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The Effects of Music Genre on Rate of Perceived Exertion in Aerobics Classes

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The University of Southern Mississippi

The Effects of Music Genre on Rate of Perceived Exertion in Aerobics Classes

by

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A Thesis

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Chapter I: Introduction

Upon entering an exercise facility it would be inconceivable not to hear some form of music playing while people are exercising. Whether music is playing over the loudspeakers, or individuals are listening to their iPods, music is a vital part of exercise for many individuals. With so much emphasis on listening to music during physical activity the question arises, “What makes music such a popular component of exercise?” Many studies have assessed the effects of music on exercise (Elliott, 2007; Karageorghis, 1999; Karageorghis & Priest, 2008; Kravitz, 1994; Matesic & Cromartie, 2002). These studies indicate that music has positive effects of lowering heart rate, decreasing rate of perceived exertion (RPE), and providing an overall escape from the discomfort of exercise. Most of these studies have assessed how music tempo and music preference affect exercise enjoyment; however, few studies have assessed the effect of genre on the psychological traits listed above. Some studies suggest that the effects of music during exercise are decreased heart rate, slowed oxygen intake and lowered RPE (Elliott, 2007; Karageorghis, 1999; Karageorghis & Priest, 2008; Kravitz, 1994; Matesic & Cromartie, 2002). These effects are beneficial, especially as they may allow individuals to exercise harder and longer. The purpose of this study is to discover whether there is a relationship between RPE and music genre during exercise, and what that relationship is.

Definitions

Fitness Center: place for exercise: a place with facilities and equipment for people to maintain or improve their physical fitness.

Fitness Class: an academic class of aerobic exercise, led by a fitness instructor who grades the students on their participation.

Rate of Perceived Exertion (RPE): the intensity of an exercise according to the exerciser's subjective judgment, ranging from very light to very heavy.

Sub-maximal: not at maximum intensity or effort.

VO₂ max: the maximal capacity to transport and utilize oxygen during exercise.

Delimitations

This study will have a few delimitations:

The study will solely focus on students enrolled in aerobics courses at a four year university

The participants will range in age from 18-34 years

The study will assess RPE of females

The study will attempt to include a variety of races and ethnicities

Assumptions

This study will require assumptions to be made:

The participants are filling out the RPE scale truthfully

Students enrolled in aerobic activity classes are representative of the average exerciser

Significance of Study

The significance of this study will be to assist fitness instructors, coaches, personal trainers and others in structuring exercise settings to be more efficient. More efficient workouts are commonly defined as longer and with less discomfort occurring during exercise (Kravitz, 1994). Current literature on the subject offers much information about the effects of music tempo on RPE; however, little information about the effects of music genre on RPE is found in the literature (Hoogstra, 2011). For anyone involved in prescribing exercise, knowing how to lower RPE is important in effectively training individuals. Hypothetically, if RPE is lowered, the participants will be able to work out longer and experience less discomfort, and therefore, see results more quickly. If workout plans can be paired with a music genre that lowers RPE, the

monotony that often accompanies exercise can be diminished leading to a more enjoyable and efficient workout. Listening to music while exercising can not only reduce the monotony, but different genres can potentially have a greater effect on how the participants perceive the intensities of different exercise programs. For instance, a higher intensity day may be enhanced with the genre of rock, whereas a more soothing genre, such as classical, may be better suited for a lower intensity day. This study will assist in better understanding which musical genre best lowers RPE during an aerobic workout.

Chapter II: Literature Review

Personal fitness is a large part of today's culture. This trend is apparent not only in the United States, but throughout the world (Sassatelli, 2010). This literature review examines fitness components, fitness facilities and music in exercise.

