THE PSYCHO-PHYSICAL RESPONSE TO MUSIC DURING MODERATE INTENSITY AEROBIC CONDITIONING

by

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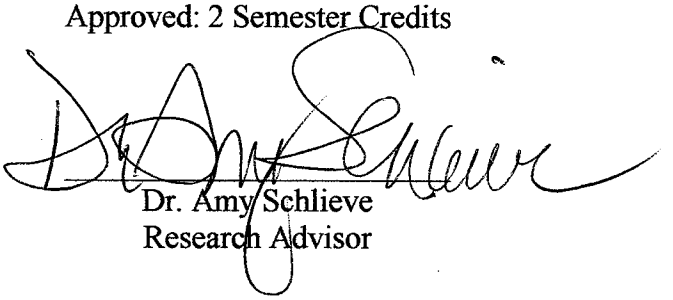

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ABSTRACT

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Music has become an increasing vital component of everyday life, especially in leisure, sport, and physical fitness. Specifically, in regards to this thesis, the purpose is to answer the research question: does variance in music affect heart rate and RPE during three format-identical indoor cycling trials? This study assessed the psycho-physical response of 4 males and 4 females ages 21 - 54 years of age in three independent research-controlled indoor cycling trials. A physical warm-up was conducted for 5 minutes followed by 3, 5 minutes phase rides with increasing intensity, and followed up by a 5 minute cool down phase. At phase 1, the participants were instructed to increase the fly-wheel resistance 1/3 or light. At phase 2, the participants were instructed to

increase the fly-wheel resistance 2/3 or moderate. At phase 3, the participants were instructed to increase the fly-wheel resistance 3/3 or max. During the study, all participants took their initial resting heart rate and recorded that number. During the 4 subsequent phases, the participants active heart rates and RPE's were taken at exactly 2 ½ minutes into each of the stages. A survey was handed out at the end of each trial to record the participants answers to the following questions: I would rate my physical performance as hard, I felt motivated by the music, I felt more energized now after the ride, and I would rate this as a successful and beneficial ride.

Findings indicate that there were no significant differences between the physiological aspect of the three independent trials. Heart rate and RPE's were virtually the same no matter the music selection, whether it was trial one with no music, trial two with classical, or trial three with aerobic music. However, findings do indicate that there were psychological differences in what the participants reported they were feeling during the three independent trials associated with the music that was heard during the rides. The participants reported they worked harder, were more motivated, felt more energized and had more success/benefit from the aerobic music.

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It goes without saying that the process of doing research and writing a thesis is really a collaborative effort. While there may be only one researcher's name on the title page, that name is supported by a enormous network of friends, advisors, collaborators, and confidants, whom without their support, inspiration, dedication, and patience would make this work impossibly unbearable. So, I would like to thank those individuals who have made this thesis a little less unbearable and a little more motivational.

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CHAPTER I: INTRODUCTION

"The phenomenon of music is given to us with the sole purpose of establishing an order of things, including particularly the coordination between man and time. To be put into practice, its indispensable and single requirement is construction...It is precisely this construction, this achieved order, which produces in us a unique emotion having nothing in common without ordinary sensations and our responses to the impressions of daily life..." (Dobrian, 1992, pg 4).

Music has become an increasing vital component of everyday life. Whether driving in a car and singing one's favorite song, going shopping at the mall and hearing music that entices the customer to buy more merchandise, or attending a sporting event where you can hear music both during the game and the breaks, music is everywhere. Specifically, in regards to this thesis, this researcher will focus her attention to the latter of the three, exclusively singling out music during sport, specifically during aerobic exercise, focusing on the effect it has on the human body during cardiovascular conditioning.

"From the introduction of aerobic dance in the early 70s, it has generally been regarded that the music accompaniment to exercise provides an important beneficial effect to the exercise experience" (Kravitz, 1994, pg. 1). Seabourne (2000), even admits music, even to the musically-untrained ear, invokes a natural stimulation and vibration of the ear drum, which in turn causes a chain reaction into the middle and inner ear itself. This chain reaction eventually causes sound wave vibrations to be transmitted and received and turned into nerve impulses received by the neuro-receptors of the central nervous system, consequently interpreted and rearranged to be understood by the brain,

and ultimately being perceived as sound. The sound then, with an added individual touch, becomes "music to your ears." The music itself provides a basis for beat, style, performance, and interpretation. The music also provides an alternative distraction to the participants and allows them to become *disassociated* with the physical exertions of the exercise and rather subconsciously obey the natural rhythmic motivation of the music.

This study examines listening to music, specifically people listening to music (with an emotional ear) while performing aerobic conditioning exercises. An article written by McCook (2002) and appearing in *Reuters Health* explored the option that when individuals listen to their favorite music when participating in physical activity they may actually push themselves harder and feel like they are working with less exertion then those exercisers who do not listen to music while working out. McCook (2002) also identifies a number of studies that have been performed investigating the ideas associated with the perceived benefits of listening to music while exercising, which include: a variety of physiological and psychological effects such as decreasing heart rate; decreasing RPE ; decreased respiratory rate; increased endurance performance; and an increase of serotonin levels in the brain leading to an increase in euphoria or mood during exercise.

Studies indicate, MacKay (1995), that even at birth, babies come into the world with distinctly individual and unique responses to music, with certain musical preferences. Other studies indicate that even before birth, the fetus responds to musical stimuli if played through the mother into the womb. If music is played into the womb that is soothing and calming, the fetus is observed to be relaxed and movement is decreased; however, if music contains dissonant notes at the end of a melody, it is

reported that the fetus will move and try to turn from the unpleasant noise, MacKay (1995). "Music is in our genes," says Mark Jude Tramo, a musician, prolific songwriter, and a neruoscientist at the Harvard Medical School. "Many researchers like myself are trying to understand melody, harmony, rhythm, and the feelings they produce, at the level of individual brain cells."(MacKay, 1995, pg.1) According to another Harvard Medical School music professor, Kay Shelemay concurs by saying,

> All humans come into the world with an innate capability for music. At a very early age, this capability is shaped by the music system of the culture in which a child is raised. That culture affects the construction of instruments, the way people sound when they sing, and even the way they hear sound. By combining research on what goes on in the brain with a cultural understanding of music, I expect we'll learn a lot more than we would by either approach alone (Cromie, 2002, pg. 1)

STATEMENT OF THE PROBLEM

Music has become an increasingly vital component of exercise, sport, and fitness, not only through a recreational aspect but also through the fitness industry standpoint. Research indicates, Seabourne (2000) that a link to music provides motivation to those individuals who may lack the drive or discipline to exercise solely through their own breath or it may also provide distractions for those who are beginning a journey of blood, sweat, and tears. Regardless of the reasons for including music into any type of aerobic conditioning routine, music is an essential and fundamental component of all group fitness cycling classes. This researcher wants to know if the music itself is responsible for the actual reduction in the physical response (decrease heart rate) or if it is purely a mental

disassociation.

PURPOSE OF THE STUDY

Music is essentially built on a variety of bricks of sound, without this framework of sound, music would not be possible. "All the music of the world arise through an elaborate interaction between the sound-generating properties of physical objects (termed instruments of music) and the sound-analysis properties of the human auditory system" (Scheirer, 2000, pg. 33).

The purpose of this research, through careful statistical analysis of the experimental data, is to study and understand the effect of music on simple motor tasks and to interpret, objectively, which mechanism (the reduction of the sensation of fatigue or cognitive arousal) has contributed more to the results of music effects on heart rate and RPE and on the psychological response. The results of this research enables construction of understanding about the body and the emotional components associated with the power of music selection and its relationship to an appropriate group exercise format, specifically in regards to indoor cycling or spinning. This research will support the conceptual framework necessary to outline the underlying motives, motivations, and inherent qualities music possesses to become what if believed to be an enormous extrinsic motivator for most exercisers.

Certain hypothesis need to be addressed. First, the fitness industry literature indicates that as music is effectively incorporated into an aerobic conditioning environment, the RPE is significantly reduced without any physiological change in the lactate acid threshold or without any alterations to the work load placed on the muscles of the body. Second, is the quantifiable measurement of heart rate where the music

positively influences a reduction of beats per minute. Lastly, is the theory of the increases, such as the increase in mood enhancing endorphins released into the body during exercise in a "musical" environment .

