Relaxing Music for Anxiety Control: Can Appropriately Selected Music be used to Control Competitive State Anxiety?

by

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Abstract

This thesis set out to determine the characteristics of relaxing music for anxiety control. Instructed to imagine themselves in an anxiety-producing situation, eighty-four undergraduate sport students were asked to (1) rate thirty music compositions for levels of relaxation; (2) identify factors that either enhanced or detracted from relaxation; (3) state the emotions induced by each composition and (4) provide an importance rating for thirteen music components. Additional information was obtained using a focus group of music experts. It was found that particular music characteristics were conducive to relaxation (e.g. slow tempo, secure melody). The most frequent emotional labels ascribed to relaxing music for anxiety control were ‘peaceful’, ‘serenity’ and ‘sadness’. Tempo, melody, beat and harmony were the components considered to be most conducive to relaxation. Gender and level of music knowledge had minimal impact upon the outcomes.

The effects of relaxing music for anxiety control on competitive state anxiety were also examined. Seventy-two undergraduate sport students were required to compete in a sports competition. Participants were assigned to one of three conditions (relaxing music for anxiety control, non-relaxing music and no-music). During a pre-competition intervention period, anxiety measures (CSAI-2R, subjective relaxation and HR) were taken (baseline, pre-intervention, post-intervention). All three interventions led to significant reductions in somatic anxiety, cognitive anxiety and HR. Both music conditions provoked significant increases in subjective relaxation. ES, mean-difference and 90% data did offer some support for relaxing music for the applications of anxiety control. This thesis also examined some of the mechanisms responsible for music’s anxiety reducing effects. It was concluded that no single

mechanism could account for music's relaxing properties. Overall, this study programme has provided some evidence to show that the appropriately selected music can be used as a valid relaxation technique.

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Author Declaration

This piece of work is original and has not been submitted for consideration, for any qualification, elsewhere. Whilst acknowledging that advice has been provided by the supervisory team, I can confirm that this PhD submission is my own work. Some of the information presented in this thesis has been published. Specifically, based upon the outcomes of Study 2, a paper entitled ‘the characteristics of relaxing music for anxiety control’ is available from the Journal of Music Therapy. Because of the advice provided by the supervisory team, Remco Polman and Richard McGregor have been included as co-authors on this paper. A paper entitled ‘The effects of relaxing music for anxiety control on competitive state anxiety’ has recently been accepted for publication in the European Journal of Sport Sciences. This paper is based upon Study 3 and includes Remco Polman as a co-author.

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List of Abbreviations

ANS	Autonomic Nervous System
ARS	Anxiety Rating Scale
ARS-2	Anxiety Rating Scale-2
BMRI	Brunel Music Rating Inventory
CI	Confidence Intervals
CNS	Central Nervous System
CSAI-2	Competitive State Anxiety Inventory-2
CSAI-2R	Competitive State Anxiety Inventory-2 (Revised)
ES	Effect Size
HR	Heart Rate
M	Mean
MAT	Multidimensional Anxiety Theory
n	Number of Participants
PNS	Peripheral Nervous System
PMR	Progressive Muscular Relaxation
RAS	Reticular Activating System
SD	Standard Deviation
SNS	Somatic Nervous System

Chapter 1: Introduction and Literature Review

Introduction

The ability to cope with pressure is an integral part of competitive sport, particularly at the highest levels (Orlick and Partington, 1988; Jones and Hardy, 1990; Gould, Eklund and Jackson, 1993; Craft, Magyar, Becker and Feltz, 2003). A failure to manage the psychological demands of sports competition can lead to competitive state anxiety. Competitive state anxiety is has traditionally been viewed as being a negative emotional response that comprises of two separate, yet related components; cognitive anxiety and somatic anxiety (Martens, Vealey and Burton, 1990; Hardy, Gould and Jones, 1996). Cognitive anxiety refers to negative thought patterns and concerns about performance (Martens et al., 1990a; Gould, Greenleaf and Krane, 2002), whilst somatic relates to the physical and affective aspects of increases in autonomic arousal (Martens et al., 1990a). Symptoms of competitive state anxiety include apprehension, worry, skill regression and attentional problems, increased muscle tension, co-ordination difficulties, reductions in cognitive processing capabilities and reduced self-confidence (Hardy, Jones and Gould, 1996; Naylor, Burton and Crocker; 2002; Weinberg and Gould, 2007). Ultimately, competitive state anxiety can have a negative effect on sports performance (Martens, Vealey and Burton, 1992; Jerome and Williams, 2000; Woodman and Hardy, 2003). Because of the potentially harmful effects of competitive state anxiety, considerable attention has been paid to the use of relaxation strategies as a means of overcoming this detrimental reaction. Commonly advocated relaxation strategies include those aimed at the somatic aspects, for example, Progressive Muscular Relaxation (PMR) and biofeedback, and those which alleviate the cognitive aspects, e.g. autogenic training, centering and hypnosis

(Onestak, 1991; Cox, 2002; Nideffer and Sagal, 2006; Williams and Harris, 2006; Gill and Williams, 2008).

Whilst often recommended, the application of such procedures can be problematic. Specifically, (1) the associated benefits are dependent upon regular practice; (2) inducing relaxation by these approaches can be a protracted affair; (3) some methods require either specialist equipment or external agents such as a therapist; (4) a prerequisite for efficacy is the need for specific environmental conditions (e.g. prone position, noise free) and (5) these methods tend to induce deep relaxation, characterised by Payne (2000) as a slowly induced state which releases all tension and detaches one from the environment. Deep relaxation is not necessarily appropriate for sports competitors (Crocker et al., 2002). It is conceivable that such constraints might explain why these procedures are ignored by many sports participants (Gould, et al., 1993; Ryska, 1998; Park, 2000; Holt and Hogg, 2002). Recognising the issues surrounding some relaxation techniques, Payne, (2000) instead recommends the use of 'on-the-spot' relaxation methods. Lichstein (1988) describes these as being brief, convenient, portable and capable of inducing relatively modest levels of relaxation. Payne (2000) considers procedures such as self-talk and imagery as viable alternatives to the aforementioned techniques; however, although self-talk and imagery are less laborious, they still require considerable practice (Conroy and Metzler, 2004; Hatzigeorgiadis, Zourbanos and Theodorakis, 2007; Guillot and Collet, 2008; Williams, Cumming and Balanos, 2010). One possible alternative to the more traditional relaxation methods is listening to music. This method not only conforms to the specifications presented by Lichstein (1988), importantly it is also unconstrained by practice requirements.

To date, the use of music to alleviate competitive state anxiety has received little attention from the sports community. However, it has been considered by medically oriented researchers and the evidence suggests that music does have the potential to be a valid relaxation aid. For example, Winter, Paskin and Baker (1994) found that listening to self-selected music could significantly reduce subjective ratings of pre-surgical anxiety, whereas MacDonald, Mitchell, Dillon, Serpell, Davies, and Ashely (2003) showed that listening to music could reduce the subjective levels of minor post-operative anxiety. Similarly, Knight and Richard (2001) indicated that subjective anxiety ratings were reduced after listening to music, whilst Davis and Thaut (1989) found that listening to music in a 'non-stress provoking' situation could reduce self-reported state anxiety, whilst inversely increasing perceptions of relaxation. Physiological indices of anxiety have also been reduced by music listening. Burns, Labbe, Arke, Capeless, Cooksey, Steadman and Gonzales (2002) have reported that listening to 'rock' and 'classical' music significantly reduced post-surgery heart-rate, whereas Knight and Rickard (2001) showed that the increases in systolic blood pressure and HR observed in a control condition were not evident when exposed to 'classical' music.

Although there is some support for the use of music as a relaxant, there are inconsistencies within the literature. For example, a study by Burns, Labbe, Williams and McCall (1999) showed that whilst music listening did induce relaxation, it was the no-music control that had the greatest anxiolytic (anxiety reducing) benefit; outcomes that were replicated by Burns et al. (2002). In the study of Davis and Thaut (1989) it was found that the psychological aspects of anxiety were alleviated by music, however, physiological indices such HR, skin temperature and muscle activity actually increased. This suggests that from a physiological perspective at least, music listening aroused rather than relaxed. Meta-analyses by Evans (2002), Pelletier (2004) and Nilsson (2008) further highlight research inconsistencies. The evidence presented by Evans (2002) indicted that whilst music could reduce the self-reported anxiety levels in hospital patients, this effect was not apparent in those undergoing 'unpleasant' medical procedures. Furthermore, the effect of music on physiological indices was considered equivocal. In a review of 42 studies, Nilsson (2008) found that music had the desired psychological effect (as measured via self-report inventory) in only 50% of the cases, whereas just 27% of the studies also reported a reduction in physiological symptoms (e.g. heart-rate and blood pressure). Finally, the meta-analysis of Pelletier (2004) concluded that whilst passive music listening might reduce stress; the strength of the effect was moderated by factors such as age, level of musical expertise and type of stressor. From the information presented, it does appear that music listening has the potential to be a valid anxiety reduction strategy. However, research outcomes have not been consistent which means that either music is not a dependable aid to relaxation, or that methodological laxity might have prevented the true nature of music's anxiolytic properties from being uncovered. Addressing the most pertinent design issues, first, previous attempts to uncover music's anxiolytic have, in some respects, been hampered by a failure to provide an operation definition of anxiety; a detail that might have implications for the validity of some research outcomes. For example, many researchers (e.g. Davis and Thaut, 1989; Knight and Rickard, 2001; Burns et al., 2002; MacDonald et al., 2003; Lai et al., 2008) have used self-report inventories to assess state anxiety levels, yet, have failed to differentiate between the somatic and cognitive components of anxiety. The second, and perhaps the most important, issue relates to music selection. In most cases, music appears to have been chosen with little regard for the inherent characteristics that might aid relaxation. Again, this threatens the validity of the research findings. The use of music as a motivational aid to sport and exercise provides some direction on the appropriate methods for the assessment of music's anxiolytic effects.

For many years there has been a lack of consensus as to the effects of music upon physical performance. For instance, a study conducted by Karageorghis, Drew and Terry (1996) demonstrated that listening to stimulative music prior to a grip strength task improved performance when compared to sedative music and a white noise condition. In this case, sedative music lowered grip strength. However, although Pearce (1981) also found that sedative music lowered grip strength, there was no difference between stimulative music and white noise upon strength expression. As to music's effect on endurance, Anshel and Marisi (1978) showed that listening to synchronous music during a cycle task increased time to exhaustion, yet asynchronous music had no effect. Based upon the belief that fast tempo music motivated the exerciser, Schwartz, Fernhall and Plowman (1990) hypothesised that stimulative music would improve performance on a sub-maximal bicycle test, however, this was not the case. Likewise, Copeland and Franks (1991) assumed that loud, fast-exciting music would lead to improved performance on a progressive endurance task. Results indicated that although this music type had no impact upon endurance, against the hypothesised expectations, soft, slow, easy listening music benefited performance. In contrast, Szabo, Small and Leigh (1999) found that switching to fast music during an endurance task did increase time to voluntary exhaustion.

According to Karageorghis and Terry (1997), the equivocal nature of this line of enquiry can be explained through limitations in the methodological designs applied to expose the effects of music on physical performance. In particular, Karageorghis and Terry (1997) and Karageorghis, Terry and Lane (1999) believed that music research has suffered from the failure of researchers to acknowledge how both intrinsic and extrinsic music factors influence responses to music. This criticism led Karageorghis et al. (1999) to develop The Conceptual Model for the Prediction of Responses to Motivational Asynchronous Music in Exercise and Sport. The model proposes several factors that need to be considered if music is to positively influence the behaviour of sport or exercise participants. For example, intrinsic music factors such as volume, tempo, rhythm, melody, lyrics and extrinsic personal factors such as socio-cultural background and personal meaning. According to Karageorghis et al. (1999), if sufficient attention is given to these factors then music can be termed 'motivational', that is, music that inspires or stimulate physical activity. Expanding upon this definition, Karageorghis et al. (1999) also classified 'motivational' music in terms of the expected outcomes. Specifically, 'motivational' music could control arousal, reduce RPE and improve affect. It was subsequently claimed that if music can be described as being 'motivational' and consideration is given to appropriate methodological design, then research outcomes would begin to uncover music's ergogenic effects. Subsequent testing of this model in sport and exercise situations has, to a degree, validated the arguments of Karageorghis et al. (1999). For example, 'motivational' music has been found to increase aerobic endurance (Karageorghis and Jones, 2002; Karageorghis, Mouzourides, Priest, Sasso, Morrish and Walley, 2009) and isometric muscular endurance (Karageorghis and Lee, 2002; Crust and Clough, 2006). Listening to 'motivational' music has also been shown to improve affective states (Karageorghis and Terry, 1999), reduce perceptions of effort (Karageorghis and Terry, 1999) and induce pre and in task flow states (Karageorghis and Terry, 1999; Karageorghis and Deeth 2002). Whilst not all research has been favourable (e.g. Elliott, Carr and Savage 2004; Elliott, Carr and Orme, 2005; Elliott, 2007), it must be acknowledged that the majority of research has supported Karageorghis et al.'s (1999) assertions. Importantly, the work of Karageorghis et al. (1999) deserves credit as it provides the first, and only, theory-driven approach to selecting music for sport and exercise.

The work of Karageorghis et al. (1999) does have important implications for those interested in music's anxiolytic properties. As with early music and sport research, researchers attempting to uncover the anxiolytic effects of music have failed to acknowledge the importance of the music factors that might be conducive to relaxation. It is therefore possible that if a framework for relaxing music can be developed, then music could be selected upon objective criteria, which might in turn lead to more significant and consistent effects. It has to be recognised that some have made efforts to do this (e.g. Wofle, O'Connel, and Wadon, 2002; Gomez and Danuser, 2007); however, the details provided by these researchers are of limited use because they lack both functional detail and breadth. Karageorghis et al. (1999) also provided an operational definition of 'motivational' music. This has allowed researchers and practitioners alike, to anticipate, and so measure, the likely effects of this music type. In addition, it provides a standard on which to compare research effects. An equivalent approach will be taken in this thesis.

As a consequence, the aim of this programme of study is to develop comprehensive criteria upon which the selection of relaxing music can be based; this will be accompanied by an operational definition. This should help both researchers and practitioners to select appropriate music for anxiety control. With objective criteria in place, this study programme will proceed to examine the effects of appropriately selected music upon pre-sports competition anxiety. Ultimately, given the importance placed upon sports anxiety and some of the constraints surrounding the use of the recommended strategies, it is anticipated that a simple, convenient alternative to the more traditional relaxation procedures might be forthcoming.

1.1.0 Thesis Overview

This thesis is presented in five chapters. The first chapter is presented in two parts, the first of which considers some of the theoretical issues surrounding anxiety. Opening with a brief overview of competitive state anxiety, this initial section of Chapter 1 proceeds to explore the conceptualisation of anxiety and also discusses how the main theories of emotion (e.g. cognitive labelling theory) are related to the general concept of anxiety. The physiological processes involved in the anxiety response are introduced and related to the current theories of anxiety. Part one concludes with a discussion of the current state of understanding of the anxiety and sports performance.

In the second part of Chapter 1, relaxation is explored. This section offers a brief introduction to the concept of relaxation and then goes onto discuss how physiological reactions might account for the relaxation response; an area that has received little attention from theorists. The chapter proceeds with a critique of the more traditional relaxation techniques (e.g., PMR, meditation) within the context of sport, and the current state of research examining music for anxiety control. The arguments presented highlight a number of concerns regarding the use of both traditional methods of relaxation, and music as a means of alleviating competitive state anxiety. The most significant of these being that (1) traditional methods are constrained by impracticality and (2) a lack of consideration to the music used in anxiety research has led, in part, to inconsistent research outcomes within this area. The influential work of Karageorghis et al. (1999) is considered as a means of addressing some of the issues raised. The chapter ends with a justification for the research approach adopted in this thesis.

Chapter 2 presents what is arguably the most important aspect of the thesis, the determination of the characteristics of relaxing music for anxiety control. The chapter begins with a section entitled ‘Study Considerations’, which highlights some of the factors that guided the subsequent research design. The next section in Chapter 2 covers a relatively small-scale preliminary study entitled ‘Music Knowledge Test’. The purpose of this preliminary study is to determine whether a sample of participants could interpret and assess the components of music that form the basis of the subsequent research investigation. This is a particularly important feature of this research, as a failure to ensure that participants understand the relevant music components will severely undermine internal validity of the investigation.

The final section presents the primary focus of Chapter 2, ‘The Characteristics of Relaxing music of Anxiety Control’. This section contains a mixed-method design; the first of which requires participants to use a rating scale to assess a selection of music for (1) its relaxation qualities; (2) characteristics they perceived to either enhance or diminish relaxation and (3) music components they considered most important for relaxation. The effects of gender and level of music knowledge are also considered. This largely quantitative approach was supplemented by the use of a focus group to gather more elaborate, qualitative information.

Chapter 3 presents the subsequent research study entitled ‘The Effects of Relaxing Music for Anxiety Control on Competitive State Anxiety’. This study investigates whether music selected in accordance with the recommendations presented in Chapter 2 actually possesses anxiolytic properties. Volunteer participants took part in a motor-task competition after being exposed to a range of anxiety inducing stimuli. The chapter presents the experimental outcomes and discusses whether relaxing music for anxiety control should be considered as a valid alternative to the traditional methods of relaxation.

At present, there have been few attempts to explain why music might be used as a relaxation aid. Chapter 4 is entitled ‘The Theory behind the Effect’ and explores some of the mechanisms that might be responsible for music’s anxiolytic properties. The first part of the discussion concerns indirect mechanisms such as dissociation and imagery, and the second examines how particular music components might act directly upon the human organism. Chapter 5 draws all the findings together and provides a review of the research investigations and considers the implications for both the practitioner and the music and anxiety researcher. Future directions and limitations are also discussed.