Fitness Components

Many factors are considered when assessing fitness. The single best indicator of cardiovascular fitness is VO_2 max testing. The term VO_2 max is defined as "the maximal capacity to transport and utilize oxygen during exercise" (Powers, & Howley, 2008, p. 56). Powers and Howley point out that lactate threshold is another important fitness component. Build up of lactate in the muscle does not cause soreness, but rather it causes muscle fatigue. They state "several studies have demonstrated that the lactate threshold used in combination with other physiological measurements (e.g., VO_2 max), is a useful predictor of success in distance running" (2008, p. 59). The VO_2 max and lactate threshold of individuals is not easily changed by extrinsic forces, rather exercise and intrinsic factors lead to changing these measures. These measures are relatively difficult to get because they require individuals trained in measuring them, and they are time consuming. RPE is a much simpler way to measure fitness. There is a parallel between heart rate and perceived exertion, and since heart rate and oxygen consumption increase linearly with workload, we can assume there is a relationship between RPE and VO_2 max (Borg, 1982). RPE is also an important factor of physical fitness; it seems to correspond with all other aspects of fitness, and it can be affected by extrinsic factors such as music (Powers & Howley, 2008). It is also known that fit individuals generally have a lower RPE than unfit individuals at the same intensity (Reynolds, 2010).

Fitness Facilities

Fitness facilities have become popular in recent years, especially around the New Year when individuals make resolutions to be healthier in the coming year. Most often this new-found exercise regimen is short-lived. This is due in part to unwillingness to travel from home to the gym to workout, expense of membership, and discomfort during workout. Interestingly, one study found that members will pay higher rates each month to have the option of cancelling at any time (Della Vigna & Malmendier, 2006). This may indicate that people think the gym might at some point become too difficult, and they want to keep the option of quitting readily available. If the perceived discomfort caused by getting in shape were somehow lessened, perhaps more people would maintain their exercise plans. In modern times, fitness has moved from “work, punishment, and education to the spheres of recreation and leisure” (Sassatelli, 2010, p.18). With this being said, recreational fitness is still uncomfortable at times. Music has become an escape from the discomfort of exercise, especially for beginners and intermediate fitness participants. Music has been found to make exercise more enjoyable and lessen the discomfort of exercise (Macur, 2007).

Music in Exercise

Elliott (2007) found that tempo was a common factor that affected exercise. Faster tempo decreased heart rate and RPE at sub-maximal exercise (any exercise below VO_2 max). Karageorghis (1999) found that music had significant effects on the psychological characteristics of athletes. Karageorghis and Priest (2006) later reviewed Karageorghis' 1999 study and stated that, “While the physiological processes tend to react sympathetically to music's rhythmical components, it is often lyrics or extramusical associations that make an impact on the emotions. Ostensibly, fast tempi are associated with higher arousal levels than slow tempi” (2008). These

findings help to cement the fact that both physiological and psychological processes are affected by music.

Maximal oxygen uptake is one physiological measure. However, Karageorghis (1999) argues that psychological factors, such as psychological state of the athlete, and synchronizing music rate with exercise intensity, are just as worthy of consideration when studying the effects of music on RPE. Elliott (2007) also described the psychophysical changes caused by listening to music with different tempi while exercising. Psychophysical effects are the combination of physiological and psychological effects. Elliot (2007) measured exercise intensity, RPE, affect, arousal, and music preference while exercising to music with a slow tempo, a moderately fast tempo and a fast tempo during four 20-minute bouts of exercise on cycle ergometers. The participants listened to the same song, but the tempo of that song was manipulated to play at varied speeds. The control group exercised without listening to music. A questionnaire was used to measure RPE, affect, arousal, and “music liking”. The results indicated that slow tempo music had the least amount of positive benefits; however, slow-tempo did not cause negative effects when compared to the control. The faster tempo produced significantly more benefits, such as lower RPE and higher arousal. Reynolds (2010) stated,

It’s not simply that music motivates you and you run faster. It may be that, instead, your body first responds to the beat, even before your mind joins in; your heart rate and breathing increase and the resulting biochemical reactions join with the music to exhilarate and motivate you to move even faster. (para. 6)

This statement suggests that the effects begin as physiological and, only after this involuntary reaction, do the psychological effects begin. Reynolds (2010) credits Kraus as stating, “‘Humans and songbirds’ are the only creatures ‘that automatically feel the beat’ of a song.” (para. 8)

Reynolds (2010) asserts that “the human heart wants to synchronize to music; the legs want to swing, metronomically, to a beat”. If this theory is correct, it could explain why music affects the body the way it does; however, more research is required to support this theory.

