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The Effect of Client Preferred Music on Workout Efficiency and Perceived Energy Exertion Among Collegiate Football Players

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THE EFFECT OF CLIENT PREFERRED MUSIC ON WORKOUT EFFICIENCY
AND PERCEIVED ENERGY EXERTION
AMONG COLLEGIATE FOOTBALL PLAYERS

By

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ABSTRACT

The differences in workout efficiency and perceived energy exertion between preferred and non-preferred music were examined through self-report. Minimal differences were shown between the types of music used; however, significant differences were found when no music was used. Observations and comments revealed preferred music as being desired above non-preferred and/or no music among the athletes during workouts. The results of both self-report and informal observations support the use of music to increase workout efficiency and motivation.
CHAPTER ONE
INTRODUCTION
The Effect of Preferred Music on Workout Efficiency and Perceived Energy Exertion among Highly Trained Athletes

American football has become a favorite pastime among many. For years, people have gathered around their radios, television and in stadiums to support their favorite teams and players. As the game has evolved, so, too have the spectators’ expectations. Fans often demand optimal athletic performance from the players, especially at collegiate and professional levels.

The main objective of football is to move the ball down the field to the endzone to score, play-by-play, while the opposing team attempts to impede the progress. Players are given specific responsibilities to assist in the progress such as throwing, catching and/or running the ball down the field. Other players’ jobs are to physically block rival players from halting offensive advancement. Due to these demands, football players are required to possess considerable physical strength. As the game evolves and training techniques improve, coaches often look for new and unique training approaches. Recently, athletes from a multitude of sports have incorporated music into their training programs.

Music is an integral facet to a sporting event ambiance. Initially, music was used to engage the crowd in the game beyond simply watching. It has also been used to fill time between plays, during time-outs, and other pauses during games. Eventually, music was not only a way to unify a fan base, but also the teams themselves. Many teams partake in pregame rituals accompanied by music that help to increase their motivation and focus prior to the start of play.

Once music was established and became commonplace in athletic environments, its effects on athletes became a source of curiosity. The advancements in music’s accessibility have
allowed athletes to not only use music on game day, but also in their everyday practice. With the integration of music into the practice arena, understanding its effects on physical training becomes all the more pertinent. While research exists regarding the benefits of music assisted exercise and physical training, more specific applications of music can be explored.
CHAPTER TWO

REVIEW OF LITERATURE

The physical and emotional demands of highly trained athletes are tremendous throughout the preparatory training of their particular craft. Athletes, coaches, and other professionals working in this area continue to research means to enhance workouts and increase efficiency for greater results. The use of music during vigorous physical exercise or training, otherwise known as a workout, has shown to be successful in elevating mood, increasing enjoyment, and providing a distraction from unpleasant stimuli experienced during exercise (Shaulov, Naama, Lufi & Dubi, 2009; Tate, Gennings, Hoffman, Strittmatter & Retchin, 2012; Whitehead & Knight, 2012). Individuals using music have experienced longer, more frequent exercise, and have been more productive compared to rates during exercise with no music (Barney, Gust & Liguori, 2012; Todd, 2006).

Today, using music during exercise is common practice among both the general population and trained athletes. Personal music players (PMPs) are “devices that allow music to be digitally downloaded or saved and then played ‘on the go,’ such as an iPod or MP3 player;” (Barney et al., 2012, p. 23). PMPs allow individuals to listen to their chosen and/or preferred music rather than adhere to the music often played over a sound system in the facility. More than half of participants in a 2012 research study stated they would engage in their workout without music, but preferred the music accompaniment. Primarily, PMPs have reportedly been used to increase enjoyment, increase exercise duration, increase exertion, and decrease perceived exertion by 86.4% of participants (Barney et al., 2012).

The enjoyment experienced by individuals during a workout often will assist in the motivation to increase frequency and duration of exercise. It is a natural human response to
desire and appreciate tokens after laboring oneself in a task, particularly physical activity. Because of this, tokens are commonly used to shape and change behaviors, such as increasing the frequency and/or duration of exercise. In 2013, a group of researchers explored the power of a monetary contingency on the fitness habits of college students. Participants received a base amount for attendance alone, and their total daily earnings were dependent on their completion of exercise criteria dictated by the investigators. All participants were successful in increasing their physical activity levels from being inactive, to three days of activity per week (Irons, Pope, Pierce, Van Patten, & Jarvis, 2013).

A contingency approach can be effective when a behavioral change is desired. A follow-up study explored music’s role in this type of system. The following four experimental conditions were explored: presentation of dependent monetary token, presentation of music, a combination of money and music, and a control of no money or music. The monetary amount provided was based on the amount of time a participant engaged in aerobic cycling. While the monetary incentive effected the cycling durations more than music, the combination of money and music showed to be significantly greater than the other conditions (Cohen, Paradis, & LeMura, 2007). The use of music on behavioral change can not only be effective on its own, but also can help to enhance other contingencies and motivators to attain certain objectives.

Music’s motivational and enhancement abilities have revealed a simple way to assist individuals in improving workout efficiency and exertion. Specific qualities of music such as tempo and rhythm can help to arouse oneself to increase effort and duration of exercise (Karageorghis, Terry, & Lane, 1999; Schneider et al., 2010). Effective physical activity at any level requires a varying amount intrinsic motivation to overcome the negative aspects of exercise. Ultimately, one is looking to reach the greatest level of intrinsic motivation referred to
as flow. Flow is described as “the complete immersion in an activity to the point in which nothing else matters” (Farmer, 2013, p. 1). Flow occurs when an individual’s recognized abilities match the perceived demands of the task allowing him to become completely immersed. The following three common areas are practiced to promote the experience of flow: practicing positive self-talk, visualizing success, and getting “pumped-up.” Adding music to these techniques helps bridge the gaps between practicing them and experiencing them. Motivational lyrics and the strong associations made to certain songs helps both trained and untrained athletes experience flow (Farmer, 2013). Choosing a specific type of music or songs to accompany the efforts towards a particular goal has demonstrated a number of positive outcomes regarding exercise and physical performance (Karageorghis & Priest, 2008; Laukka & Quick, 2011). The natural emotional response to music is powerful and can provide valuable assistance to motivational techniques.