Part 1

Literature Review: Anxiety in Sport

1.2.0. Introduction

Many believe that being able to cope with the psychological demands of competitive sport anxiety is crucial to optimal performance (Hardy et al., 1996; Craft et al., 2002; Becker and Feltz, 2003). As such, the impact of anxiety upon sports performance has received considerable attention from sports researchers. Anxiety is generally regarded as a negative emotional response to situations that are perceived to be threatening (Spielberger, 1989). Although seemingly straightforward, this multifaceted definition does convey a number of important issues. First, anxiety is considered to be a negative reaction, thus implying detrimental consequences for those experiencing this emotion. These can be psychological, for example, feelings of apprehension and worry, or physical in the form of excessive sweating, rapid heart rate and/or increases in muscular tension (Martens et al. 1900a). Such reactions can have a negative effect on sports performance (Martens et al., 1992; Jerome and Williams, 2000; Woodman and Hardy, 2003). Second, the statement introduces the notion of perceived threat, indicating that rather than being a product of objective and realistic threat, it is an individual's subjective interpretation of a situation that mediates this response. Therefore, if a situation is perceived as threatening, irrespective of objective danger, an anxiety response may be evoked. Thirdly, the implication that anxiety is a response to specific situations relates directly to Spielberger's (1966) distinction between state and trait anxiety. Trait anxiety refers to a general disposition to perceive situations as threatening (Spielberger, 1966; Martens et al., 1990a). Martens et al. (1990a) have modified this generalised concept to include a situational-specific dimension, formulating the term *competitive trait anxiety* to describe a tendency to perceive competitive situations as threatening. In contrast, state anxiety is a transitory reaction, which varies in intensity and is liable to fluctuations (Spielberger, 1966), and is a situationally specific response (Hardy et al., 1996; Naylor et al., 2002). Although not exclusively, in the context of sports performance, state anxiety is generally associated with competition (Martens et al., 1990a) and as such, the term competitive state anxiety has been adopted to describe this situational response. Although classified separately, a relationship between trait and state anxiety does exist as it is generally agreed that athletes exhibiting a disposition for high competitive trait anxiety tend to experience higher levels of competitive state anxiety than low competitive trait anxious athletes (Spielberger, 1989; Martins and Gill, 1991; Raglin and Hanin, 2000). The final reference to the initial statement concerns the view that anxiety is an emotional response. Although originally viewed as being unidimensional (Naylor et al., 2002), there is now consensus that competitive state anxiety is in fact a multidimensional emotion, consisting of two distinguishable components, cognitive and somatic anxiety.

Distinguishing between the two components, cognitive anxiety can be considered as the ‘thought’ component of anxiety, and is provoked by a perceived inability to meet demands, unrealistic expectations of success, images of failure and negative self-evaluation (Hardy and Jones, 1990; Martens et al., 1990a). Symptoms include: worry, distressing visual images, lack of concentration and a conscious awareness of unpleasant feelings about oneself and the environment (Morris, Davis and Hutchings, 1981). Regarding somatic anxiety, Morris et al. (1981), who refer to this construct as emotionality, and Martens et al. (1990a) regard somatic anxiety as the physiological-affective element of the anxiety experience. Addressing the physiologic-affective aspects of somatic anxiety, when experiencing somatic anxiety an individual is likely to experience autonomic reactions such as increased heart rate, sweating and muscular tension; these reflect the symptoms of physiological arousal. The affective component of somatic anxiety regards the perception and interpretation of these reactions. That is, the physiological manifestations are perceived as being unpleasant. These distinctions will be discussed in further detail later. Although cognitive and somatic anxiety may act in consort, that is, an alteration in one can cause a directionally similar change in the other (Martens et al., 1990b), the 'conceptually independent' nature of the components suggests that they can also act separately (Morris et al., 1981).

It is perhaps worth noting that the term anxiety, as applied within the current context, relates to what Bourne (2000) describes as 'normal' anxiety. That is, a response which is considered to be an inevitable part of contemporary life, and is regarded as being a normal, albeit potentially detrimental, reaction to stressful situations (Keable, 1997). Normal anxiety should be distinguished from anxiety disorders, which are more intense, persistent and can lead to more severe ailments, for example panic attacks and phobias (Bourne, 2000). Anxiety disorders generally lead to a significant reduction in an individual's quality of life (Dworetzky, 1994).

1.2.1. Stress, Arousal, Activation and Anxiety

When examining the literature it is apparent that the terms stress, arousal, anxiety and to a lesser degree, activation are often used interchangeably. However, these concepts are not synonymous. According to Hardy et al. (1996) and Gould et al. (2002) this lack of distinction between these terms has impaired the understanding of the effects of anxiety upon sports performance. The following section will address the conceptual issues surrounding stress, arousal, activation and anxiety.

1.2.2. Stress and the Stress Response

The conceptualisation of stress has proved difficult due to the fact that there are numerous interpretations of what the term stress implies. Although many 'models of stress' have been proposed, they can be placed into three distinct groups (Cox, 1978). Response-based models define stress as a being an actual physiological and/or psychological response to a threat or stressor, so an individual actually feels 'stress'. Stress is considered as a negative reaction and an individual feeling 'stress' will exhibit an 'alarm response' to an impending threat (Seyle, 1956). Stimulus-based (Engineering) models describe stress as being the actual environmental demand, the response to which is strain, for example an important event is the stress (or), which results in an individual feeling 'strain'. Lastly, interactional models view stress as a complex and dynamic transaction between the environment and the individual (Cox, 1978). Stress is described as a process in which a *demand* is placed upon an individual and the individual will then cognitively appraise this demand and their ability to cope with the situation (Jones, 1990). Based on this appraisal, a person may or may not experience a negative reaction. An inability, or doubt about one's ability, to cope with the demands placed upon them can trigger stress emotions such as anger, fear or anxiety (Cox, 1978). Gould, Greenleaf and Krane (2002), opting for the interactional approach, characterising the stress process thus:

1. Rather than being defined as an emotion, stress is a sequence of events that lead to a specific behavioural response.
2. The stress process is an interaction of the situation and the individual's interpretation of the situation.
3. The stress process is cyclical.
4. Stress can be viewed as being either positive or negative.

This brief discussion highlights some of the confusion surrounding stress and anxiety. The Response Models classify stress as being conceptually similar to anxiety in that both are negative reactions to a perceived threat. In contrast, the Stimulus-Based models describe stress as being something that it placed upon the individual. From the Stimulus-Based perspective, anxiety is homologous to strain. However, it is the interactional model that reflects the current theories of competitive state anxiety. Stress is process in which a perceived threat (stressor) might, or might not, depending upon interpretation, induce an anxiety response.

1.2.3. Arousal, Activation in Relation to Anxiety

Traditionally, arousal has been seen as synonymous to anxiety, this has led to arousal-based theories such as the inverted-U hypothesis, being used to explain the anxiety performance relationship (Hardy et al., 1996). However, although arousal and anxiety are conceptually related, they should be considered as separate constructs (Anshel, 1995). Webster's Master English Dictionary (2002) defines arousal simply as 'a state of stimulation'. Expanding upon this, Martens et al., (1990a, p.6) describes arousal *'as the state of the organism (person), that varies on a continuum of deep sleep to high states of excitement, and represents the intensity level of behaviour*'.

Although originally classified as a physiological process (Anshel, 1995), there is now consensus that arousal is multidimensional, consisting of both a physiological and an affective-psychological component (Thayar, 1989; Anshel, 1995; Gould et al., 2002). This two-component conceptualisation has received further sub-division, with theorists such as Lacey (1967) and Oxendine (1970) differentiating between particular forms of arousal. For example, electro-cortical (e.g. cognition and information processing), autonomic (e.g. physiological activity such as heart rate and blood pressure), behavioural (e.g. overt behaviours) and emotional (e.g. positive and negative mood states). According to Lacey (1967), activity in one of these arousal divisions is not necessarily accompanied by activity in another; Lacey (1967) refers to this as directional fractionation. It is apparent from the preceding description that rather than being a single unitary construct, arousal is a relatively complex, multidimensional response.

Addressing the arousal-anxiety distinction, as stated, arousal was originally classified as a physiological process, albeit, with particular subdivisions. As Hardy et al. (1996) state, arousal can be considered to be a signal to the individual that he or she has entered a heightened state, and this is characterised by physiological signs. However, when considered in the context of anxiety, theorists such as Oxendine (1970), Morris et al. (1981) and Martens et al. (1990a) also refer to an interpretative component. That is, the perception of, and subsequent affective reaction to the physiological dimensions of arousal. It is a negative evaluation of the physiological symptoms that is associated with the somatic aspect of anxiety (Morris et al., 1981; Martens et al., 1990a). Another difference between arousal and anxiety relates to the fact that anxiety is generally, although not exclusively (e.g. Ntoumanis and Jones, 1998), viewed as a negative reaction (Spielberger, 1989). Arousal can be perceived as being appropriate or inappropriate depending on the requirements of a given sport or action (Hardy et al., 1996). A further distinction stems from Sonstroem (1984), who suggests that whereas arousal lies on a continuum, from low to high, anxiety is only associated with high states of arousal, that is, it is argued that anxiety should not manifest during low arousal. As to antecedents, arousal, unlike anxiety, is not necessarily a product of a perceived imbalance between environmental demand and response capability and can be evoked for example through excitement or anger (Neiss, 1988). Lastly, whilst theorists such as Morris et al. (1981) and Martens et al. (1990a) refer to arousal's cognitive dimension, it has to be recognised that this relates to the feeling states associated with the physiological reactions and not with the more complex evaluative cognitions regarding one's ability to perform (Gould et al., 2002).

Another concept that is often referred to within the sport anxiety literature is activation. Similar to anxiety and arousal, activation is a multidimensional reaction that is considered to be an organism's readiness to respond to particular stimuli (Martens et al., 1990a; Hardy et al., 1996). In contrast, arousal is seen as an immediate response to a new input or stimulus (Gould et al., 2002). For example, before executing a particular action, an individual will be required to achieve an appropriate state of activation. The introduction of a new stimulus may induce changes in arousal, thus altering activation states and ultimately an athlete's readiness to respond to the target action (Hardy et al., 1996). So to achieve an optimal level of activation, one must have an appropriate level of arousal.

To summarise, the preceding section has discussed the conceptual differences between arousal, activation, the stress process and state anxiety. Arousal is a multidimensional response that consists of both a physiological and affective-psychological component. It is characterised by autonomic, electro-cortical, behavioural and emotional/affective reactions. Alterations in arousal ultimately affect activation, which is an individual's readiness to perform. High levels of arousal are not necessarily detrimental to performance or associated with anxiety. Stress, rather than being an emotion, is a process which has the potential to provoke state anxiety. Anxiety, or more specifically, competitive state anxiety, is defined by Martens et al. (1990a) as being a negative, multidimensional reaction that consists of two distinct, yet, related components; cognitive and somatic anxiety. Cognitive anxiety is the mental aspect and is characterised by worry, lack of concentration, intrusive thoughts and unpleasant feeling states. Somatic anxiety, which is similar to the concept of arousal, refers to the physiological-affective aspects of anxiety. Responses include autonomic reactions such as sweating, increased HR and muscular tension. A negative evaluation of these responses is associated with somatic anxiety. It is this multidimensional view of competitive state anxiety that will be adopted throughout this thesis.

1.2.4. Theories of Emotion in Relation to Anxiety

To understand the processes involved in the anxiety response and how these might impact upon sport participants, an examination of some general theories of emotion is warranted. Rubin and McNeil (1983) describe emotion as being an internal factor that can energise, direct and sustain behaviour, in other words, emotions can be considered as motivators. Emotions are felt, thereby conveying information to oneself and others through thoughts, feelings and overt manifestations (Clore, 1994). Entwined with cognition, emotions influence experience, for example what we think about a situation relates to how we feel about a situation (Mook, 1996). Plutchik (1980) identified eight primary emotions, these being: fear, anger, joy, disgust, acceptance, sadness, surprise and anticipation. Plutchik (1980) believes that all emotions derive from a combination of these eight. According to Cox (1978), there are two distinct emotional directions, those that are in general positively toned (e.g. joy and excitement) and those that are negatively toned (e.g. fear and anger). Although Lazarus (1991) has termed anxiety as an emotion, specifically a stress emotion, this assertion requires some clarification. Plutchik's (1980) emotional classification does not actually refer to anxiety as an emotion. However, Kagan (1994) describes emotions as being acute and relatively temporary in nature, and as such does classify temporary anxiety (e.g. competitive state anxiety), as an emotional reaction.

All emotions have three distinct components. These are, subjective experience, the felt response to a situation (e.g. joy or anxiety); physiological change, through the activation of the Autonomic Nervous System (ANS) and overt behavioural responses such as laughter, crying or avoidance behaviours (Gross, 2005). Of particular importance to emotional direction is the process of cognition, with emotional orientation being a product of an individual's appraisal of their interaction with the environment (Cox, 1978).

1.2.5. Cognitive Theories of Emotion

According to Schachter and Singer's (1962) Cognitive Labelling Theory, physiological change precedes the feeling of emotion. As such, exposure to a given stimulus will provoke an alteration in an individual's state of autonomic arousal, the physiology of which according to Schachter and Singer (1962) is similar across all emotions. Based on past or presently available information, an appraisal will be made regarding the nature of this response. This evaluation will enable a 'label' to be ascribed to the sensation. It is the labelling of this state that will determine emotional, and subsequent behavioural responses (Cox, 1978; Mook, 1996). Therefore, the same state of arousal could receive different 'labels' depending on the cognitions available (e.g., excitement or anxiety).

In their landmark investigation, Schachter and Singer (1962) informed participants they were studying the effects of a vitamin supplement on vision. Participants were actually injected with what the researchers named 'Suproxin'; this was either epinephrine or a saline placebo. Those injected with epinephrine were allocated into one of three conditions: Epinephrine Informed (accurate information regarding side-effects); Epinephrine Ignorant (no information given) and Epinephrine Misinformed (inaccurate information regarding side effects). Participants who were injected with the placebo were given the same treatment as those in the Epinephrine Ignorant condition. Emotional states were then manipulated by one of two means. In condition one (Euphoria), a stooge was used to create a sense of disarray, and in condition 2 (Anger), a stooge exhibited rage. During the manipulation phase participant behaviours were observed, and when completed, participants filled out a self-report of mood and physical condition inventory.

Presenting the major findings of the study, the results showed first, all those injected with epinephrine experienced the associated sympathetic reactions (e.g. increased HR, tremors and palpitations). Second, Epinephrine Informed participants, because they were made aware of the side effects, were immune to the manipulation conditions. Third, Epinephrine Misinformed participants reported feeling states congruent with the manipulation condition; either anger or euphoria. In other words, the physical symptoms were labelled in accordance with the cognitions available to the participants. Thus, support for the cognitive-labelling theory was forthcoming.

This particular view of emotion also highlights the consequences of misinterpretation. Specifically, incorrect labelling will elicit behavioural responses congruent the particular ascription. In essence, if excitement is misinterpreted as anxiety, it is the symptoms of the latter that will manifest.

Weiner's (1986) Attributional Theory of emotion extends Schachter and Singer's theory, arguing that emotion is a not only a product of how an individual interprets the aroused, but also the causal attributions ascribed to specific situational occurrences and achievement outcomes. As Mook (1996) explains, we ask not just "What am I feeling and why" but also "What has happened and why". The basic premise of Weiner's theory is that an event or situation may evoke an initial and general emotional reaction (i.e. arousal); in this respect it is similar to Schachter and Singer's theory. However, rather than simply naming the emotion the individual will attempt to determine why this response has happened, for example, 'is it the demands of this particular competition that has caused this outcome?' It is this causal attribution that will ultimately determine the specific emotional reaction. Weiner (1986) claims that there are three prominent attributional dimensions (1) locus of causality, which refers to whether a particular outcome is ascribed to the individual (internal/external), for example ability, or to external influences such as weather conditions; (2) stability, pertaining to the relative consistency over time, for example ability or intelligence and (3) controllability which refers to whether the cause is under a person's control (e.g. illness, lack of effort). Although Weiner (1986) makes no specific predictions regarding the attributional processes that precede anxiety, it is likely that causal interpretations can evoke such a response. For example, loss of internal control (external/unstable) and concerns about performing to one's ability (internal/stable) have been shown to elevate the anxiety levels of athletes (Kroll, 1979;

Gould and Weinberg, 1985). Importantly, the perceived causality attributed to an emotional response will not only have immediate consequences, but will also influence future expectations, hence future behavioural and emotional responses (Crocker, Kowalski, Graham and Kowalski, 2002).

Developing the work of Schachter and Singer (1962) and Weiner (1986), Lazarus (1991) has proposed a situational approach to explain the emotional process. Although agreeing with the notion that labelling sensations and/or attributing causes to events *can* impact upon emotional reactions, The Cognitive-Motivational-Relational Theory (Lazarus, 1991) claims that emotions primarily arise from multifaceted appraisals of a particular situation. According to Lazarus (1991), the appraisal process has primary and secondary components which interact to provoke a particular emotional response. Primary appraisals are concerned with motivationally oriented evaluations about goal relevance, goal congruence and ego-involvement (Lazarus, 2000). Secondary appraisals are those which relate to evaluations of locus of causality, future expectations and coping ability (Lazarus, 1991). Expanding further, goal relevance refers to whether or not an individual believes an event to be important; the greater the perceived importance, the greater the emotional intensity. Goal congruence concerns whether one can achieve what one wants; this appraisal will determine affective tone (positive or negative emotions). Ego involvement refers to goal disposition, such as maintaining one's ego identity; a threat to ego will induce a negative emotional reaction. As to the secondary appraisals, locus of causality concerns an attribution of accountability and perceived level of control. Coping ability is the use of deliberate and planned processes used to control negative emotions, whereas future expectations refers to the stability of future events, for example will circumstances improve or worsen? According to Naylor et al. (2002), anxiety will manifest if a situation is perceived as threatening (primary appraisal) and an individual perceives little personal control, and lacks coping ability (secondary appraisal). Despite its theoretical appeal, there is little empirical support for the assumptions presented within the framework (Naylor et al., 2002).

A theory which attempts to explain the interaction between emotion and behaviour is Action Theory (Hackfort, 1989; 1991). This postulates that actions and emotions are reciprocal, that is, actions can influence emotions and emotions can influence actions. For example, the player who scores an important goal may experience joy, whereas as the player who misses a goal may experience anxiety, hence actions cause the emotion. In contrast, a player who experiences anxiety may suffer performance detriments, whereas feelings of excitement may energise a person, hence emotions influence actions. Action Theory does also highlights the importance of the appraisal process, suggesting that both action and emotional outcomes are mediated by appraisals of ones' interaction with the environment (Naylor et al., 2002).

The preceding theories, although differing in their emotional antecedents, all highlight the importance of the appraisal process. Whether simply ascribing labels to physiological states, or making complex, multidimensional appraisals of a given situation, cognitive evaluation plays an important role in determining emotional intensity and direction. Although the theories of Schachter and Singer (1962) and Weiner (1986), have important implications in understanding the emotional process, it is the suggestions of Lazarus (1991) and Hackfort (1989; 1991) that most closely reflect the definition of cognitive anxiety (Cratty, 1989). Applying these theories to the manifestation of cognitive anxiety, the athlete makes an appraisal of the competitive environment and the associated demands, if the athlete perceives a threat and/or an inability to cope, then an anxiety response is likely. Emotional reactions based upon cognitive appraisals can occur throughout the competitive process. Increases in cognitive anxiety acquired from the appraisal process can also induce directionally similar increases in somatic anxiety (Martens et al., 1990b).

1.2.6. Anxiety as a Conditioned Response

As has been discussed, emotional theories suggest that cognitive anxiety is likely to be induced through situational appraisals. Such appraisals might also cause increases in the somatic aspect of anxiety. However, many have suggested that somatic anxiety can also manifest via S-R conditioning (Morris and Fulmer, 1976; Morris et al., 1981; Martens et al., 1990a). For example, the sight of a particular venue that the athlete associates with a negative experience might act as a stimulus that triggers an automatic physiological response. Given the possible interdependence of somatic and cognitive anxiety (Martens et al., 1990b), somatic anxiety stemming from a conditioned reaction, might then cause increases within the cognitive dimension.

