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Enhancing Sports Performance Through The Use Of Music

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ABSTRACT

Brooks, KA, Brooks, KS. Enhancing Sports Performance Through The Use Of Music *JEPonline* 2010;13(2):52-57. This is a review of current studies dealing with the use of music in sport and during exercise as a motivational tool. Anaerobic and aerobic training generally elicit changes specific to the mode of training, and the physiological response to both types of exercised differs greatly. Therefore, the purpose of this review is to examine the effects of the use of music as a motivational tool in aerobic versus anaerobic performance, and how it is enhanced through music. Many studies have mixed results due to failure to control the environment. Self-selection of music, versus using pre-selected music, or music that is categorized as motivational have also produced mixed results. This review provides insight into the specific fitness adaptations acquired by selectively utilizing endurance, resistance, or combination training. By reviewing numerous studies, this review demonstrates that the greatest response to music as a motivational aid is found with aerobic or endurance training, while resistance training and anaerobic training need further investigation. As indicated by these results, music as a motivational tool has the greatest impact on cardiovascular exercise, while resistance training and anaerobic exercise have not been analyzed as often. Submaximal versus maximal performance as well as exercise at moderate intensity versus high intensity have all produced mixed finding. Problems with current research and recommendation for future studies are given.

Key Words: Motivation, Exercise, Performance, Anaerobic

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INTRODUCTION

Music can be heard at any major sporting event or in any exercise facility. Music during sporting events or exercise can represent or express the individuality of the participant, motivate the participant, or add excitement to the atmosphere (6). It can be inspirational to some. It is said that the music accompaniment to exercise and sporting events provides an important beneficial effect to the exercise and sports experience (11). Music has become a major influence on society, so it is no surprise that music has become prominent in the physical activity arena. With the development of newer, more compact portable music devices such as MP3 players, I-pods, and Zunes, music has become more accessible and convenient.

Many fitness instructors consider the addition of music to exercise similar to an ergogenic aid (13). Thus, with the removal of music or an inappropriate selection of music, the instructors often feel that it is an automatic indication of an unsuccessful class (15). Music has been said to improve mood state, increase arousal, and help provide a reduced feeling of fatigue.

Different psychophysiological measures have been used to determine whether or not music has any influence, such as heart rate (HR) (13), Borg's Rating of Perceived Exhaustion (RPE) scale (3,4), blood lactate (20), blood pressure (BP), Physical Activity Questionnaire (PAQ), 10-point bipolar Feeling Scale, Music Rating Inventory, and Multiple Affect Adjacent Checklist-Revised (11). The research findings of previous research have been inconsistent.

Researchers have looked at the effects of music on exercise performance and results have revealed conflicting data, but do indicate that music may provide ergogenic gains.

AEROBIC EXERCISE TESTING

Atkinson (1) investigated 16 subjects during timed trials on a cycle ergometer. A no music control 10-kilometer trial was compared to a dance music 10-kilometer trial with 16 subjects. Results showed that average speed, power, and HR were significantly higher while listening to dance music when compared to the no music control group. The time to complete the test was significantly lower in the music group. Subjects noted that the music provided a stimulatory effect to the cycling performance (2). Priest and colleagues (12) showed participants were inspired to exercise by preferential choices of music after testing a large group of 532 subjects. It was noted that the one commonality being that the music has a strong rhythmical component (18).

Conflicting research with the theory that music may provide ergogenic gains includes an investigation in which the effects of different types and intensities of music (fast, slow, and no music) was

presented to 24 subjects during a graded maximal treadmill test as they walked/ran to maximal capacity. No significant results were found and the actual times to exhaustion varied by less than 30 seconds and the maximal HRs varied by 2 beats/min in the three conditions (2). Copeland and Franks (6) noted that the research was indicative that in measures of maximal work capacity, music is not able to provide an ergogenic effect above that of the body's physiological limitations. It is very consistent in the research that individuals enjoy the exercise regimen much more when the music is motivating to them (2).

Szabo and colleagues (22) studied the effects of slow-rhythm and fast rhythm classical music on progressive cycling exercise to voluntary exhaustion to test a theory of how music improves exercise performance. In this study, 24 subjects (12 male, 12 female) performed testing with a control of no music, slow music, fast music, slow to progressively fast music, and fast to progressively slower music. The investigators found a slightly higher exercise workload (statistically significant) was completed by participants when listening to music progressing from slow to faster paced. From these findings, the authors proposed that music may provide a temporary distracting effect to some of the body's internal cues associated with fatigue (21).