Kravitz (1994) found that exercising while listening to music leads to a more efficient workout, and listening to music while exercising allows for the participant to be distracted from sensations such as pain and discomfort. This distraction is part of what produces the increase in efficiency of the sub-maximal workout. However, others suggest that after a certain percent of maximal effort is attained music is no longer beneficial (Harmon & Kravitz, 2007). Perceived exertion rates are reported by subjects to be just as high with music as without once workout intensity reaches 60% of VO_2 max. Matesic and Cromartie (2002) established that VO_2 max is less affected by music in a trained than in an untrained individual. A trained individual's VO_2 max is higher than an untrained person's because they are closer to their peak performance; therefore less change will be recorded.

At one time it was a common practice for athletes running marathons to listen to music while running the race; however, this is no longer possible. According to Macur (2007) when portable audio devices were banned from marathons many people were outraged. Elite runners who preferred to listen to their own bodies over their favorite song were not among those who were outraged over the policy. Many elite athletes are so in tune with their bodies that they can tell when they are near their peak performance in exercise. These athletes prefer to pay close attention to their bodies during exercise, so they can attend to changes that may need attention. Listening to music may distract them from important information (Macur, 2007). Trained athletes are closer to reaching their peak performance than untrained athletes, thus their measurable improvement in VO_2 max is much less because they are so much nearer the threshold

of peak performance (Macur, 2007). Therefore, Macur's article infers that untrained athletes, who have more improvement to make and experience more discomfort during exercise, receive greater benefit from the masking and motivational effects of music while exercising.

Numerous studies have assessed the effect of music on exercise (Elliott, 2007; Karageorghis, 1999; Karageorghis & Priest, 2008; Kravitz, 1994; Matesic & Cromartie, 2002). Much of the literature suggests that music has a positive effect on exercise, but the reasons for this are not entirely known. A few variables have yet to be addressed conclusively, such as whether genre has a significant effect on exercise. Researchers continue to search for more evidence of why music affects the human body both physiologically and psychologically. With music playing such an important part of exercise, there is no doubt that these studies will continue until a more definite answer regarding the relationship between music genre and RPE is found.

Chapter III: Methods

This chapter is a description of the pilot and final study involving the effects of music genre on RPE.

Procedure

A pilot study was conducted with an aerobics class from the Payne Center on the campus of The University of Southern Mississippi. The survey class was chosen by asking aerobics instructors from the university if the pilot study could be performed during their class, one instructor complied. The pilot consisted of one session with music from a single genre. The participants were asked to fill out a short demographic questionnaire and an RPE rating scale. The primary purpose of the pilot study was to reveal how much time it would take to administer the questionnaire and to discover what questions the participants might have regarding the procedure. This pilot study determined potential problems in the actual study, such as how the music would be played. After executing the pilot it was discovered that, with relatively small class sizes, finding participants would be more difficult than previously thought. .

The final study was conducted with an aerobics class from a four year university in a southern state. All four aerobics instructors at the university were asked to participate in the study, however only one instructor replied with a willingness to comply with the study procedures. This led to a regrettably small sample size. The participants were asked to engage in their normal aerobics class routine while listening to selected music tracks over the loudspeakers. This study required participants to attend four consecutive class periods to be included in the study. Prior to the first exercise session, the study was explained and students enrolled in the class were asked to complete an informed consent form. Those who agreed to participate were then asked to fill out a short demographic questionnaire (see Appendix A). During data

collection, regular class was held with the only adjustment being music selection. Music normally played by the instructor (rock genre) served as the control. As the treatment, one genre was exclusively played for an entire class period for each of three consecutive class periods (classical, 80s, country). In order to create control for factors besides genre, the songs were of a similar tempo that averaged 126 beats per minute. The control class took place during the first data collection period and consisted of classic rock music selected by the instructor. This is the control based on the assumption that the participants were familiar with the instructor's musical selections. The next three class sessions served as the treatment condition. After completing each bout of exercise, participants were asked to fill out Borg's (1982) Rate of Perceived Exertion Scale (see Appendix B).

