in PE class.

Who will know that I am in the study?

We won't tell anybody that you are in this study and everything you tell us and do will be private. Your parent may know that you took part in the study, but we won't tell them anything you said or did, either. When we tell other people or write articles about what we learned in the study, we won't include your name or that of anyone else who took part in the study.

Do I have to be in the study?

No, you don't. The choice is up to you. No one will get angry or upset if you don't want to do this. You can change your mind anytime if you decide you don't want to be in the study anymore.

What if I have questions?

If you have questions at any time, you can ask us and you can talk to your parents about the study. We will give you a copy of this form to keep. If you want to ask us questions about the study, contact Kelsey Higginson at 385-375-1569 or kelseyhigg@byu.edu.

You will receive no reward or benefit for being in this research study. Before you say yes to be in this study what questions do you have about the study?

If you want to be in this study, please sign and print your name.

Name (Printed): ____________________ Signature: ______________________ Date: _____________

Jóvenes de dictamen conforme (15-17 años)

¿Qué es este estudio?

Mi nombre es Kelsey Higginson. Soy de la Universidad Brigham Young. Me gustaría invitarte a participar en un estudio de investigación. Tus padre (s) saben que estamos hablando contigo sobre el estudio. Esta formulatrio te informará sobre el estudio para ayudarte a decidir si desea o no estar en ella. En este estudio, queremos aprender acerca de la motivación durante las clases de educación física.

¿Qué se me pide que haga?

Si decides participar en el estudio, te pediremos que respondas algunas preguntas durante tu clase normal de educación física y usar un monitor de frecuencia cardíaca durante la clase de educación física como tú lo has hecho antes. Todo el estudio se llevará a cabo durante su clase de educación física regular.

¿Cuáles son los beneficios para mí para participar en el estudio?

No recibirás ningún beneficio directo por ser parte de este estudio. Sin embargo, al estar en este estudio puedes ayudarnos a entender cómo motivar a los estudiantes como ti en clases de educación física en el futuro.

¿Hay algo malo que puede suceder si participo este estudio?

Creemos que hay pocos riesgos para ti por participar en este estudio, pero algunos niños fueron preocupados debido a algunas de las preguntas que hacemos. No tienes que contestar ninguna de las preguntas que no quieras contestar. No vas a estar en peligro de daño físico más de día normal en la clase de educación física.

¿Quién va a saber que yo estoy en el estudio?

No le diremos a nadie que estás en este estudio y todo lo que nos digas y hagas será privado. Tus padres pueden saber que tomaste parte en el estudio, pero no les diremos nada que dijiste o hiciste, tampoco. Cuando decimos a otras personas o escribimos artículos sobre lo que hemos aprendido en el estudio, no vamos a incluir tu nombre o el de cualquier otra persona que participó en el estudio.

¿Tengo que estar en el estudio?

No, no tienes que hacerlo. La decisión depende de ti. Nadie va a estar enojado o molesto si no quieres hacer esto. Puedes cambiar de opinión en cualquier momento si decides que no quieres estar en el estudio más.

¿Qué pasa si tengo preguntas?

Si tiene preguntas en cualquier momento, puedes preguntarnos y puedes hablar con tus padres sobre el estudio. Te daremos una copia de este formulario para llevar. Si quieres hacer preguntas sobre el estudio, pónte en contacto con Kelsey Higginson al 385-375-1569 o kelseyhigg@byu.edu.

No recibirás ninguna recompensa o beneficio por participar en este estudio de investigación. Antes de decir que sí y participar en este estudio ¿qué preguntas tienes sobre el estudio?

Si quieres participar en este estudio, por favor firme y escriba su nombre.

Nombre (Impreso): ____________________ Firma: _____________________ Fecha: ___________

Parental Permission for a Minor

Introduction

My name is Kelsey Higginson. I am a graduate student from Brigham Young University. I am conducting a research study about motivation in PE. I am inviting your child to take part in the research because (he/she) is currently enrolled in a Fitness for Life class at (school).