Motivation and emotion are closely related when exploring the application of music to transform behaviors and enhance physical activity experiences. Music affects people on an individualized basis and, therefore, has differing results from one person to another. Dr. Oliver Sacks illustrates this phenomenon in his book, *Musicophilia: Tales of Music and the Brain*. In his chapter, *The Case of Harry S.: Music and Emotion*, Sacks intimately illustrates his experience with a critically ill patient who was affected by a sudden brain aneurysm and fell into a coma. When the man awoke from the coma, he was unable to experience emotion and was indifferent to his surroundings despite regaining much of his intellectual functioning. However, when the man sang his preferred music, he was able to express a wide range of emotions and briefly transfer them to his normal daily living. While the man would relapse soon after he
stopped singing, the music served as a way to express emotional and acted as a substitution for
the lack of brain functioning responsible for displaying emotions (Sacks, 2007, Chapter 26).

The emotional experience of music is deeply rooted on a neurological foundation. Music
is experienced through the auditory brainstem into the nervous system causing the cerebellum to
arouse (Bergland, 2012). Once the auditory stimulus of music reaches in the brain, the amygdala
is activated. The amygdala is largely responsible for motivation and emotion. The music heard
facilitates an emotional response of the amygdala allowing it to have an ample affect on one’s
mood (Wright, 1999). Some characteristics of music can affect the type of emotional response
such as tempo, timbre, range and tonality. When examining the syntax of a composed musical
work, data has shown differences in emotional responses when listening to a consonant versus
dissonant work. A more predictable chordal structure elicits more stable emotions, while an
unpredictable structure is described as “more emotional” and evokes a variety of emotions
(Koelsh, Fritz & Schlaug, 2008). The influence of music on emotional state causes the
associations to be made that influence our mindsets, memory, and motivation in an assortment of
life experiences (Rolls, 2013). Because of this, music can aid in maintaining or altering mood to
achieve certain exercise goals.

The effectiveness of different types of music is important to consider when using it as a
tool to improve mood during workouts. Over time, expectations about specific characteristics of
music have evolved. For example, music with an up-beat tempo would be used in a stimulating
environment advocating dancing and excitement, whereas slower tempos are used in calmer
settings and are described as being “more relaxing.” Similar ideas apply when using music with
exercise. Faster tempos are typically used to increase mood, motivation and energy, while slower
tempos promote calming and/or “cooling down” (Sorenson et al., 2008). Using music to
increase mood before and during physical activity can both be effective. When comparing passive listening before a workout and implementing a musical agency during exercise, music has been successful in decreasing negative feelings associated with poor mood such as agitation, anxiety and tiredness. Although, there are physiological explanations to increased mood, data supports music conditions of passive listen before exercise and an active music program during exercise were both significantly lower than the baseline conditions when comparing negative emotions of people engaging in physical activity (Fritz, Hardikar, et al., 2013; Fritz, Halfpaap et al. 2013).

When music is successful in decreasing negative emotions associated with exercise, it often promotes an increased enjoyment throughout the activity. Listening to preferred music provides a positive, pleasant experience that masks negative stimuli that may be responsible for decreasing frequency and duration of exercise (Barney, 2012). Music combined with other means of entertainment has shown to be superior to a single form distraction, yet the availability of other methods of distraction during physical activity can be limited (Annesi, 2001). In the present day, music is a means of entertainment, and customarily enjoyed by those partaking in the variety of musical experiences available. After years of music being a pleasurable experience, the preconceived notion of music-listening increasing enjoyment, alone, has shown improve satisfaction levels of those participating in physical activity (Knight & Whitehead, 2012). It has been suggested that fitness behaviors have been influenced by the degree of enjoyment experienced during the actual experience. The addition of music to a fitness program has been linked to an increase in frequency and adherence in weight-loss and generic exercise programs among a variety of populations (Hradil, 2006).
The enjoyment experience during exercise commonly correlates to an improved physical performance. When engaging in exercise, people normally use music they prefer, which often contain lyrics. Many have reported song lyrics helping to facilitate a more thorough emotional preparation for a competitive sport or lengthy exercise session (Sorenson et al., 2008). These reports remained consistent in a study specifically comparing the use of music with and without lyrics during aerobic cycling. No significant difference was found between the two music conditions; however, music with lyrics did show slightly increased rotations per minute (RPMs). The two music conditions did elicit significantly higher RPM measures than the no music control condition (Sanchez, Moss, Twist & Karageorghis, 2014). Similarly, faster tempi and higher volume can cause a greater neurological activation. The intensity of the music coincides with the intensity of the listeners’ actions resulting in increased exertion during physical activity (Bishop, Wright, Karageorghis, 2014). The nuances of varying musical styles can be influential on neurological and physical feedback during a multitude of fitness techniques.

The intensity of a physical response may depend on and be manipulated by the intensity of the auditory stimulus; furthermore, a higher intensity of the exercises’ demands may clout the effectiveness of music as a performance enhancement. Two studies compared the effects of music on treadmill runs of low and high intensities. The first revealed music providing an escape or distraction from the less intense condition while acting as a training mechanism to enhance runners’ form and strides. The second, like in design, proposed the intensities of preferred music did not mirror the intensities of workouts, but remained consistent while still improving their overall performances and a pleasurable psychological experience (Hutchinson & Karageorghis, 2013; Hutchinson & Sherman, 2014). The use of preferred music appears to provide the most
favorable psychological and performance outcomes when engaging in strenuous physical activity.