Eight people, ranging in age (starting at age 21-54) and of varying physical fitness levels, preformed three, 30-minute cycling rides on a weighted-flywheel, indoor-cycling bike (Johnny G Spin cycle). All subjects participated in a series of three independent trials while playing one of three types of music (white noise, classical, or aerobic) during each cycling session. Each test was administered on separate days with a minimum of one week rest between testing sessions. Throughout the testing process, the subjects were monitored in several different ways, including RPE and heart rate (as taken using a Polar Heart Rate Monitor). A battery of questions was presented in a pre- and post- test given to monitor the psychological effect of the music and its relationship to the reduction of the sensation to fatigue or the addition of cognitive arousal.

Participants of this study consisted of volunteers 18 years and above who were members at a local franchise gym in the Midwest. The study investigated the relationship between music and the psycho-physical response of the body to the music during aerobic conditioning. The study took place during the first three weekends in June of the year 2004. The study was conducted on site, in alliance with the franchise facility, in a room sanctioned specifically for indoor cycling. The study consisted of 3 identical, 30-minute indoor cycling rides following the same format. Each cycling class started exactly at 7:15 am on Saturday mornings and the duration was 30-minutes. The format of the class was to start by taking the participants initial pre-exercise heart rate and was recorded. There after the class started and went in 5-minute increments, as follows: 7:15-7:20 Warm-Up,

7:20-7:25 Phase 1, 7:25-7:30 Phase 2, 7:30-7:35 Phase 3, 7:35-7:40 Cool-down, 7:40-7:45 Post Exercise survey. At 2.5 minutes into each of the 4 phases, the heart rate and RPE was taken from each the 8 participants and recorded. After the final 5th phase, the cool-down, the participants were instructed to proceed off their bikes and into a stretch (quadriceps, hamstring, glute, and calf stretch) and then asked to complete a final 5-question survey on overall performance. The first 30-minute ride was without any music, the participants were exposed to only "white noise." The second 30-minute ride was performed to a ballad, specifically a compilation of Pachelbel's *Canon in D*, Valvaldi's *The Four Seasons: Winter: II Largo*, and Bach's *Air on the G String*. . The third 30-minute ride was performed to an aerobic mix compilation CD with beats per minute constant at 135. The format of all three indoor rides was identical and consisted of 5, 5-minute phases (warm-up, phase 1, phase 2, phase 3, and a cool down).

RESEARCH QUESTION

The industry belief is that music has a powerful, almost hypnotic quality about it, especially in the realm of exercise. Music exudes an enticing ambiance that lures the brain and subsequently, the body, to fall into a trance of inviting harmonies, tempting melodies, and driving beats. The research question of this thesis is: does variance in music affect heart rate and RPE during three format-identical indoor cycling trials?

DEFINITION OF TERMS

As in any research, there are certain terms or words used that are specific to the research itself. Some terms are common words, yet other's are unfamiliar and need to be defined. The following is a list of terms that will be commonly used throughout this thesis.

Psychoacoustics: the study of the perception of sound. This includes active listening, our psychological response, and the physiological impact of music and the sound impact on the human nervous system. In the realm of psychoacoustics, the terms music, sound, frequency, and vibration are interchangeable (Leeds, 2001).

Rate of Perceived Exertion (RPE): a 10-point Borg scale used to regulate intensity during aerobic endurance training. Categories range from 0 (nothing at all) to 10 (extremely strong).

Semiotics: the ways in which listeners receive signs, indexical associations, and icons when they listen to music, and the ways in which such entities become associated with significant containing emotional connotations.

ASSUMPTIONS OF THE STUDY

According to Freudenrich (2002), exercise is one of the best ways to decrease stress levels, increase mood-enhancing hormones, and acquire a more healthy self. Exercise can help to reduce anxiety and relieve stress levels through the release of endorphins and increase serotonin levels in the brain. With the inclusion of music this researcher believes that the overall effects will increase the euphoric levels and decrease heart rate and RPE at the same levels of work placed on the human body, therefore increase the enjoyment of the activities and the overall benefits to the body.

LIMITATIONS OF THE STUDY

With any study, certain unavoidable limitations exist. In this case, there a variety of limitations that pose problems to this study. One of the most unavoidable limitations that exists is the implementation of human subjects into the equation. As each individual is directed to stay as objective as possible in their answers, some subjectivity is always

present, therefore some answers might be skewed to reflect what the subjects believe will be the "correct" response. Another limitation that exists is the use of manual tools such as a manual blood pressure cuff, respiratory rate, and RPE. Other limitations are directed to the equipment used. Since the subjects will be riding indoor cycles, the accuracy of the rpm's and the work load, in pounds, of each participant is more difficult to measure and is open to subjectivity. The last limitation would be in the selection of music chosen and if the participants are or are not particularly motivated to exercise as they listen.

CHAPTER II: LITERATURE REVIEW

The review of literature presents information supporting the evidence that music affects exercise performance by encouraging synchronization, inducing relaxation, increasing levels of arousal, and reducing sensations of fatigue. In the search of literature pertaining to the effects of music on the body, both psychological and physiological, this researcher came upon some difficulties finding substantiated and credentially supported literature. There has been significant bodies of literature on the effects of music on the body and the effects of exercise on the body, but only limited research on the combination of the two. Therefore, an experimental approach was taken to support the theories and research specific to each topic, followed closely by the research in relevant areas and summarizing the conclusions of current research and experimentations.

The review of relevant literature is divided into three sections. The first section will explore the history of music as language and how it has found its place into the fitness industry of today. It will investigate music through its first inclusion into daily life up to the present day and the many ways it is being incorporated in the group fitness class setting. The second section will explore the biology, anatomy, and physiology behind exercise, specifically aerobic conditioning related to indoor cycling, the body systems, and the benefits of exercise on the body. The third and final section will explore the hard-to-define concepts of emotion and how the afore mention two sections tie into the relevance that emotions hold in regards to group exercise and personal gratification obtained through success in group exercise settings.

Music has a powerful effect on people emotionally and a common theme through the literature review is the structure of an experienced emotion, which includes inducing

levels of relaxation, increasing levels of arousal, reducing levels of fatigue, and increasing personal euphoria while exercising, along with the adjectives that people use to describe their feelings, moods, and emotions.

THE HISTORY OF MUSIC AS A LANGUAGE

Music, throughout history, has been both a powerful tool for survival and powerful tool for relaxation and enlightenment. The power that it holds can bring about both positive and negative changes in our lives. According to Rooke (1986) the ideas of using music and sound to improve health is not a avant-garde idea. He cited that both harmful and beneficial effects of music have been recognized by the ancient Greeks and Romans, including Pythagoras, Democritus, and Aristotle, just to name a few of the greats. Jowett (1999) also agreed by saying that Plato, Cicero, and Seneca all believed that music profoundly affected societies entire, collective behavior and that the state should regulate the performance of music and actually prohibit certain types because of the potentially harmful effects the music might permit. While Plato's views of music might be a little on the archaic side, he also reminds us that the modern interpretation of music as simply, as Carrol (1998) would put it as, auditory cheesecake, that highly opposes the more traditional ideas of music as a powerful fixture of ancient ways and cultural ideals, whether it was implemented positively or negatively. "According to many musicologists, music is a form of language or communication that directly accesses the emotions without the intermediation of words and rational thoughts" (Wicke, 2002, pg. 2).

"Music is the universal language of mankind" says Deryck Cooke, a British musicologist (cited in Dobrain, 1992, pg. 4) and maintained that "music is a language for expressing emotional states, and that furthermore it is (at least in the case of tonal music)

a strictly codified language in which each scale degree signifies a certain emotion and permits only a single specific reading" (Dobrain, 1992, pg. 4). Music to many is a holy place, a sanctuary, a mountain peak full of grandeur, in some way it is a place or an experience so awe-inspiring that even if there would be *words* to truly describe this *place*, the *place* is too majestic to encapsulate in mere words alone.