1.2.7. The Psychophysiology of Anxiety

The discussion so far has shown some of the sources of anxiety e.g. appraisal based cognitions and conditioned reactions. However, although detailing the causes of anxiety it offers no explanation as to exactly how the anxiety symptoms originate, or the reasons behind the independence/interdependence of the somatic and cognitive components. To do this an exploration of the associated physiological mechanisms is required.

Considering first the physiological mechanisms of somatic anxiety, the physiological reactions associated with somatic anxiety emanate directly from autonomic arousal (Martens et al., 1990a) and to comprehend the mechanisms involved in this reaction, the organisation of the nervous system must be considered. Although interrelated, the nervous system can be separated into two major divisions. The first, the Central Nervous System (CNS) comprises of the brain (cortical and sub-cortical regions) and spinal cord. The second, the Peripheral Nervous System (PNS) consists of the nerves that connect the brain and spinal cord to other parts of the body. The PNS can be further divided into the Somatic Nervous System (SNS) and Autonomic Nervous System (ANS). It is the activation of the ANS that is generally associated with arousal; however the somatic system is also implicated particularly with regard to muscle tension. The PNS possesses both afferent and efferent components, and it is the afferent division being responsible for the detecting, encoding and transmitting of information about the internal and external environment into the CNS. Afferent signals can be received from the special (sight, sound), proprioceptive (e.g. muscle and joint position) and somatic (e.g. pain, temperature and tactile sensations). This incoming (afferent) information can be processed consciously by the cortical structures (cerebrum), or unconsciously through the sub-cortical emotional regions and is subsequently directed through the efferent pathway into the ANS (Tortora and Grabowski, 2003). From this, either the parasympathetic or sympathetic division of the ANS is activated; in terms of arousal, it is the sympathetic system that is associated with the activation of the human organism (Sherwood, 1993; Atkinson, Atkinson, Smith and Bem, 1993; Keable, 1997; Tortora and Grabowski, 2003).

Although termed autonomic, the ANS is regulated through centres within the brain. Situated within the mid-brain are the primitive brain structures (e.g. hypothalamus and the amygdala), which form part of the limbic system (Gross, 2005). It is these sub-cortical structures that appear to be closely related to emotional response (Cox, 1978; Sherwood, 1993; Dworetzky, 1994). Specifically, the hypothalamus, through links with the pituitary gland, controls the pituitary-endocrine system (Tortora and Grabowski, 2003). Pituitary hormones are an important link between the nervous and endocrine system. The amygdala is also believed to be involved in emotional functions, for example aggression and fear (Gross, 2005). Providing a link between the cortex and the sub-cortical structures is the reticular activating system (RAS). The RAS is a bi-directional communicational structure which transfers information from the cortex to the sub-cortical regions and the spinal cord. Essentially, the RAS controls the degree of cortical alertness (arousal), whilst also playing an important role in directing attention and refining muscular activity. The RAS also transmits information from the ANS into the cortex for processing, thus activation of the ANS can be consciously perceived. Importantly, because the RAS provides cortical-sub-cortical link, conscious interpretation of feeling states can induce an emotional response (Cox, 1978; Keable, 1997; Tortora and Grabowski, 2003).

Once the sympathetic division of the ANS has been activated through the associated pathways, the efferent signals initiate a series of physiological responses collectively termed the ‘fight or flight’ response. This is related to the release of the the hormones adrenaline, nor-adrenaline and thyroxine. It is this adrenaline-thyroxine combination that stimulates the alpha and beta-receptors, initiating the fight or flight arousal response. As a result of this hormonal activity, the following responses are likely: pupil dilation, muscular tremors and tension, increases in heart rate, respiration rate, blood pressure, cardiac output and sweat production (Tortora and Grabowski, 2003). It is these symptoms that are generally associated with the onset of physiological arousal.

This information can now be used to explain the mechanisms behind the anxiety response. As stated, many believe that the somatic component of anxiety can be initiated via S-R conditioning (Morris and Fulmer, 1976; Morris et al., 1981; Martens et al., 1990). In this instance, an athlete when exposed to a particular stimulus (e.g. sports venue) that is associated with a negative experience would receive this external information via the special senses (sight, sound, smell). From the special senses afferent signals would pass into the amygdala and RAS. This signal would be transmitted into a specific area of the cerebrum that will activate the conditioned arousal response (Dworetzky, 1994). From this area, the signal will be transmitted back into the limbic structures (e.g. the Hypothalamus and Amygdala) and the RAS, thus initiating both the somatic (skeletal muscle excitation) and autonomic (cardiac, smooth muscle excitation and glandular activity) responses associated with somatic anxiety. Simultaneously, messages from the RAS will activate an increase in the neurotransmitter dopamine (a catecholamine, dopamine is responsible for increasing cortical stimulation) and reduce the levels of the mood regulator serotonin (Sherwood, 1993; Tortora and Grabowski, 2003; Guyton, 2006). It is a negative perception of these reactions that is related to the affective component of somatic anxiety.

The athlete is now experiencing both the physiologic-affective dimensions of somatic anxiety. With the reactions now being felt, an emotional label will attached, releasing the related neurotransmitter, and the limbic system will act accordingly, producing the relevant emotional tone. Because the RAS provides two-way link between the various strands of the nervous system, the athlete might now begin to appraise the negative physiologic-affective reactions, which can result in cognitive anxiety, which in turn might cause further increases in the physiological component of somatic anxiety.

Attention will now turn to how cognitive appraisals can provoke anxiety. This in the main will follow a similar process to the conditioned reaction. An athlete makes an appraisal of a particular situation; this can be based upon specific external environmental cues derived via the special senses or internally via self-talk (Zinsser, Bunker and Williams, 2006). Unlike the conditioned response, which only involves momentary cerebral activity, this appraisal process requires greater cerebral involvement. The cerebral cortex, situated within the forebrain region, is where the appraisal will be interpreted. This appraisal now raises negative thoughts, or in other words cognitive anxiety. With the appraisal made, information will now, via the RAS, induce physiological reactions. Again, this is a felt reaction and as such will receive an affective label. Because the athlete is experiencing detrimental cognitions, the physiological symptoms receive a negative tone, thus somatic anxiety is also experienced.

As has been shown, cognitive anxiety can occur in response to the physiological symptoms associated with the sympathetic and somatic divisions of the PNS. Somatic anxiety can manifest via the CNS from negative thoughts within the cerebrum. This interrelationship accounts for cyclical association of somatic and cognitive anxiety. For example, cognitive anxiety causes an increase in the physiological symptoms associated with somatic anxiety, these in turn are interpreted negatively, leading to further increases in physiological arousal, which then increases cognitive anxiety; the cycle continues. This brief overview of the physiology of anxiety shows how each component might manifest and also the interrelated nature of the anxiety components. However, the details presented do not fully explain how the anxiety components can also manifest independently, nor do they account for Lacey's (1967) concept of directional fractionation. Information appears to be scarce on these issues, nevertheless, based upon the details presented some effort can be made to provide explanations. Regarding an independent somatic response, if an athlete experiences a conditioned response and does not make a negative appraisal of the situation, then somatic anxiety alone is likely to be the outcome. As to an independent manifestation of cognitive anxiety the work of Lacey (1967) might offer some insight. The intake-rejection hypothesis is used to explain how the various forms of arousal do not necessarily covary with the same level of intensity, or in the same direction (Blaylock, 1972). It is suggested that high levels of cortical activity, especially when related to cognitive and perceptual processes, reduce autonomic reactions because of the mental effort required to attend to the increased cortical activation. As a result, autonomic stimulation is in effect ‘rejected’, thus increases in this system are not necessarily experienced. Conversely, intense reactions in the autonomic system limit cortical arousal. According to Blaylock (1972) the intake-rejection hypothesis also explains how cognitive anxiety can be experienced independently from somatic anxiety.

1.2.8. Anxiety and Sport Performance

A number of theoretical frameworks have been advanced to explain how competitive state anxiety upon sports performance. Traditionally, sport psychologists have attempted to explain the anxiety-performance relationship through unidimensional arousal based theories (Hardy et al., 1996), the most enduring being the inverted-U hypothesis (Kerr, 1985). According to the inverted-U hypothesis, a curvilinear relationship exists between arousal and performance (Sonstroem, 1984). That is, initial increases in arousal are accompanied by improvements in performance, however, performance detriments ensue once levels of arousal reach a critical point

(Kerr, 1985). The inverted-U hypothesis also postulates that moderate level of arousal should be considered optimal for all sports (Kerr, 1985). However, this has been refuted by Oxendine (1970; 1984) who instead claimed that optimal arousal is mediated by both task complexity and the degree of muscle control required. This led to an amendment of the original proposals in which task characteristics were considered. Specifically, whilst agreeing in general that moderate levels of arousal should be considered optimal for many motor tasks, Oxendine (1970; 1984), argued that for fine motor tasks with a high level of cognitive complexity, relatively low levels of arousal were required. In contrast, gross motor tasks of low cognitive complexity should benefit from relatively high levels of arousal. Although being instinctively appealing (Kerr, 1985) and gaining a degree of empirical support (Sonstroem, 1984), the usefulness of the inverted-U hypothesis, and the subsequent classifications of Oxendine (1970; 1984) have received criticism. Firstly, concerns have been raised regarding the assumption that arousal is a unitary construct. As stated previously, arousal consists of a number of distinct components, namely, electrocortical, autonomic, behavioural and emotional (Hardy et al., 1996). The inverted-U hypothesis makes no attempt to distinguish between, or explain how these might interact to influence performance. Second, whilst the inverted-U hypothesis does have some predictive value (Kerr, 1985), it provides no explanation as to why a curvilinear arousal-performance relationship exists (Gould et al., 2002). Thirdly, and perhaps most importantly, the inverted-U hypothesis is overly simplistic and so fails account for the complex nature of the anxiety-performance relationship (Krane, 1990). Subsequently, multidimensional theories of sport anxiety were developed.

The Multidimensional Theory of Anxiety (MAT) accounts for the multidimensional nature of competitive state anxiety (Burton, 1988; Martens et al., 1990b). According to MAT, the cognitive and somatic components of anxiety are conceptually independent, and as such MAT predicts that each will have a particular effect upon sports performance. Specifically, it is claimed that cognitive anxiety has a negative, linear relationship with performance. Somatic anxiety, given its association with arousal, has a curvilinear, inverted-U relationship. During work to develop the Competitive State Anxiety Inventory-2, Martens et al. (1990b) found that those items relating to cognitive anxiety could be split into two components. One of these contained negatively worded items associated with cognitive anxiety and the other positively worded items; this component was believed to be indicative of self-confidence. Martens et al. (1990b) considered this to indicate that cognitive anxiety and self-confidence were on the opposite end of the same continuum and that a change in one should cause the opposing change in the other. As such, self-confidence was believed to possess a positive linear relationship with performance. It was also suggested that self-confidence might protect against the onset of cognitive anxiety.

Explaining the anxiety-performance relationships presented in MAT, it is claimed that cognitive anxiety influences performance in a negative linear fashion because cognitive resources are redirected from the demands of the task. This focus upon maladaptive thoughts essentially directs attention away from the cognitions required for sport (Martens et al., 1990b). Whilst agreeing with the assertion that cognitive anxiety redirects attention, Masters (1992) attributes the detrimental effects of cognitive anxiety to the initiation of mental control strategies. As a result, there is a disruption of normal automatic functioning (Masters, 1992). This can lead to a regression to earlier stages of learning, for example the cognitive stage, resulting in less fluidity and precision, and an increase in energy expenditure (Schmidt and Wrisberg, 2000). The prediction that self-confidence and performance should follow a positive correlational path is based upon the assumption that high levels of self-confidence are conducive to performance simply because it is viewed positively (Bandura, 1977). As such, self-confidence is hypothesised to protect against the effects of anxiety (Hardy et al. 1996).

The relationship between somatic anxiety and performance is less clear (Woodman and Hardy, 2003). According to MAT, the somatic anxiety-performance relationship should be curvilinear in nature; however, MAT fails to distinguish between the affective and physiological components of the somatic response. Because of its association with arousal, it is more likely to be the physiological dimension that will act in an inverted-U manner. Numerous explanations have been provided to explain why the physical aspects of somatic anxiety negatively affect sports performance. For example, increased autonomic arousal may impair fine motor control (Parfitt, Jones and Hardy, 1990), intensify muscular tension (Weinberg, 1978) and cause increases in electrocortical activity, which may result in cognitive overload and attentional narrowing (Hardy et al., 1996). Regarding the affective component, Morris et al. (1981) suggest that feeling states are related to the perception or interpretation of physiological arousal. It is unlikely that this aspect of somatic anxiety would follow a curvilinear fashion, as one would assume that the more one perceives responses as unpleasant, the greater the detriment. Furthermore, although Morris et al. (1981) believe it unlikely, it is possible that pre-occupation of physiological arousal, whether perceived as positive or negative, would encourage a redirection of attention from the external to the internal (Edelman, 1992). Such an attentional switch would likely have a negative impact upon sports performance, although perhaps not in an inverted-U fashion. The subjective interpretation of the affective states associated with somatic anxiety has been considered by Kerr (1985). The relationship between arousal and affect is considered later when the implications of Reversal Theory are discussed.

Whilst popular, the hypothesised performance predictions of MAT are not fully supported by research literature. One of the most widely cited studies is that of Burton (1988), who examined the impact of anxiety upon swim performance. In this instance the proposals of MAT were supported. The anxiety-performance relationships were as hypothesised, and anxiety did have a negative effect upon swim times. Although Martens et al. (1990b) have cited this study to support the validity of MAT, Craft et al. (2003) have questioned the veracity of these findings, arguing that the conclusions presented were, in part, influenced by the analysis procedures. Other studies have provided only partial support for MAT. Krane (1990) did find that the effects of cognitive anxiety upon football performance could be predicted by MAT, however, for somatic anxiety this was not the case. As with cognitive anxiety, somatic anxiety was also found to possess a negative linear relationship with performance. Assessing MAT within the context of pistol shooting performance, Gould, Petlichkoff, Simmons and Vevera (1987) did find support for the curvilinear impact of somatic anxiety. However, there appeared to be no relationship between cognitive anxiety and performance. Furthermore, and somewhat unexpectedly, self-confidence was found to have a negative linear relationship with performance. Others still have found no support for the proposals of MAT. For example, Maynard and Howe (1987), examined the association between competitive state anxiety and rugby performance, they found that although somatic anxiety was related to performance, this relationship followed a negative linear path. However, this was only evident in players who were considered to be performing below their ability. Cognitive anxiety was found to have no significant impact upon rugby performance.

Despite the lack of empirical support, MAT has been invaluable in the development of sport psychology, specifically because it distinguishes between the somatic and cognitive aspects of competitive state anxiety (Gould et al., 2002). The proposed conceptual independence of these two components has led researchers to develop a number of further predictions regarding MAT and sports performance. It has been postulated, although not fully supported, that cognitive anxiety will have a greater impact upon sport performance than somatic anxiety. The rationale behind this assumption stems from the fact that Martens et al. (1990b) claim that somatic anxiety is a conditioned response. Because of this, it is believed that once an event has begun, somatic symptoms should recede (Martens et al., 1990b), therefore minimising the influence upon sports performance (Hardy, Parfitt and Pates, 1994). In contrast, because cognitive anxiety is not considered to be a conditioned response, although as argued previously it is possible that cognitive anxiety might be initiated in this manner, it is hypothesised that maladaptive or distracting thought patterns can manifest prior to and throughout an actual performance. Whilst there is support for this belief (e.g. Burton, 1988; Hardy et al., 1994), others disagree (e.g. Gould et al., 1987; Krane, Williams and Feltz, 1992), claiming instead that is somatic anxiety that has the greatest impact. Addressing this contradiction, Parfitt and Hardy (1993) have argued that the influence of each might be dependent upon the task characteristics. For example, cognitive anxiety should have a greater impact upon tasks requiring mental acuity, and somatic where fine motor control is required (Burton, 1988; Parfitt et al., 1990). This view has some merit (Gould, Petlichkoff and Weinberg, 1984; Gould et al., 1987).

Although somewhat inconclusive, it does appear that both aspects of competitive state anxiety have the potential to interfere with sports performance.

However, not all researchers agree with assertion that cognitive and somatic anxiety should be viewed as independent factors (Hardy et al., 1994). Catastrophe models (Hardy and Fazey, 1987; Hardy et al., 1994) address this concern (Hardy, et al., 1996). Unlike the two-dimensional MAT, the Catastrophe model is three-dimensional, consisting of one dependent variable (performance) and two independent variables (cognitive anxiety and arousal). It is worth noting that Hardy and Fazey (1987) have incorporated the term arousal rather than somatic anxiety. This decision was based upon the fact that when related to somatic anxiety, arousal should only be considered to be influential if interpreted negatively; although it was recognised that physiological arousal could influence performance regardless of valence (Hardy et al., 1994).

Essentially, the Catastrophe model predicts that when physiological arousal is low, cognitive anxiety might benefit performance. Under low levels of cognitive anxiety, the arousal performance relationship will be curvilinear. However, when physiological arousal is high, cognitive anxiety is likely to have a detrimental impact upon sport performance. When both components are high, a catastrophic drop in performance is experienced. One further prediction offered by the Catastrophe model is that a self-confidence may mediate the anxiety - performance relationship as might protect against the potentially detrimental effects of cognitive anxiety (Hardy et al., 1994; Gould et al., 2002). There is some support for the predictions presented in the model. For example, Hardy et al. (1994) found that when both arousal and cognitive anxiety were high, crown green bowlers did indeed suffer catastrophic performance detriments; similar findings have been presented by Edwards and Hardy (1996). However, currently, due to a lack of supportive evidence (Gould et al., 2002) definite conclusions regarding the validity of the Catastrophe model cannot be drawn.

The theories discussed so far have been based upon the assumption that competitive state anxiety has a debilitating effect upon sport performance. This assertion is by no means irrefutable. Craft et al. (2003) performed a meta-analysis of relevant studies and concluded that (1) neither cognitive nor somatic anxiety conformed to the performance relationships offered by MAT, and (2) neither predicted actual sports performance; there was however moderate support for the positively linear influence of self-confidence. Furthermore, Butt, Weinberg and Horn (2003), whilst not dismissing the negative performance relationship of anxiety, nevertheless recognised that it is relatively weak. A study by Jerome and Williams (2000) confirms this, indicating that although the anxiety sub-components did impact upon bowling performance, their influence was low (variance explained: cognitive, 4.1% and somatic anxiety, 3.0%).