Participants

The twenty participants ranged in age from 18-34. They were recruited from academic aerobics classes. The class consisted of all females, six Caucasian and fourteen of African-American ethnicity.

Chapter IV: Results

Rate of perceived exertion was measured using the Borg's Scale after four different exercise bouts. The independent variable for this study was music genre and the dependent variable was rate of perceived exertion. This study began with twenty participants, but because of compliance issues (participants must complete all four sessions), only seventeen participants completed the study.

Descriptive Statistics

Table 1
Participation rates outside the aerobic class.

Total Number of Participants	17
Average Age	22.23 years
1 activity per week	3 participants
2 to 4 activities per week	9 participants
5 to 9 activities per week	4 participants
10 or more activities per week	1 participant

Statistical Analysis

The extremely small sample size limits the validity of the statistical analyses described below. A 4 (exercise frequency) by 4 (music genre) analysis of variance (ANOVA) was conducted using SPSS 18.0 computer software to determine if there was a significant difference for rate of perceived exertion across music genre based on training frequency. Results indicate there was no significant difference in RPE between groups across genres $F(9, 27) = .289, p = .972$. Results also indicated no significant main effects for music genre or for exercise frequency. There was however, a trend found between RPE and the number of activities

participants do a week. As seen in Figure 1, data demonstrate a trend toward a difference in RPE based on the level of activity an individual engages in throughout the week. Participants that did 10 or more activities a week had lower RPE across the board than did participants whose only activity was this aerobics class.