Procedures

If you agree to let your child participate in this research study, the following will occur:

1. Your child will participate normally in their PE class; our study will take place over 6 days of your child's class.
2. During your child's PE class your child will be asked to wear a heart rate monitor.
3. Your child will be asked to respond to questions about motivation during their PE class.
4. Your child will be asked to complete a survey at the end of each week of the study.

Your child will be doing what they would normally do during their PE class and our study simply has them respond to questions during the class.

Risks

There is a risk of loss of privacy, which the researcher will reduce by not using any real names or other identifiers in the written report. The researcher will also keep all data in a locked file cabinet or on a password protected laptop in a secure location. Only the researcher will have access to the data. At the end of the study, data will be used to write and publish a research article; after publication the data will be destroyed.

Confidentiality

The research data will be kept in a secure location in a locked office or on a password protected laptop and only the researcher will have access to the data. At the conclusion of the study, all identifying information will be removed and after publication the data will be destroyed.

Benefits

There are no direct benefits for your child's participation in this project.

Compensation

There will be no compensation for participation in this project.

Questions about the Research

Please direct any further questions about the study to Kelsey Higginson at 385-375-1569 or kelseyhigg@byu.edu. You may also contact David Barney at 801-422-6477, or david_barney@byu.edu. Questions about your child's rights as a study participant or to submit comment or complaints about the study should be directed to the IRB Administrator, Brigham Young University, A-285 ASB, Provo, UT 84602. Call (801) 422-1461 or send emails to irb@byu.edu.

You have been given a copy of this consent form to keep.

Participation

Participation in this research study is voluntary. You are free to decline to have your child participate in this research study. You may withdraw you child's participation at any point without affecting your child's grade or standing in PE class.

Child's Name: ____________________

Parent's Name: ____________________ Signature: ______________________ Date: ______________

Permiso de los padres de un menor

Introducción

Mi nombre es Kelsey Higginson. Soy un estudiante de posgrado de la Universidad Brigham Young. Estoy realizando un estudio de investigación sobre la motivación en la educación física. Estoy invitando a su hijo a tomar parte en la investigación debido a que (él / ella) está inscrito actualmente en un gimnasio para la clase de vida al (escuela).

Procedimientos

Si está de acuerdo para que su hijo participe en este estudio de investigación, ocurrirá lo siguiente:

1. Su hijo participará normalmente en su clase de educación física; nuestro estudio se llevará a cabo durante 6 días de clase de su hijo.
2. Durante la clase de Educación Física de su hijo a su hijo se le pedirá que use un monitor de frecuencia cardiaca.
3. Se le pedirá a su hijo a responder a las preguntas sobre la motivación durante su clase de educación física.
4. Se le pedirá a su hijo a completar una encuesta al final de cada semana del estudio.

Su hijo va a hacer lo que hacen habitualmente durante su clase de educación física y nuestro estudio sólo se les responder a preguntas durante la clase.

Riesgos

Existe el riesgo de pérdida de privacidad, que el investigador reducirá al no utilizar ningún nombre reales u otros identificadores en el informe escrito. El investigador también mantendrá todos los datos en un archivero bajo llave o en un ordenador portátil protegido con contraseña en un lugar seguro. Sólo el investigador tendrá acceso a los datos. Al final del estudio, los datos serán utilizados para escribir y publicar un artículo de investigación; después de la publicación serán destruidos los datos.

Confidencialidad

Los datos de la investigación se mantendrán en un lugar seguro en una oficina cerrada con llave o en un ordenador portátil protegido por contraseña y sólo el investigador tendrá acceso a los datos. Al concluir el estudio, toda la información de identificación será retirado y después de la publicación será destruido los datos.

Beneficios

No hay beneficios directos para la participación de su hijo en este proyecto.

Compensación

No habrá compensación por la participación en este proyecto.

Preguntas sobre la Investigación

Por favor, dirija cualquier pregunta sobre el estudio a Kelsey Higginson al 385-375-1569 o kelseyhigg@byu.edu. También puede comunicarse con David Barney en 801-422-6477, o david_barney@byu.edu.