> Aaron Copeland's intermediary view that music may express both musical and extra-musical meaning strongly suggests a communicative (informative) power in music, but his belief that music 'may even express a state of meaning for which there exists no adequate word in any language' indicates that he feels music does not possess anything like the explicit significative nature of this language. (Dobrain, 1992, pg. 5)

According to Wicke (2002), the physiological and psychological effects of music is the current research trend in music therapy and is accomplished by focusing on proving that music has measurable effects on the person's psyche and emotions. Much of the recent research is directed through a phenomenon called the "Mozart Effect." Today it is hard to read any substantial research in music and music therapy without reading about the Mozart Effect. As stated by Dr. Robert Wicke,

> The 'Mozart Effect' is based on research by Frances Rauscher et al., who determined that listening to 10 minutes of Mozart's 'Sonata for Two Pianos in D Major' briefly increased scores 48% (relative to control groups) on the paper -folding task, a component of the Stanford-Binet intelligence test that measures

> spatio-temporal reasoning abilities. Listening to a few minutes of Mozart does not permanently make smarter; however, the results of Rauscher's study, modest though they seem, are profound. If such seemingly benign stimuli affect even momentary intelligence, one might wonder whether people exposed to specific types of music and sound over extended periods would experience proportionately greater effects, both positive and negative. (Wicke, 2002, pg. 3)

Understanding music as a more abstract form of language is a matter of individualized, habitual acquisitions in ones-self and ones-life. It is seemingly so simple and so private that none of us can even begin to understand the deepest passions and secrets it possesses. Just as the ability for formulating and understanding speech is taken for granted with every deliberate syllable, so to is the transforming power and ability of music to transpose our emotional and psychological state with every resonating tone. Such phenomenon holds true too in the fitness industry.

Understanding what motivates people extrinsically in a group exercise setting is as specifically-abstract as how the language of music is spoken to and through each individual. Dr. Steven Keteyian, the program director of preventive cardiology at the Henry Ford Heart and Vascular Institute of Detroit, admitted that "Music pervades many aspects of human existence. Since prehistoric times, music has been used as a means of communication, worship, socialization, and healing. Recognizing a link between music and athletic performance or exercise, researchers have extensively study the topic over the past decade" (Keteyian, 2001, pg. 1). Dr. Keteyian goes on to say that, "Clearly, we have sensed or observed the relationship between music and athletic performance. For example, film and media often associate a song or track from a popular movie to athletic performance. One good example of this is the music that

came from the *Rocky* series. Another is the *Chariots of Fire* theme" (Keteyain, 2001, pg. 1).

Other pioneers in the field, just as Dr. Keteyian, concur with the theory that music definitely has a prominent place within the health and fitness and/or exercise field of today. "Music acts to help exercise and athletics in at least one of three ways," (cited in Karageorghis and Terry, 1997, pg. 1). "First, music narrows an exerciser's attention, and as a result, it diverts awareness of bodily sensations such as fatigue" (Keteyain, 2001, pg. 1). This researcher has experienced what a lot of exercisers refer to as a zone of training. This zone happens with the inclusion of driving or rhythmic beats, beats that capture the imagination and pull the attentions away from breathlessness and into the spiritual, percussive pulse of the music itself. The zone could also be seen as a cruise control mechanism on a car, a steady, driving state.

"Second, music can alter mood and provide a stimulant or sedative effect. A song used to stimulate or inspire the athlete is usually one the elicits a positive mood, energizes the person and is consistent with current culture. Music in this instance is often used prior to competition. Conversely, some music can provide a sedative effect, calming the overanxious athlete or the athlete involved in sports that require fine motor performance..." (Keteyain, 2001, pg. 1). This topic of the effects of mood and music will be discussed later in the third and final section with the hard-to-define emotions and musically-emotional stimuli.

"Third, music and exercise are related because of the obvious similarities between the rhythm of music and the rhythm of human movement. Synchronization between the two helps explain the popularity of exercise-to-music classes" (Keteyain, 2001, pg. 1). Typically, the music that most inspires exercise is fluid and contains a pulsing beat, similar to the heart beat of the human body, which is ultimately the driving force of exercise, not only physically, but also mentally. To fully understand the idea of the heart beat in music, one must first understand the

physiology behind the human body in accordance with aerobic conditioning specific to indoor cycling.

BIOLOGY, ANATOMY, AND PHYSIOLOGY OF THE HUMAN BODY

> Imagine working your heart, lungs, muscles, mind, and soul in unison. Imagine a fitness journey that take the real training principles of bicycle racing, blends them with yoga and martial arts, and provides a workout that encourages you to find the champion within. Imagine an indoor training system that welcomes and nurtures newcomers, exhilarates and challenges even the most seasoned athlete, and yet totally non-competitive. Imagine men and women of all ages and backgrounds working together in a communal environment with a common goal: to become the fittest, healthiest, happiest human being possible...(Kostman, 2001, pg. 1).

As noted by Freudenrich (2002), normal physiological responses to exercise include heavier breath, faster breath, faster heart rate, muscle fatigue (sometimes hurt) and sweat. All of these normal physiological responses occur to all exercisers regardless of their level of fitness or what type of exercise they are participating. When performing in indoor cycling, just as in running or in swimming, different muscles are used to generate motion and, typically, forward movement. Depending on the level of stress and strain placed on the body during the exercise, the brain will help determine how the body most effectively and efficiently focuses its efforts on helping the muscles do their work.

In cardiovascular endurance training, as in indoor cycling, several factors go into keeping the body a well-oiled machine. As with any cardiovascular event, if the participant will be exercising for more than a few minutes, the body needs to maintain a constant supply of oxygen to the muscles in order for them to remain working. Freudenrich (2002) also admits that just

how much oxygen your muscles will use depends on two processes: getting blood to the muscles from inhalation and delivery by the heart and extracting oxygen from the blood into the muscle tissue at a more cellular level. Oxygen uptake by the working muscles can be done is several ways, which include: increasing the respiratory rate (including both depth and rate of breathing), increasing the cardiac output (increasing the blood flow from the heart), increasing the blood flow to the working muscles, and diverting the blood flow from the non-essential organs (like the stomach) and supplying it to the working muscles. "These mechanisms can increase the blood flow to your working muscles by almost five times...meaning that the amount of oxygen available to the working muscles can be increased by almost 15 times" (Freudenrich, 2002, pg. 4).

When the muscles start to work harder, they automatically produce certain by-products associated with the stressors being placed on the body. Freudenrich (2002) admits that certain by-products include carbon dioxide, adenosine, hydrogen ions, and lactic acid. The muscles try to rid the body of these waste materials, but sometimes (depending on levels of aerobic conditioning) the body will eventually reach a certain warning level, or the lactic acid threshold. This is where the body starts to *feel the burn* and this is where, typically, untrained exercisers will quit; however, this is where, too, the motivating power of music can be very effective and vital to the success of the exerciser.

"The effects of music on respiration and cardiac activity have been of particular focus to researchers due to the value of these physiological parameters to health and disease prevention" (Kravitz, 1994, pg. 2). For many years, scientists have been painstaking working to understand the positive ramifications that music has on the human body during birth, surgical procedure, and even disease prevention, however, the idea of using music in sport and exercise is a rather

new entity.

> In a well-designed study, Ellis and Brighouse (1952) noted that respiration rate increased significantly with the onset of jazz music and tends to return to pre-music levels with the cessation of music. Heart rate was only moderately effected by the introduction of the music. The average heart rate is between 72-80 beats per minute while music tempos may range from 70-170 beats per minutes. A review of studies indicated that heart rate tends to only moderately follow the music; increasing in response to fast music and deceasing in response to slow music...several investigations that actually show any type of music (sedative or stimulative) will show a moderate increase in heart rate. Much of this increase in heart rate by all types of music can be explained due to the fact that music does produce some kind of emotional effect, thus increasing the heart rate. (Kravitz, 1994, pg. 2)

As depicted above, jazz music tended not to increase the average heart rate or change the overall physiological response, which in this case, supported the idea that music can be somewhat of a sedative or relaxing agent therefore, in the long run, would prove to support the theory that music does act as a erogenic aid in exercise, specifically aerobic conditioning. So, it is true that exercise plays a role in physical exertion and it is also true that music can play an important role in physical relaxation, however, is it possible that music can have a positive effect on mood and adapt the physiological and psychological response when incorporated into a high-intensity, cardiovascularly straining, endurance indoor cycling class?