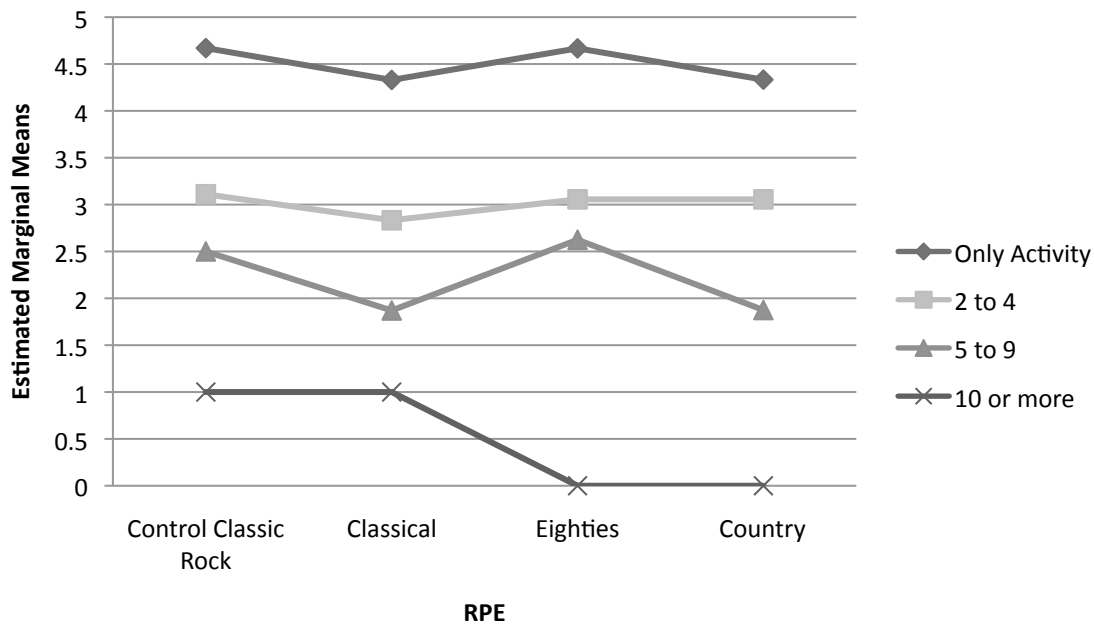


Figure 1: Relationship between RPE and frequency of activity

Limitations

The sample size was admittedly small due to difficulties recruiting participants. All aerobics instructors at the university were asked to participate, however only one instructor was willing to participate. This unfortunately small sample size limits the legitimacy of this study. Though the results of this study showed no significant difference, it is possible that with a larger sample size some significant differences could be found. Using different music styles might be beneficial, because the music used in this study was music that had been altered slightly from its original format to have a uniform tempo. It could possibly change the outcome if music could be

used that was not altered, but that had a uniform tempo already. However, for the purpose of this study finding music with the proper tempo in the genres needed was difficult.

Statistical Procedures

An analysis of variance was used to reveal effects or interactions between music genre and RPE.

Risks

Participants' foreseen limitations included health problems. If there was any suspected risk to participants' wellbeing, they would have been immediately dropped from the study. Trained healthcare professionals were on-site at all times to monitor the safety of the participants. While every effort was made to remove risks of this study, anytime humans are included in research, there exists the possibility for error. However, this was not expected to be a concern, because the participants had been participating in the class for several weeks prior to the study.

Chapter V: Discussion

Though music genre may not have proven to have significant effect at lowering RPE, this might be due in part to the small sample size of seventeen individuals. We cannot generalize these results to represent a larger population. However, the data did demonstrate a trend related to frequency of participation and RPE. This correlation shows that it may not be the music genre that affects RPE but rather the frequency of activity (Macur, 2007).

Future Considerations

If this study were repeated, it would be beneficial to greatly increase the sample size in order to reflect a broader range of the population. The next study should focus on the effect of music genre on participants with the same frequency of activity per week. We see that there is a trend between frequency of activity and lower RPE. Perhaps there would be a significant difference if the study was done with people that had similar activities per week. It is possible that music genre would still not have a significant effect, because frequency of activity is the more influencing factor. The more a person works out, the more accustomed to exercise their body becomes, which in turn lowers their RPE.

In this study, the Borg scale was the only tool used to assess RPE. Using a more in-depth analysis of RPE or some other physiological markers of fitness could produce a more comprehensive set of results. In future studies, it would be beneficial to incorporate heart rate monitors, blood pressure monitors, and possibly even VO_2 max assessment because RPE is not the only method of measuring exercise exertion. Despite the fact that RPE is the easiest assessment of exertion it could be more insightful to include other assessments. If this study were repeated, it would be beneficial to include these methods of measurement to get a broader

spectrum of results for comparison. By including more data you would have more reliable results.

Appendix A

Instrument

Cover page for questionnaire.

By completing this questionnaire I _____ hereby give my consent to participate in this study entitled The Effects of Music Genre on Rate of Perceived Exertion. Information was made available to me regarding all risks, inconveniences, or discomforts that could be expected while participating in the study. I understand that all personal information will remain strictly confidential and no names will be disclosed. Participation in this study is strictly voluntary and I may leave the study at any time with no penalty.

Signature of participant

Date

Signature of person explaining the study

Date

Questionnaire

1. Age _____
2. Gender
 - a. Male
 - b. Female
3. I participate in ___ physical activities a week.
 - a. This aerobics class is my only activity
 - b. 2-4 activities a week
 - c. 5-9 activities a week
 - d. 10 or more activities a week
4. Ethnicity?
 - a. Caucasian
 - b. African-American
 - c. Asian
 - d. Hispanic
 - e. Other not listed _____

Appendix B

Scale	Severity
0	No Breathlessness At All
.5	Very Very Slight (Just Noticeable)
1	Very Slight
2	Slight Breathlessness
3	Moderate
4	Somewhat Severe
5	Severe Breathlessness
6	No description included in original scale
7	Very Severe Breathlessness
8	No description included in original scale
9	Very Very Severe (Almost Maximum
10	Maximum

Borg RPE Scale (1982)

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