



MUSIC IN SPORT AND EXERCISE

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Abstract:

Introduction:

An Update on Research and Application Sports Exercise Science, Sports Studies and Sports Psychology

In spring 1999, almost a decade ago, the first author published in *The Sport Journal* an article titled “Music in Sport and Exercise: Theory and Practice.” The present article’s origins are in that earlier work and the first author’s research while a master’s student at the United States Sports Academy in 1991–92. To a greater degree than in the original 1999 article, this article focuses on the applied aspects of music in sport and exercise. Moreover, it highlights some new research trends emanating not only from our own publications, but also from the work of other prominent researchers in the field. The content is oriented primarily towards the needs of athletes and coaches.

Music in Sport and Exercise: An Update on Research and Application

With the banning of music by the organizers of the 2007 New York Marathon making global headlines, 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. The marathon committee upheld this ban, which is often otherwise overlooked, justifying its action in terms of safety.

The response to the ban was emphatic. Hundreds of runners flouted the new regulation and risked disqualification from the event—such was their desire to run to

the beat. Experience at other races around the world confirms the precedent set in New York; try to separate athletes from their music at your peril! But why is music so pivotal to runners and to sports people from a wide variety of disciplines?

How Music Wields an Effect

In the hotbed of competition, where athletes are often very closely matched in ability, music has the potential to elicit a small but significant effect on performance (Karageorghis & Terry, 1997). Music also provides an ideal accompaniment for training. Scientific inquiry has revealed five key ways in which music can influence preparation and competitive performances: dissociation, arousal regulation, synchronization, acquisition of motor skills, and attainment of flow.

Dissociation

During submaximal exercise, music can narrow attention, in turn diverting the mind from sensations of fatigue. This diversionary technique, known to psychologists as dissociation, lowers perceptions of effort. Effective dissociation can promote a positive mood state, turning the attention away from thoughts of physiological sensations of fatigue. More specifically, positive aspects of mood such as vigor and happiness become heightened, while negative aspects such as tension, depression, and anger are assuaged (Bishop, Karageorghis, & Loizou, 2007). This effect holds for low and moderate exercise intensities only; at high intensities, perceptions of fatigue override the impact of music, because attentional processes are dominated by physiological feedback, for

example respiration rate and blood lactate accumulation.

Research shows that the dissociation effect results in a 10% reduction in perceived exertion during treadmill running at moderate intensity (Karageorghis & Terry, 1999; Nethery, 2002; Szmedra & Bacharach, 1998). Although music does not reduce the perception of effort during high intensity work, it does improve the experience thereof: It makes hard training seem more like fun, by shaping how the mind interprets symptoms of fatigue. While running on a treadmill at 85% of aerobic capacity (VO₂max), listening to music will not make the task seem easier in terms of information that the muscles and vital organs send the brain. Nevertheless, the runner is likely to find the experience more pleasurable. The bottom line is that during a hard session, music has limited power to influence what the athlete feels, but it does have considerable leverage on how the athlete feels.

Arousal Regulation

Music alters emotional and physiological arousal and can therefore be used prior to competition or training as a stimulant, or as a sedative to calm “up” or anxious feelings (Bishop et al., 2007). Music thus provides arousal regulation fostering an optimal mindset. Most athletes use loud, upbeat music to “psych up,” but softer selections can help to “psych down,” as well. An example of the latter is two-time Olympic gold medalist Dame Kelly Holmes’s use of soulful ballads by Alicia Keys (e.g., “Fallin” and “Killing Me Softly”) in her pre-event routine at the Athens Games of 2004. While the physiological processes tend to react sympathetically to music’s rhythmical components, it is often lyrics or extramusical associations that make an impact on the emotions. Ostensibly, fast tempi are associated with higher arousal levels than slow tempi.

Karageorghis and Lee (2001) examined the interactive effects of music and imagery on an isometric muscular endurance task which required participants to hold dumbbells in a cruciform position for as long as possible. Males held 15% of their

body weight and females held 5% of their body weight. The authors found that the combination of music and imagery, when compared to imagery only, music only, or a control condition, enhanced muscular endurance (see Figure 1), although it did not appear to enhance the potency of the imagery. The main implication of the study was that employing imagery to a backdrop of music may be a useful performance-enhancement strategy that can be integrated in a pre-event routine.

