Music and Exercise: Tunes Are a Natural Steroid

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Abstract: *This paper discusses the motivating capabilities of music, deeming music an effective tool to enhance physical performance. Through tempo that increases with intensity of exercise, and rhythm that is synchronized with movement, music is efficient in enhancing work output and duration of activity. The use of music for the purpose of physical enhancement or increased activity is achieved through various pathways including motivation by way of controlled tempo before, during, and immediately following exercise, and the use of personal music players to distract from fatigue and pain. Music also plays a key role in improving children/adolescents' ability to learn through increasing their mood and focus; as such, integration into physical education produces benefits in academics and health. Exercise is essential, and music can make it more enjoyable and efficient.*

Introduction

In a day and age where protein powder, Muscle Milk, and a variety of steroids are abundant, it is clear that both men and women value increased physical performance. Some of these quick and easy fixes are not effective, or even safe, sometimes leading to complications and even death. However, as technology expands the diversity, accessibility, portability, and personalization of various products, more and more people begin to use one of the most natural and effective steroids without even realizing it – music. What is it about music that enhances physical performance, to what extent, and under what conditions? How can one maximize his or her personal workout using music?

Some coaches create very specific workouts where each component of exercise is accompanied by a song that is thought to enhance the athlete's performance best. For example, as the workout

progresses and exercise intensity increases, coaches incorporate songs of increasing tempo to match the intensity. An example would be "Umbrella" by Rihanna featuring Jay-Z for mental preparation because it has a slow tempo at 89 beats per minute. "Gettin' Jiggy With It" by Will Smith is efficient during warm-ups because it has 108 beats per minute. Stretching is accompanied by a slower tempo song, strength training and endurance exercises have the highest intensity and thus the fastest paced songs at about 150 beats per minute, and warming down is accompanied by the slowest paced song of the whole sequence (Karageorghis and Priest). All in all, there is an infinite amount of ways in which music can be tailored to a specific person, group of people, or most people in general, with the goal of increasing activity or enhancing performance.

Moreover, music combined with other factors can have an even greater effect on enhancing performance and even mood. For example, in the article "A Qualitative Investigation Into The Characteristics And Effects Of Music Accompanying Exercise," David-Lee Priest and Costas I. Karageorghis conduct interviews on the topic of motivational qualities of music. Their findings display the "importance of musical (e.g. rhythm, lyrics, bass), contextual (e.g. time of day) and individual factors (e.g. background, personality) in determining both short-term (e.g. mood, imagery) and long-term (e.g. heightened work-rate, endurance) outcomes. The findings point towards a more expansive conceptual framework" for how music works to increase athletic ability (347). Music and exercise is a complex topic, and coupled together, they have massive capabilities for positive effects on the human body and mind, especially when combined with other factors such as those stated by Priest and Karageorghis. Music that is synchronized with movement, such as in rowing, leads to enhanced performance by increasing levels of activity. Music associated with activity, moreover, leads to motor skills, as music makes one more comfortable to experiment with creative movements. . Rhythm and tempo are two elements of music that allow distraction from pain and cause stimulating physiological effects due to neural responses. Ultimately, the effects of music on exercise show

that music can be fitted to a number of different situations and people with the same overall aim of enhanced physical performance or activity in mind. In societies where children, adolescents, and even adults are becoming more sedentary, it is crucial to understand the motivating capabilities of music in regards to exercise. The relationships between music and increased physical activity are key in prompting people to move and thus may provide numerous health benefits.

Tempo and Motivation

Music tempo, which is measured as the number of beats per minute, influences heart rate and motivation during exercise. David-Lee Priest and Costas I. Karageorghis theorize that, "Generally, a fast and 'upbeat' tempo [is] considered to be motivational during exercise… Further, it was suggested by a number of the participants that the musical tempo should be in synchrony with the movement tempo" (354). In other words, the tempo should increase with the intensity of the activity in order to be motivational. It should not, however, be so fast that the body cannot identify with it anymore. In order to test this theory, Harry B. T. Lim et al., the authors of the article "Revisiting The Relationship Between Exercise Heart Rate And Music Tempo Preference," performed an experiment involving undergraduate students in southeast England that would determine the relationship between the intensity of exercise, measured by heart rate, and desired music tempo during that time. They found that people prefer to listen to songs with fast tempos while exercising at moderate to high intensity (Lim et al. 275), which agrees with Priest and Karageorghis; in addition, a new piece of information the authors found is that, "music tempo preferences reach a plateau at higher intensities of exercise…this may be due, in part, to the lack of familiarity of such high tempi in everyday listening situations" (Lim et al. 275). In other words, high-intensity exercise favors fast-paced music, but at a certain tempo, the music becomes too rapid to be efficient. This is due in part because most familiar songs are not constructed of such a rapid tempo; songs having fast tempos increase motivation to exercise intensely, yet there is greater motivation and likelihood to

