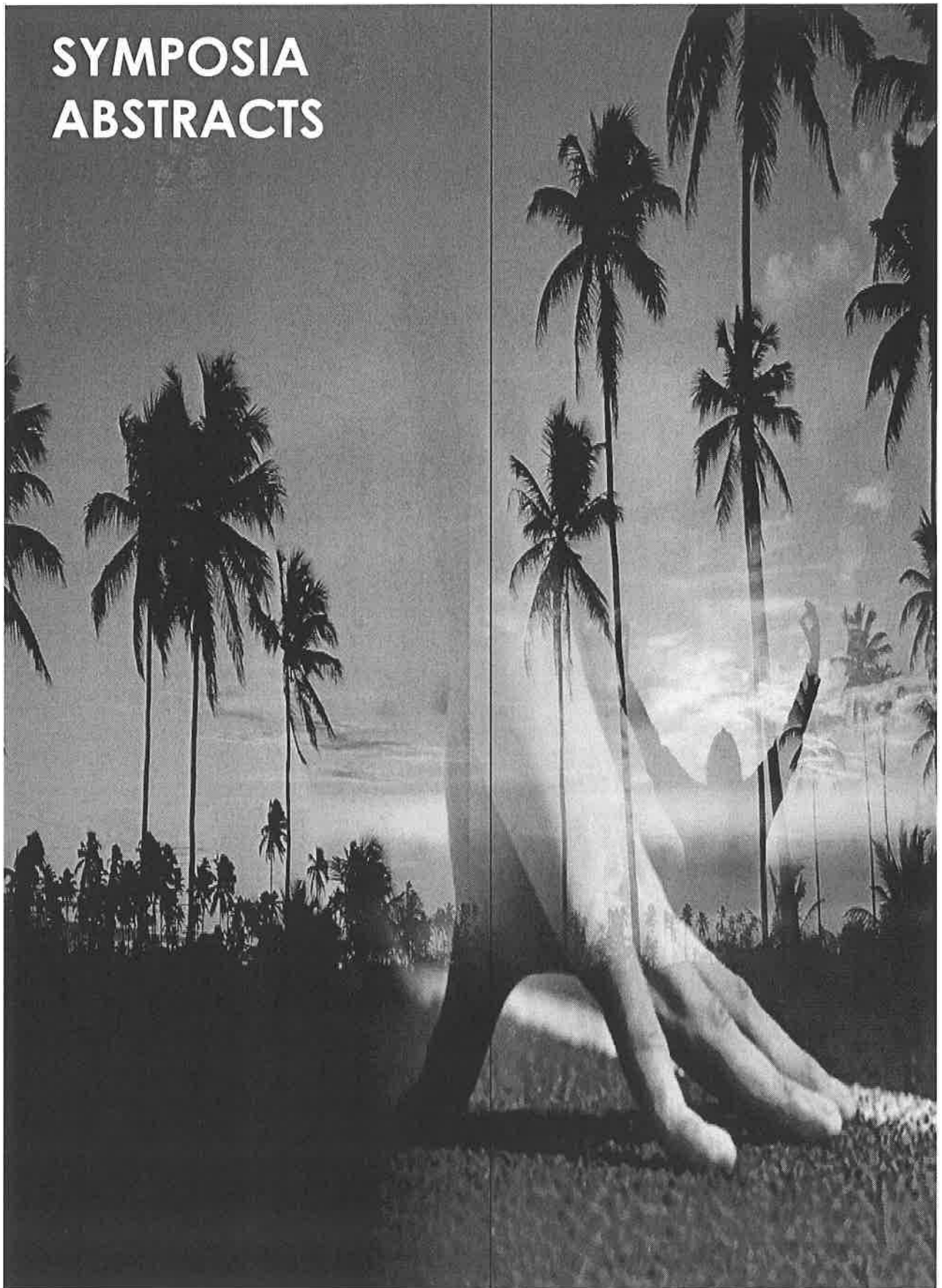


# SYMPOSIA ABSTRACTS



did influence athletic performance and ability to coach at the Games. This presentation will summarize the findings from both the pre-games and post-games assessments, focusing specifically on findings relative to psychological preparation and perceived importance of psychological skills for Paralympic competition.