Another investigation testing the same theory of music enhancing exercise performance allowed subjects to choose their own music when testing. This study by Yamasita and colleagues (27) had 8 male subjects perform one 30-minute submaximal cycle ergometer test at 40% VO_2 max and another at 60% VO_2 max. No significant findings were found during the 60% of VO_2 max test trial, but the researchers did find that the subjects had lower RPE listening to their music rather than no music at all (25). This theory was tested once again by North and Hargreaves (18), and they suggest that music choice needs to provide a sufficient stimulus to be able to sustain and optimize the state of physical and mental arousal (16).

ANAEROBIC EXERCISE TESTING

Many studies have investigated the effects of music on cardiovascular endurance performance and perceived exertion during exercise, but few studies have investigated such effects on supramaximal exercise bouts. One study assessed whether music affects performance on the Wingate Anaerobic Test. Two tests were completed, one with music and one without music (15). All music selections were set at the same tempo. Mean Power Output, Maximum Power Output, Minimum Power Output, and Fatigue Index were compared between conditions for each test and time to fatigue resulted in no significant differences between conditions for any measures.

Karageorghis (14) completed a study on 50 subjects (25 males, 25 females) measuring grip strength after listening to stimulative, sedative, and no music. Significantly higher strength scores were found after subjects listened to stimulative music compared to no music and sedative music. Also, sedative music produced significantly lower strength scores when compared to no music (10).

A study was completed to determine the effect of music during warm-up on anaerobic performance in elite national level adolescent volleyball players (8). A Wingate Anaerobic Test following a 10-minute warm-up with and without music was performed. This study found that during warm-up with music, mean HR was significantly higher, but music had no significant effect on mean anaerobic output or fatigue index. The importance of this finding is that music affects warm-up and may have a transient beneficial effect on anaerobic performance.

The effects of listening to music at certain times during a muscular endurance test instead of prior to testing were examined by Crust (7). Twenty-seven subjects listened to either white noise or self-

selected motivational music. The subjects were subjected to music or white noise immediately before test, during testing and terminated halfway through, and throughout the entire test. Crust (7) found that all conditions of music exposure, whether prior, half or full, produced significantly longer endurance times than white noise. He also found that those who experienced full exposure to music during their entire test produced significantly longer times compared to those with exposure prior to test. Crust added that using self-selected motivational music instead of researcher-selected music was much more indicative of a real-life situation.

Another study on music's effect on Wingate performance was completed with music (ACDC-Thunderstruck) and the other is without music, no encouragement was allowed during both tests (19). The results of the testing show that there was a significance in peak power relative to Watts of .018 ($P < .05$) and relative to Watts/kg of .049 ($P < .05$). These findings show that music can physiologically improve anaerobic exercise performance.

Szmedra (25) studied the effect of listening to two different types of music prior to supramaximal cycle exercise, on performance, heart rate, the concentration of lactate and ammonia in blood, and the concentration of catecholamines in plasma. Six male students performed supramaximal exercise for 45 seconds using a cycle ergometer after listening to slow rhythm or fast rhythm music for 20 minutes. The results showed that listening to slow and fast rhythm music prior to supramaximal exercise did not significantly affect the mean power output and the type of music had no effect on blood lactate and ammonia levels or on plasma catecholamine levels following exercise. The results show that type of music has no impact on power output during exercise.

DISCUSSION

Aerobic testing with music showed improved performance, mental arousal, and physical arousal (16). Anaerobic testing continues to show inconsistent results. Therefore, after reviewing the literature on the effects of music on anaerobic and aerobic performance, it is important to clarify if music influences anaerobic performance.

There are conflicting data on Wingate testing, as well as other types of anaerobic power testing, and the use of motivational music. Aerobic exercise and its relationship with music as motivation has been studied in further detail and the connection between the two has been substantiated several times by different researchers (17). Self-selection of music has produced the most consistent results in aerobic exercise performance and in VO_2 testing, both at maximal and submaximal exertion (23). Intensity, mode, and duration of aerobic exercise have been factors in limiting the results of these studies (20).

CONCLUSIONS

Opposed to aerobic testing and exercise performance, and its relationship with music as motivation, anaerobic testing and exercise performance have produced mixed results (7). The effect of music on motivation in anaerobic performance is very important in sports performance. Most of the popular sports in our society are power sports, or have an anaerobic component (3). If music is significant in motivating athletes, it can be used as both a positive and a negative in the sports arena. Intensity of music in anaerobic performance could prove to be positive or negative in athletics. If the motivational music contributes to prove a significant increase in anaerobic performance, it can be said that slow, sad, and discouraging music may have a negative effect on performance (4). The intensity and beats per minute of the music may prove to limit or enhance anaerobic performance, as it does in aerobic performance. These are considerations that need to be addressed in future research.

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