Preguntas sobre los derechos de su hijo como un participante en el estudio o para enviar comentarios o quejas sobre el estudio deben ser dirigidas al Administrador del CEI, la Universidad Brigham Young, A-285 ASB, Provo, UT 84602. Llame al (801) 422 a 1461 o enviar mensajes de correo electrónico a irb@byu.edu.

Se le ha entregado una copia de este formulario de consentimiento para mantener.

<u>Participación</u>

La participación en este estudio de investigación es voluntaria. Usted es libre de negarse a que su hijo participe en este estudio de investigación. Usted puede retirar la participación del niño en cualquier momento sin afectar la nota de su hijo o su posición en la clase de educación física.

Nombre del niño: ____________________

Nombre del Padre: ____________________ Firma: ____________________ Fecha: ____________

Appendix B: Letter to Principal

My name is Kelsey Higginson and I am a graduate student at Brigham Young University. I am conducting a research study about the effects of distraction during exercise on motivation and enjoyment levels. I have obtained IRB approval to conduct this study from Brigham Young University and from **your district**. I am hoping to work with **teacher's name** at your school. If you grant approval students in *Fitness for Life* classes will respond to questions during their indoor cycling unit. Classes will be put into either a control group with no distraction or a treatment group with music and video distraction. Music and videos selected are those that have been used in previous classes by these teachers. Students will also be asked to complete a motivation survey at three points during the study. The study would take six class periods plus 5-10 minutes a few days before the data collection begins to ensure all students know the procedure of the study. These six days of class will be fairly similar to what students would normally do in *Fitness for Life* with the exception of doing a cycling workout written by the researchers instead one written by the teachers; it also will have them answer questions while they ride instead of only riding.

Risks

There are minimal risks in participating in this study.

Confidentiality

All data gathered will be matched to a particular participant and then have any identifying data erased so that identities of participants will not be known outside of the researchers and classroom teachers. Data will be kept on a password protected laptop or in a locked office where only the researchers will have access.

Benefits

There will be no benefits to your students for participating in this study. However, we do hope this study will help us learn more about motivation for exercise with high school students.

Compensation

There will be no compensation for participation in this study.

Questions about the Research

You can contact Kelsey Higginson by phone (375) 385-1569 or email: kelseyhigg@gmail.com to inquire about any part of this study. You may also contact David Barney by phone (801) 422-6477 or email: david_barney@byu.edu.

You can also contact the IRB Administrator, Office of Research and Creative Activities (ORCA), A-285 ASB, Brigham Young University, Provo, UT 84602. Phone: (801) 422-1461, Email: irb@byu.edu.

Participation

Participation in this research study is voluntary.

If you agree to have classes at your school participate in this study, please contact Kelsey Higginson or David Barney, by email, confirming your approval.

Appendix C: Lesson Script

A) Today we will be cycling with (no distraction/music/video). *We will be turning on the music/video in a few minutes*. After the warm up, keep your heart rate at 70 percent of your max heart rate for the whole cycling session. HRs will be projected on this wall (point with hand), glance at it periodically to check your HR but focus on (the front/the music/the video). Every few minutes you will be asked to report your current RPE and level of enjoyment use your iClicker to answer these questions. Be honest and as accurate as you can.

B) The warm up is over; keep your heart at 70 percent for the rest of the cycling session.

C) Periodically: if you haven't checked your heart rate in a while, check now and remember to stay at 70 percent.

D) 5/10/15/20 minutes after the warm up is over: Please use your iClicker to answer the questions

1. Right now, what is your current level of RPE?

A(1): very, very light   B(2): light   C(3): somewhat hard   D(4): hard   E(5): very, very hard

2. "On a scale of 1-5, 1(A) I hate it, 2(B) I don't like it, 3(C) I don't care either way, 4(D) I like it, 5(E) I love it, how much are you enjoying the activity right now?"

3. (seen only at 20min) What treatment did you experience today?

A: no distraction   B: music   C: video

4. (seen only at 20min) On a scale of 1-5, 1(A) not at all, 2 (B) a small amount, 3 (C) a medium amount, 4 (D) a large amount, 5 (E) completely, how much did the video/music take your minds off the exercise today?