MUSIC, EMOTION, AND PERSONAL GRATIFICATION

> Music expresses, at different moments, serenity or exuberance, regret or triumph, fury or delight. It expresses each of these moods, and many others, in a numberless variety of subtle shadings and differences. It may even express a state of meaning for which there exists no adequate word in any language. In that case, musicians often like to say that it has only a purely musical meaning. They sometimes go farther and say that all music has only a purely musical meaning. What they really mean is that no appropriate word can be found to express the music's meaning and that, even if it could, the do not feel the need of finding it. (Dobrian, 1992, pg. 4)

"Research has demonstrated that music can affect concentration, endurance, muscle tension, blood pressure, heart rate, and breathing. Music increases positive emotions and lifts spirits by stimulating neurochemical changes associated with healing" (Seabourne, 2000, pg. 1). This bedazzling relationship between music and human emotion is not only a hot tool from the club industry perspective but also from the personal gratification perspective. According to the *Aerobics and Fitness Association of America* (Seabourne, 2000, pg. 1), " the music can bring good health, motivation, and harmony." Feelings associated with the fast, driving beats, the back-bone of aerobic fitness, inspire joy, euphoria, and a sense of drive. According to the Pittsburgh Tribune-Review (Green, 2002, pg. 2B), "Mark Puchany, director of group exercise for Club One in Shadyside and Fox Chapel, 'It's amazing, the power of music. I can't underestimate the importance of music in a workout.'" Mark goes on to say, "Group exercise is a union or marriage between good music and movement. A lot of the vibe or energy of an exercise class comes from the music. It determines the environment you put your students in" (cited in Greene, 2002, pg. 2B)).

Music can play an enormous role in what it is that moves us and what it is that drives us to succeed. Certain music, as evident in movies and films, is used to inspire a distinct display of emotion. Just as Hollywood has used musical works according to what emotions are sought, so too is music used in an exercise club to inspire the same responses. For instance, a yoga master would not choose to play a aerobic version of Jennifer Lopez's music to stimulate a soothing and tranquil environment, just as a cardio kickboxing instructor would not choose Yanni's music to ignite the spark needed to push the high-energy class above and beyond their limits. When choosing the music best suited to fit the environment, it is vitally important to create a zone for the aspiring participants to achieve. "Kevin Tishky, who taught cardio kickboxing for two years at Kim's Martial Arts in Cranberry, agrees that exercising to music has a positive affect on many people by helping to release tension. 'When exercising to music, people feel like they're in a zone. Music puts you mentally in a place you need to be to have a good workout" (cited in Greene, 2002, pg. 2B).

As an instructor, this researcher tries to select the type of music that conveys the spirit and pave the path for the class as a whole. The direction of the class is very important. For an instructor, besides having strong leadership skills and superb communication skills, the music has to pick up and fill the holes for the class, as well as lead the class to the next level. "Instructors select the songs based on the direction they want the class to go. Music can range from Mozart to Metallica" (Greene, 2002, pg. 2B). Emotions are the bull's-eyes for this researcher's class. If the instructor can cater to the emotions of the participants and engage them, arouse them into a zone where they are feeling like their minds are turned off and their bodies are turned on, then the job has been done and done well.

According to Scheirer (2000), there are many interesting facts about the relationship

between music and emotion.

> The major organizing force in modern thinking on emotion in music was the work of LB. Meyer, particularly an extensive volume on the topic (Meyer, 1956). Meyer made a number of key points that continue to influence thinking about the aesthetics and philosophy of music today. First, he explicitly denies that music gives rise to a consistent, differentiated affective behavior (such as a sadness response). He focuses instead on the notion that the affective response is mainly a modulation of the listener's overall level of arousal. He equates the affective response to music with arousal, using terms familiar to musicologists such as tension and release, and attempts to relate the musicological use of this terminology to more rigorous emotional-psychology definitions.
>
> Second, Meyer denies that the affective response to music is based on designative semiotics in the sense described above. Rather, he claims that all (or nearly all) emotion and meaning in music is intra-musical; music only references itself and thus the excitement and tension in music are present only insofar as a listener understands the references. He thus views expectation and fulfillment or denial of expectation in music as the singular carriers of emotion in music.(Scheirer, 2000, pg. 33)

The current interest in music research is not simply due to a one-time, one-shot study about the effects or correlations between music and emotions or behavior; however, it is in effect a combination of many things that have happened. First, since music has the ability to foster a given (positive or negative) emotional response, it is no wonder why researchers have finally uncovered the prospect that between music and emotion or behavior exists a strong, tangible relationship. Second, since a new spawning interest in this area is now being researched and

older research is rediscovered, we are able to make new and even more impressive connections to the theories of the past and the practical applications and research of the present. Thirdly, we, as people, are finally able to embrace the ideas once thought to be too abstract as a form of truth and as a form of science.

CHAPTER III: METHODOLOGY

INTRODUCTION

"The phenomenon of music is given to us with the sole purpose of establishing an order of things, including particularly the coordination between man and time. To be put into practice, its indispensable and single requirement is construction...It is precisely this construction, this achieved order, which produces in us a unique emotion having nothing in common without ordinary sensations and our responses to the impressions of daily life..." (Dobrian, 1992, pg. 4).

In order to test the objectives of any research, data specific to the research must be gathered and analyzed. In the pages that follow, an in-depth discussion of the subjects and their selection, the instrumentation used for this study, the data and the collection and analysis process will all be discussed.

SELECTION AND DESCRIPTION OF THE SAMPLE

The subjects who are to be used have several characteristics in common: they all preside in the state of Wisconsin; they all are current members at the participating franchise gym; and they all share a similar and habitual pattern in exercise and fitness. Eight people of varying physical fitness levels preformed three 30-minute cycling rides on a weighted-flywheel, indoor-cycling bike. All subjects participated in a series of three independent trials while listening to one of three types of music (white noise, instrumental, or aerobic) during each cycling session. Each test was administered on separate days with a minimum of one week rest between testing sessions. Throughout the testing process, the subjects were monitored in several different ways, including RPE and heart rate (as taken using a Polar Heart Rate Monitor). A battery of questions were presented in a pre- and post- test given to monitor the psychological effect of the music and its relationship to the reduction of the sensation of fatigue or cognitive arousal.

INSTRUMENTATION

The instruments that were used for this study were in two parts. The first part was the psychological component of the study. A pre- and post- test was developed by this researcher to meet the specific criterial enabling questions pertaining to mood and music to be used and assessed. The test was a survey devised using a Likert scale. It was two pages in length. The pretest ask a battery of questions, such as: do you currently exercise, what type of exercise and the duration, do you participate in leisure time activity, do you listen to music while you exercise, and what type of music to you listen to while you exercise. The second part of the testing involved the use of physiological equipment to be implemented. The use personal heart rate monitors and RPE was recorded for each of the 5 phases in the study. The participants were instructed to collect their starting heart rate. After that was completed, a 5-minute warm-up took place, followed by phase 1, phase 2, and phase3, all of which became increasingly difficult. The third phase was followed by a cool down phase in which the participant brought their heart rates down to an appropriate level and then dismounted their bikes. After a stretch of the legs, the participants then were given the post test survey in which they were to answer the following questions: I would rate my physical performance as hard; I felt motivated by the music; I felt energized now, after the ride; and I felt this was a beneficial and successful ride. After they answered the questions they were free to leave. The study, as well as the instrumentation, was approved by the IRB in May 2004 (APPENDIX A).

SUBJECT SELECTION

In the early part of June 2004, June 1- 4th, a posting was hung in the participating facility explaining the study being conducted and for all interested participants to contact the examiner for more information. After the subjects who met the age requirement were obtained, they were

contacted and asked if they were willing and able to participate. The subjects then had the opportunity to accept the position in the study or reject their position. Eight of the contacted participants were willing and able to perform the tasks. From there, a formal letter of consent was issued and signed informing them of their rights as volunteers. The participants who consented to be studies fell into the age category of 21-54 year old. There were 4 male participants and 4 female participants. All participants exercised consistently 3 or more days a week in the gym and all had taken at least 1 indoor cycling class before the study. All participants brought their own heart rate monitors for the study.

DATA COLLECTION

The data was collected in three parts, during three separate class rides taking place in the first three weekends of June 2004. Each cycling class started exactly at 7:15 am on Saturday mornings and the duration was 30-minutes. The format of the class was to start by taking the participants initial pre-exercise heart rate and was recorded. The class started and went in 5-minute increments, as follows: 7:15-7:20 Warm-Up, 7:20-7:25 Phase 1, 7:25-7:30 Phase 2, 7:30-7:35 Phase 3, 7:35-7:40 Cool-down, 7:40-7:45 Post Exercise survey. At 2.5 minutes into each of the 4 phases, the heart rate and RPE was taken from each the 8 participants and recorded. After the final 5th phase, the cool-down, the participants were instructed to proceed off their bikes and into a stretch (quadriceps, hamstring, glute, and calf stretch) and then asked to complete a final 5-question survey on overall performance. After the survey was complete the participants were free to leave.