keep exercising if those fast-paced songs are familiar to the person. If someone does not know a song, he or she is less likely to want to listen to that song, let alone exercise to it. Overall, a person must stick to fast-paced, familiar songs during high intensity workouts.

A similar experiment conducted on undergraduates from Great Britain shows different results from the first two articles in that medium tempos are preferred during intense exercise, but for the same ending reason that the songs are familiar. In the article "Psychological Effects Of Music Tempi During Exercise," medium tempi (115 to 120 beats per minute) were favored over fast tempi (140-145 beats per minute) even when working out at moderate intensity level due to most popular music that people listen to in everyday situations being recorded in medium tempos. The authors provide another possible reason why individuals prefer not to workout to music that is very fast by adding, "Another plausible explanation for the present findings relates to self-determination theory and satisfaction of the needs underlying intrinsic motivation. [Very fast] tempi conditions serve to 'force the pace' a little and thus may undermine self-determination and flow" (Karageorghis, Jones, and Stuart 617). The more a tempo increases, the music subconsciously pushes individuals to work harder and faster, and people who do not think they are capable of that at this stage in their exercise may burn out and give up. The three articles used here express that overall, exercisers prefer a tempo that is not too slow nor too fast throughout their routine, so as to raise the heart rate enough to motivate them, to keep the pace, and to provide a sense of enjoyment due to distraction from the pain.

Tempo and Recovery From Intense Exercise

Immediately following intense exercise, it is healthier to keep moving and gradually reduce activity rather than to abruptly sit down, and specific tempos can motivate an athlete to do so. Whether relaxing music or fast-paced music increases motivation for active recovery may depend on the individual. Regardless, both of the following articles agree that music definitely has a positive effect on athletes to engage in active recovery, such as walking or jogging, as opposed to passive

recovery, such as sitting or lying down. According to the article "Effect of Motivational Music on Lactate Levels during Recovery from Intense Exercise":

> Active recovery [is] more efficient than the passive one, for removal of lactate from the blood and for restoring exercise capacity... Despite this recommendation, some athletes would not be willing or able to keep a dynamic active recovery after intense exercise…motivational music may help athletes to overcome physiologic and psychological barriers and perform a more active recovery. (Yoav Meckel, et al. 84)

Music can ultimately serve to distract athletes from fatigue or pain due to exertion, urging them to keep moving. To test this theory, the authors of the article "Evaluation On The Effects Of Relaxing Music On The Recovery From Aerobic Exercise-Induced Fatigue," took the heart rate, blood lactic acid, and blood glucose of male college students before and after intense exercise; they were taken once again during the recovery period after relaxing music was introduced to the experimental group and no music was introduced to the control group. The authors define relaxing music as, "primarily of string composition, low-pitched, having a simple and direct musical rhythm, and having a tempo of approximately 60-80 beats [per minute]" (Jing and Xudong 105). The results show that this type of music was found to have "better effects on the rehabilitation of cardiovascular, central, musculoskeletal and psychological fatigue" than no music (Jing and Xudong 105). It also caused the urinary protein to descend quickly after the exercise, which is a sign of good regulatory capability of the kidneys. Overall, relaxing music helps to transition a person from intense exercise to a gradual relaxation, whereas when no music is involved, an individual's perceived fatigue is not eliminated as efficiently (Jing and Xudong 105).

On the contrary, an experiment featured in the article "Effect Of Motivational Music On Lactate Levels During Recovery From Intense Exercise" shows a completely different pathway of motivating active recovery and disagrees with the first article by favoring fast tempos.