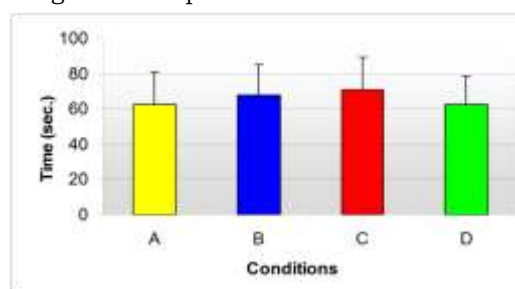


Figure 1. Bar chart illustrating mean scores (+ 1 SD) for isometric muscular endurance under conditions of imagery only (A), motivational music (B), motivational music and imagery (C), and a no music/imagery control (D).

Synchronization

Research has consistently shown that the synchronization of music with repetitive exercise is associated with increased levels of work output. This applies to such activities as rowing, cycling, cross-country skiing, and running. Musical tempo can regulate movement and thus prolong performance. Synchronizing movements with music also enables athletes to perform more efficiently, again resulting in greater endurance. In one recent study, participants who cycled in time to music found that they required 7% less oxygen to do the same work as compared to cycling with background (asynchronous) music (Bacon, Myers, & Karageorghis, 2008). The implication is that music provides temporal cues that have the potential to make athletes’ energy use more efficient.

The celebrated Ethiopian distance runner Haile Gebrselassie is famous for setting world records running in time to the rhythmical pop song “Scatman.” He selected this song because the tempo perfectly

matched his target stride rate, a very important consideration for a distance runner whose aim is to establish a steady, efficient cadence. The synchronization effect in running was demonstrated in an experimental setting by Simpson and Karageorghis (2006), who found that motivational synchronous music improved running speed by $\sim .5$ s in a 400-m sprint, compared to a no-music control condition (see Figure 2).

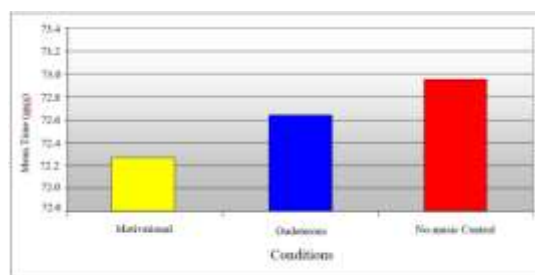


Fig. 2. $F(2, 68) = 10.54, p < .001, \eta^2 = .24$

Figure 2. Mean 400 m times for synchronous motivational music, synchronous oudeterous music, and a no-music control.

Acquisition of Motor Skills

Music can impact positively on the acquisition of motor skills. Think back to elementary school days and your initial physical education lessons, which were probably set to music. Music-accompanied dance and play created opportunities to explore different planes of motion and improve coordination. Scientific studies have shown that the application of purposefully selected music can have a positive effect on stylistic movement in sport (Chen, 1985; Spilthoorn, 1986), although there has been no recent research to build upon initial findings.

There are three plausible explanations for the enhancement of skill acquisition through music. First, music replicates forms of bodily rhythm and many aspects of human locomotion. Hence, music can transport the body through effective movement patterns, the body providing an apparent visual analogue of the sound. Second, the lyrics from well-chosen music can reinforce essential aspects of a sporting

technique. For instance, in track and field, the track “Push It” (by Salt-n-Pepa) is ideal for reinforcing the idea that the shot should be put, not thrown; throwing the shot is the most common technical error. Third, music makes the learning environment more fun, increasing players’ intrinsic motivation to master key skills.

Conclusion:

We have established that there are many ways in which music can be applied to both training and competition. The effects of carefully selected music are both quantifiable and meaningful. As Paula Radcliffe, the world record-holding marathoner, has said, “I put together a playlist and listen to it during the run-in. It helps psych me up and reminds me of times in the build-up when I’ve worked really hard, or felt good. With the right music, I do a much harder workout.”

The findings we have discussed lead to the possibility that the use of music during athletic performance may yield long-term benefits such as exercise adherence and heightened sports performance, through a superior quantity and quality of training. Although many athletes today already use music, they often approach its use in quite a haphazard manner. We hope that through applying the principles outlined in this article, athletes and coaches will be able to harness the stimulative, sedative, and work-enhancing effects of music with greater precision.

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