DATA ANALYSIS

The data was analyzed though the use of statistics to determine if there was a positive or negative correlation between the psychological effects of the music and the physiological

response of the body to the music and the exercise. A pre-exercise survey was used to gather the demographic information about the research subjects. The pre-exercise question on this survey asked about current physical fitness and exercise levels at the gym, about leisure activity level outside the gym, and about the participants use of music and the types in their own exercise regime. During the actually indoor cycling trials, the individuals were instructed to collect individual heart rates and rates of perceived exertion during the 5, 5-minute phase rides. These intrinsic statistics were then used to measure, on a physiological standpoint, any variations that the extrinsic motivators (specifically the variance in music) and how they might change the heart rate or rpe. Also, 4 follow-up questions were asked at the end of the trials. These questions asked the participants to (1) rate their own physical performance as hard, (2) rate if they felt motivated by the music of that specific trial, (3) rate if they felt more energized now after the ride, and (4) to rate the ride as successful and beneficial.

LIMITATIONS

As with any study, there are certain limitations that need to be addressed. In any type of a survey or questionnaire, there is a reality of participant subjectivity. The questions of mood and emotion may be issues for some people and their reply to the answers may reflect this subjectivity. In fact, some participants may choose to keep their emotions to themselves and not admit "true" feelings during the study. This method of data collection (the psychological questionnaire) will be one of the most subjective parts of the study. Other limitations include the size of the sample. The aerobics room designed for indoor cycling is small and is only able to accommodate 10 participants, and in this case there we only 8 participants. Since such a small number of participants are being used and since the majority of the participants come to this study with similar backgrounds, practices, and beliefs, the study results may be skewed. Finally,

the last limitation is in regards to the physiological component of work load placed on the weighted flywheel and the physiological measure of the RPE . Both these testing aspects are very subjective even with precautions in-place.

CHAPTER IV: RESULTS

RESULTS

This study investigated the differential effects of three independent types of musical selection for an endurance-based indoor cycling class and compared the types of music with the participants heart rate and RPE within a series of five progressively increasing phases of resistance. The music that was selected fell into one of three different types. In trial 1, "white noise" or no music was integrated, in trial 2 classical (no beat music) was integrated, and in trial 3 aerobic (driving beat) music was integrated. The problem to be evaluated was does music affect heart rate and RPE during the identical trials with a variance of music? A 30-minute indoor cycling class was performed and a survey was given out at the end of the class. The survey provided information pertaining to the participants heart rates, RPE, physical exertion, energy factor, motivation factor, and success and benefit factor from the class. Men and women were recruited through the gym in a mid-size, northwestern Wisconsin city and represented a physically conscious and active group.

QUESTIONS ANALYSIS

Before the study was conducted, participants were given a current physical activity level and music usage survey (APPENDIX A). Results indicated that at the starting point all the participants were currently active, in an aerobic capacity, at the gym. Question 1.0, Do you currently exercise? 100% of the participants reported yes. 62.5 % of the participants were regularly aerobically active 3-4 times a week with a 21- 45 minute duration. Question 1.1, Have you been exercising for more than one year or less than one year. Of these participants studies, 87.5 % have been active for more than 1 years time. Question 1.2, On a scale of 1 to 5, with 1 describing a light exercise program where the participants do not sweat, 3 describing a moderate

exercise program where the participants breaths a little harder and may possibly sweat, and 5 describing a vigorous exercise program where the participants breaths hard and sweats, how would you rate the average intensity of your exercise program. The participants reported a mean answer of 4.25 out of the 5 point scale. Question 2.0, Do you participate in Leisure Time Activity, 62.5 % said that they did. Question 3.0, Do you currently listen to music when exercising? When the participants were questioned if they listened to music while exercising, 6 out of 8 of the participants said yes, with 62.5 % expressing alternative music was their first choice, followed by 37.5 % selecting fast aerobic dance music, and 12.5 % listening to classical. Question 3.1 asked, When listening to music while exercising, do you feel more energized? Of those participants indicating that they listened to music while exercising, 100 % of the participants felts more energized while exercising with music. Question 3.2, When listening to music while exercising, do you feel less tired? Out of the five participants who responded to the question, 100% said yes. Question 3.3, When listening to music while exercising, do you disassociate yourself from the exercise? 50% of the participants responded yes they disassociate themself from the exercise and 50% responded no. Question 4.0, Would you listen to music while exercising? When asked if they would listen to music while exercising, 85.7 % of the participants said yes.

During the research study, all eight participant performed three independent indoor cycling rides under the same physical conditions. Verbal instructions and a written instructional outline was given when all the participants were present as to what would be taking place. The first of the three independent rides used no music. The second of the three independent rides used a compilation of Pachelbel's *Canon in D*, Valvaldi's *The Four Seasons: Winter: II Largo*, and

Bach's *Air on the G String*. The third of three independent rides used a pre-mixed, 32 count aerobic music compact disc with a consistent 135 beat per minute tempo.

The demographics of the class was the same for each of the rides. A physical warm-up was conducted for 5 minutes followed by 3, 5 minutes phase rides with increasing intensity, and followed up by a 5 minute cool down phase. At phase 1, the participants were instructed to increase the fly-wheel resistance 1/3 or light. At phase 2, the participants were instructed to increase the fly-wheel resistance 2/3 or moderate. At phase 3, the participants were instructed to increase the fly-wheel resistance 3/3 or max. During the study, all participants took their initial resting heart rate and recorded that number. During the 4 subsequent phases, the participants active heart rates and RPE's were taken at exactly 2 ½ minutes into each of the stages.

An identical survey was administered at each of the three independent trials (APPENDIX B). Questions one through five were identical and pertained to heart rate and RPE. Question one asked, *Right now, I am in my pre-exercise heart rate?* 100% of the participants were in the normal range (60-100 beats per minute) of the pre-exercise heart rate. Question two through question five all read the same way. *In regards to phase 1, 2, 3, or cool down, my RPE is* ___ *and my heart rate is* ____. Below is a chart depicting the results from both the participants heart rates and the participants rates of perceived exertion from the 3 independent rides. The first chart indicates the mean values for the heart rates from the participants in beats per minute for all three of the independent rides and types of music used.

Heart Rate

Music Type

	No Music	**Classical**	**Aerobic**
Pre-Exercise	96.5	85.6	95.5
Phase1	117.9	116.5	122.4
Phase 2	135.4	138.8	140.8
Phase 3	160.3	160.9	162.1
Cool Down	109.6	111.8	112.9
Post-Exercise	96.0	98.0	102.8

Chart 1A. This chart represents the mean heart rates of the participants in the 3 independent cycling rides.

As shown above in Chart 1A, the mean heart rates of the participants holds no significant statistical evidence that the music effects the heart rates of the participants. The heart rates throughout the phases maintain consistent values varying no more than 10.9 beats in the pre-exercise phase, 5.9 beats in phase 1, 5.3 beats in phase 2, 1.8 beats in phase 3, 3.3 beats in the cool down phase, and 6.8 beats in the post-exercise phase. Regardless of the type of music used, the participants' heart rate are consistent for the phase.

Question two through question five all read the same way. The second chart indicates the measure of RPE for all three independent rides and the type of music used. *In regards to phase 1, 2, 3, or cool down, my RPE is ___ and my heart rate is ____.*

Rate of Perceived Exertion

Music Type	**No Music**	**Classical**	**Aerobic**
Phase 1	3.4	2.9	3.0
Phase 2	5.8	5.4	6.0
Phase 3	8.3	8.0	8.6
Cool Down	1.5	2.3	1.9

Chart 1B. This chart represents the mean RPE on a scale from 0-10 from the participants in the 3 independent cycling rides.

As shown above in chart 1B, the mean RPE of the participants holds no significant statistical evidence that the music effects the RPE of the participants. The RPE throughout the phases maintain consistent values varying no more than 0.5 in phase 1, 0.6 in phase 2, 0.6 in phase 3, and 0.8 in the cool down phase. Regardless of the music used in the independent trials, the RPE showed no significant statistical variance or value. As shown by both the heart rate and RPE, the type of music has no significant effect of the physiological effect on the body.