Music commonly has been used to enhance both general and specific fitness goals as well as performance objectives in athletics. There is evidence that preparation of athletes, both physically and mentally, can help to improve overall performance when engaging in a physically demanding activity such as sport, strength and speed training. Preceding sport competition, the use of music can help to significantly decrease pre-performance anxiety and tension, thus improving overall performance (Todd, 2006). A team of competitive soccer players participated in music accompanied imagery prior to a series of games. The separate uses of both imagery and music showed to be helpful in experiencing flow and performance; yet, the combination of music and imagery had greater success in flow states and performance (Pain, Harwood & Anderson, 2011). Music can complement preexisting preparatory rituals utilized by athletes to prepare for optimal focus and performance.

Numerous occasions and researched evidence has demonstrated the capabilities of music to assist in general physical fitness training and adequate preparation for athletes. It has also been employed to assist with facets of training in specific areas and crafts. Circuit training is a technique used to increase muscular endurance via highly intense aerobic exercise. Karageorghis et al. (2010) provided music accompaniment with synchronous tempi to both men and women engaging in circuit-type exercise programs. Preferred music was also taken into account, but showed little affect on the outcome of the exercise. Using synchronous music, motivational music specifically, to accompany and complement the exercise, despite not showing significance, did improve endurance among trainees (Karageorghis et al., 2010).
CrossFit training, a more specific type of circuit-type training, uses combinations of highly intense aerobic and strength exercise to improve overall muscular endurance (Smith et al, 2013). A 2014 study revealed a decrease in performance when music was playing during this type of training. The music used was a compilation of songs commonly heard in a gym setting. The principle investigator stated a suspicion that the music’s lack of effectiveness was due to the advanced physical demands and focus necessary in CrossFit training.

An important skill to acquire to accomplish heavy weight programs is to have reliable grip strength. Arousing oneself with stimulating music rather than relaxing with soothing music may help increase grip strength improving overall productivity during weight-lifting workouts (Karageorghis, Drew & Terry, 1996). Addressing the variety of fundamental skills vital to complete complex exercise techniques is important when looking for advanced enhancement approaches in physical training.

The aforementioned training techniques and programs frequently utilized music to assist with particular goals in mind. The same type of attention and focus goes into training for a specific sport. Regularly, the use athlete-preferred music during training has shown to be far superior to non-preferred and/or no music. Though not to a significant degree, this trend remained consistent when a rowing team’s listening to preferred music increased athlete output and decrease the pain of rowing. The presence and absence of music showed little difference overall (Sudar, 2012). A variety of music being played simply as an auditory stimulus with little purpose did not show to be particularly effective, a purposeful use of music with a faster tempo resulted in significantly faster completion times for distance rowing trials compared to slow and no music (Rendi, Szabo & Szabo, 2008). A generic use of music may be effective in routine
physical activity; however, a more structured use of music may be more beneficial when aiding in definitive sport training areas.

Music is easily accessible and often present during many athletes’ trainings requiring a more intentional plan for music to be effective. Swimmers rarely have the luxury of music-accompanied workouts due to few music-playing devices suitable for water submersion. A device was developed utilizing bone conduction to transmit sound through small ceramic plates giving swimmers the opportunity to experience music during timed trials. The music condition proposed significant improvements in both the 80-meter and 500-meter times in contrasting with no music (Tate et al., 2012). Another group of swimmers showed significantly improved trials when listening to music in general over no music; yet, music with motivational qualities showed to be the most effective in decreasing trial times (Karageorghis, Hutchinson, Jones et al., 2013). Exposing athletes to an unfamiliar technique of training such as music can provide positive physical and mental performance outcomes.

Music does not necessarily have to be an unfamiliar entity to be successful in improving specific tasks such as the swimming trials. Simpson and Karageorghis (2006) examined the effect of motivational, ouderterous and no music on runners completing a 400-meter sprint. Identical to the above swimming trials, the music conditions improved sprint times, motivational music being superior to ouderterous and no music. Pre-performance mood was assessed, but showed little affect on the athletes. These athletes were not considered to be elite, but experienced in their sport areas. Music enhanced the performances of experienced athletes similarly to the general population engaging in routine fitness workouts.

The effectiveness of music is not limited to sub-elite athletes, but also experienced by highly trained athletes. In Surowiecki’s article Better All the Time, he presents and discusses how
the alleged “performance revolution” has affected the professional athletes. Historically, athletes’ workouts consisted of simply staying in shape, not seeking masteries of skills. Upon eligibility to play a sport professionally, a modern-day athlete is expected to possess the skills to be a starting player. The professional success of an athlete relies little on inherent ability, but on the degree of training accessible. The extent to which performance enhancing techniques and equipment has increased is drastic. Professional sports teams and coaches spend millions of dollars to improve players’ trainings and abilities (Surowiecki, 2014).

Not only are coaching staffs exploring new ways to motivate and improve physical performance, but athletes, too, look for enhancement approaches. Music has been used by a number of notable athletes to increase motivation and enjoyment during physical training. For example, Olympic gold medalist Michael Phelps reportedly listens to “aggressive hip-hop” in preparation for a race to achieve the motivation and focus he needs to swim his best race every time he gets into the pool. Krystal Wier, an Olympic sailor, prepares herself with music that mirrors the sea conditions the day of competition. Gold medal shooter Suzy Balough partly credits music for her motivation and focus to shoot well. She has also shared having a variety of genres on her music-playing device to reflect her desired mood (Jeffery, 2012). Music has served as a cost effective, safe, accessible tool to help enhance the training of professional and Olympic level athletes.