5. (seen only at 20min) If you had the option to continue cycling, would you continue cycling today?

A: yes B: no

E) On days 2, 4, and 6: Please complete the survey before switching to the next activity.

Appendix D: SIMS Survey

Why are you currently engaged in this cycling activity?

		Not at all	Very little	A little	Moder-ately	Enough	A lot	Exactly
1	Because I think that this cycling activity is interesting	1	2	3	4	5	6	7
2	Because I am doing it for my own benefit	1	2	3	4	5	6	7
3	Because I am supposed to	1	2	3	4	5	6	7
4	There may be good reasons to do this cycling activity, but personally I don't see any	1	2	3	4	5	6	7
5	Because I think this cycling activity is pleasant	1	2	3	4	5	6	7
6	Because I think that this cycling activity is good for myself	1	2	3	4	5	6	7
7	Because it is something that I have to do	1	2	3	4	5	6	7
8	I do this activity, but I am not sure it is worth it	1	2	3	4	5	6	7
9	Because this cycling activity is fun	1	2	3	4	5	6	7
10	By personal decision	1	2	3	4	5	6	7
11	Because I don't have the choice	1	2	3	4	5	6	7
12	I don't know; I don't see what this cycling activity brings me	1	2	3	4	5	6	7
13	Because I feel good, when in P.E., doing challenging activities	1	2	3	4	5	6	7
14	Because I believe doing this cycling activity is important for me	1	2	3	4	5	6	7
15	Because I feel that I have to	1	2	3	4	5	6	7
16	I do this cycling activity but I am not sure it is a good thing to pursue it	1	2	3	4	5	6	7

Appendix E: RPE Scales

Borg Original RPE Scale	Modified Scale used in this study
6	A(1) – 6, 7, or 8 on original scale – very, very light
7 – Very, very light	B(2) – 9, 10, or 11, on original scale – light
8	C(3) – 12, 13, or 14 on original scale – somewhat hard
9 – Very light	D(4) – 15, 16, or 17 on original scale – hard
10	E(5) – 18, 19, or 20 on original scale – very, very hard
11 – Fairly light	
12	
13 – Somewhat hard	
14	
15 – Hard	
16	
17 – Very hard	
18	
19 – Very, very hard	
20	