The lack of consistent support for both the theoretical predictions discussed and the detrimental anxiety-performance relationship has led researchers to readdress the effects of anxiety on sports performance (Butt et al., 2003). Based on Carver and Scheier's (1988) control theory of anxiety, and reflecting the assumptions of cognitive labelling theories, it is now believed that directional interpretation plays an important role (Gould et al., 2002; Naylor et al., 2002). The theory holds that anxiety can be either debilitative or facilitative depending upon how one interprets the symptoms; an assumption appears to adhere to some of those presented in the Reversal Theory of anxiety (Robson, 2009). Specifically, the Reversal Theory stipulates that emotional responses in sport are a product of an individual's interpretation of arousal; this relates to affective dimension of somatic anxiety. The theory introduces the notion of metamotivational state; the telic and paratelic state being of particular importance. It is suggested that when in a telic mode (e.g. serious-minded), low arousal is generally sought. However, when in a paratelic mode, (e.g. playful), high arousal is preferred. Relating to cognitive interpretation, it is suggested that metamotivational state will influence hedonic tone. Specifically, when in a paratelic state, high arousal will be perceived pleasantly as excitement. In contrast, when in a telic state, high arousal will be considered as unpleasant, thus as anxiety.

This directional aspect of anxiety has received considerable attention from sports researchers, and there is evidence to support its existence. For example, Ntoumanis and Jones (1998), Jones and Hanton (1996) and Swain and Jones (1996) have all shown that the same intensity of anxiety can be interpreted as either debilitative or facilitative. Factors that appear to moderate this interpretation include perceived ability to utilise coping strategies (Ntoumanis and Jones, 1998), trait anxiety levels (Mullen, Lane and Hanton, 2009) and level of experience (Mellalieu, Hanton and O'Brien, 2004). As to the impact upon performance, there appears to be very little data on this. Supporting the notion that anxiety can be facilitative, Jones, Swain and Hardy (1993) found that gymnasts who performed well on a gymnastics task interpreted anxiety as being facilitative. Similarly, Chamberlain and Hale (2007) found that direction (42% of variance) was a better predictor of performance than intensity (22%), whilst Butt et al. (2003) showed that field hockey performance was more closely related to direction than intensity. In contrast, Edwards and Hardy (1996) found that direction was no better a predictor than intensity alone.

Considerable debate has ensued on this issue. Supporters reference the research presented above as evidence, whereas others disagree with the notion of facilitative anxiety outright. Naylor et al. (2002) for example, suggest that this particular view is somewhat contradictory as individuals with the ability to cope should not, in theory, experience anxiety. Similarly, Burton and Naylor (1997) believe that the notion of facilitative anxiety is flawed, asserting that athletes who claim that anxiety is beneficial to performance are by definition not experiencing anxiety, rather they are likely to be experiencing other states, for example excitement. Others (i.e. Lane, 2009; Polman and Borkoles, 2011) disapprove of this avenue of research, suggesting that it detracts from the central tenet that anxiety is a negative emotional reaction (Speilberger, 1989). They also claim that the instrument that has guided most of the debilitative/facilitative research, the CSAI-2, is inadequate (Lane, Sewell, Terry, Bartram, and Nesti, 1999; Craft et al., 2003; Polman and Borkoles, 2011).

To conclude this section, the area of sport anxiety research contains many contradictions. Whilst MAT should be credited for distinguishing between cognitive and somatic anxiety (Gould et al., 2002), its predictions have not withstood empirical scrutiny. The Catastrophe model (Hardy and Fazey, 1987; Hardy et al., 1994) expands upon MAT with a three-dimensional framework that attempts to predict how the components of competitive state anxiety interact. However, to date research has not fully confirmed the assertions made. Despite the traditional view that the manifestation of anxiety should have a detrimental effect upon performance, this is now being questioned, with some researchers considering anxiety to be facilitative if the associated reactions are perceived positively. On that latter point, from the available literature, support for debilitative anxiety is currently stronger than that for facilitative anxiety. As such, this will be the focus of this programme of study. The next section will consider the temporal patterning of competitive state anxiety, as this will have important implications for those wishing to use anxiety control strategies (Hanton, Mellalieu and Young, 2002).

1.2.9. The Temporal Patterning of Competitive State Anxiety

Whilst criticisms have been raised regarding the performance-relationship value of MAT, the supposed conceptual independence of the somatic and cognitive aspects of anxiety has led a number of researchers to examine the time-course patterns of competitive state anxiety. This avenue of research is important, providing as it does, valuable information about the content and timing of anxiety control implementation. Confirming the independent nature of the somatic and cognitive dimensions of anxiety, studies by Gould, Petlichkoff and Weinberg (1984) and Martens et al. (1990b) have shown that cognitive anxiety remains relatively stable during the days prior to the competitive event, only immediately prior to competition do significant increases in this state occur. It should be pointed out that Gould et al. (1984) and Martens et al. (1990b) do not explicitly state whether cognitive anxiety levels during this period are elevated above the norm, yet stable, or whether the values represented 'normal' levels of cognitive anxiety. The results from both studies also suggest that somatic anxiety remains relatively low during much of the pre-competition time-course. However, as the day of competition nears, levels of somatic anxiety become elevated, with the largest increases being immediately prior to event.

These particular time-to-event patterns have not been fully supported. Jones and Cale (1989) examined the mediating effect of gender and found that for males, cognitive anxiety replicated the pattern observed by Gould et al. (1984) and Martens et al. (1990b). Females however, reported steady linear increases as competition neared. In addition, females also experienced increases in somatic anxiety at an earlier stage than males. Because of some concerns over the methodological approach adopted by Jones and Cale (1989), Jones, Swain and Cale (1991) re-evaluated the effect of gender on pre-competition temporal patterning. The results failed to validate the outcomes presented by Jones and Cale (1989). In this case, patterns of somatic anxiety were not mediated by gender; instead both males and females only experienced increases of the day of the competition. Again, the largest increases were observed immediately prior to the event. However, for cognitive anxiety, some gender differences were apparent. Although females did not necessarily the exhibit gradual increase in the run up to competition suggested by Jones and Cale (1989), cognitive anxiety did increase sharply on the day of competition in females, but not in males.

Whilst the preceding information provides a valuable insight into the nature of pre-competition anxiety, Hanton, Thomas and Maynard (2004) have been critical of the methods used to assess time-to-event patterns. In particular, Hanton et al. (2004) claim that the focus upon the intensity dimension of anxiety ignores an equally important aspect of competitive state anxiety, namely the frequency dimension. Hanton et al. (2004) subsequently demonstrated that frequency of intrusions were actually more sensitive to changes-over-times than intensity. Specifically, it was found that increases in both anxiety components were observed two days prior to competition; these increased further two hours from the event.

Although not particularly extensive, the available literature provides a useful insight into the nature of pre-competition anxiety. Unfortunately, because of the difficulties involved in measurement **(**Hackfort and Schwenkmezer, 1989), information regarding the behaviour of competitive state anxiety during competitive play remains scarce. Suggestions have be made by Martens et al. (1990b) and Morris et al. (1981), who assert that somatic anxiety, being a conditioned response, should dissipate once competition begins. In contrast, cognitive anxiety is liable to fluctuate throughout this period, particularly if performance expectancies change. Although instinctively viable, support for these assumptions is limited. A study by Caruso, Dzewaltowski, Gill and McElroy (1990) required participants to partake in a competitive cycle task. Anxiety measures were taken pre-, mid-, and post-task. Of particular interest is the finding that participants experienced mid-competition elevations in both anxiety components; this being particularly evident when participants believed they were performing poorly. Before drawing conclusions from this study, it should be noted that Caruso et al. (1990) did acknowledge that somatic patterns might have been more indicative of the physiological arousal associated with exercise, rather than a somatic anxiety response. However, this particular concern is not applicable to the study of Karteroliotis and Gill (1987), in which participants were involved in a competitive, yet non-exertive pegboard task. Again, both somatic and cognitive anxiety became elevated during competition. As with in-task anxiety, research on post-competition levels is also in short supply. Haneishi, Fry, Moore, Schilling, Li and Fry (2007) did measure post-competition anxiety in female collegiate soccer players and found that levels of both somatic and cognitive anxiety were actually higher than those taken pre-competition. Caruso et al. (1990) presented similar results. In this case, cognitive anxiety was found to dissipate once competition had ceased, but this was only so for successful participants. For failing participants, post-event elevations in both cognitive and somatic anxiety were evident.

Information regarding the temporal patterning of competitive anxiety, whilst in some instances scarce, does provide some useful guidance to those considering the use of anxiety control techniques. First, the studies mentioned highlight the conceptual independence of the somatic and cognitive anxiety, thus giving credence to the Matching Hypothesis (this will be discussed later). Second, although there is some debate about the specific nature of time-to-event anxiety patterning, the preceding discussion shows that anxiety control techniques might be required throughout the entire competitive time-frame.

Part 2

Literature Review: Relaxation for Anxiety Control

1.3.0. Relaxation Defined

Ryman and Rankin-Box (2002) define relaxation as a state of consciousness characterised by feelings of peace and accompanied with release from tension, anxiety and fear. Regarding relaxation techniques, according to Titlebaum (1988) the primary aim of relaxation is to act as a coping skill that allows thinking to become clearer and more effective. However, Titlebaum (1988) does not acknowledge the fact that relaxation can have physical consequences. Recognising the somatic aspect, Coville (1979) describes relaxation as an ability to reduce muscular tension. Thus, relaxation in this sense is considered to be a motor skill, and provides the opportunity to perform efficient, precise, co-ordinated movement (Alter, 2000). This definition is also lacking as it fails to recognise autonomic reactions. Benson's (1975) description does incorporate this aspect, suggesting that relaxation is a response that results in physiological changes that include decreased heart rate, respiration rate and blood pressure. Collectively, the above definitions indicate that (1) relaxation should be considered as a multidimensional response that consists of mental and physical components, and (2) the reactions derived from relaxation contrast with those that are associated with state anxiety.

1.3.1. The Matching Hypothesis

The fact that both relaxation and competitive state anxiety are considered to be multidimensional, combined with the independence of the somatic and cognitive components (Morris et al., 1981; Martens et al., 1990b), has led to the formulation of the Matching Hypothesis. The Matching Hypothesis stipulates that relaxation methods should be ‘matched’ to the type of anxiety being experienced (Burton, 1988; Martens et al., 1990; Maynard and Cotton, 1993; Maynard, Hemmings, Greenlees, Warwick-Evans and Stanton, 1998). Specifically, physical techniques (e.g. PMR) should be administered to alleviate the symptoms associated with somatic anxiety, and cognitive relaxation methods (e.g. mediation, imagery and autogenic training) used to control the cognitive aspects (Crocker et al., 2002; Williams and Harris, 2006). At present, supportive evidence for the Matching Hypothesis is limited, which has led some to reject the central tenet of the hypothesis (e.g. Crocker et al., 2002; Abouzekri and Karageorghis, 2010). Nevertheless, the Matching Hypothesis does require consideration. If music is to be used as a valid multidimensional relaxation technique, then effects of music on each specific anxiety component need to be quantified.

1.3.2. Relaxation Strategies and the Temporal Patterning of Competitive State Anxiety

The discussion on the temporal patterning of competitive anxiety has shown that both somatic and cognitive anxiety can manifest, at varying degrees of severity, throughout the competitive time frame. As such, anxiety-control strategies might be required at various stages of the competitive process, and under a number of different environmental conditions. Relating these requirements to the more ‘traditional’ anxiety-control methods, some issues arise. First, as has been argued, many of the current methods involve lengthy procedures (e.g. PMR, meditation). It is likely that the protracted nature of such techniques might be less of an issue if being used in the days prior to competition. However, their application might be more problematic in situations where time constraints exist, for example immediately before, during and after competition. It should be acknowledged that the ultimate aim of many the ‘traditional’ techniques are to provide rapid relaxation (Ost, 1987; Hardy et al., 1996), so that they can indeed be applied on-site. Unfortunately, as stated previously, for this aim to be realised considerable practice is required. Furthermore, in many cases, a prerequisite for effective use is the need for specific environmental conditions (Cratty, 1989; Payne, 2000). Again, in the days preceding competition this should be possible, but once ‘on-site’, this might not be easily achievable.

The use of on-the-spot methods (e.g., imagery and self-talk) can address some of these concerns, but again, utility depends on regular practice. Another issue relates to the fact that the ‘traditional’ methods tend to be categorised as being either physical, addressing the somatic aspects, or mental, those which are used to regulate cognitive anxiety. Despite being interrelated, the conceptual independence of the anxiety components suggests that athletes might need to become proficient in both mental and physical methods, thus increasing the practice demands. As will be argued, music listening as a relaxation aid might provide some advantages over the ‘traditional’ methods because (1) it has the potential to be a relatively brief intervention and so can be used, for some sports at least, at various stages of the competitive process, (2) it is not dependent on practice or constrained by environmental conditions and (3) might have the potential to counter both the somatic and cognitive aspects of anxiety.

1.3.3. The Psychophysiology of Relaxation

Before turning attention to the techniques used to induce relaxation, a brief summary of the parasympathetic nervous system (PNS) is warranted, as this will provide an insight into how relaxation techniques can be used to manage anxiety. Although there is a wealth of information regarding the procedures and benefits of relaxation, there is a distinct lack of detail regarding the actual psychophysiological mechanisms involved in this response. The PNS does appear to be implicated in this process, for example Lavey and Taylor (1985) have claimed that relaxation may be a parasympathetic mediated set of protective changes to over-stress, whereas Payne (2000) suggests that in the absence of excitement, the parasympathetic division of the ANS assumes control and so restores the body to a state of calm. Similarly, Martini (2001) has stated that a fundamental function of this division of the nervous system is to induce relaxation. Despite making such assertions none of these authors elaborate upon the psychophysiological processes of relaxation. To understand how the parasympathetic nervous system might counteract the effects of anxiety one must again turn to the mainstream physiology texts. Unfortunately, there is a tendency for these to focus upon the role of the sympathetic nervous system; hence again, information is limited. Nevertheless, some insights into the physiological processes of relaxation can be gleaned.

As described in Part 1 of this chapter, the ANS consists of two divisions, the sympathetic and the parasympathetic. The parasympathetic division is primarily concerned with those responses that are associated with the conservation of energy (Tortora and Grabowski, 2003) and inhibiting those activities associated with the sympathetic system (Sherwood, 1993). As such, parasympathetic activation is directly responsible for decreasing heart rate, blood pressure and respiratory rate (Sherwood, 1993; Martini, 1995). As the name suggests, regulation of the autonomic system is generally automatic. For example, under normal conditions an increase in blood pressure would initiate a decrease in heart rate, thus restoring it to resting levels (Tortora and Grabowski, 2003). This reaction is considered to be a reflex response and is initiated at the spinal level. However, parasympathetic activation can also be influenced by both the mid-brain and the higher cortical centres and as such, emotional reaction and cognition can also influence this system (Martini, 1995). It is the non-reflex actions that can be implicated in the relaxation response.

The structures involved in the activation of the parasympathetic response reflect those responsible for sympathetic activity, namely, the brain centres such as the cerebrum, the thalamus, the hypothalamus, the limbic system, the RAS, the medullary autonomic centre and ultimately the ANS (Seeley, Stephens and Tate, 1992). According to Jones and Heyman (2005), these structures work as an integrated, co-ordinated system and so activation in one area will instigate action in another. For example, 'calming thoughts' could provoke a corresponding reaction within the limbic system and in turn, would instruct the medullary centre to initiate the corresponding autonomic responses (i.e., parasympathetic). Located within the medulla, and under the influence of the hypothalamus (Dworetzky, 1994), is the system responsible for the secretion of serotonin (Guyton, 2006). It is suggested that an increase in the availability of this particular neurotransmitter can induce feelings of calm and suppress the activity of the RAS (Guyton, 2006) and so reducing mental and physical arousal. As to the somatic component of anxiety, the muscle unit is not actually connected to the parasympathetic network; rather it is the somatic division of the sympathetic system that controls muscle tone (Tortora and Grabowski, 2003). This suggests that when in a relaxed state, reduced muscle tension is caused by the suppression of sympathetic activity, rather than the activation of the parasympathetic division.

From this brief discussion of the parasympathetic system a number of propositions can be offered. It does appear that thought processes can influence cortical, autonomic and somatic arousal. Furthermore, given that the ascending neural pathways of the ANS and SNS provide the brain with feedback regarding activation states (Sherwood, 1993; Atkinson et al., 1993; Tortora and Grabowski, 2003) it is possible that decreased activity in these systems will reduce neural activity in the higher centres. This is likely to act in circular fashion, that is, reduced peripheral and autonomic activation causes a reduction in cortical activity, which in turn further lessens autonomic and somatic activation. As mentioned previously, the physiological aspect of somatic anxiety can be initiated through conditioning. It is unclear whether relaxation can be induced through associative learning. This is a plausible assumption given that PNS is under control of the ANS. However, given the evolutionary purpose of the ‘flight or fight’ response, if conditioned relaxation is indeed possible, it is unlikely to be as intense or immediate as that associated with arousal. If relaxation strategies are to be effective, they must either directly affect the parasympathetic system (e.g., inducing calming thoughts, reducing emotional, autonomic, cortical and somatic activity) or indirectly by inhibiting activation of the sympathetic system (e.g., disrupting maladaptive cognitions, reducing muscle tension). Indeed, as will become clear, many of the relaxation strategies appear to do induce relaxation by either one, or both of these mechanisms.

1.3.4. Relaxation Techniques

Numerous techniques are available to help the athlete control the onset of, or alleviate the symptoms of competitive anxiety. According to Carver, Scheier and Weintraub (1989), relaxation methods can be assigned into two distinct classifications; problem-focused and emotion-focused. The aim of problem-focused strategies is to reduce anxiety by addressing the sources of stress. This is achieved through the implementation of problem solving processes, pre-planning, goal setting, information seeking and increasing the physical effort. Cratty (1989) states that these methods are often implemented by, and under the control of, the coach. Emotion-focused strategies are aimed at managing the anxiety caused by the situation, and are used when an individual must endure the stresses caused by the competitive environment (Carver et al., 1989); methods include deflecting, positive focus and relaxation. Although the coach, and/or sport psychologist can initiate emotion-focused strategies, they are fundamentally person-centred (Cratty, 1989), with the various decisions regarding selection, practice and implementation residing within the user. It is the emotion-focused classification that provides the focus of this investigation and in particular, relaxation.

By its nature, relaxation can be considered as an anxiety reduction technique and as such, the ability to induce relaxation is considered to be an important sport performance strategy (Cratty, 1989; Hardy et al., 1996; Cox, 2002; Crocker et al., 2002; Williams and Harris, 2006; Gill and Williams, 2008). The ability to control anxiety might also benefit the athlete in other ways, for example, increase social function and sports enjoyment (Crocker at al., 2002). Relaxation techniques can be broadly arranged into two categories: (1) physical procedures, including those that target the somatic symptoms, e.g., PMR and methods such as biofeedback, which counter autonomic reactions, and (2) the cognitive techniques used to reduce or modify irrelevant or disruptive thought patterns. Examples include meditation and Cognitive Behavioural Therapy (CBT; Patel, 1999; Payne, 2000; Cox, 2002).