Many well-trained athletes have reported the positive psychological benefits of music-accompanied workouts. Despite their high degree of athleticism, music has also been effective in increasing physical exertion. Music’s use during warm up exercises has exhibited the potential to significantly increase exertion, thus improving the primary physical performance (Jarraya et al., 2012). The outcomes of varying tempi among the well trained have shown to be parallel to the
previously mentioned of the untrained. A group of competitive cyclists were evaluated while listening to music with different tempi. Participants were given a list of songs all within 110-120 beats per minute (bpm) to choose from in order to have uniformity across each cyclist. The primary investigator altered the tempi of the selected songs randomly to 100 bpm, 120 bpm, or 140 bpm. The faster music had a tendency to increase tension and negative mood among the athletes; however, their physical performance and exertion slightly increased. The athletes’ performances remained consistent under each condition, but the tempi seemed to affect them psychologically and emotionally (Dyer & McKune, 2013). At this level, athletes often use intrinsic motivators and techniques to assist in preparation and physical performances, but music can still be effective in some aspects of their training.

The vast majority of music’s purpose in fitness and training has been dependent on the activities’ participants. There is little research on music’s use to achieve group or team objectives other than group fitness class accompaniment. With the positive effects of music becoming more familiar, sports teams are beginning to use it in unique ways that fits their needs. Team sports, namely collegiate, normally workout in groups. This helps to maintain team unity and gives players the opportunities to encourage a support their teammates during their highly intense training programs. Outside of their strength and conditioning, teams are beginning to use music to facilitate accurate play execution and pacing specific to the game itself.

While music is a new technique being used by many teams, few collegiate football teams have shared their uses with the public media. The University of Oregon are known for their fast-paced offense leaving many of their competitors fatigued. The Ducks have reported using music to teach this ambitious style. During practices, the music is used as a cue to achieve a fast transition between plays. The music is played during the entire practice with a consistent
drumbeat encouraging the players to move quicker. The team listening to the same music at the same time helps the players move at the same pace and become unified to execute plays quickly and successfully. Following suit, The Baylor University, Texas Tech University, Houston University, and Iowa State University have all reported using music to increase motivation and productivity during their team practices. Baylor teammates reported the music unifying them as a team by finding common preferences among players. Many collegiate football coaches have seen and reported noticeable differences between music-accompanied and no music practices.

The therapeutic use of music present in the aforementioned examples is often referred to as “music therapy”; however, the American Music Therapy Association (AMTA) defines Music Therapy as the “clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program” (1998). In order to receive the Music Therapist-Board Certified (MT-BC) credential, one must complete an AMTA-approved degree program and 1,200 supervised clinical hours including a six-month internship. Once the academic coursework and clinical hours are completed, a national board exam through the Certification Board for Music Therapists (CBMT) must be passed before earning the credential of MT-BC.

There are many Music Therapy practices and interventions that are appropriate for athletic training. An important area in strength training is creating neurological connections allowing the brain and body to work together to increase strength and endurance (Hoffman, 2014). These connections are necessary for an increase in muscular strength that is often required in sports. Music in strength training has shown to be an effective neurological experience both physically and emotionally (Zhurnal, 1986). Music Therapy research has shown great success in neurological development and rehabilitation that can be transferred to this type of neurological
advancement. Music Therapy is often used to address injuries resulting in a compensatory function in limbs or other areas of the body. Evidence-based Music Therapy interventions are implemented to teach clients to regain control of their bodies and rehabilitate the functions in regions for which the body compensates (Baker & Roth, 2004). Post-injury athletes are no exception to this issue and, therefore, participate in an extensive rehabilitation program. Athletes with new and seasoned injuries may benefit from Music Therapy interventions to correct any compensatory function hindering their athletic performances.

Physical compensations tend to result in coordination issues, however it is not routinely the cause. A lack of coordination can be caused by a developmental delay, brain injury, or simply inadequate neurological development. Sports require a great amount of coordination for appropriate play. Some aspects of play can be difficult for even highly trained athletes. For example, the wide receiver is required to engage in intricate footwork when running certain routes to deceive his defender to complete the play and advance down the field. Motor-training based therapies have made the greatest improvements among individuals with coordination issues, mainly children (Smits-Engelsman et al. 2012). It is natural for the brain to lock into a rhythm to make physical tasks and movement easier. The rhythmic aspects of music help the brain organize the neurological messages of repetitive motions (Sacks, 2007, Chapter 19). Music Therapy interventions such as Rhythmic Auditory Stimulation (RAS) have been used to enhance these therapies. RAS is used to help teach or rehabilitate movements that are innately rhythmic. Goals, such as improved gait patterns, have been greatly influenced with the addition of RAS to existing therapies (Thaut et al., 2008, Chapter 6). RAS has the potential to have similar success if applied to physical training for athletes. Much of the movement involved in
sports is very precise and rhythmic. Using an RAS-type training could be used to compliment the training currently being used by coaches.

Coaches are not only responsible for the physical performance of their athletes, but also their safety during practice and training. Endurance and conditioning practices can be highly intense and, in some cases, dangerous for young athletes. When engaging in conditioning exercises such as running drills, heart rates can increase to an unhealthy level if the expectation is beyond an athlete’s ability. The ability to speed up and slow down heart rates during cardiovascular exercise is of greater importance as exercise intensity increases. In 2014, Costas et al. examined the effect of music on heart rate stability during exercise finding a positive correlation between tempi and heart rates. Faster music showed to facilitate increased heart rates while moderate and slower tempi.

A technique in tempi manipulation has been developed and used by MT-BCs called the Iso Principle. The Iso Principle is a technique by which “music is matched with the mood of a client, then gradually altered to affect the desired mood state. This technique can also be used to affect physiological responses such as heart rate and blood pressure” (Davis et al., 2008, p. 547). MT-BCs use their backgrounds in assessment and reactivity to adjust the music to their clients’ needs. To facilitate appropriate heart rates necessary to complete their physical tasks safely and efficiently, sports teams could utilize the Iso Principle to facilitate effective warm-up and cool-down actions. Numerous Music Therapy interventions are a purposeful and adaptable use of music related to the current applications in athletic and physical training.