Appendix F: McNemar Macro

To account for the Yates' correction of McNemar tests in SPSS making the results too conservative, the following macro was used. It was developed by Marta Garcia-Granero and translated into English, adding a Newcombe 95% confidence interval, by the creator of how2stats.net.

```
* MACRO definition (it also computes a 95%CI -Newcombe's method- for the difference in
percentages, nice extra!) *.
DEFINE MYMCNEMAR(!POSITIONAL !TOKENS(1) /!POSITIONAL
!TOKENS(1)/!POSITIONAL !TOKENS(1)/!POSITIONAL !TOKENS(1)).
DATASET NAME Datos.
DATASET DECLARE Results1 WINDOW=HIDDEN.
DATASET DECLARE Results2 WINDOW=HIDDEN.
PRESERVE.
SET ERRORS=NONE RESULTS=NONE.
MATRIX.
COMPUTE nanb=!1 .
COMPUTE napb=!2 .
COMPUTE panb=!3 .
COMPUTE papb=!4 .
COMPUTE a=nanb.
COMPUTE b=napb.
COMPUTE c=panb.
COMPUTE d=papb.
COMPUTE perc={(c+d)/(a+b+c+d);(b+d)/(a+b+c+d)}.
COMPUTE chi2=((b-c)**2)&/(b+c).
COMPUTE chi2sig=1-CHICDF(chi2,1).
COMPUTE chi2cor=(ABS(b-c)-1)**2&/(b+c).
COMPUTE chi2sigc=1-CHICDF(chi2cor,1).
COMPUTE z = 1.959964.
COMPUTE zsq = 1.959964*1.959964.
COMPUTE x5=papb+panb.
COMPUTE x6=napb+nanb.
COMPUTE x7=papb+napb.
COMPUTE x8=panb+nanb.
COMPUTE x9=x7+x8.
COMPUTE x10=(panb-napb)/x9.
COMPUTE x11=2*x5+zsq.
```

```
COMPUTE x12=z&*(zsq+4*x5&*x6/x9)&**0.5.
COMPUTE x13=2*(x9+zsq).
COMPUTE x14=(x11+x12)/x13.
COMPUTE x15=(x11-x12)/x13.
COMPUTE x16=x5/x9-x15.
COMPUTE x17=x14-x5/x9.
COMPUTE x21=2*x7+zsq.
COMPUTE x22=z&*(zsq+4*x7&*x8/x9)&**0.5.
COMPUTE x24=(x21+x22)/x13.
COMPUTE x25=(x21-x22)/x13.
COMPUTE x26=x7/x9-x25.
COMPUTE x27=x24-x7/x9.
COMPUTE x29=x5&*x6&*x7&*x8.
COMPUTE x30=1.
DO IF x29 EQ 0.
- COMPUTE x30=0.
END IF.
COMPUTE x31=papb&*nanb-panb&*napb.
COMPUTE x32=0.
DO IF (x31 GT 0).
- COMPUTE x32=1.
END IF.
COMPUTE x33=x31-x9/2.
COMPUTE x35=0.
DO IF (x33 GT 0).
- COMPUTE x35=x33.
END IF.
COMPUTE x36=x32&*x35+(1-x32)&*x31.
COMPUTE x37=x30&*x36.
COMPUTE x38=x30&*x29&**0.5+(1-x30).
COMPUTE x39=x37/x38. /* phi hat.
COMPUTE x40=x16&*x16-2*x39&*x16&*x27+x27&*x27.
COMPUTE x41=x17&*x17-2*x39&*x17&*x26+x26&*x26.
COMPUTE x42=x10-SQRT(x40).
COMPUTE x43=x10+SQRT(x41).
COMPUTE vnames={'P1','P2','Puntual','Lower.CI','Upper.CI'}.
SAVE {100*T(perc),100*x10,100*x42,100*x43} /OUTFILE=Results1
/NAMES=vnames.
COMPUTE vnames={'Chi2','Sig'}.
SAVE {chi2,chi2sig;chi2cor,chi2sigc} /OUTFILE=Results2 /NAMES=vnames.
```

```
END MATRIX.
RESTORE.
DATASET ACTIVATE Results1.
FORMAT P1 TO Upper.CI (PCT4.2).
VAR LABEL P1 'Percent A'/P2 'Percent B'/ Puntual 'Difference'.
OMS /SELECT TABLES
 /IF COMMANDS='Summarize' SUBTYPES='Case Processing Summary'
 /DESTINATION VIEWER=NO.
SUMMARIZE
 /TABLES=ALL
 /FORMAT=LIST NOCASENUM NOTOTAL
 /TITLE='95%CI for difference in proportions (paired) (*)'
 /CELLS=NONE.
OMSEND.
ECHO '(*) Exact (As per Newcombe, 1998)'.
DATASET ACTIVATE Results2.
DATASET CLOSE Results1.
FORMAT chi2(F8.3) Sig (F8.4).
VAR LABEL chi2 'Chi-Square'/ Sig 'Sig.'.
STRING Test (A12).
IF ($casenum EQ 1) Test = 'Uncorrected' .
IF ($casenum EQ 2) Test = 'Corrected*' .
OMS /SELECT TABLES
 /IF COMMANDS='Summarize' SUBTYPES='Case Processing Summary'
 /DESTINATION VIEWER=NO.
SUMMARIZE
 /TABLES=Test chi2 Sig
 /FORMAT=LIST NOCASENUM NOTOTAL
 /TITLE='McNemar Chi-square statistics'
 /CELLS=NONE.
OMSEND.
DATASET ACTIVATE Datos.
DATASET CLOSE Results2.
ECHO '(*) Corrected for continuity; this correction is too conservative in most cases.'
!ENDDEFINE.

* An example of the macro call: suppose your crosstab table output (from
SPSS' McNemar output)
  looks like this:
*     No   Yes
```

```
* No   14    2
* Yes   8    9

MYMCNEMAR 2 4 8 18.
.
```