Relaxation techniques are often recommended on the basis that their use will alleviate the symptoms of competitive state anxiety, leading to improved sports performance (e.g. Onestak 1991; Cratty, 1989; Hardy et al., 1996; Cox, 2002; Crocker et al., 2002; Williams and Harris, 2006; Gill and Williams, 2008). This assertion has received some empirical support. Providing female volleyball players with PMR training, Lanning and Hisanaga (1983) found that participants experienced both reductions in competitive state anxiety, and improvements in performance. Similarly, the practice of PMR has been shown to improve shot-putt execution (Nideffer and Deckner, 1970), sprint (Winter, 1982) and golf (Ortiz, 2006) performance. Regarding meditation, one particular study by Reddy, Bai, and Rao (1976) has shown that this method can improve a range of athletic skills, including sprinting, agility and standing long jump; it should however be noted that the participants were devotees of this particular technique and as such had experience of this technique. Cox (2002) also suggests that meditation can be beneficial for gross motor tasks, yet only Reddy et al. (1976) is cited as support for this claim. The absence of empirical support has led Crocker et al. (2002) to assert that currently the use of meditation as a performance-enhancing agent cannot be justified. Biofeedback has received a great deal of attention as a performance enhancement strategy, however, as an anxiety control technique, information is limited (Crocker et al., 2002). For example, from a review of literature Zaichkowsky and Fuchs (1988) confirmed biofeedback's ergogenic potential, however, the authors did not specifically discuss the mediating effects of relaxation. As such, it is difficult to ascribe cause-effect relationships. Cognitive restructuring is another method that appears to augment physical training. In particular, Greenspan and Feltz (1989) have shown that athlete practitioners do consider this technique to be an effective performance enhancing strategy.

According to the Matching Hypothesis, for maximum effect, relaxation interventions should be targeted at the symptoms being experienced. A series of investigations by Maynard and colleagues have examined this assertion. The first of these (Maynard and Cotton, 1993) assessed the effects of Ost's (1987) Applied

Relaxation (AR) upon somatic anxiety, and Positive Thought Control on cognitive anxiety. The results confirmed that 'matching' was the most effective means of reducing the specific anxiety manifestations. It was also found that use of AR provided some, albeit small, performance benefit. Maynard, Hemmings and Warwick-Evans (1995), again utilising AR, found that whist this method was useful at alleviating cognitive anxiety, the strongest effect was for somatic anxiety. These reductions were accompanied by increases in performance and an interpretative redirection of somatic anxiety, from debilitative to facilitative. Support for the Matching Hypothesis has also been presented by Maynard, Smith and Warwick-Evans (1995).

Although empirical support for some relaxation techniques is currently limited (e.g., biofeedback, meditation), overall the literature suggests that relaxation techniques are advantageous. Furthermore, it should also be acknowledged that relaxation procedures can also provide non-performance benefits. For example, reductions in competitive state anxiety might increase enjoyment of sport competitions and improve social relations (Hardy et al., 1996). However, although research indicates that relaxation techniques might prove beneficial, it appears that their use is inhibited within the sporting environment.

Many relaxation techniques, like those mentioned above, are in effect skills, and like other skills, efficacy is dependent on regular practice (Patel, 1991). Consequently, athletes are required to devote time to their mastery. The time required to perfect these skills does not appear to be definite; nevertheless some approximations can be made. Harris and Williams (1993), whilst offering no longitudinal time frame, have suggested that physical (somatic) relaxation methods will require at least two training sessions a week. The need for regular practice is also highlighted by the study of Lanning and Hisanaga (1983), in which participants were provided with a systematic training package of seven 30-minute sessions. Although the intervention did lead to reductions in competitive trait anxiety, upon cessation of the programme, the beneficial effects subsided within two weeks. In the Nideffer and Deckner's (1970) case study, the athlete in question was required to practice the relaxation procedures twice a day, for 10-minutes at a time, and immediately before competition. Four weeks after the initiation of this programme the athlete reported performance improvements. Arguably, this particular finding suggests that a relatively brief intervention can provide benefit, however the fact that subject was considered to be 'highly motivated' and did not actually suffer from state anxiety, diminishes the importance of this finding. Furthermore, the authors also acknowledged that the absence of a controlled environment meant that subsequent performance improvements could not, with any certainty, be attributed to relaxation.

A modified version of PMR, namely Passive Relaxation (PR) is available to those seeking relaxation. Although promoted as being more expeditious than PMR, this procedure still requires practitioners to memorise scripted text (Patel, 1991). As stated, there is little in the literature regarding biofeedback's use in relaxation, and as such, specific practice requirements are unavailable. However, Crocker et al. (2002) and Gill and Williams (2008) do confirm that this method requires both systematic training and specialised equipment, thus reducing the practicality of this technique (Patel, 1991). Centering is a process that can be used to redirect attention from intrusive thoughts and also reduce muscle tension. According to Nideffer and Sagal (2006), centering requires practitioners to rehearse the various components on a regular basis. Ost's (1987) AR method of anxiety control is considered to be a particularly brief method of relaxation. The aim of this technique is to eventually allow the practitioner to induce relaxation within 30 seconds, thus making particularly useful for use in sport (Crocker et al., 2002). However, this again requires a lengthy and systematic training period (Ost, 1987).

As to cognitive relaxation strategies, again no specific timeframes are available, however the practice demands can be inferred from their inherent characteristics. For example, meditation can be a multifaceted skill involving breath control, visualisation, mantras and thought management (Payne, 2000). Likewise, CBT is a comprehensive stress management program that incorporates both physical and mental elements. In relation to the cognitive aspect, under the direction of a consultant, practitioners are guided through a cognitive restructuring program, the aim of which is to address the cognitive antecedents to anxiety. According to Gill and Williams (2008), the nature of this intervention makes the process particularly time consuming. This is evidenced by the study of Brent (2004), as those in the treatment group not only received five hours of formal training in PR, imagery, self-talk and cognitive restructuring, but were also required to practise regularly. Another point worth making relates to necessity for specific environmental conditions. Payne (2000) recommends that relaxation techniques be performed in quiet, warm and comfortable surroundings, a prerequisite that may not always be possible when applied within the sport context. Further, because of their relative complexity, many of these procedures require an instructor to guide the participant through the specific procedures (Cratty, 1989). Lastly, many of these methods induce a state a deep relaxation, a state that could lead practitioners to become under-aroused (Crocker et al., 2002). A case study by Jones (1993) highlights the complexities of an integrated relaxation intervention. The client in question was introduced to AR and was required to perform some preliminary exercises. Following this, a form of cognitive restructuring was employed, the aim of which was to make the client aware of counterproductive behaviours. Next, full AR training was given; this comprised of four phases. The first involved listening to 20-minutes of recorded meditative instructions every day for 2-weeks. The client was required to practice a number of meditative procedures with the aim of inducing a relatively deep state of relaxation. The second phase consisted of 5-minutes of daily training for 2-weeks. In phase 3, the client was required to reduce inducement time to 5-20 seconds. During this phase the client was required to practice 20-minute, 5-minute and 'brief' relaxation procedures. This phase lasted 2-weeks. Phase 4 put these techniques into practice. During the programme, the client was also trained in imagery and anxiety control in simulated game play. In total, the intervention package was monitored for 6-months. This is an extreme case and it is likely that many competitors will not require this level of intervention. Nevertheless, these details do show the protracted nature of some of the traditional relaxation methods. Furthermore, it highlights the need for commitment from those embarking upon integrated relaxation intervention procedures (Jones, 1993).

From the discussion so far, it can be seen that although there is research to support the application of relaxation techniques, usage might be constrained by the inherent practice demands. It is perhaps because of this that they are not readily utilised by the sporting community. For example, Gould et al. (1993) found that only 40% of Olympic wrestlers actually utilised emotional control strategies (e.g. relaxation). A similar study by Gould, Finch and Jackson (1993), examined the coping strategies adopted by National figure skaters. They found that sixty-five percent of respondents utilise pre-competition mental preparation and anxiety-control techniques. However, this dimension included seven first-order themes, only one of which was termed relaxation. From a sample of one hundred and eighty elite athletes, Park (2000) found that forty-eight percent made use of meditation and thirty-one percent adopted physical relaxation strategies. Similarly, Holt and Hogg (2002) showed that although the majority of elite female soccer players did adopt psychological coping methods, none of the sample appeared to use actual relaxation strategies. It needs to be highlighted that the preceding examples focused upon elite athletes and as such one might expect these figures to be substantially lower for non-elite participants. The use of relaxation strategies by recreational athletes has been studied by Ryska (1998), who found that although relaxation methods were the most frequently used psychological strategies, this still only accounted for twenty-one percent of the sample. A number of theories can be advanced to explain this lack of application. First, the negative effects of anxiety are overstated; hence, relaxation is not required. Second, anxiety is detrimental, but relaxation methods are ineffective. Third, athletes would utilise relaxation techniques if more practical alternatives were available. Given the information presented thus far, it is the latter explanation that seems most probable.

To conclude this section, the practice requirements of the aforementioned relaxation techniques might limit their use by athletes. If this assertion is indeed correct, then it would follow that less complex methods would be more applicable to sport. Payne (2000) suggests the use of 'on-the-spot' techniques when methods such as PMR and cognitive-behaviour therapy are impractical. According to Lichstein (1988) on-the-spot techniques should be portable, relatively brief, convenient, unobtrusive, and capable of inducing moderate levels of relaxation; thus allowing the individual to maintain a degree of alertness (Payne, 2000). Recommended techniques include self-talk and imagery (Payne, 2000). However, although less laborious, these methods do still require regular practice (Conroy and Metzler, 2004; Hatzigeorgiadis, Zourbanos and Theodorakis, 2007; Guillot and Collet, 2008; Williams et al., 2010) and in the case of latter, efficacy is dependent upon imagery ability (Hardy et al., 1996; Cox, 2002; Gill and Williams, 2008). Another technique that would also fulfil the criteria offered by Lichstein (1988) and Payne (2000), and is the focus of this course of study, is music listening.

1.3.5. An Introduction to Music and Emotion

It has long been recognised that music has the power to affect human emotion (Waterman, 1996; Juslin and Sloboda, 2001. Music can make us happy, sad, excited or tense (Rickard, 2004), is used by film makers to enhance the emotional tone of their work (Baumgartner, Lutz, Schmidt and Janke, 2006), and those attending music events expect to be moved or excited by the experience (Simonton, 2001). Music is also used in everyday situations to induce emotional reactions (Sloboda and O'Neill, 2001). It is generally agreed that within a particular ethnic group (i.e. Western or Eastern) individuals respond similarly to the emotional content of a musical piece (Landry 2004), and that emotional recognition within music is a universal quality (Robazza, Macaluso and D'urso, 1994; Waterman, 1996; Fredrickson and Coggiola, 2003).

Whilst it is accepted that music can affect the emotional state, the mechanisms responsible for this are not clearly understood. A number of theories have been proposed and of particular interest to the current line of enquiry are the psychological and biological approaches to music and emotion. From a psychological perspective, the sources of emotion in music can be either intrinsic or extrinsic (Sloboda and Juslin, 2001). Sloboda and Juslin (2001) believe that emotion can be conveyed through music intrinsically by both its inherent structure (e.g. melody, harmony, tempo and volume) and via musical expectancies; musical expectancies referring to whether or not the music conforms to the listeners preconceived expectations. Extrinsic sources of emotion are those that are not strictly concerned with musical structure. Iconic relationships, although in some ways similar to intrinsic sources in that they do relate to structure, relate to the similarity between music and some event or agent with emotional tone. For example, music that is soft, slow, repetitive and played with legato articulation, might be perceived as being indicative of waves lapping the shoreline and so, related to feelings of calmness. Associative meaning is another extrinsic source. This concerns the fact that music can be associated with some event or agent (Sloboda and Juslin, 2001). That is, a particular music piece can trigger past memories. Hence, music induces emotions by reminding the listener of a previous experience. Currently, research to support the preceding theories is limited.

Biological music theorists believe that music affects the human organism directly (Trainor and Schmidt, 2003). According to Trainor and Schmidt (2003), music is processed in the auditory centres and cortex, afterwhich the inferential meaning descends to the limbic regions, causing the associated physiological and hormonal reactions. Research has also shown that music listening can effect alpha wave activity in the brain, which in turn can alter levels of alertness (Hodges, 1980), and also affect the brain stem and the subsequent regulatory systems, e.g. HR and blood pressure (Perry, 2006). It should be noted that the biological and the psychological perspectives of musical emotion should not be considered as being mutually exclusive. Trainor and Schmidt (2003) allude to the importance of musical structure in determining emotional tone, so music containing particular characteristics will be interpreted in a particular way, and the limbic system will elicit a related emotional response. Likewise, associations and iconic relationships might also influence the limbic system indirectly through memory recall. In other words, music can affect the organism directly through the activation of the limbic centres or indirectly through personal interpretation. These theories are discussed in further in Chapter 4.

1.3.6. Music and Anxiety Control

The use of music as an 'on-the-spot' anxiety reduction technique has received little consideration from sports researchers. However, evidence from both medically orientated researchers and music therapy does show that music listening has the potential to be a valid relaxation aid. Attending first to studies that have utilised self-report inventories to assess anxiety severity, Winter, Paskin and Baker (1994) examined the effect of music upon the perceived anxiety levels of pre-operation hospital patients who were waiting in the Surgical Holding Area. The experiment consisted of a no music control and a self-selected music condition. Those listening to music did so during the pre-operation waiting period. Immediately before transfer the operating theatre, state anxiety was assessed by way of a self-report inventory, and the results showed that those patients who listened to music reported significantly less anxiety than those in the control. In a similar vein, Knight and Richard (2001) informed participants that they would be required to give a difficult oral presentation. Participants were led believe that their performance would be recorded and assessed by staff and a group of peers. During a twenty-minute preparation period, the experimental group were provided with experimenter-selected musical accompaniment. Again, the results revealed that subjective anxiety ratings were significantly lower in the music condition. Davis and Thaut (1989) conducted a study in which participants were merely required to remain seated for approximately thirty minutes. During this time the group listened to self-selected music. Again, music was found to reduce state anxiety, whilst inversely increasing perceptions of relaxation. More recently, Lai, Hwang, Chen, Chang, Peng and Chan (2008) examined the effects of 'preferred' music on patients receiving root canal treatment. Listening to music did reduce levels of state anxiety.

Although the preceding examples support music's anxiolytic properties, research outcomes have not always been supportive. Burns et al. (1999) did find that hard-rock, classical and self-selected music increased perceptions of relaxation in those waiting to perform a 'stressful' mental task; however, it was participants the no music control group that exhibited the greatest increases in relaxation. In a replication, Burns et al. (2002) showed that whilst levels of post-treatment state anxiety were indeed lower in a classical music condition than in the control condition, between-condition difference scores were of a similar magnitude.

Regarding physiological indicators, the study of Burns, et al. (2002) found that music could significantly reduce heart rate, but not electromyography (EMG) or skin temperature readings. Results from Knight and Rickard (2001) indicated that the significant increases in systolic blood pressure and heart rate observed in the control, were not evident within the music condition. However, music listening did not alter levels of the stress hormone cortisol. These results offer some support for Lacey's (1967) directional fractionation phenomenon. Whilst the preceding examples showed music can act upon, at least some of the physiological reactions, both Burns et al. (1999) and Lai et al. (2008) found that music had no significant effect upon any of the physiological measures of arousal (HR and blood pressure). In contrast, in a study by Mok and Wong (2003) showed music listening to significantly reduce both heart rate and blood pressure.

Such inconsistencies become more marked when the meta-analyses of Evans (2002), Pelletier (2004) and Nilsson (2008) are examined. Evans (2002) scrutinised a total of nineteen relevant studies. The following conclusions were presented. When measured by self-report inventory, music listening does appear to reduce the anxiety levels of some hospital patients. However, for those undergoing 'unpleasant' medical procedures, this effect was not apparent. Regarding physiological indices, music did not have a consistent effect. The impact of music upon HR and respiratory rate was inconclusive, whilst blood pressure did not appear to be affected by music. Also examining the effects of music upon hospital-induced anxiety, Nilsson (2008) reviewed a total of forty-two related articles. Results showed that in only fifty-percent of these did music significantly reduce self-reported anxiety, whilst just twenty-percent showed that listening to music could produce reductions in heart rate and blood pressure. Pelletier (2004) examined the impact of music listening across a number of variables, including age, level of stress and type of stress. In this instance, the analysis revealed that in general, passive music listening did have stress-reducing (the term stress, as opposed to anxiety, was used in this analysis) properties and this effect was evident for both 'high' and 'low' stress situations. However, the strength of this response was dependent upon participant characteristics. Findings indicated that those under the age of eighteen and those with some degree of musical experience received the greatest benefit. Furthermore, the magnitude of the response was moderated by the stressor; the strongest effect being observed in patients preparing for labour, followed by artificially induced stress and then stress due to surgery, medical procedures and occupational stress.

Although the preceding examples show that music listening does have the *potential* to be a valid relaxation aid, there remains a lack of consensus regarding the specific effects of music listening upon anxiety related measures. As such, music cannot currently be recommended as a viable alternative to the more traditional relaxation methods. However, it is possible that methodological weaknesses have prevented the true nature of music's anxiolytic properties from being uncovered. Music and exercise research might provide some direction on this issue.

For many years there had been a lack of consensus regarding the specific effects of music upon physical performance. Whilst there was a generally held view that music possessed ergogenic properties (Kodzhaspirov, Zaitsev, and Kosarev, 1986; Gfeller, 1988; Karageorghis et al., 1999), research had not always supported this assumption. The lack of consistent research outcomes led Karageorghis and Terry (1997) and Karageorghis et al. (1999) to claim that methodological weakness had confounded the examination of music's performance-enhancing properties. Specifically, it was maintained that researchers had failed to consider the characteristics of music that might promote increases in work intensity. In response, Karageorghis et al. (1999) developed The Conceptual Model for the Prediction of Responses to Motivational Asynchronous Music in Exercise and Sport. In essence, the framework proposes that attending to both intrinsic music factors (i.e. volume, tempo, rhythm, melody, lyrics) and extrinsic personal factors (i.e. socio-cultural background and personal meaning) when selecting musical accompaniment for exercise and sport, will provide stronger and more consistent experimental outcomes. Testing of the framework has provided some verification of these assertions (e.g. Karageorghis and Terry, 1999; Karageorghis and Jones, 2000; Karageorghis and Lee, 2002; Karageorghis and Deeth 2002). Relating this to the current line of enquiry, like the initial attempts to uncover music's ergogenic properties, researchers examining the anxiolytic effects of music have taken a casual approach to music selection.