In 1996, Florida State graduate student Errol Greig conducted a study showing varying effects of different types of music on football players’ focuses and perceived intensities during weight lifting workouts. The purpose of this research study is to contribute to this existing study
by determining the effect of client-preferred music on workout efficiency and perceived energy exertion among highly trained collegiate football players. Workout was defined as the series of individualized weight lifting exercises developed by the Florida State University Strength and Conditioning coaching staff.
CHAPTER THREE

METHOD

Design

Two experimental conditions, preferred and non-preferred music, and one no-music control condition were examined with a posttest only. Repeated measures of each conditioned were determined by self-report via an experimenter-designed survey. The dependent variable was the self-report survey scores. Data was collected for 20 sessions under each experimental and control condition. A computerized randomization was utilized to determine the condition for each weight lifting session. The players completed a posttest survey (see Appendix A) to report their perceptions of the workouts by scoring their level of agreement of three statements on a one-to-ten Likert-type scale, with ten being the strongest agreement. The average scores of all participants for each survey question were calculated at the conclusion of each session.

Participants

One hundred fifteen male members of the Florida State University (FSU) Seminoles football team (85 roster players and 30 walk-on players) were recruited by the FSU football head strength and conditioning coach upon beginning the 2015 off-season workout series. Participants were provided no compensation for their participation. All FSU football players were age 18 to 22 years old at the time of the study.

Setting and Equipment

Workouts were held in the Roger Holler Training Complex weight room located in the Doak Campbell Stadium on the Florida State University campus. The 14,700 square-foot weight room is equipped with 24 half-racks (12 squat, 12 bench-press), a variety of plate machines and free-weights. Prior to entering the weight room, the players engaged in a staff-led group warm-
up routine located on the second level of the fitness facility. After completing the warm-up exercises, the players jogged down the steps and to their designated weight racks while the Florida State War Chant played over the previously installed, permanent public address (PA) system.

The music was played from an iMac desktop computer via the iTunes application. The music tracks were selected from the preexisting FSU Strength and Speed iTunes account. There was no predetermined decibel level. The players and staff were free to adjust the volume throughout the sessions. During the experimental conditions, the music played from the end of the War Chant and continued until the last player of the group completed his assigned workout. Surveys were distributed to players upon exiting the weight room through the first level door to the locker room.

**Procedure**

Prior to the start of data collection, informed consent (see Appendix B) was obtained during daily individual-player weigh-ins. At this time each participant was asked his most and least preferred music genre, artist(s), song(s), etc. and responses were noted by the primary investigator. Once preferences were established, an iTunes playlist containing the preferred genre, artists and songs was created per the primary investigator’s judgment (see Appendix C) and an iTunes playlist comprised of the genre, artists and songs of the least preferred by the majority of team members (see Appendix D).

Lifting workouts occurred on each odd hour of the day from seven o’clock in the morning to one o’clock in the afternoon on Mondays, Wednesdays and Fridays. Athletes typically attended the same time-slot each day, but consistent groups were not guaranteed.
To begin the workout, the athletes engaged in a pre-workout stretching sequence as a group led by a Strength and Conditioning coach that was not accompanied by music. The players entered the weight room accompanied by the Florida State Seminole War Chant with no dependence on the experimental group assigned. When the War Chant finished, the primary investigator established the assigned condition of the workout. Throughout either music workouts, the music was played from the end of the War Chant until each player left the weight room. Due to the individualized nature of the workouts, players would spend anywhere from 30 to 60 minutes engaging in their workouts.

Upon completion of their workouts, players filled out a brief survey (see Appendix B) to determine perceived energy exertion, productivity and motivation throughout their workouts prior to exiting the weight room. The survey used a Likert-type scale to rate the level of agreement for three statements to measure their personal workout experiences. Once each player completed the survey, the means of each survey questions’ scores were calculated to illustrate the group effect of the varying conditions. Data collection took place of a total of six consecutive weeks.
CHAPTER FOUR

RESULTS

To compare the effectiveness of preferred music, non-preferred music and no music on the players’ perceptions of their workouts, the mean of the total survey scores under each condition were taken. A one-way ANOVA was conducted and revealed significance between the condition averages (see Table I).

Table I. Results of ANOVA

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<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
<th>P</th>
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<td>Treatment [between groups]</td>
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<td>2</td>
<td>9.2754</td>
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<td>57</td>
<td>0.7516</td>
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A Newman-Keuls Multiple-Comparison Procedure was performed to determine significance between the experimental conditions (see Table 2). There was no significant difference between the preferred and non-preferred music groups, however there was significance between both the control and preferred music, and the control and non-preferred music conditions (see Figure 1).
Table 2. Results of Newman Keuls

<table>
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<th>Condition</th>
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<th>Mean</th>
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<td>Preferred</td>
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<td>27.79</td>
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<tr>
<td>Non-Preferred</td>
<td>20</td>
<td>27.49</td>
</tr>
<tr>
<td>No Music</td>
<td>20</td>
<td>26.69</td>
</tr>
</tbody>
</table>

27.79 - 27.49 = 0.3
27.49 – 26.69 = 0.8
27.79 – 26.69 = 1.1

Figure 1. Overall Outcomes Graph
CHAPTER FIVE
DISCUSSION

The results revealed that the athletes highly preferred having music accompany their workouts rather than no music. When music was used, the players reported more energy exerted, more efficient and productive workouts, and being more motivated throughout their workouts.

There are a number of possible explanations regarding the results of the study. Despite the music having differing characteristics that may have contributed to the athletes’ responses, both music conditions were effective. For example, some songs on the preferred music playlist had an upbeat, fast tempo, while others had a slower tempo. The tempi of the non-preferred pop songs had upbeat tempi more consistently. In past research, faster tempi have been shown to increase energy and improve physical performance during exercise (Dyer & McKune, 2013; Rendi, Szabo & Szabo, 2008). The preferred songs with slower tempi may have had other motivational qualities, balancing the qualities between the preferred and non-preferred music causing similar results.