Question number six read, *Overall I would rate my physical performance as hard?*

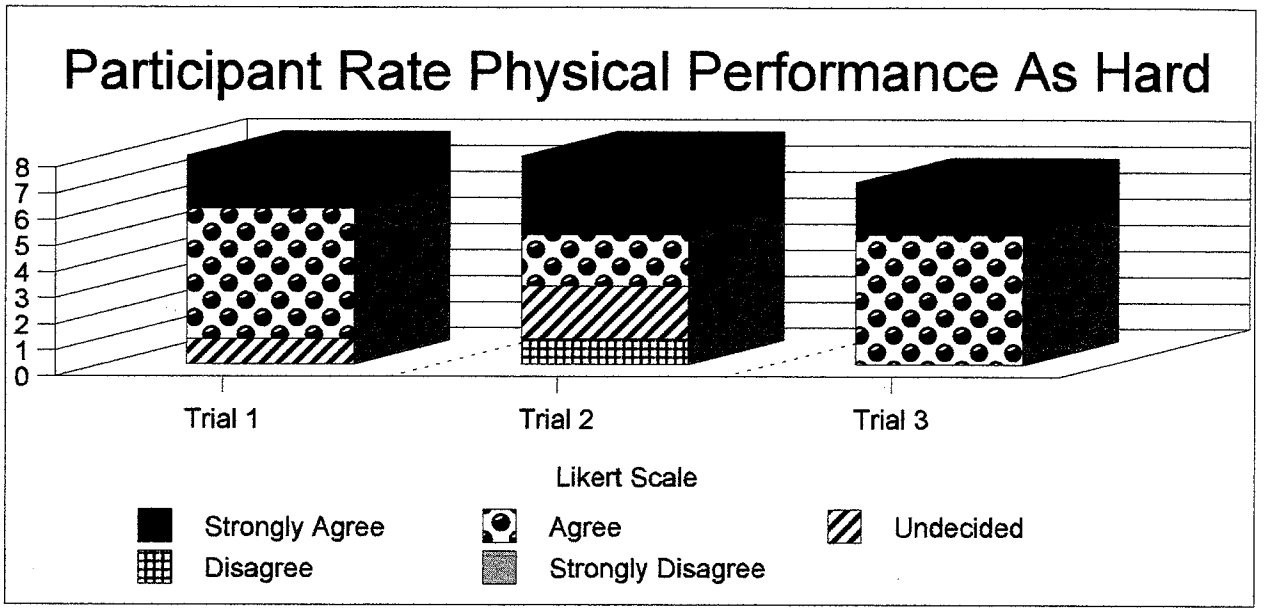

Figure 1 represents the participants rating of a hard physical performance.

When the participants reported on the survey if they rated their overall physical performance as hard, according to the answers during the 1st independent trial with no music 1 participant was undecided, 5 participants agreed, and 2 participants strongly agreed; during the 2nd independent trial with classical music 1 participant disagreed, 2 participants were undecided, 2 participants agreed, and 3 participants strongly agreed; during the 3rd independent trial with aerobic music 5 participants agreed, 2 participants strongly agreed, and 1 participant had no response. These results are seen in Figure 1.

Question number seven read, *Right now, I am in my post exercise heart rate, yes___ or no___* According to the participants, 100% were in their post exercise heart rates. Question number eight read, *I felt motivated by the music during the ride?*

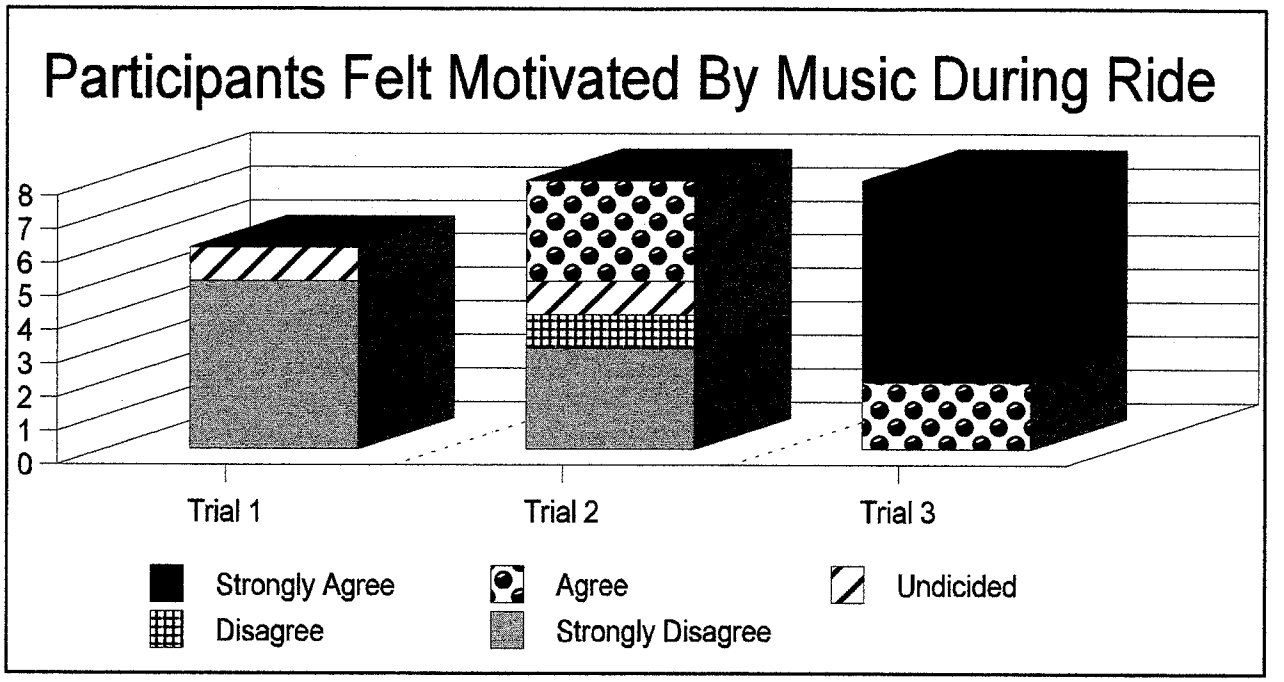

Figure 2 represents the participants report when asked if they felt motivated by the music in the three independent trials.

When the participants reported in the study if they felt motivated by the music during the ride, according to the answers during the 1st independent trial with no music, 5 participants strongly disagreed, 1 participant was undecided, and 2 did not respond; during the 2nd independent trial with classical music, 3 participants strongly disagree, 1 participant disagreed, 1 participant was undecided, and 3 participants agreed; during the 3rd independent trial with aerobic music, 2 participants agreed and 6 participants strongly agreed. These results are seen in Figure 2.

Question number nine read, *I feel more energized now, after the ride?*

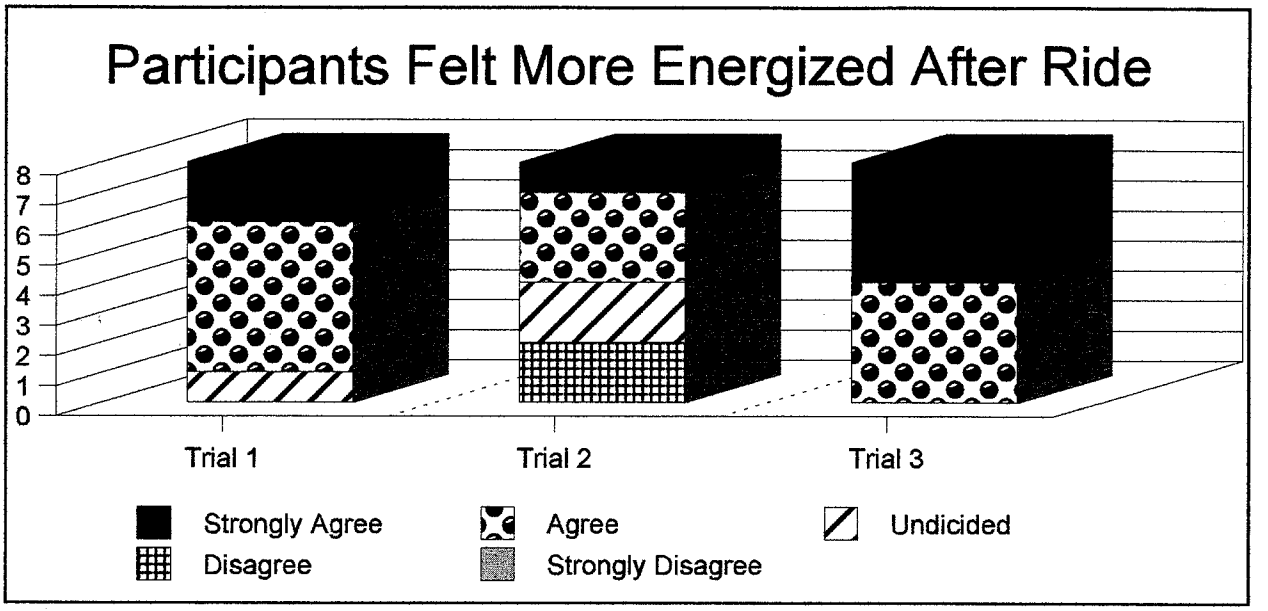

Figure 3. represents a demographic depicting the participants felt more energized after the three independent trial rides.