When choosing music for experimental investigations, researchers have tended to adopt either the participant-selected approach in which participants are able to choose their own music, or the experimenter-selected approach in which the music is provided by the researchers. Both of these methods are problematic. According to Karageorghis et al. (1999), there is an inherent bias in allowing participants to select their own music, as the listener may unwittingly over evaluate the effects of the musical stimuli. As to the experimenter-selected method, most researchers have selected music based upon a narrow and subjective criterion. In most instances, music has been chosen based solely upon the genres being indicative of relaxation, e.g., new age and classical (Nilsson, 2008). Selecting music based purely upon descriptive labels is insufficient. To illustrate, classical music is a rather broad genre of music, so one must question whether all classical music would necessarily induce similar psychophysical responses. Also, even supposing that the desired response was forthcoming, it is always possible that alternative compositions of a similar style might provoke an even stronger response. Furthermore, selecting music in this manner is subjective; hence there is no guarantee that the listener's interpretation concurs with that of the experimenter. Importantly, both of these approaches threaten external validity as they lack generalisability, hence the outcomes must be considered as being specific to the composition(s) being utilised. From the applied perspective, one may argue that this may not be an issue with self-selected music as long as it provides benefit to the individual listener. However, there may be situations in which multiple listeners are present. For example, the dressing/changing room at a sports venue, a hospital waiting room or an exam waiting area. In such instances, the application of self-selected music may not be an option. Also, it could be argued that relaxing music that is based upon an objective, research-formulated criterion may provide a greater effect than self-selected music that is merely based upon a personal preference.

Another issue with previous efforts to uncover music's anxiloytic properties relates to the fact that many of the studies have failed to provide an operational definition of anxiety; an omission that compromises the validity of research outcomes (e.g. Davis and Thaut, 1989; Knight and Rickard, 2001; Burns et al., 2002; MacDonlad et al., 2003; Lai et al., 2008). The meta-analyses of Evans (2002), Pelletier (2004) and Nilsson (2008) show that the most commonly used measure in music-anxiety research is Spielberger, Gorsuch, Lushene, Vagg and Jacobs' (1983) State-Trait Anxiety Inventory (STAI). Indeed, the studies of Davis and Thaut (1989), Knight and Rickard (2001), Burns et al. (2002), MacDonlad et al. (2003) and Lai et al. (2008) all made use of this inventory. As the name suggests, the STAI measures both state and trait anxiety. However, the STAI also includes statements that allude to the multidimensional nature of anxiety (Wetsch, Pircher, Lederer, Kinzl, Traweger and Heinz-Erian, 2009). Although the State-Trait distinction is recognised, the differentiation of somatic and cognitive has not; the results have instead been presented as total anxiety scores. Although it has to be acknowledged that many music-anxiety studies have included physiological (somatic) measures, in terms of the self-report outcomes, it is not possible to determine which particular anxiety component has, or has not, been affected by music listening. The use of an appropriate operational definition of state anxiety might have alerted researchers to this particular flaw.

As previously stated, unlike the use of motivational music in sport and exercise, there have been few attempts to produce a comprehensive standard upon which to base relaxing musical selections. Efforts have been made by Wolfe, O'Connel, and Wadon (2002). Wolfe et al. (2002) provided a panel of six musicians with ninety-eight compositions and asked them to specify the characteristics they felt were conducive to relaxation. The panel were then asked to rank each track for its relaxing qualities. From this, the ten most relaxing tracks were presented to a group of eighty-six non-musicians who were asked to consider which musical characteristics enhanced perceptions of relaxation. The results from this investigation revealed that factors such as tempo, dynamics, instrumentation and melody can have an impact on upon the relaxing interpretation of a musical composition.

Whilst these outcomes do offer some practically useful guidelines, some of the suggestions made by Wolfe et al. (2002) lacked functional detail. For instance, although it was stated that 'slow tempi', 'softer sounds', 'constant dynamics', 'low volume', 'a pleasant combination of instruments' and 'few structural changes' were conducive to relaxation, these were not elaborated upon. For example, there were no information on precisely what slow tempi or softer sounds were. Furthermore, there are issues with the internal validity of Wolfe et al.'s (2002) study; these will be discussed in Chapter 2. Some additional information can be gleaned from Gabrielsson and Lindstrom (2001) who have suggested that characteristics such as rhythm regularity, slow tempo, legato articulation, high pitch, narrow pitch range with stepwise ascending progressions, simple, consonant harmonies and regular rhythm can enhance the relaxing nature of music. Utilising the suggestions of Gabrielsson and Lindstrom (2001), Gomez and Danuser (2007) also looked at the relationship between musical structure and emotions. Thirty-one participants, the majority musically trained, were asked to rate a number of music pieces for their level of relaxation. From this, the opinions of three music experts were used to identify those music components that differentiated 'low arousal' music from 'high arousal' music. It was found that tempo, accentuation and rhythmic articulation possessed the greatest discriminatory power. However, as with the study of Wolfe et al. (2002), Gomez and Danuser (2007) failed to elaborate.

1.3.7. Music for Anxiety Control: The Moderating Effects of Gender and Level of Music Knowledge

As well as the intrinsic music characteristics, music and anxiety researchers have also failed to consider is the impact of extrinsic influences such as the characteristics of the listener. There is an assertion that music preference, or liking, can impact upon the listening response (Davis and Thaut, 1989; Karageorghis et al, 1999; Wolfe et al., 2002; Walworth, 2003). LeBlanc (1980) suggests, via The Model of Variation in Music Preference, that personal factors such as age, ethnic group, gender and musical knowledge moderate the relationship between music and degree liking[1]. Supporting some of the assertions of LeBlanc (1980), research has shown that males prefer music styles that are ‘hard’ and ‘tough’; for example heavy rock, rock ‘n’ roll (Russell, 1997) and rap (Buzarovski, Humphreys and Wells, 1996). In contrast, females have a greater preference for ‘soft’ and ‘romantic’ music and styles such as pop, modern dance (Russell, 1997) and spiritual (Buzarovski et al., 1996). It has also been suggested that females are more positive towards classical music than males (Russell, 1997; Teo, 2005). Finally, although both genders appear to have a preference for male artists, the bias appears to be stronger in males (Millar, 2008).

In a similar vein, it has been suggested that musically skilled individuals have a greater affinity for relatively complex music forms, whereas the musically unskilled

[1] Note: given that the anticipated samples for the subsequent investigations are likely to be homogeneous in terms of age and ethnicity, only the effects of gender and level of music knowledge will be considered here.

are more inclined to prefer compositions with a relatively simple structure (Hargreaves, 1986). For example, Fay, Warren and Middleton (1941 cited in Hargreaves, 1986, p. 140) found that participants with higher than average musical talent had a greater propensity for classical pieces, whereas those with limited talent preferred ‘less serious’ music. Likewise, Hargreaves, Messerschmidt and Rubert (1980) also showed a positive relationship between degree of music training and liking for classical styles. More recently, Hargreaves, Comber and Colley (1995) found that as level of music training increased, so did the liking for more serious styles of music (e.g. classical, jazz and opera).

Attempting to explain the interaction between music preference and personal characteristics is difficult as the precise mechanisms remain unclear. For gender, Kemp (1997) has suggested socialisation and gender role stereotyping as being potential explanations. With regard to musical expertise Berlyne (1971 cited in Hargreaves and North, 1997a, p. 87) put forward the theory of experimental aesthetics. Music liking in this view is dependent, in part, upon its relative complexity. Specifically, compositions of a moderate structural complexity are most preferred. Perhaps, musical knowledge impacts upon an individual’s perception of moderate complexity. That is, what those with limited knowledge classify as being of moderate complexity (e.g., pop) might be considered low complexity by those with a high degree of musical knowledge. Conversely, the more complex styles such as classical might be perceived as being of high complexity for low knowledge individuals, but relatively moderate for those with a high level of musical knowledge. Alternatively, like gender, socialisation might also be an influence is this regard. Of course, much of this is conjecture (Hargreaves, 1986), nevertheless, despite a lack of theoretical explanations, it is clear that personal variables do impart influence on music preference.

As well as influencing music preferences, musical ability might also mediate attentional direction during music listening. A study by Williams (2005) concluded that as music ability increases, so does attention towards the harmonic aspects of the music. In contrast, those with limited music ability tended to focus upon melody; this intensified as the harmonic elements became more complex. Similar findings have also been presented by Rentz (1992). This study required participants to listen to orchestral pieces and it was found that although there were similarities in aural attentional focus, there was nevertheless, a tendency for non-musicians to direct attention towards the more obvious brass, percussion and wood-wind instruments for longer periods than musicians. This became particularly evident when such instruments were doubled with strings. Musicians on the other hand focused upon stringed instruments more frequently and for longer periods than non-musicians, and were also more adept at focusing on simultaneous instrumentation. Like the Williams (2005) investigation, non-musicians were also drawn towards the melodic aspects of music. Currently, no information is available as to whether attentional differences exist between the genders. Accounting for the attentional differences between those with differing levels of music knowledge, explanations are again limited. Kemp (1997) suggests that those with music training might be more analytical, more involved and less emotive during music listening, thus attentional focus is directed towards the technical aspects of a composition. Likewise, Williams (2005) claims that as music sophistication increases, so does discriminatory ability, particularly harmonic, rhythmic, tempo and complexity perception.

It is clear that music has the capacity to alter the emotional state (Juslin and Sloboda, 2001) and researchers have attempted to establish whether these affective reactions are global or dependent upon personal factors. In terms of emotions ascribed to music, gender (Robazza et al., 1994) and level of music knowledge (Waterman, 1996; Fredrickson and Coggiola, 2003) appear to have little impact. As to felt emotions, Ott, Teichmann, Osawa and Vaitl (2007) found that those without formal music training had the strongest affective responses for the emotions such as 'happiness', 'sadness', 'anger' and 'fear', but there was no interaction for the 'peace' reaction. It was also found that a preference for the idiom used enhanced intensity of the felt emotion. Examining gender, Nater, Abbruzzese, Krebs and Ehlert (2006) reported that females exhibited increased emotional reactivity to adverse musical stimuli; males in contrast, did not.

As to whether any of the factors discussed might actually impact upon the relaxation response, research evidence is scarce as the majority of studies have ignored these moderators. Investigations by Davis and That (1989) and Mok and Wong (2003) have claimed that 'preferred' music does have anxiety reducing potential. However, neither study included a 'less preferred' music condition for comparative purposes. Burns et al. (1999) have showed that listening to self-selected (preferred) music pieces provoked the strongest relaxation response when compared to other music conditions; however, it was the no- music control that had the greatest impact. One study has found a significant negative correlation between music preference and level of anxiety induced by a dental procedure (Lai et al., 2008). Regarding the moderating effects of gender and level of musical knowledge, this was considered by Knight and Rickard (2001) and the results indicated that gender and level of musical knowledge had no significant impact upon music reactivity; however, in this instance music preference was not considered.

The information on music liking suggests that personal characteristics might moderate responses to music. It has been argued that the failure of previous research to show consistent anxiolytic benefit might be due to the lack of consideration to internal music factors. However, it is also possible that personal characteristics might have some bearing on experimental outcomes. For example, if the music used in an experimental procedure was more suited to males, then females might not experience a similar strength of reaction. Hence, the inclusion of females could, in theory, 'dilute' the effect. As such, any attempt to classify relaxing music should consider the moderating influence of personal characteristics such as gender and/or level of music knowledge.

1.3.8. Chapter Summary

Anxiety is one of the most widely studied areas in sport psychology, and whilst arguments exists regarding the predictions of MAT, directional interpretation and performance effects, for some at least, competitive state anxiety should be considered as being an undesirable response. Relaxation techniques are often recommended as a means of reducing competitive anxiety. However, as has been argued, these methods are constrained by practical limitations. Furthermore, the fact that many sports people fail to utilise these techniques is concerning. Whilst it is possible that the debilitative effects of anxiety have been overstated, hence relaxation is not sought, the current author suggests that it is also likely that the practice demands and/or their inappropriateness for sport, discourages their use. If this assertion is correct, then it follows that a more convenient and suitably effective method might be more appropriate. Although not conclusive, music does appear to have some potential as an anxiety control technique. It is the contention of the author that affording sufficient attention to the selection of music for relaxation purposes will provide stronger and more consistent research outcomes.

Taken together, the contributions of Wolfe et al. (2002), Gabrielsson and Lindstrom (2001) and Gomez and Danuser (2007) do provide direction to those selecting music for anxiety control research. Unfortunately, the suggestions are of little practical use as they lack functional detail. It is perhaps because of these limitations that the information currently available has not been readily adopted by music for anxiety control researchers. Furthermore, these offerings are not specifically related to relaxing music for anxiety control. This might have a bearing upon the outcomes as Hargreaves and North (1997b) have claimed that music appropriateness might be dependent upon listening context. This means that music used to relax within the home environment for example, might not be structurally identical to music required for anxiety control. Although the study of Wolfe et al. (2002) offers some information on the relative importance of each musical characteristic, this is again limited. An expansion of this might be a useful addition to the area.

To date, there has not been a single, integrated and comprehensive investigation that has aimed to qualify the relaxing characteristics of music for anxiety control. As such, this thesis will expand upon the work Wolfe et al. (2002), Gabrielsson and Lindstrom (2001) and Gomez and Danuser (2007) and develop in-depth criteria from which both researchers and practitioners can select appropriate music for anxiety control purposes. Ultimately, the validity of suggestions made will be tested within the competitive sport environment.

Chapter 2: Determining the Characteristics of Relaxing Music for Anxiety Control

Study Considerations

2.1.0. Terminology

As part of their efforts to develop a framework through which the motivational effects of music could be expressed, Karageorghis and Terry (1997) raised concerns about the operational definitions applied to the musical selections used in music and exercise research. Specifically, Karageorghis and Terry (1997) believed that the lack of a standardised and functionally appropriate description had hampered attempts to uncover the psychophysical effects of music. Subsequently, Karageorghis et al. (1999) offered a definition that encompassed music characteristics, functional application and the likely psychophysical responses. Terming music that would provide benefit to the sport and exercise participant as 'motivational music', Karageorghis et al. (1999) suggested that listening to' motivational music' during exercise would lead to increased work intensity, reduced effort perception, improved affect and increased arousal. Importantly, to be classified as 'motivational music', a composition must conform to a predetermined criterion. For example, tempo, melody, rhythm etc. must be rated highly on a 10-point motivational scale. Listening to music that does not fulfil the set criteria *(*oudeterous music) will provide little gain. This approach is advantageous because it not only sets a standard for the selection of musical accompaniment to sport and exercise, it also, when utilised, allows between-study comparisons to be made. A similar approach will be utilised within this programme of study.

2.1.1. Stage 1: Select a noun that encompasses the qualities of the music.

From the available literature, two obvious choices emerge. Authors such as Iwanaga, Ikeda and Iwaki (1996), Karageorghis et al. (1999) and Iwanaga and Moroki (1999) have applied the term 'sedative' to describe music that possesses anxiolytic properties. In contrast, Davis and Thaut (1989), White (1992) and Knight and Rickard (2001) have adopted the term 'relaxing'. Referring to the Oxford English Dictionary, the term 'sedative' is defined thus: 'promoting calm or inducing sleep', with 'calm' being defined as 'settled, not agitated, self-assured and confident'. 'Relaxing' is defined as 'conductive to relaxation'; with 'relax' being defined as 'becoming less tense or rigid'. Conceivably, either of these definitions could be utilised. However, whilst the Oxford English Dictionary defines as above, some dictionaries (e.g. America Oxford Dictionary, Australian Oxford Dictionary) also include sedative as an adjective to mean 'drug induced'. Because the term sedative might have pharmaceutical connotations, the term 'relaxing' will be adopted.

2.1.3. Stage 2: Intended application.

North and Hargreaves (1997b) have suggested a 'preference-for-prototypes model' of music predilection. In other words, music preference is, in part, determined by its typicality and appropriateness to a given setting. Testing this theory, North and Hargreaves (2000) found that participants preferred 'high arousing' music when performing physical exercise and 'low arousing' music when relaxing. In a similar vein, Shäfer and Sedlmeier (2009) showed that when individuals wanted to be energised they reported a preference for electronic music. In contrast, when intellectual stimulation was sought, there was a preference for 'sophisticated' music. It is recognised that the research of North and Hargreaves (1997b) and Shäfer and Sedlmeier (2009) studied preference variations between distinctively dissimilar situations. Nevertheless, it is possible that slight differences in application might influence whether music is deemed appropriate for task. For example, Wolfe et al. (2002) examined the use of music for relaxation under non-anxiety conditions (e.g. relaxing at home). The subsequent recommendations therefore can only be related to those who are not anxious. It is possible that the characteristics of music required for anxiety control might differ from music for general relaxation.

Whilst the focus of this thesis is the use of music to control competitive state anxiety, it is evident that there are many environments that could benefit from music's relaxing properties. Currently, there is nothing in the literature that suggests that anxiety stemming from sport competition, for example, is different to that experienced prior to an exam or during dental surgery. In terms of antecedents, it is likely that many commonalties exist. For example, an exam or attending a dental surgery could induce a conditioned somatic responses and/or negative appraisals (Morris et al., 1981). It could therefore be argued, as long as the magnitude of the anxiety responses are comparable, then relaxing music should be equally effective in other environments. As such, it might imprudent at this time to confine the application of relaxing music to sport settings.

The fact that both competitive state anxiety (Martens et al., 1990a) and relaxation (Ryman and Rankin-Box, 2002) are considered as being multidimensional also requires attention. If music is to be a comprehensive relaxation strategy, then it should offer relief from both somatic and cognitive anxiety. Previous research does suggest that music might be effective at controlling both of these components. Based upon these considerations, the term 'Relaxing music for anxiety control' will be utilised. Relaxing music for anxiety control is that which controls the somatic and cognitive components of state anxiety. However, this term and operational definition will be amended if (1), future research does indeed show the effects of relaxing music for anxiety control to be context dependent and (2), if this thesis uncovers contrary evidence regarding relaxing music for anxiety control's ability to manage both aspects of competitive state anxiety.

2.1.4. The Music Rating Procedure

When considering those factors that might be conducive to the motivational qualities of music, Karageorghis et al. (1999) asked the opinions, via questionnaire, of a sample of fitness experts and exercise participants. This approach was successful and it ultimately resulted in the development of the Brunel Music Rating Inventory (BMRI); an inventory used to select musical accompaniment to exercise and sport. However, adopting a similar approach to determine the characteristics of relaxing music for anxiety control might be problematic. Musical accompaniment to exercise is common, and as such, it is likely that those involved in exercise have at least some knowledge of the musical characteristics that can aid motivation. In contrast, the use of music as an aid to relaxation within the sport environment appears to be relatively uncommon. Without point of reference, simply asking participants to state the factors that enhance the relaxing properties of music is unlikely to yield worthwhile data. Wolfe et al. (2002) also asked participants to consider those characteristics that enhanced relaxation; in this instance study participants were presented with a selection of musical excerpts as a point of reference. Wolfe et al's (2002) approach should, in theory, help participants to make more considered and valid decisions. Another difference between the approaches of Karageorghis et al. (1999) and Wolfe et al.