The nuances of the preferred and non-preferred genres may have contributed to the results, yet individual factors among the participants also may have affected the outcomes. When asking about musical preferences, the intended purpose for the music was revealed. Often, people will have different musical desires for certain environments. It is possible that the players chose music they preferred to listen to during workouts rather than a general preference. A preconceived association of a musical type potentially could facilitate a different response than an unassociated, but preferred, type of music. It is possible that the non-preferred music was not associated with a workout, and may have been a distraction from physical and mental fatigue. Participants reported an increased
perceived exertion and productivity during workouts to a similar degree as to that with their preferred music.

Past workout experience may have developed preconceived associations with the preferred music genre and exercise. After experiencing the weight room, the coaches and players also develop a variety of expectations. When a player enters the weight room, the coaching staff expects the players to exert an appropriate amount of energy to complete an efficient and productive workout. It is not acceptable for a player to come into the weight room and not exert sufficient effort. The music still had a significant impact on elite athletes despite their being held accountable for their workout efficiency and effectiveness. Elite-level athletes are trained to be able to complete an effective workout regardless of present variables, similar to game day expectations. They also have already neurologically matured to the degree necessary to perform these tasks; therefore the music plays little-to-no role in physical training development, but evidently affects perceived benefits.

Despite a lack of reported physiological effects, many nonverbal observations were made under each condition. During the preferred music condition, the players’ facial affects appeared stern and focused. A Certified Strength and Conditioning Specialist (CSCS) on staff believed that the preferred music increased focus during exercise, but also increased rest periods between sets. (R. Rosado-Vega, personal communication, March 21, 2015). The players who did not like the generally preferred music were easily recognized during the workouts due to their lack of reactions to the stimulus. The players most enjoying the music would bob their heads, sing along and dance between sets. When preferred music was played during the 7 o’clock AM workout, the players seemed to be more energized the moment the music played as evidenced by faster walking paces, faster switching of weight plates and overall weight room conversation.
The non-preferred condition brought about drastically different behaviors during the workouts. When a song was not immediately recognized, the players went along with their workouts normally; however, if a frequently-aired radio song was played, there was an immense increase in smiles, laughs and playful behaviors among the athletes. They did not appear as focused during the exercise as evidenced by talking and laughing with each other while appropriately positioned for a lift, but rest times between sets seemed to decrease.

When the no music control condition was being implemented, many players would look over to the computer housing the music with inquisitive looks, most likely wondering if the music would be played. Players often put their arms up from across the room asking about the music’s absence, only to be told there would be no music during that workout. Their responses were often displeased facial expressions and drooped shoulders as they sauntered back to their designated workout space. Once the participants experienced all three conditions they would ask the coaches what workouts were to be control groups in an attempt to avoid working out with no music (R. Rosado-Vega, personal communication, March 21, 2015).

Many of the notable nonverbal behaviors occurred during the workouts, yet many players expressed their thoughts on the presence or absence of music upon exiting the weight room. Most verbal responses were comments to be expected under each experimental condition. The preferred music evoked positive comments about the music, and the players expressed their enjoyment and approval of the playlist after completing their workouts. They did not hesitate to express their disgust of the non-preferred music and irritation with no music during control groups (See Table 3).
Table 3. Participants’ Verbal Responses

<table>
<thead>
<tr>
<th>Verbal Responses of Athletes during Data Collection</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Preferred:</strong></td>
</tr>
<tr>
<td>“Loved the playlist today!” (Participant A)</td>
</tr>
<tr>
<td>“Music was great!” (Participant D)</td>
</tr>
<tr>
<td>“Nice throw-back today, I knew every song!” (Participant C)</td>
</tr>
<tr>
<td><strong>Not Preferred:</strong></td>
</tr>
<tr>
<td>“Why are we listening to this?” (Participant G)</td>
</tr>
<tr>
<td>“Do you play this just so we complain about it?” (Participant B)</td>
</tr>
<tr>
<td>“Can we please change this music?” (Participant B)</td>
</tr>
<tr>
<td><strong>Control of No Music:</strong></td>
</tr>
<tr>
<td>“No music? I can’t workout now.” (Participant C)</td>
</tr>
<tr>
<td>“-1 motivation. I need music.” (Participant D)</td>
</tr>
<tr>
<td>“This is worse than the real silent treatment” (Participant E)</td>
</tr>
<tr>
<td>“No music today? Dang it!” (Participant E)</td>
</tr>
<tr>
<td>“This was horrible without music.” (Participant F)</td>
</tr>
<tr>
<td>“I am supposed to sacrifice my workout for a research study?” (Participant B)</td>
</tr>
</tbody>
</table>

Both verbal and nonverbal reactions to the conditions demonstrated the effectiveness of music-assisted workouts with elite athletes and provided evidence for potential benefits of a purposeful use of music in Music Therapy. Knowing the different reactions to preferred versus non-preferred music helps to create a foundation to be used by an MT-BC. During the study, both players and coaches were educated about Music Therapy and the application possibilities to the football team. When asked if the integration of an MT-BC into collegiate and/or professional sports is appropriate, R. Rosado-Vega answered, “Most definitely...they can improve the mood of a team drastically, which is key when you have 135 ‘tough guys’ going 100% every day! Not everyone will come in with the right mindset but a Music Therapist can alter the players’ moods by manipulating their senses. So instead of just having a coach yell and scream at him, possibly furthering his frustration and anger, you can just let the music alter his behavior, even if just for a few minutes at a time.” (personal communication, March 21, 2015).
With the acceptance and enthusiasm for Music Therapy use in strength and conditioning with collegiate athletes, further research should examine the effectiveness of specific Music Therapy interventions on physical training. For example, an Iso Principle-type technique could be implemented to facilitate appropriate psychological and behavioral alterations resulting in an improved physical performance. Using music to rehearse game-specific movement patterns may promote accuracy and precision among less-seasoned team members. This research study contributed to existing evidence of music’s effectiveness among highly trained athletes. The various outcomes and responses, both verbal and nonverbal, gave grounds to proceed with the implementation of purposeful music use, that is, Music Therapy in sports training programs.
APPENDIX A
POSTTEST SURVEY