When the participants reported in the study if they felt more energized after the ride, according to the answers during the 1st independent trial with no music, 1 participant was undecided, 5 participants agreed, and 2 participants strongly agreed; during the 2nd independent trial with classical music, 2 participants disagreed, 2 participants were undecided, 3 participants agreed, and 1 participant strongly agreed; during the 3rd independent trial with aerobic music, 4 participants agreed and 4 participants strongly agreed. Results are reported in Figure 3.

Question number ten read, *I would rate this as a successful and beneficial ride?*

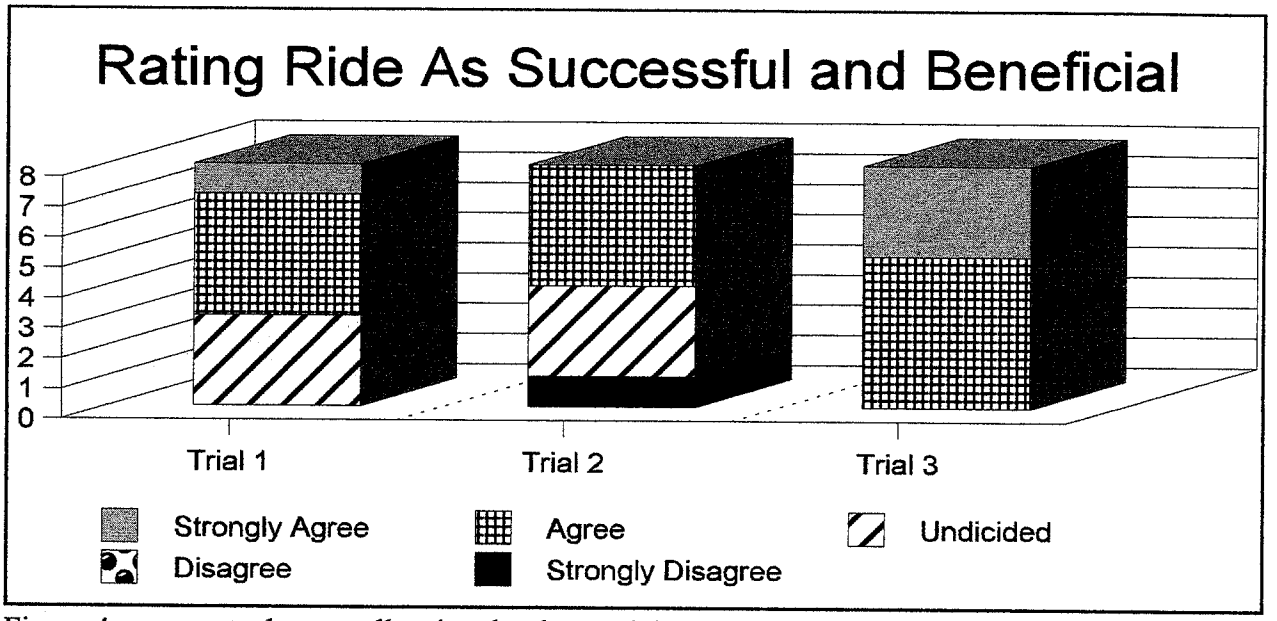

Figure 4 represents the overall rating, by the participants, as a successful and beneficial ride.

When the participants reported in the study if they would rate this ride successful and beneficial, the answers during the 1st independent trial with no music, 3 participants were undecided, 4 participants agreed, and 1 participant strongly agreed; during the 2nd independent trial with classical music, 1 participant strongly disagreed, 3 participants were undecided, and 4 participants agreed; during the 3rd independent trial with aerobic music, 5 participants agreed and 3 participants agreed strongly. These results are seen in Figure 4.

SUMMARY OF FINDINGS

In summary, this chapter describes three independent indoor cycling trials. Trial 1 consisting of a 30-minute ride with no music, trial 2 consisting of a 30-minute ride with classical music, and trial 3 consisting of a 30-minute ride with aerobic music. In chart 1, a representation of the heart rates is given according to the specific phase of the ride and according to the specific trial. In chart 2, a representation of the RPE is given according to the specific phase of the ride and according to the specific trial. Figures 1-4 depict how the participants rated each of the trial rides. Figure 1 provides a rating by the participants on their physical performance as hard. It shows that more participants agreed that their physical performance was harder in the third trial. Figure 2 provides information by the participants on the feeling of more energy after the ride. Again, the participants agreed or strongly agreed that the third trial led to more of these feelings. Figure 3 depicts participants motivation by the music during the three trials. The third trial, again, involved a strong correlation between the music used in this trial and the participants feelings of motivation by the music. Figure 4 expresses a rating by the participants of benefit and success. The figures clearly express that the third trial (aerobic music) had a much great psychological impact on the participants than did the first and second trials. Even though this research study did not invoke a change in the physiological components of physical fitness, heart rate and RPE with the variance in the external stimuli, the statistical analysis did find that the music with a steady, 135 aerobic beat supplied the participants with the more rewarding psychological ride.

CHAPTER V: DISCUSSION

Music has become an increasingly vital component of exercise, sport, and fitness, not only through a recreational aspect but also through a fitness industry standpoint. Research indicates that music is able to provide motivation to those individuals who may lack the drive or discipline to exercise solely through their own breath or it may also provide distractions for those who are beginning a journey of blood, sweat, and tears. Regardless of the reasons for including music into any type of aerobic conditioning routine, music is an essential and fundamental component of all group fitness cycling classes. This researcher wanted to know if the music itself is responsible for the actual reduction in the physical response (decrease heart rate) or if it is purely a mental dissociation.

During the research study, eight participant performed three independent indoor cycling rides under the same physical conditions. Instructions and an instructional outline was given when all the participants were present as to what would be taking place. The first of the three independent rides used no music. The second of the three independent rides used a compilation of Pachelbel's *Canon in D*, Valvaldi's *The Four Seasons: Winter: II Largo*, and Bach's *Air on the G String*. The third of three independent rides used a pre-mixed, 32 count aerobic music compact disc with a consistent 135 beat per minute tempo.

The format of the class was the same for each of the rides. A physical warm-up was conducted for 5 minutes followed by 3, 5 minutes phase rides with increasing intensity, and followed up by a 5 minute cool down phase. At phase 1, the participants were instructed to increase the fly-wheel resistance 1/3 or light. At phase 2, the participants were instructed to increase the fly-wheel resistance 2/3 or moderate. At phase 3, the participants were instructed to increase the fly-wheel resistance 3/3 or max. During the study, all participants took their initial

resting heart rate and recorded that number. During the 4 subsequent phases (phase 1 thru cool down) the participants active heart rates and RPE's were taken at exactly 2 ½ minutes into each of the stages and recorded. At the end of the study 4 questions were asked of the participants, these questions included: I would rate my physical performance as hard, I felt motivated by the music, I felt more energized now after the ride, and I would rate this as a successful and beneficial ride. Once completing the questions the participants were free to leave.

RECOMMENDATIONS

It is this researchers recommendation that further research be done on this topic. It appears this study will provide an excellent pilot study for a larger, more complex scale study. Some components that would assist in the gathering of information would be to have a larger, more diverse population in the study. This larger, more diverse population would allow for more information on the psychological response of participants to the music used in the research. Another recommendation would be to have more than one practitioner administering the research survey and conducting the study. A longer program with more of a variety based protocol, such as more variance in music, more variance in participants, and more variance in fitness and activity levels should be tested for acceptability, adherence, and psychological changes. Also, a greater variety of external stimuli or music could be used to incorporate the diversity of the participants and the demographic area.

CONCLUSION

Does music affect heart rate and RPE during the identical trials with a variance of music? No. Does music affect the psychological response to exercise? Yes. Even though this research study did not invoke a change in the physiological components of physical fitness, heart rate and RPE, as it was assumed to have, it did supply the industry with information vital to indoor cycling

classes and music selection on a psychological aspect. The statistical analysis did find that the music with a steady, 135 aerobic beat supplied the participants with the more rewarding psychological ride. Therefore, the current research study demonstrated that even though the physiological components of an indoor cycling class remain consistent no matter on the variance of the external stimuli of music, the psychological components of emotion are directly linked to the external stimulus of music.