(2002) concerns the presence of the investigatory team. It appears that Karageorghis et al. (1999) were absent during the questioning process, whereas in the Wolfe et al. (2002) study, one of the research team was in attendance. The approach of Wolfe at al. (2002) might reduce the likelihood of satisficing (Bryman, 2004; Krosnick, 2000). For current purposes, it is an adaptation of the strategy of Wolfe et al. (2002) that will be used to determine the characteristics of relaxing music for anxiety control. That is, the characteristics of relaxing music for anxiety control will be, in the main, determined via questionnaire. Participants will be provided a range of musical excerpts as a point of reference, and the author will be present during the rating procedure.

2.1.5. Sample Composition

Whilst the method used by Wolfe et al. (2002) does have advantages, there is a particular issue that might have a bearing upon internal validity. Specifically, in their study Wolfe et al. (2002) asked a sample of non-musicians to rate the characteristics of 'music for relaxation'. This was completed without any indication of whether the participants had sufficient knowledge to provide the required detail. It is anticipated that the sample being used in this study will also include many non-musicians. The decision to utilise non-musicians was taken because it is expected that results will be used by individuals who might not have a high degree of musical knowledge; thus making the sample representative of the target population. Furthermore, limiting the sample to individuals with a high level of music knowledge could have a negative impact on participant numbers. As such, to maximise internal validity, it is imperative that efforts are made to ensure that the sample being used to determine the characteristics of relaxing music for anxiety control possess adequate requisite knowledge. Therefore, before the main music rating procedure, a representative sample will be tested on their level of music knowledge and their perceived ability to actually rate music for its relaxing qualities.

Because of the potential threats associated with using non-musicians (e.g. their ability to provide the required detail), an additional information-gathering strategy will be included. According to Bryman (2004) focus groups provide an opportunity to emphasise, and explore in depth, topics of interest. Robson (2002) also claims that this procedure empowers participants and encourages the free exchange of thoughts and ideas. Bryman (2004) recommends that focus groups should (1) consist of between 6-10 participants (2) include individuals who possess the required expertise and (3) where possible, minimise moderator involvement. Bryman (2004) also states that, conditions permitting, multiple focus group sessions should be administered. Unfortunately, given the need for participants who possess specific subject knowledge, this is may not be possible.

2.1.6. The Music Components

Some consideration of the number of music components to be assessed is required, as it is impractical to include all of the elements of sound. Wolfe et al. (2002) tended to focus on what could be considered to be the fundamentals of musical structure (e.g. tempo, harmony, dynamics). In contrast, the review of musical structure provided by Gabrielsson and Lindstrom (2001) included information on elements such as melodic direction, pitch level, timbre and tonality.

To ascertain which music components might be included in this investigation, a number of discussions were held with Professor of Music at University of Cumbria, Richard McGregor. During this dialogue the music components presented by

Gabrielsson and Lindstrom (2001) and Wolfe et al. (2002) were discussed in detail. In particular, Professor McGregor was questioned as to which music components he believed might be comprehendible to a group of non-musicians as an inability of the sample to comprehend the music components would threaten both the internal and external validity of the music rating procedure. Through this discourse, it was decided that some music components might not only difficult to understand, but also difficult to articulate through words.

The current author therefore decided that this thesis should focus upon the major musical components as it was felt that these might be easier to convey to the intended sample group. Using the aforementioned studies for guidance, an initial pool of eight components was selected. These were tempo, melody, beat, harmony, rhythm, complexity, interval and articulation. From the discussions with Professor McGregor, the author decided to include scale, key and melodic range. This gave a total of eleven internal music components. Following the suggestions of Karageorghis et al. (1999), two external factors were also included; these were music liking and familiarity.

2.1.7. Contextualising

As mentioned, it has been suggested that music appropriateness is a function of its intended application (North and Hargreaves, 1997b). The importance of this was recognised by Karageorghis et al. (1999) who include contextual instructions in the BMRI. Specifically, when rating music for its motivational qualities, respondents are required to 'imagine you are participating in sub-maximal aerobic treadmill running'. In line with this, during the relaxing music for anxiety control rating procedure, a statement of context will be given. Specifically, participants will be instructed with the following contextual statement 'imagine that you are in a situation that produces a relatively mild state of anxiety; for example, prior to a sport competition, prior to an exam in the dentist's waiting room'.

2.1.8. Conclusion

Taking the preceding considerations into account, the characteristics of relaxing music for anxiety control will be determined through a two-part investigation. First, and prior to main music rating procedure, a music knowledge test (Study 1) will be conducted. This procedure will be used to determine whether a representative sample of participants possess the required levels of requisite music knowledge. The results of this study will inform the design of Study 2. Study 2 will be the main music rating procedure and will be used to determine the particular characteristics of relaxing music for anxiety control. The study will be conducted in two-parts. The first will utilise a sample of predominately non-musicians to assess a selection of musical excerpts for levels of relaxation, music factors conducive to relaxation, emotional responses to music and the importance to relaxation of various music components. In the second part of the study, a focus group of music experts will be used to expand upon the details provided by the participants involved in the first.

Study 1: The Music Knowledge Test

2.2.0. Introduction

The characteristics of relaxing music for anxiety control will be determined through the use of a self-completion questionnaire. According to Bryman (2004), self-completion questionnaires provide a convenient and quick approach to data collection. They reduce the likelihood of interviewer effects and can be used to extract information from large groups of respondents (Gillham, 2000; Bryman, 2004). Despite these advantages, the use of self-completion questionnaires is not without issue. For self-report questionnaires to be completed successfully, respondents must have sufficient requisite knowledge (Oppenheim, 1992; Cozby, 1997; Gillham, 2000 and Bryman, 2004). In other words, the questions must be answerable. A lack of requisite knowledge can cause satisficing. Satisficing occurs when respondents answer with little or no cognitive effort or motivation; this can manifest as a lack of differentiation in ratings (Krosnick, 2000). Such an occurrence would obviously threaten the validity of any subsequent outcomes.

It is envisaged that many of the participants involved in the process to uncover the characteristics of relaxing music for anxiety control will have received little training, or education in music theory, yet they will be required to make judgements about the relevance of music components such as tempo, melody, harmony and articulation. It is possible that such a sample profile will not have the required levels of requisite knowledge to provide the required information; this could lead to participants satisficing. It is therefore crucial to assess whether this is indeed the case. The decision to utilise such a sample to determine the characteristics of relaxing music for anxiety control, as opposed to employing individuals with a high degree of music knowledge, should be explained. From a practical perspective, it is envisaged that the populations most likely to utilise the subsequent research findings (e.g. sports coaches, dentists) would not necessarily have extensive knowledge of music theory. Therefore, a sample that, in terms of level of music knowledge, reflected the population of interest (Jones, 1996) was deemed appropriate.

This approach is credible. When developing the BMRI, Karageorghis et al. (1999) opted to utilise a sample of student volunteers and fitness instructors. It is likely that many of these did not have musical training or high levels of music knowledge. Nevertheless, to date, the BMRI has been successfully utilised in many research investigations. However, the BMRI considers the impact of limited number of music components i.e. tempo, melody, rhythm and harmony. The current investigation will be much broader in scope. As such, it is prudent to examine the levels of requisite knowledge, and the ability to recognise and rate music components in a sample representative of that to be used to classify the characteristics of relaxing music for anxiety control. As stated previously, failure to do so might make any subsequent outcomes invalid.

Therefore, the aim of this study was to determine the levels of music knowledge in a sample of participants that were deemed to be representative of those to be used to determine the characteristics of relaxing music for anxiety control. To meet this end, the investigation was conducted in two parts. The first was designed to assess the level of knowledge without being prompted by definitions; this will provide information on the current state of understanding. In a further check, participants were asked to provide a definition of each of the components under scrutiny; this might also reduce the possibility of response bias. In part two, the definitions of various music components were supplied and participants were again questioned on both understanding, and their ability to rate the importance of each component.

2.2.1. Method

Participants

Fifty participants (male *n* = 21; female *n* = 29) aged between 17 and 29 years (*M* age = 20.2 years, *SD* = 2.7) took part in this study. All individuals classified themselves to be 'White British'. The University Ethics Committee approved the study and participants completed an informed consent form prior to involvement. The majority (78%) claimed to have little music knowledge (musical understanding), 12% a moderate level and 10% considered themselves to have a high level of music knowledge.

Instrument

Based on the work of Wolfe et al. (2002) and Gabrielsson and Lindstrom (2001), and the input of a music expert, two questionnaires were developed. Prior to questionnaire completion, participants were asked to rate their level of music knowledge as being either 'high', 'moderate' or 'low'; they were instructed to write this on the top of the questionnaire package. The distinction between knowledge about music (e.g. music history or current popular acts) and knowledge about music theory (e.g. relating to music components and structure) was verbally clarified. Participants were then asked to complete Questionnaire 1. This questionnaire asked participants if they understood the ten music components (e.g. *I understand the concept of tempo*). Responses were rated on a 5-point Likert scale (*1 = Very much so, 5 = Not at all*).

Next, participants were asked to provide a definition of each of the music components (e.g. *My description of Scale is..*).

Questionnaire 2 provided participants with a definition of each of the ten music components (Sadie, 2001; Kennedy, 1996) (e.g. *Interval: The distance between one note and another*). Participants were then asked whether they understood (e.g. *I understand the concept of interval*) and whether they would be able to rate the impact of each characteristic on relaxing qualities of music (e.g. *I feel I would be able to rate the impact of interval on the relaxing qualities of music*). Again, both questions were scored on a 5-point Likert type scale (1 = *Very much so*, 5 = *Not at all*). It was felt that liking, familiarity and complexity need not be tested as these were concepts that are not specific to music theory (see Appendix 1).

Procedure

According to Oppenheim (1992), response rates tend to be higher when questionnaires are completed in the presence of an 'official' figure. As such, the author was present during this process. Following a standardised verbal explanation of the aims of the study, participants were provided with an opportunity to read the participant information sheet. When participants agreed to take part in the study they signed the informed consent form, completed some demographical information (age and gender) and the two questionnaires. The questionnaires were completed in two groups of twenty-five.

Data analysis strategy

For the Likert items, mean and standard deviations were calculated. Following this, a median-split was used to determine the level of understanding for each of the ten musical components. Given that a 5-point scale was employed to assess this, the median value was set as three. For the definitions given by participants, responses were graded as percentage correct.

2.2.2. Results

Mean Values for Questionnaires 1

The mean scores reveal that only two of the music components received ‘understanding’ ratings that were less than the median value (see Table 1).

Table 1: Shows the Means and SD for Questionnaires 1 and 2.

	Questionnaire 1	Questionnaire 2	
Music Component	Mean ‘Understanding’	Mean ‘Understanding’	Mean ‘Ability to rate’
Tempo	2.58 (1.08)	2.12 (0.98)	2.58 (0.88)
Beat	2.86 (0.95)	1.92 (0.88)	2.16 (0.97)
Key	3.44 (1.32)	2.74 (1.08)	3.20 (1.05)
Rhythm	3.48 (0.98)	2.04 (0.94)	2.46 (1.07)
Melody	3.62 (1.11)	2.24 (1.04)	2.60 (1.04)
Melodic range	4.51 (0.98)	3.00 (1.35)	3.50 (1.21)
Scale	3.41 (1.50)	2.64 (1.27)	3.30 (1.27)
Harmony	3.55(1.12)	2.64 (1.19)	2.86 (1.26)
Articulation	4.55 (1.05)	3.46 (1.18)	3.50 (1.26)
Interval	3.75 (1.32)	2.56 (1.03)	2.92 (1.12)

Note: the lower the mean value the greater the level of understanding and ability to rate. Mean ‘Understanding’ refers to perceived level of understanding for each component and mean ‘Ability to rate’ refers to ability to rate a components impact upon the relaxing qualities of music.

Participant Definitions

For the definitions provided by the participants, the mean 'correct' score was, *M* = 36.6%, *SD* = 27.8%, *Range* = 0% - 90%. For the individual components, the definitions supplied for tempo were 89% correct; there were no incorrect responses as the remaining 11% utilised the 'not sure' option. For beat, 39% were correct; examples of incorrect responses are 'each sound played within music' and 'what makes up music'. Responses for key were 28% correct; incorrect responses included '*buttons on a piano*' and '*tone*'. For rhythm, there was a 35% correct response rate with incorrect answers including 'staying in time with the music' and 'frequency of music'. Melody received a 17% correct response rate; incorrect responses included 'the middle section of the music' and 'similar to chorus'. For melodic range, only a 5% of the answers were correct. There were no incorrect answers as the remaining 95% utilised the 'not sure' option. Scale received a response rate of 39% correct; incorrect responses included 'how high you are singing' and 'how the music goes'. For harmony, 35% of the answers were correct; examples of incorrect answers are 'peaceful' and 'the melody which accompanies music'. Articulation received a correct response rate of only 5%. Most utilised the 'not sure' option, although one participant responded with 'the bony joints'. Lastly, the percentage of correct answers for interval was 5%, with incorrect responses including 'a gap in the music' and 'a break in a song'.

Mean Values for Questionnaire 2

Questionnaire 2 provided participants with Dictionary definitions of the music components (Sadie, 2001; Kennedy, 1996). When the definitions were given, the reported level of understanding increased, with nine of the ten components receiving mean values that were equal to, or below the median value (see Table 1). As to whether participants felt they would be able to rate the impact of each upon the relaxing qualities of music, in this case, only four of the ten components were above the median value (key, melodic range, scale and articulation).

2.2.3. Discussion

If the characteristics of relaxing music for anxiety control are to be determined, it is vital that participants who might have little music knowledge are able to understand the nature of the music components being scrutinised. Questionnaire 1 asked participants to rate their level of understanding of the ten components. The results showed that without direction, the majority of respondents had difficulty understanding, or were confused as to, the meaning of the music components to be investigated. Specifically, only tempo and beat met the criterion measure of knowledge ($M < 3$). This lack of knowledge was borne out when participants were asked to provide definitions for each component. Marked as a percentage correct, scores ranged from 0 – 90%. However, the mean score was only 36% correct. It was also noted that some who believed that they possessed a reasonable degree of music understanding were actually mistaken in this belief when the definitions they offered were scrutinised. Overall, the results from Questionnaire 1 showed that participants in general had low levels of requisite knowledge. This would have serious implications for main study; the determination of the characteristics of relaxing music for anxiety control.

Fortunately, when the Dictionary definitions were presented (Sadie, 2001; Kennedy, 1996), the perceived level of understanding increased, with nine of the ten components now meeting the required criteria. Importantly, for six of the ten components, the respondents now believed that they would be able to rate their impact upon the relaxing qualities of music. Although not ideal, this outcome is an improvement and suggests that participants with limited music knowledge can be utilised to determine the characteristics of relaxing music for anxiety control; as long as definitions are provided.

Although the results from Questionnaire 2 are encouraging, a number of issues require consideration. First, once participants had been supplied with the definitions of each music component, asking them to confirm understanding by providing there own definition became pointless. Thus, there was no way to detect whether response bias was evident. Response bias occurs when participants want to please the researcher or might be embarrassed about lack of understanding and as such, provide false responses (Kay, 2005); although some believe that the strength of this concern is overstated (Wildman, 1977). Participant anonymity has been offered as a means of reducing response bias (Wildman, 1977; Oppenheim, 1992). This was provided in the current investigation, so perhaps the responses did reflect the true level of understanding. Second, even with the increased level of understanding, the respondents generally felt that they would not be able to rate the impact of melodic range, articulation, scale and key upon the relaxing qualities of music. This outcome does have serious implications as those involved in the determination of the characteristics of relaxing music for anxiety control will be asked to rate the influence of these components. This suggests that using forced response items during this process would be inappropriate. Forcing participants to respond to unanswerable questions is likely to threaten validity. The inclusion of a ‘not sure’ option appears to be the obvious course of action. However, according to Krosnick (2000) and Bryman (2004) this can increase the likelihood of participants satisficing. Whilst the risk of participants satisficing is concerning, this is preferred to forcing participants to respond to questions they cannot answer. In other words, participants gravitating towards a ‘not sure’ response, is preferable to forcing what is likely to be a false response.

To conclude, the results from this study revealed that many participants had an insufficient level of requisite music knowledge. However, when definitions were supplied this understanding rose to what might be considered an acceptable level. These results suggest that participants without high levels of requisite knowledge can be used to uncover the characteristics of relaxing music for anxiety control. These outcomes have highlighted some issues surrounding the use of forced response items and response bias. These will be taken under consideration when designing the instruments, and methodological processes, for the determination of the characteristics of relaxing music for anxiety control. Specific attention will also be afforded to melodic range, articulation, scale and key before any definite conclusions are drawn.

Study 2: The Characteristics of Relaxing Music for Anxiety Control

2.3.0. Introduction

Anxiety is generally regarded as a negative emotional response to situations that are appraised to be threatening, (Spielberger, 1989). At the cognitive level, anxiety can produce feelings of apprehension, uneasiness, preoccupation, and worry (Martens et al., 1990a; Carson, Butcher and Mineka, 1998). Anxiety also contains a somatic component (Martens et al., 1990a). Somatic anxiety relates to both the physiological reactions (e.g. increased heart-rate, cortisol secretion) and the affective responses associated with the physical changes (Morris et al., 1981). Intervention methods have been developed to help individuals control both the cognitive (e.g. meditation and CBT) and somatic components (e.g. PMR and AR) of competitive state anxiety (e.g., progressive muscular relaxation, biofeedback, meditation and systematic desensitisation). Whilst such procedures are believed to be beneficial they are not without limitations (Keable, 1997). Some of the techniques might induce deep-relaxation, a response that is not always required (Payne, 2000), for example immediately prior to sports competition (Crocker et al., 2002). Furthermore, the efficacy of most techniques will be dependent on regular practice (Crocker et al., 2002). As such, practitioners are required to devote considerable time to their mastery. Many also require specific conditions, for example lying in the prone position and quiet (Cratty, 1989). Thus, the demands associated with the 'traditional' relaxation methods might make them impractical. These constraints have been recognised by Payne (2000) who suggest that 'on-the-spot' relaxation methods might be more viable in many instances. The aim of such methods is to reduce superfluous tension whilst allowing the individual to maintain a degree of alertness. Furthermore, the essential characteristics of ‘on-the-spot’ relaxation procedures are that they are portable, relatively brief, convenient, and unobtrusive, whilst still being an effective aid to relaxation (Lichstein, 1988). One technique that would fulfil the recommended criteria is music listening.