Please circle the number that corresponds to your level of agreement with the following statements:

Disagree - Neutral - Agree - Strongly Agree

1) I exerted maximal effort in this workout.  1  2  3  4  5  6  7  8  9  10

2) My workout was productive.  1  2  3  4  5  6  7  8  9  10

3) I remained motivated throughout my workout.  1  2  3  4  5  6  7  8  9  10

______________________________________________________________________________

PRIMARY INVESTIGATOR USE ONLY: Preferred Not Preferred Control

Strongly Disagree -

28
APPENDIX B

IRB & INFORMED CONSENT FORM

Office of the Vice President for Research
Human Subjects Committee
Tallahassee, Florida 32306-2742
(850) 644-8673 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 12/05/2014

To: Brittany Mohney

Address:

Dept.: MUSIC SCHOOL

From: Thomas L. Jacobson, Chair

Re: Use of Human Subjects in Research
The Effect of Client Preferred Music on Workout Efficiency and Perceived Energy Exertion Among Highly Trained Athletes

The application that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Secretary, the Chair, and two members of the Human Subjects Committee. Your project is determined to be and has been approved Expedited per 45 CFR § 46.110(7) by an expedited review process.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals, which may be required.
If you submitted a proposed consent form with your application, the approved stamped consent form is attached to this approval notice. Only the stamped version of the consent form may be used in recruiting research subjects.

If the project has not been completed by 12/04/2016 you must request a renewal of approval for continuation of 12/04/2015 the project. As a courtesy, a renewal notice will be sent to you prior to your expiration date; however, it is your responsibility as the Principal Investigator to timely request renewal of your approval from the Committee.

You are advised that any change in protocol for this project must be reviewed and approved by the Committee prior to implementation of the proposed change in the protocol. A protocol change/amendment form is required to be submitted for approval by the Committee. In addition, federal regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Human Research Protection. The Assurance Number is IRB00000446.

Cc: Jayne Standley <jstandley@fsu.edu>, Advisor
HSC No. 2014.14144
Collegiate Athletes Consent Forms

My name is Brittany Mohney. I am a graduate student of music therapy with the Florida State University. You are encouraged to participate in this research study about the effects of using preferred music to enhance workout efficiency. You will be asked to engage in your pre-existing workouts with your preferred music, music you dislike and no music. Please read this form and ask any questions you may have before participating.

**Background Information:** The purpose of this research study will be to determine the effect of music preference on workout efficiency and perceived energy exertion. Results may offer benefits of using music to accompany workouts.

**Procedures:** If you agree to participate in this research study, you will be asked to complete your scheduled workouts under three different music conditions (preferred, not preferred, and no music). Prior to beginning the study, you will be asked to provide a list of your preferred music genre, artists and songs. Following each workout, you will be asked to complete a brief survey.

**Risks and Benefits of Participating in this Study:** This study involves minimal risk that does not exceed the risks associated with normal daily activities. Potential benefits of participating in this study include increasing workout efficiency.

**Compensation:** There will be no compensation for participating. Participation is voluntary and research activities will take place as part of regularly scheduled workouts without additional incentives.

**Confidentiality:** All records of this study will be kept private and confidential. I will never include any information that could possibly be used to identify any research participants in any published report. A master list of names will be used for data collection purposes only. Documents will be protected in a sealed container and will be destroyed six months after the conclusion of this study.

**Voluntary Nature of the Study:** Research participation is voluntary. Your choice whether or not to participate will not affect your current or future relations Florida State University. If you choose to participate, you may refuse to answer any question or decide to leave at any time without penalty or loss of benefits for which you are otherwise entitled.

**Contacts and Questions:** The researcher for this study is Brittany Mohney, who is overseen by Dr. Jayne Standley. Dr. Standley is the faculty advisor and major professor for this study. You may contact Brittany Mohney at xxxxx@xxxx.com. You may contact Dr. Standley by phone at (850) 644-4565 or by e-mail at jstandley@fsu.edu. Please ask me any questions you have, either now or at any point in the future. If you have any questions or concerns about your rights as a research participant, you may contact the Florida State University Institutional Review Board by at (850) 644-8836 or online at http://www.research.fsu.edu/.
Statement of Consent: I have read the information above. I have asked any questions I may have and have received answers. By signing I consent to participate in this research study.