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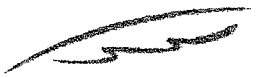

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Date: June 2, 2004

To: Jennifer Awe

Cc: Dr. Amy Schlieve

From: Sue Foxwell, Research Administrator and Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research (IRB)

Subject: **Protection of Human Subjects--Expedited Review**

Your project, "The Psycho-Physical Response to Music during Moderate Intensity Aerobic Conditioning," has been approved by the IRB through the expedited review process. This protocol has been approved provided the following items are addressed. Then the measures you have taken to protect human subjects are adequate to protect everyone involved, including subjects and researchers.

> **Reviewer comment**: In the consent form add a statement on the "voluntary assumption of risk agreement" informing participants of the purpose of the research and risks and benefits to their participation in research, if any. You did address these issues in #1 of you protocol but need to include this information in the consent form. If you have any questions, please get in touch with me at dockd@uwstout.edu.

This project is approved through June 1, 2005. Research not completed by this date must be submitted again outlining changes, expansions, etc. Annual review and approval by the IRB is required.

Thank you for your cooperation with the IRB and best wishes with your project.

***NOTE: This is the only notice you will receive – no paper copy will be sent.**

Ls:dd

Voluntary Assumption of Risk Agreement
Graduate Thesis Research Project

Jennifer Awe of the Education Department at the University of Wisconsin-Stout is conducting a research project for completion of her M.S.Ed. Degree, I _____ freely choose to participate in the graduate thesis research project.

Participating in any activity is an acceptance of some risk of injury. I agree that my safety is primarily dependent upon my taking proper care of myself. I understand that it is my responsibility to know what personal equipment is required (such as footwear, clothing, and other personal equipment) and provide the proper personal equipment for my participation in the research study. I agree to ask questions to make sure that I know how to safely participate in the activity, and I agree to observe the rules and practices, which may be employed to minimize the risk of injury while pursuing the benefits of the activity. I agree to advise the researcher immediately if I do not believe I can safely continue in the activity. I agree to reduce the risk of injury to myself and/or others by limiting my participation to reflect my personal fitness level, wearing the proper protection as dictated by the activity, not wearing anything that would pose a hazard in the pursuit of the activity, not ingesting or using any substance during the activity which could pose a hazard to myself or others. I agree that if I fail to act in accordance with this agreement I may not be permitted to continue to participate in the research. All participation is voluntary. The results of this research will be used to better understand under what conditions active participants exercise best. With your help, research on this topic will not only benefit the participant but also the instructor and the group exercise program as a whole to further successful exercise.

Despite precautions, accidents and injuries can occur. I understand that participation in some of the activities of this research may be potentially dangerous. Therefore, **I, ASSUME ALL RISKS RELATED TO THE ACTIVITIES** including but not limited to:

•Death, injury or illness from accidents of any nature whatsoever, including but not limited to bodily injury of any nature whether severe or not, including but not limited to head trauma, joint trauma, broken bones, oral, eye or other facial injury, other muscular-skeletal injury which may be temporary or permanent, including heat exhaustion, stroke, or death, which may occur as a result of participating in an activity.

I further understand that any information about me that is collected during this study will be held in the strictest confidence and will not be part of my permanent record. I understand that the strictest confidentiality will be maintained throughout this study and that only the researcher will have access to the confidential information. I understand that at the end of this study all records, which identify individual participants, will be destroyed. I understand my participation is voluntary and my stop at any time. My signature below indicates that I have read and freely signed this agreement, which shall take effect as a sealed instrument.

IMPORTANT - READ ENTIRE AGREEMENT BEFORE SIGNING

Signature: _____

Date: _____

Name Printed: _____

Address: _____

Tel. No.: _____

NOTE: Questions or concerns about the research study should be addressed to Jennifer Awe, the researcher, at 715.579.6743 or Dr. Amy Schlieve, the research advisor, at 715.232.1332. Questions about the rights of research subjects can be addressed to Sue Foxwell, Human Protections Administrator, UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, UW-Stout, Menomonie, WI, 54751, phone 715.232.1126.

Pre-Exercise Survey

Directions: Below are a list of question related to physical exercise. There are no right or wrong answers and your responses will be kept confidential. Please answer each presented question as accurately and as completely as possible. Thank you for participating in this survey!

1.0 Do you currently exercise?

C Yes C No

If "No" go to question 2.0

If "Yes", what kind of exercise do you do?

Aerobic:_____

Frequency (per week): 0 1-2 3-4 5+

Intensity: 0-3 4-7 8-10

Duration: 0-20 min, 21-45min, 45+ min

Strength:_____

Frequency (per week): 0 1-2 3-4 5+

Intensity: 0-3 4-7 8-10

Duration: 0-20 min, 21-45min, 45+ min

Flexibility:_____

Frequency (per week): 0 1-2 3-4 5+

Intensity: 0-3 4-7 8-10

Duration: 0-20 min, 21-45min, 45+ min

1.1 Have you been exercising for more than one year or less than one year?

C *More* C *Less*

1.2 On a scale of 1 to 5, with 1 describing a light exercise program where you don't sweat, 3 describing a moderate exercise program where you breathe a little harder and may possibly sweat, and 5 describing a vigorous exercise program where you breathe hard and sweat, how would you rate the average intensity of your exercise program?

C *1* C *2* C *3* C *4* C *5*

2.0 Do you participate in Leisure Time Activity?

C Yes C No

If "No" go to question 3.0

If "Yes", what kind of exercise do you do?

Endurance:_____

Frequency (per week): 0 1-2 3-4 5+

Intensity: 0-3 4-7 8-10

Duration: 0-20 min, 21-45min, 45+ min

Non-Endurance:_____

Frequency (per week): 0 1-2 3-4 5+

Intensity: 0-3 4-7 8-10

Duration: 0-20 min, 21-45min, 45+ min

3.0 Do you currently listen to music when exercising?

C Yes C No

If "No" go to 4.0

If "Yes", what kind of music do you listen to when exercising?

_____ Alternative	_____Heavy Metal
_____Classical	_____Instrumental
_____Classic Rock	_____Pop
_____Dance (Fast)	_____Rap
_____Folk	_____Top 40
_____Hard Rock	_____Other

3.1 When listening to music while exercising, do you feel more energized?

C Yes C No

3.2 When listening to music while exercising, do you feel less tired?

C Yes C No

3.3 When listening to music while exercising, do you disassociate yourself from the exercise?

C Yes C No

4.0 Would you listen to music while exercising?

C Yes C No

Exercise Survey

1. Right now, I am in my **pre-exercise** heart rate?

   ○ Yes ○ No HR _____

2. In regards to **phase 1**, my:

   (Scale from 1 – very, very easy, not work to 10 – very, very difficult, breathing heavy)

   RPE (rate of perceived exertion): _____

   Heart rate: _____

3. In regards to **phase 2**, my:

   (Scale from 1 – very, very easy, not work to 10 – very, very difficult, breathing heavy)

   RPE (rate of perceived exertion): _____

   Heart rate: _____

4. In regards to **phase 3**, my:

   (Scale from 1 – very, very easy, not work to 10 – very, very difficult, breathing heavy)

   RPE (rate of perceived exertion): _____

   Heart rate: _____

5. In regards to the **cool down**, my:

   (Scale from 1 – very, very easy, not work to 10 – very, very difficult, breathing heavy)

   RPE (rate of perceived exertion): _____

   Heart rate: _____

6. Overall, I would rate my physical performance as:

   (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree)

   ○ 1 ○ 2 ○ 3 ○ 4 ○ 5

7. Right now, I am in my post exercise heart rate zone?

   ○ Yes ○ No HR _____

8. I felt motivated by the music during the ride?

   (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree)

   ○ 1 ○ 2 ○ 3 ○ 4 ○ 5

9. I feel more energized now, after the ride?

   (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree)

   ○ 1 ○ 2 ○ 3 ○ 4 ○ 5

10. I would rate this as a successful and beneficial ride?

    (1=strongly disagree, 2=disagree, 3=undecided, 4=agree, 5=strongly agree)

    ○ 1 ○ 2 ○ 3 ○ 4 ○ 5