In this study, young adult physical education students were to run on a treadmill for six minutes intensely and then slow down gradually after that; one group listened to motivational music during recovery, and the other did not. The findings were that, "Listening to motivational music [rhythmic with fast tempo] during the recovery was associated with increased voluntary activity, determined by the significantly greater number of steps taken…[It also caused a] greater decrease in blood lactate concentration and [a]…greater percentage decrease in [Rating of Perceived Exertion]" (Yoav Meckel, et al. 84). It was found that fast-paced music influenced the athletes who otherwise would have wanted to sit or lie down rather than keep moving. The authors also state that the music made the athletes feel like they were exercising less intensely than they actually were, which allowed them to walk for a longer period of time. Overall, although these two studies differ in their findings on tempo, they agree that music positively contributes to the motivation of athletes to keep moving after completion of exercise; listening to music helps athletes to transition from exercise to rest. This finding is crucial since active recovery is more efficient in removing lactate from the blood and restoring the full potential to exercise again without remaining fatigue.

Use of Personal Music Players and Distraction From Pain

Since the advent of the personal music player, such as the iPod, listening to music while exercising has grown increasingly common; having one's personal music selection so readily available contributes positively to attitudes toward exercise through dissociation of pain. In an experiment from an article titled "College Students' Usage Of Personal Music Players (PMP) During Exercise," the use of iPods positively contributes to increasing exercise by distracting athletes from pain. In this study, university students in the United States were directed to perform cardio and weight lifting while listening to different types of music via their personal music players and others while listening to no music at all. The verdict was that the Rating of Perceived Exertion was considerably lower while listening to music, regardless of fast, classical,

or personally chosen music. According to this article the findings prove that "music can act as an effective distracter during exercise… motivational music can improve attitude towards exercise and reduce sense of effort during exercise, thus making exercise 'more fun' and 'seem easier'" (Barney, Gust, and Liguori 25). Students listening to music while exercising felt like the time passed more quickly and they did not feel like they were exercising as intensely as they actually were because they were immersed in the music.

A counterargument to the previous article lies in "Exercising With An Ipod, Friend, Or Neither: Which Is Better For Psychological Benefits," which presents an experiment with findings that are actually counterproductive to exercise. This experiment tests the influence of different factors (music being one of them) on the psychology of exercise using undergraduate college students in the United States. The authors believe that if one can identify environmental factors that benefit his or her exercise routine, this may help him or her to exercise more regularly and willingly. The participants walked and bicycled inside and outside, alone and with someone else, and with or without an iPod with music of their choice. The findings were that, "Exercising alone indoors had added benefits in terms of enhanced calmness and stress reduction compared with exercising indoors with music or with a friend…among indoor exercisers, those who exercised without an iPod or a friend were most calm and less stressed" (Plante, et al. 206). While exercising indoors, without fast or slow paced music exciting the heart rate and making them feel like they had to move, the participants exercising without music experienced more enjoyment and less tension. However, calming a person down and making him feel like he does not have to move may be counterproductive if increased activity is the ultimate goal. Being calm is often accompanied by a decrease in heart rate, yet in order to be motivated to exercise, the goal must be an increased heart rate, which music effectively achieves, as explained earlier. Overall, the authors of the first article found that listening to music on personal music players, especially fast-paced, can increase the heart rate and raise motivation to

exercise, whereas the authors of the second article claim that listening to no music provides a more enjoyable exercise by calming a person down, which is counterproductive to exercise in actuality. Therefore, in order to successfully be motivated to begin, as well as actually complete, intense exercise, it is beneficial for people to listen to the fast-paced songs that are on their personal music players.

Music in Physical Education: Helping Children Learn

At a time when children and adolescents are growing more sedentary than in previous generations, music can motivate them to become active by distracting them from the pain of physical activity. Motivating students to become active is crucial for their present and future health. According to the article "A Qualitative Investigation Into The Characteristics And Effects Of Music Accompanying Exercise," Priest and Karageorghis state that, "Reductions of perceived exertion are particularly important in an educational context, and the impact of music on student mood is also significant in terms of the beneficial effect it may exert on learning" (Priest and Karageorghis 348-349) Not only does music impact the physical fitness of children, but it also causes them to be in a better mood, enabling them to be more focused on and receptive to academic material being taught.