______________________________  ______________________
Signature                      Date

______________________________  ______________________
Signature of Investigator       Date
## APPENDIX C

### PREFERRED MUSIC PLAYLIST

<table>
<thead>
<tr>
<th>Song Title</th>
<th>Artist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) WARCHANT</td>
<td>FSU MARCHING CHEIFS</td>
</tr>
<tr>
<td>2) GET LOOSE</td>
<td>TYGA</td>
</tr>
<tr>
<td>3) WALK IT OUT</td>
<td>UNK</td>
</tr>
<tr>
<td>4) FAR AWAY</td>
<td>TYGA</td>
</tr>
<tr>
<td>5) GOLD AND GARNET</td>
<td>DC</td>
</tr>
<tr>
<td>6) BLACK AND YELLOW</td>
<td>WIZ KHALIFA</td>
</tr>
<tr>
<td>7) HOTEL</td>
<td>KID INK</td>
</tr>
<tr>
<td>8) TRUFFLE BUTTER</td>
<td>NICKI MINAJ</td>
</tr>
<tr>
<td>9) SHOTS</td>
<td>LMFAO &amp; LIL JON</td>
</tr>
<tr>
<td>10) AYO</td>
<td>CHRIS BROWN &amp; TYGA</td>
</tr>
<tr>
<td>11) LET IT ROCK</td>
<td>KEVIN RUDOLF &amp; LIL WAYNE</td>
</tr>
<tr>
<td>12) ALL I DO IS WIN</td>
<td>DJ KHALED</td>
</tr>
<tr>
<td>13) THRIFT SHOP</td>
<td>MACKLEMORE &amp; RYAN LEWIS</td>
</tr>
<tr>
<td>14) LIL BIT</td>
<td>K CAMP</td>
</tr>
<tr>
<td>15) IT’S GOIN’ DOWN</td>
<td>YUNG JOC</td>
</tr>
<tr>
<td>16) GOT MONEY</td>
<td>LIL WAYNE</td>
</tr>
<tr>
<td>17) NOT AFRAID</td>
<td>EMINEM</td>
</tr>
<tr>
<td>18) PARTY LIKE A ROCKSTAR</td>
<td>SHOP BOYZ</td>
</tr>
<tr>
<td>19) THROW SUM MO</td>
<td>RAE SREMMURD</td>
</tr>
<tr>
<td>20) UPTOWN FUNK</td>
<td>MARK RONSON</td>
</tr>
<tr>
<td>21) YOU KNOW I GOT IT</td>
<td>RICK ROSS</td>
</tr>
<tr>
<td>22) LOLLIPOP</td>
<td>LIL WAYNE &amp; STATIC MAJOR</td>
</tr>
<tr>
<td>23) SHE WILL</td>
<td>LIL WAYNE</td>
</tr>
<tr>
<td>24) WOBBLE</td>
<td>V.I.C.</td>
</tr>
<tr>
<td>25) LOSE YOURSELF</td>
<td>EMINEM</td>
</tr>
<tr>
<td>26) SCHEMIN UP</td>
<td>OB OBRIEN</td>
</tr>
<tr>
<td>27) HONEST</td>
<td>FUTURE</td>
</tr>
</tbody>
</table>
## APPENDIX D

### NON-PREFERRED MUSIC PLAYLIST

<table>
<thead>
<tr>
<th>Song Title</th>
<th>Artist</th>
</tr>
</thead>
<tbody>
<tr>
<td>1) WARCHANT</td>
<td>FSU MARCHING CHEIFS</td>
</tr>
<tr>
<td>2) GIVES YOU HELL</td>
<td>ALL-AMERICAN REJECTS</td>
</tr>
<tr>
<td>3) SOME NIGHTS</td>
<td>FUN.</td>
</tr>
<tr>
<td>4) HEY THERE DELILAH</td>
<td>PLAIN WHITE T’S</td>
</tr>
<tr>
<td>5) COMIN’ TO YOUR CITY</td>
<td>BIG &amp; RICH</td>
</tr>
<tr>
<td>6) PHOTOGRAPH</td>
<td>NICKLEBACK</td>
</tr>
<tr>
<td>7) BOUNCING OFF THE CEILING</td>
<td>A*TEENS</td>
</tr>
<tr>
<td>8) LARGER THAN LIFE</td>
<td>BACKSTREET BOYS</td>
</tr>
<tr>
<td>9) MMMBOP</td>
<td>HANSON</td>
</tr>
<tr>
<td>10) TAKE IT OFF</td>
<td>KESHA</td>
</tr>
<tr>
<td>11) PARTY IN THE U.S.A.</td>
<td>MILEY CYRUS</td>
</tr>
<tr>
<td>12) WANNABE</td>
<td>SPICE GIRLS</td>
</tr>
<tr>
<td>13) AIN’T NO OTHER MAN</td>
<td>CHRISTINA AGUILERA</td>
</tr>
<tr>
<td>14) DOES ANYBODY REALLY KNOW WHAT TIME IT IS</td>
<td>CHICAGO</td>
</tr>
<tr>
<td>15) I STILL HAVEN’T FOUND WHAT I’M LOOKING FOR</td>
<td>U2</td>
</tr>
<tr>
<td>16) EVERYBODY HAVE FUN TONIGHT</td>
<td>WANG CHUNG</td>
</tr>
<tr>
<td>17) BLANK SPACE</td>
<td>TAYLOR SWIFT</td>
</tr>
<tr>
<td>18) SHAKE IT OFF</td>
<td>TAYLOR SWIFT</td>
</tr>
<tr>
<td>19) I KNEW YOU WERE TROUBLE</td>
<td>TAYLOR SWIFT</td>
</tr>
<tr>
<td>20) RED</td>
<td>TAYLOR SWIFT</td>
</tr>
<tr>
<td>21) ROAR</td>
<td>KATY PERRY</td>
</tr>
<tr>
<td>22) DARK HORSE</td>
<td>KATY PERRY</td>
</tr>
<tr>
<td>23) WIDE AWAKE</td>
<td>KATY PERRY</td>
</tr>
<tr>
<td>24) FIREWORK</td>
<td>KATY PERRY</td>
</tr>
<tr>
<td>25) PROBLEM</td>
<td>ARIANA GRANDE</td>
</tr>
<tr>
<td>26) BREAK FREE</td>
<td>ARIANA GRANDE</td>
</tr>
<tr>
<td>27) BANG BANG</td>
<td>JESSIE J.</td>
</tr>
</tbody>
</table>
REFERENCES


BIOGRAPHICAL SKETCH

Name: Brittany Ann Mohney

Birth: December 18, 1990
Greenville, Pennsylvania

Education: Florida State University
Tallahassee, Florida
Major: Music Therapy
Degree: M. M. (2015)

Pennsylvania State University
State College, Pennsylvania
Major: Music Education
Degree: B.M.E. (2013)

Experience: Wolfson Children’s Hospital Clinical Internship
Jacksonville, Florida
June through December, 2014

Memberships: Member of the American Music Therapy Association