#### **SYMPOSIUM 47**

##### **I've Got the Music in Me: Scientific Basis and Application of Music in Sport and Exercise**

Organizer/Convener and Chair: **Peter C. Terry**, University of Southern Queensland, Australia  
Discussant: **Tony Morris**, Victoria University, Australia

#### **Symposium Summary**

Music is almost omnipresent in sport and exercise environments, and is recognized by researchers and practitioners alike as having the potential to produce significant benefits for physical performance and associated psychological responses. This symposium addresses the use of music in sport and exercise from several different perspectives. The first paper, presented by Dr. Costas Karageorghis, establishes the conceptual basis for music benefits in sport and exercise; discussing conceptual models that explain underlying processes and introducing a revised scale for rating the motivational properties of music. The second paper, presented by Prof. Peter Terry, describes the findings of a meta-analysis of the entire research literature that has tested the purported benefits of music in sport and exercise environments. The meta-analysis confirms significant benefits of music and identifies moderating effects of several personal and situational variables. The third paper, presented by Mr. Garry Kuan, evaluates the effects of unfamiliar music on psycho-physiological measures during imagery, with a view to identifying whether relaxing or arousing music enhances or detracts from the impact of imagery rehearsal on sports performance. The fourth paper, presented by Dr. Costas Karageorghis, re-evaluates the relationship between exercise heart rate and music tempo preference. The final paper, presented by Prof. Peter Terry, reflects on the what, why and how of music interventions with elite performers, based on his experiences as an applied practitioner over the past 25 years. Prof. Tony Morris will act as discussant to stimulate audience participation in an interactive session once the formal presentations are concluded.

##### **Symp 47-a. Conceptual Basis for Effects of Music in Sport and Exercise**

**Costas. I. Karageorghis<sup>1</sup> and Peter C. Terry<sup>2</sup>**

<sup>1</sup>School of Sport and Education, Brunel University, United Kingdom

<sup>2</sup>Faculty of Sciences, University of Southern Queensland, Australia,

The ubiquitous use of music in sport and exercise domains points to a widespread appreciation of its potential benefits. Although such appreciation has existed since the dawn of civilization, the process and mechanisms by which benefits of music might accrue have not been well understood. It is only in the past 10 years or so that scientific attempts have been made to conceptualize this process. The past decade has seen the development of several conceptual models to explain

various aspects of the psychophysical effects of music in sport and exercise (see Karageorghis & Terry, 2009). All of these models emphasize, to a greater or lesser degree, how situational and personal factors interact to promote the beneficial effects of music, with several factors – including rhythm response, aspects of musicality, cultural impact, and extra-musical associations – mediating the extent and nature of the various effects. These conceptual models will be explained and critiqued in this presentation. Additionally, a revised measure designed to assess the motivational qualities of specific music selections, referred to as the Brunel Music Rating Inventory III (BMRI-3), will be presented and its psychometric properties evaluated.

**Symp 47-b. Meta-analysis of Effects of Music in Sport and Exercise**

**Peter C. Terry<sup>1</sup>, Julian Lim<sup>1</sup>, Amy Charnley<sup>1</sup>, and Costas I. Karageorghis<sup>2</sup>**

<sup>1</sup>Faculty of Sciences, University of Southern Queensland, Australia

<sup>2</sup>School of Sport and Education, Brunel University, United Kingdom,

Music interventions have been shown to provide a range of significant benefits in sport and exercise environments. Such benefits include, but are not limited to, ergogenic effects (i.e., increased work output); reduced ratings of perceived exertion; more efficient physiological functioning, such as reduced oxygen expenditure for equal work output; and a range of psychological benefits, such as increased perceptions of flow, arousal control, and enhanced mood responses. The beneficial effects of music were exemplified clearly in 1998 when Haile Gebreselassie broke the indoor 2000m world record while synchronizing his stride rate to the techno track Scatman, which was played over the stadium public address system. This paper presents the results of a meta-analysis that objectively summarized findings of the entire research literature related to effects of music in sport and exercise. Results confirmed that music produces robust, statistically significant benefits. Effect sizes were larger when music was synchronized to physical activity. Music produced positive effects of similar magnitude for physical performance measures, psychological responses, and ratings of perceived exertion but smaller effects were found for improved physiological processes. Ergogenic and physiological effects were associated with the rhythmical components of music, such as rhythm, tempo, and beat. Links between other components of music (melody, lyrics, associations, and so on) and specific effects will be discussed, as will the principles of selecting and delivering music appropriately to maximize its potential benefits.