An example of this theory at work lies in an experiment featured in "Effects of Interactive Video Game Cycling On Overweight and Obese Adolescent Health," in which the authors test the effects of music on children. The authors had a control group, which performed stationary cycling, a group that cycled with music, and a group that cycled in an interactive video game format. They found that, "In comparison with video game cycling, participants cycling to music attended more sessions (92% vs. 86%)…the latter is a common practice that may be an effective distraction from physical discomfort and may enhance exercise performance in non-elite or beginner exercisers" (Adamo, Rutherford, and Goldfield 810). Although video games were initially expected to yield better physical performance and adherence due to visual distraction from pain as well as sound effect distractions, music was more effective

in motivating children to be active and remain active for an hour or more at a time. Many think that video games should be incorporated into gym class to promote better participation in physical activity at young ages because children can enjoy and relate to games. However, music alone is a much better option because video games require a substantial amount of "visual-spatial attention" and concentration, leading the children to "adopt a less vigorous level of intensity while cycling to compensate" (Adamo, Rutherford, and Goldfield 810). Overall, listening to music does not demand an overwhelming amount of attention or concentration, which makes it so effective in children and adolescents. These two articles agree that children who listen to music during exercise experience higher intensity workouts for longer periods of time, which in turn improves their moods and thus their ability to learn; therefore, music should be incorporated into physical education.

Conclusion

In 2007, the New York Marathon banned music, seeing it as an unfair advantage due to the efficiency of music as an athletic aide. Subsequently, according to the authors of "Music In Sport And Exercise: An Update On Research And Application," "the potentially powerful effects of music on the human psyche were brought into sharp focus. In fact, music was banned from the New York Marathon as part of the wider USA Track & Field ban on tactical communications between runners and their coaches" (Karageorghis and Priest 2). The committee felt that music posed a threat to the athletic integrity of the marathon because it can enhance performance through "dissociation, arousal regulation, synchronization, acquisition of motor skills, and attainment of flow" (Karageorghis and Priest 5). It causes dissociation when the enjoyment of the music is more intense than the pain of exercise, leading the athlete to forget the discomfort and be immersed in the music. It arouses or motivates the athlete to perform harder or faster through its use of tempo and rhythm, which increase the flow of work done. Music that is synchronized with movement leads to increased levels of activity, and music associated with activity leads to improved motor skills. All

of these elements interact with each other to enable an athlete to endure higher intensity workouts for longer durations of time, which is why listening to music while running the New York Marathon is an unfair advantage.

Whether a person is trying to train for the New York Marathon, to increase muscle mass to impress a girl, to go for a relaxing walk to shed the stresses of the day, or to influence children to be more active in gym class, music is an effective tool to accomplish all of the above and more. To summarize, Len Kravitz states, in "The Effects of Music on Exercise":

> Preferred music may facilitate focus on the music or other external stimuli rather than the discomforts that often accompany strenuous exercise. Thus, music also has the capability to evoke pleasant associations, possibly masking unpleasant stimuli (such as heavy breathing associated with exertion) or serve as a distraction to internal feelings associated with discomfort… it has been clearly demonstrated that music can reduce factors contributing to pain and discomfort such as stress, tension, and anxiety. (Kravitz)

This really outlines the ways in which music makes exercise a more enjoyable experience. Manipulating tempo allows for motivation to begin intense exercise or motivation to practice active recovery following intense exercise. Tempo can be controlled to mentally prepare for exercise, stretching, warm ups, weight lifting, running, and warming down. Rhythm keeps the pace of exercise, tempo forces the pace of exercise, and enjoyment of music causes one to dissociate from the exercise. These factors combine to an extent that exercise almost feels like it is happening subconsciously. This allows individuals to workout for a longer period of time more intensely because, as the sources show, they barely feel it, as Ratings of Perceived Exertion lower with music. Athletes feel like they are performing less intensely than they are, allowing them to push harder.

In places where children, adolescents, and adults grow more

sedentary, it is crucial to understand how music can motivate people to exercise. Not only does music increase activity, but it also increases attitude toward activity because music paired with exercise allows for goals to be reached sooner due to distraction from pain, leading to increased work output and duration of activity. It also produces a good mood. If a goal is met quickly, people will feel inspired to continue progressing; the association between empowering feelings due to the achievement of one's goals, and the good moods naturally produced by exercise, will inspire a person to keep exercising. Over the years, music continues to enhance physical performance and increase activity levels by inspiring and motivating people to either start or continue to get up and move around. By increasing knowledge of how music can be used to positively manipulate performance through further research, and by spreading that knowledge, it will be interesting to see how activity levels change around the world in upcoming years and how that will affect the youth especially.

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