opposite trend was evident in the control condition. It appears that trained women do not perform better than their male counterparts when synchronous movements are compared. Also, men may be more able to coordinate their movements to a regular beat in the absence of musical stimuli (i.e., a metronome). Therefore, music used for male groups should have high motivational qualities and a particularly prominent beat. Also, practitioners should be particularly sensitive to the affective qualities of music when selecting an accompaniment for women participating in anaerobic exercise.

Keywords: *music, synchronize movements, performance, aerobic and anaerobic tasks, gender differences*

Quantification of physiological arousal during familiar arousing music, unfamiliar arousing music, and unfamiliar relaxing music during imagery in elite shooters

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In the current study, we aimed to determine whether arousing music produces higher levels of physiological arousal than relaxing music during sport imagery. This was a precursor to examining the impact on performance of imagery accompanied by music. We examined whether unfamiliar music increased or decreased arousal level during familiar sport imagery. We chose unfamiliar music to minimize confounding effects of past associations. We added familiar arousing music for comparison. 10 elite shooters (7 males, 3 females) performed shooting imagery while we played relaxing music, unfamiliar arousing music, and familiar arousing music. Using a ProComp+ system and BioGraph Software version 5.0 from Thought TechnologiesTM, we monitored blood volume pulse-amplitude (BVPAmp), heart rate (HR), galvanic skin response (GSR), and peripheral temperature (PT), for consistent patterns of physiological arousal during each type of music, while participants did sport imagery. All participants listened to nine classical music excerpts, chosen by the researchers, before their normal training schedule. Three excerpts were played in each of three training sessions. Resting levels of physiological measures were recorded first. Between music excerpts, participants rested until those levels were reached again. Analysis of variance revealed significant changes on GSR, $F2,162=15.35$, $p<.05$, eta2=.16, BVPAmp, $F2,162=10.83$, $p<.05$, eta2=.12, and HR, $F2,162=24.33$, $p<.05$, eta2=.23, for different categories of music. There was a significant interaction effect for PT and different categories of music, $F16,162=1.87$, $p<.05$, eta2=.16. Unfamiliar arousing music created higher arousal levels than familiar arousing music. Relaxing music showed lower levels of arousal compared to other pieces of music. GSR, PT, and HR showed consistent patterns of interpretation for arousal level of music during imagery. BVP-Amp showed more variable results, which might be due to the highly sensitive measurement of BVP, which could be easily influenced by small amounts of noise. In conclusion, some music may produce greater arousal or relaxation than others. Thus, careful selection of music to be used during imagery rehearsal is important to manipulate arousal level for examining the effect of arousal/relaxation on imagery.

Keywords: *physiological arousal, familiar arousing music, unfamiliar arousing music, unfamiliar relaxing music, sport imagery*

Effects of synchronous music on treadmill running among elite triathletes

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Research has shown that running in time to music that is synchronized to stride rate can provide significant benefits for sub-elite athletes, although it is uncertain whether such benefits also accrue for elite performers. The present study evaluated the effects of running in time to music on a treadmill using a range of psychological, physiological and performance indices among a sample of elite triathletes. An initial test was conducted to establish aerobic

capacity and individual stride rates at various running speeds. Triathletes were presented with music selections of appropriate tempi for each running speed (i.e., synchronous music), and chose tracks they considered to be (a) motivational, and (b) neutral. They then completed a standardised running test on three occasions in counterbalanced order under three conditions (no-music, motivational music, neutral music). The test protocol involved a warm-up, three 4-minute periods of steady state running at progressively faster velocities, followed by a run-to-exhaustion at approximately 110% of blood lactate threshold. Dietary intake was controlled over the day preceding each test. Measures were taken after each 4-minute period of steady state running and after the run-to-exhaustion for (a) perceived exertion using the Borg Scale; (b) psychological state using the Feeling Scale; (c) oxygen utilization; and (d) blood lactate. Time to exhaustion was recorded and mood responses were assessed prior to and following each test, using the Brunel Mood Scale. Perceived exertion was lower with music than without music even though the same amount of work was completed. Feelings remained more positive throughout the test with motivational music compared to neutral music and no-music. Oxygen consumption was about 3% lower when running in time to music compared to running without music, although blood lactate levels remained almost identical. Compared to the no-music condition, time-to-exhaustion improved by more than 12% when running in time to music. Mood responses were more positive with music. Results confirmed the hypothesized benefits of music but suggested that synchronicity of the music to the activity may be more important in functional terms than the motivational qualities of the music.

Keywords: *synchronous music, treadmill running, elite athletes, performance, motivational qualities*

Music applications for athletes

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Empirical and anecdotal evidence of the benefits of music for athletes has grown over the past decade. Michael Phelps, the most successful Olympian of all time, listens to music until about two minutes before his races start and has attributed part of his phenomenal success to this practice. The aim of this presentation is to demonstrate ways in which the evidence base can be applied in practice. A range of evidence-based music applications for athletes is discussed. First, use of inspirational music is presented, giving examples from bobsled and trap shooting. Secondly, manipulation of pre-competition mindset using music is explained, giving examples from rowing, boxing and athletics. Thirdly, the role of music in rehabilitation from injury is exemplified, based on work with a six-time kayak world champion incapacitated by chronic fatigue syndrome and unable to compete. Fourthly, the incorporation of innovative use of technology to enhance the effects of music is presented and discussed. Brainwave training utilising the flicker response delivered via custom-made glasses to promote alpha wave activity was shown to be an effective mood regulation strategy when used in conjunction with music among shooters at the 2006 Asian Games. Similarly, music used in conjunction with analysis of EEG activity was utilised among shooters preparing for the 2008 Olympic Games. Firstly, individualised links between brain activity and best shots were assessed using on-range EEG analysis, followed by neurofeedback training (NFT) to promote ideal brain activity. Next, music with associations of winning was used during NFT to promote a conditioned response. This music was then used as a pre-task stimulus to promote ideal brain activity during performance. Finally, a recent innovation has incorporated appropriate music, words and photographs into a PowerPoint presentation, converted it into an mp4 file and loaded the presentation onto a mobile phone for viewing by the athlete as and when required. The principles and practice of using music interventions with athletes has been demonstrated and discussed. The evidence-based examples described in this presentation provide a guide for applied sport psychology practitioners to implement music interventions with elite athletes.

Keywords: *inspirational music, athletes, competition, rehabilitation, technology*