**Symp 47-c. Effects of Unfamiliar Music on Psycho-physiological Measures During Imagery**

**Garry Kuan<sup>1</sup>, Tony Morris<sup>1</sup>, and Peter C. Terry<sup>2</sup>**

<sup>1</sup>School of Sport and Exercise Science and Centre for Ageing, Rehabilitation, Exercise and Sport, Victoria University, Australia

<sup>2</sup>Faculty of Sciences, University of Southern Queensland, Australia,

Imagery is a valuable technique for enhancing sports performance (Morris et al., 2005). Given the complexity of imagery processes, researchers continue to explore the optimal conditions for imagery rehearsal. Music is also closely associated with sport. Many researchers have demonstrated that music has beneficial effects for sport performance, including increased work output, arousal control, lower perceived exertion, more efficient physiological functioning, arousal control, increased perceptions of flow, and enhanced mood responses (see Terry & Karageorghis, in press). A key issue in imagery research has been whether relaxation facilitates imagery rehearsal. In this research, we aim to examine whether relaxing or arousing music enhances or detracts from the impact of imagery rehearsal on sports performance. Researchers have proposed that familiarity of music should influence the selection of particular music (Terry & Karageorghis, in press). Thus, first we must demonstrate that specific music is consistently arousing or relaxing. In order to examine whether music is arousing or relaxing, we chose unfamiliar music, unlikely to be known to participants, to minimize confounding effects of familiarity and past associations. The music was tested on psycho-physiological measures and subjective experience of arousal for consistency of arousing or relaxing responses. Imagery with unfamiliar relaxing or arousing music was examined to investigate the role of music during imagery rehearsal for the enhancement of sport performance. Six unfamiliar music excerpts were selected. Psycho-physiological responses to hearing these unfamiliar music pieces during imagery of sports performance by skilled pistol shooters will be reported and discussed.

**Symp 47-d. Re-examining Exercise Heart Rate and Music Tempo Preference: A Cubic or Quartic Relationship?**

**Costas I. Karageorghis, Leighton Jones, David-Lee Priest, Rose I. Akers, Adam Clarke, Jennifer M. Perry, Ben T. Reddick, Daniel T. Bishop, and Harry B. T. Lim,**

School of Sport and Education, Brunel University, United Kingdom,

Iwanaga (1995) proposed a linear relationship between exercise heart rate and music tempo preference but subsequent empirical investigations have not provided support for this hypothesis (Karageorghis, Jones, & Low, 2006; Karageorghis, Jones, & Stuart, 2008). The aim of the present study was to comprehensively examine the exercise heart rate-music tempo preference relationship with particular reference to a hypothesized

quartic trend (Karageorghis & Terry, 2009, p. 23). Tempi bands used in the present study were slow (95-100 bpm), medium (115-120 bpm), fast (135-140 bpm), and very fast (155-160 bpm). Music was standardized for motivational qualities using the Brunel Music Rating Inventory-2. Twenty eight undergraduates (mean age = 20.6 years, SD = 0.9 years) cycled at exercise intensities representing 40%, 50%, 60%, 70%, 80%, and 90% of their maximal HR reserve (maxHRR) while their music preference was assessed using a 10-point scale. The Exercise Intensity x Music Tempo interaction was significant,  $F(6.16, 160.05) = 7.08, p < .001, \eta_p^2 = .21$ , as was the test for a quartic trajectory in the exercise HR-preferred music tempo relationship ( $p < .001$ ). Despite the statistically significant quartic trend, graphical representation of the results indicated a cubic relationship characterized by a plateau in tempo preference at exercise intensities  $> 70\%$  maxHRR. Whereas slow tempi music was not preferred at any exercise intensity, preference for fast tempi increased relative to medium and very fast tempi music as exercise intensity increased. The findings will be discussed in the context of psycho-biological, socio-psychological, and information processing theories.

**Symp 47-e. Music Interventions Among Elite Athletes: What, Why, and How**

**Peter C. Terry**

Faculty of Sciences, University of Southern Queensland, Australia

Music has been shown to contribute to a range of beneficial effects among elite athletes. Michael Phelps, the most successful Olympian of all time, listens to music until about 2 minutes before his races start and has attributed part of his phenomenal success to this practice. Music interventions with elite athletes are discussed; firstly using music to inspire, giving examples from bobsled and trap shooting. Secondly, music used to manipulate pre-competition mindset is explained, using examples from rowing and boxing. Thirdly, the role of music in rehabilitation from injury is explained, using examples from work with a six-time world champion while she was incapacitated by chronic fatigue syndrome and unable to compete. Fourthly, brainwave training using the flicker response delivered via custom-made glasses to promote alpha wave activity is introduced. Working with shooters at the 2006 Asian Games, this strategy was augmented with simultaneous use of music to manipulate pre-event mood. Finally, music used in conjunction with analysis of EEG activity among shooters preparing for the 2008 Olympic Games is described. Links between brain activity and best shots for each shooter were assessed using on-range EEG analysis, followed by individualized neurofeedback training (NFT) to promote ideal brain activity. Next, music with associations of winning was used during NFT to promote a conditioned response. Finally, music was used as a pre-task stimulus to promote ideal brain activity during performance. The evidence-based examples described in this paper provide a guide for

applied sport psychology practitioners to implement music interventions with elite athletes.