There have been numerous attempts to determine the anxiolytic effects of music; these have generally been conducted within medical environments. Reviews by Evans (2002), Pelletier (2004), and Nilsson (2008) have all shown that listening to music can be effective at alleviating state anxiety. However, there are inconsistencies within the extant literature. In the review by Evans (2002), nineteen studies were scrutinised and it was concluded that music whilst can reduce the self-reported anxiety levels in many hospital patients, the effect was not apparent for those undergoing ‘unpleasant’ medical procedures. Furthermore, the effect of music on physiological indices was equivocal. Nilsson’s (2008) review of forty-two relevant studies, found that music only had the desired psychological effect (as measured via self-report) in fifty-percent of the cases. Just twenty-seven percent reported that music could reduce the somatic symptoms of anxiety (e.g. heart-rate and blood pressure). Finally, Pelletier (2004), analysing twenty-two studies, concluded that passive listening to music could reduce stress. However, a number of moderator variables were identified (e.g. age and musical expertise). In addition, the type of stressor influenced the strength of the response. For example, women preparing for labour received the greatest benefit whilst those suffering from occupational stress, the least.

One of the main difficulties with investigating the anxiety reducing effects of music regards the selection of appropriate stimuli. Music for anxiety research has generally adopted one of two approaches, a participant-centred approach in which the participant selects the music, or the experimenter-centred approach in which music is selected by the experimenter. The participant-centred method has an inherent bias as the listener may unwittingly over evaluate the effects of the music (Karageorghis et al., 1999). Although the experimenter-centred method nullifies the possible response bias, there has generally been a failure to consider the music characteristics that may impact upon how music is appraised. For example, experimenter-selected studies have used a large variety of musical styles and broad based descriptions, for example, ‘new age’, ‘classical’, and ‘slow instrumental’ (Nilsson, 2008). This approach is problematic because even if the desired effects are forthcoming, the lack of detail provides little direction for others wishing to select music for anxiety control purposes.

The issues surrounding participant-selected music are not restricted to response bias. For example, if the music selected by the participant does induce a relaxation response, it is still possible that alternative compositions may have produced an even greater effect. Furthermore, although self-selected music might work for the individual, from an applied perspective, this might be of little benefit in environments where multiple listeners are present (e.g. sport dressing rooms, hospital waiting room or exam waiting areas). On the whole, it appears that selection of music for anxiety research has been based on subjective criteria rather than being directed by objective empirical evidence, thus the external validity and generalisability of previous studies is questionable. Moreover, selecting music by either method fails to provide any indication as to which components of music might be most conducive to relaxation (e.g. tempo, melody, harmony). Overall, the failure to give proper consideration to the musical stimuli might account, in part, to the contradictory findings of previous research.

To date, there have been few attempts to establish which musical characteristics might be used to classify a piece as relaxing. Wolfe et al. (2002) have made efforts and have offered some guidance on this issue. The results from their study revealed that components such as tempo, dynamics, instrumentation and melody can impact upon the relaxing interpretation of a musical piece. It was also found that non-musicians and musicians tended to agree on which tracks were most/least relaxing. Gabrielsson and Lindstrom (2001) have also provided some recommendations. In a review of how musical structure influences emotional expression, they suggested that characteristics such as rhythm regularity, slow tempo, legato articulation, high pitch, narrow pitch range with stepwise ascending progressions, simple and consonant harmonies and regular rhythm may enhance the relaxing nature of music. More recently, Gomez and Danuser (2007) also touched on this when they looked at the relationship between musical structure and emotions. Questioning thirty-one participants, the majority musically trained, they found that tempo accentuation and rhythmic articulation were the components that differentiated what they termed, ‘low arousal’ music from ‘high arousal’ music.

Whilst this information does suggest that particular music characteristics might be conducive to relaxation, the works of Gabrielsson and Lindstrom (2001), Wolfe et al. (2002) and Gomez and Danuser (2007) are of little practical use as the information provided lacks functional detail, thus hampering practical application. For example, Gabrielsson and Lindstrom (2001) state that characteristics such as ‘slow tempo’, ‘harmonic consonance’ and ‘regular rhythm’ are considered to be relaxing. Wolfe et al. (2002) inform the reader that ‘softer sounds’, ‘a pleasant combination of instruments’ and ‘low volume’ aid the relaxation response. In most cases, there was a failure to elaborate on such recommendations.

The criticisms of previous efforts to classify relaxing music are not confined to a lack of functional detail. In general, these attempts have failed to acknowledge the importance of personal characteristics. It has been suggested that music preference, or liking, influences how the listener responds to music (LeBlanc, 1980; Davis and Thaut, 1989; Karageorghis et al, 1999; Wolfe et al., 2002; Walworth, 2003), and according to LeBlanc (1987), personal characteristics such as gender and level of musical knowledge moderate music preference. There is support for LeBlanc's (1980) assertions. Focusing firstly upon gender, research by Russell (1997) and Buzarovski, Humphreys and Wells (1996) has shown that gender specific music preferences do exist. For example, Buzarovski et al. (1996) showed that males have a propensity for the harder styles of music such as rap and rock. In contrast, females have been found to prefer the 'softer' styles of music such as pop, modern dance (Russell, 1997). Females have also been found to possess more favourable attitudes towards classical music than males (Russell, 1997; Teo, 2005). Additional evidence of gender-based preferences is presented by Millar (2008), who found that whilst both genders expressed a preference for male recording artists, this inclination was stronger for males.

Regarding degree of music knowledge, it has been claimed that musically skilled individuals, which one would assume have relatively high levels of music knowledge, have a greater affinity for relatively complex music forms. The musically unskilled are more likely to prefer relatively simple compositions (Hargreaves, 1986). This has been supported by Fay, Warren and Middleton (1941 cited in Hargreaves, 1986, p. 140) who found that participants with higher than average musical talent did have a greater propensity for classical pieces; those with limited talent preferred 'less serious' music. More recently, Hargreaves, Comber and Colley (1995) also found that as level of music training increased, so did the liking for more series styles of music (e.g classical, jazz and opera).

It is suggested that musical ability might also affect attentional direction during music listening. Williams (2005) concluded that individuals with high music ability were more attentive to the harmonic aspects of the music, whilst those with limited music ability tended to focus upon melody. Similar findings have been offered by Rentz (1992), who asked participants to listen to a number of orchestral pieces and state which music components they were focusing on. It was found that there was a tendency for non-musicians to attend to the more obvious brass, percussion and wood-wind instruments for longer than musicians. Musicians were more likely to focus upon stringed instruments, more frequently and for longer periods than non-musicians. Musicians were also more able to focus on simultaneous instrumentation. As in the Williams (2005) study, non-musicians were also more likely to be drawn towards the melodic aspects of music. It must be acknowledged that Wolfe at al. (2002) did compare the ratings of relaxation given to music excerpts between musicians and non-musicians. It was found that level of music knowledge had little impact upon which pieces were considered relaxing. However, that fact that only six music experts included in the study undermines the veracity of this conclusion. It appears that there is currently no information on whether attentional differences exist between the genders.

The third issue with previous attempts to classify relaxing music relates to intended application. According to North and Hargreaves's (1997b) 'preference-for-prototypes model' of music preference, preference for music is dependent on context. It is therefore possible that the characteristics of relaxing music might be context specific. For example, music required for relaxation when in a non-anxious state could have different properties to music required for anxiety control. The works of Gabrielsson and Lindstrom (2001), Wolfe et al (2002) and Gomez and Danuser (2007) considered music as it relates to the non-anxious listener, and not for the purposes of anxiety control.

In summary, Gabrielsson & Lindstrom (2001); Wolfe et al. (2002) and Gomez and Danuser (2007), have presented details of some of the music characteristics that might aid relaxation. From there recommendations it does appear that particular structural characteristics are considered conducive to this state. However, the information provided is limited as first, the lack of functional detail makes the selection of music for the purpose of relaxation difficult. Second, it is possible that personal characteristics such as gender and level of music knowledge could influence both predilection for, and reactions to music. Third, music application might be context specific and as such it may be useful to assess the relaxing characteristics of music with specific reference to anxiety reduction; an approach that has not previously been utilised. These factors might have a bearing upon the recommendations for relaxing music for anxiety control. Based upon these limitations the aims of this two-part investigation are (1) provide detailed information on the characteristics of relaxing music for anxiety control, (2) determine which music components (e.g. tempo, melody, harmony) are considered to be most conducive to relaxation, (3) establish which music genres are most appropriate for this application (4) record the emotions induced by listening to relaxing music and (5) assess whether the gender and level of music knowledge has any impact upon the selection of relaxing music for anxiety control.

Music Rating Procedure

2.3.1. Method

Participants

In total, eighty-four participants (male *n* = 55; female *n* = 29) aged between 16 and 35 years (*M* age = 19. 77 years, *SD* = 3.28) took part in the music rating procedure. For level of music understanding, participants were allocated into one of two groups; this was based on their responses to the associated Likert item (*how would you rate your level of musical understanding?*). This created a high musical knowledge group (responses 1, 2, 3), which comprised thirty-one participants (*M* age = 19.41, *SD* = 3.80), twenty-six males and five females, and a low music knowledge group (responses 5, 6, 7) of thirty-five participants (*M* age = 20.11, *SD* = 3.13), sixteen of whom were male and eighteen were female. Four participants did not specify their level of musical knowledge; these were nevertheless included in the main and gender sample analysis). Seventy-nine of the participants classified themselves as being 'White British'; three as 'White Irish' and two as 'Asian British'. The study was approved by a University Ethics Committee and participants completed an informed consent form prior to study participation.

Instruments

A questionnaire was developed to assess various aspects of relaxing music. The instrument composed of four sections. Section one provided information on the aim of the study and also included a list of musical compositions that would be presented. Section two required the participants to complete demographic information (age, gender, and ethnicity). Participants were also asked to state their current level of music knowledge (*How would you rate your level of musical understanding?*). This was rated on a 7-point Likert item. It should be noted that in this instance the term ‘level of musical understanding’ was utilised in preference to ‘level of musical knowledge’. This decision was taken because it felt that musical knowledge could be interpreted to mean knowledge about, for example, musical acts. Musical understanding was considered to be more indicative of being able to comprehend music theory. The distinction between these phrases was explained to participants. Level of musical understanding was however rated with the response anchors (*1 = very knowledgeable, 7 = not at all knowledgeable)*.

Based on recommendations by North and Hargreaves (1997b), participants were asked to create a context in which they would complete the assessment of the music pieces. That is, participants were requested to imagine themselves in a ‘situation that provokes a relatively mild state of anxiety’. This was recorded on the information sheet. Finally, participants were provided with a definition of ‘relaxing’. The following definition was provided: ‘making less tense, calming, soothing’. This description was contrived from the entries for ‘relax’ and ‘sedative’ as provided in the Webster’s Master English Dictionary (2002). The author felt that this definition offered a good description of the intended application of relaxing music.

In section three, participants were asked to rate each composition on its relaxing qualities on a 7-point Likert scale (*1 = very relaxing, 7 = not at all relaxing)*. Following this, participants were required to indicate the emotions elicited by the music track by selecting from a list of twenty-three emotions (e.g. boredom, joy, peaceful, pensiveness). Most of these were obtained from the work of Plutchik (1980), however, during the pilot process (see below for details) a number of participants were unclear as to the meaning of the term ‘serenity’. Therefore, the term ‘peaceful’ was added to the twenty-two emotions selected from the classifications of Plutchik

(1980). For each composition, participants were provided with the opportunity to provide details of any particular music factors that either enhanced or diminished the perceptions of relaxation.

Section four was designed to assess the relative importance of 13 music components (tempo, beat, key, rhythm, melody, melodic range, scale, harmony, articulation, interval, complexity, liking and familiarity) to the relaxation response (e.g. *I feel that harmony influences how relaxing a piece of music is*). Responses were scored on a 7-point Likert scale (-3 = *not at all*, 0 = *not sure*, +3 = *very much so*). To aid understanding, a definition was provided for each component (Kennedy, 1996; Sadie, 2001). The selection of these music components was directed by the work of Gabrielsson and Lindstrom (2001) and Wolfe et al. (2002) with some additional input from a music expert (Professor of Music at University of Cumbria, UK).

Music Sample

The music sample selected for this investigation consisted of the following styles of music, classical, popular chill-out, chilled dance, new age, ambient and space rock. The majority of the tracks were taken from albums that were either suggestive of relaxation, or actually titled as such. Initially, a pool of forty compositions was selected. Guided by the works of Gabrielsson and Lindstrom (2001), Wolfe et al. (2002) and Gomez and Danuser, (2007), a discussion was held with the music expert during which all forty pieces were considered for inclusion into the study. From this process, a sample of thirty compositions was agreed upon (see appendix 2). The music sample contained pieces that conformed strongly to assertions of Gabrielsson and Lindstrom (2001), Wolfe et al. (2002) and Gomez and Danuser, (2007), some that moderately conformed and others weakly. A 90 second segment that represented the major features of each piece was recorded onto CD-R. The compositions were played via a LGDUC8 700 DVD/CD player with Denon PMA-100M amplifier. A Silverline sound level meter was used to set volume.

Procedure

Prior to the main investigation a pilot study was conducted. This process involved ten, University students (male n = 6; female n = 4) aged between 19 and 26 years (*M* age = 21.20 years, *SD* = 2.04) and was used to examine the veracity of both the instrument and the intended research protocol. Upon completion of the pilot study, participants were asked a series of questions relating to the activity that they had undertaken. Participants were also encouraged to voice any favourable/unfavourable opinions. It was found that participants were able to rate the relaxing properties of music using the instrument. Also, it was established that the participants preferred to listen to all tracks in the same session rather than in two separate sessions, that the musical excerpts were of an appropriate duration and that the scoring system was both understandable and manageable. Pilot participants also indicated that it was important to provide a clear context in which the music was listened to because this would influence ratings of the tracks.

The actual experimental procedure took place in a quiet and comfortable room in groups of 15-20 participants. The order of presentation of tracks was varied for each session (given the number of compositions, strict counter-balancing was not utilised in this instance as). Following instructions by the author, the provision of consent, and the completion of the demographic information the rating procedure began. The researcher presented each composition at a volume of 70 decibels; this was in accordance with the findings of Staum and Brotons (2000). Participants actively listened to each track for the initial 45-seconds, and then a signal was given to complete the relevant sections once this time interval had passed. Once the first composition was over, the CD player was paused to allow the participants to finish their assessment. The next excerpt was not introduced until all had completed this task. All remaining tracks were presented in this manner. Upon completion of this section, participants were instructed to complete the final section.

Data analysis strategy

For the data analysis, the sample as a whole was first considered (main sample). Analysis procedures were then conducted on the sample split by gender (gender samples) and then by level of music knowledge (level of music knowledge samples). Unfortunately, due to the sample size restrictions, gender × level of music knowledge analysis was not feasible. To determine the relaxing qualities (relaxation quotient) of each musical piece, mean values were calculated. An average relaxation quotient was calculated for both the most (n = 8) and least relaxing music samples (n = 7), and paired-sample t-tests were employed to assess whether the most relaxing and least relaxing music samples differed significantly. For gender, the relaxation quotients for the most relaxing tracks were analysed for between-group differences using MANOVA. This procedure was also utilised for the least relaxing selections. The MANOVA procedure was repeated to assess for level of music knowledge differences.

A simple count was used to determine which music genres were present in each of the samples. Response frequencies were used to ascertain the most prevalent emotional labels; these were then converted into a percentage of the total responses given. The relative importance of the music components under scrutiny was calculated by using sample means and rank orders. However, for the gender and level of music knowledge samples, between-group comparisons of the importance ratings were examined using MANOVA. Finally, for the open-response data simple content analysis was applied in which themes were created (e.g. melody, vocals, tempo, lyrical content) and the frequencies of statements related to these themes being counted and the most common presented (Jones, 1996; Robson, 2002; Wilkinson, 2004).

2.3.2. Results

Relaxation quotient

Main Sample: For the main sample the most relaxing tracks ranged from M = 2.65, SD = 1.34 to M = 2.94, SD = 1.33, and the least relaxing from M = 5.02, SD = 1.66 to M = 5.78, SD = 1.19. Nineteen of the pieces had a mean relaxation quotient below the median value (the median value was 4), and eleven pieces were above. To classify music as relaxing or non-relaxing, initially inter-quartile ranges were utilised, however, this approach was ineffective because there were too few pieces placed in the lower and upper boundaries to be of practical use. Therefore those tracks (n = 8) with a mean relaxation quotient equal to, or less than three were considered as being the most relaxing music and those with relaxation quotients equal to, or greater than five (n = 7) as least relaxing. The paired-sample t-tests showed that the sample relaxation quotients were significantly different, t (83) = -20.77, $p < .001$. These results suggest that there were clear differences between the most and least relaxing music samples. The most relaxing tracks for the main sample, in descending order, were 'Watermark' performed by Enya; 'Orchestral Suite #3 In D, Air- On The G String' (Bach) performed by the Stuttgart Chamber Orchestra; 'Rainbird' (artist unknown) available on the CD compilation Pure Ambience and Relaxation (Eye of the Storm); ‘Adagio for Strings Op.1’(Barber) performed by The London Festival Orchestra; ‘Flower Duet (Dome Epios) from Lakme’ (Debiles) performed by The Vard Sisters; ‘Novio’ performed by Moby; ‘Symphony No. 5 in C Sharp Minor: IV. Adagietto’ (Mahler) performed by The Chicago Symphony Orchestra and ‘Blue Creatures’ (artist unknown) available on the CD compilation Pure Ambience and Relaxation (Oceania). The least relaxing tracks, in descending order were: ‘O-I’ performed by the Ozric Tentacles; ‘Chai’ performed by the Ozric Tentacles; ‘Little Fluffy Clouds’ performed by The Orb; ‘Ride of the Valkyries’ (Wagner) performed by the London Symphony Orchestra; ‘En Csak Azt Csodalom (Lullaby for Katharine)’ performed by Marta Sebestyen; ‘633 Squadron’ (Goodwin) performed by London Symphony Orchestra and ‘Agog in the Ether’ performed by Ozric Tentacles.

Gender: Examining the gender samples, the mean values for the eight most relaxing pieces selected by the males ranged from *M* = 2.49 (*SD* = 1.44) to *M* = 2.96 (*SD* = 1.46). The seven least relaxing pieces ranged from *M* = 4.76 (*SD* = 1.86) to *M* = 5.72 (*SD* = 1.39). Nineteen of the pieces had a mean relaxation quotient below the median value and eleven pieces were above. For females, the most eight relaxing tracks ranged from *M* = 2.44 (*SD* = 1.18) to *M* = 3.28 (*SD* = 1.38) and the seven least relaxing from *M* = 5.13 (*SD* = 1.27) to *M* = 5.93 (*SD* = .70). Fifteen of the pieces were below the median value. Comparing the relaxation quotients for the individual tracks (in total ten from the most relaxing selections were analysed and nine from the least relaxing selections) by gender, the MANOVA showed that of the most relaxing pieces only one, Adagio for Strings Op.1 (Males *M* = 2.51, *SD* = 1.43; Females *M* = 3.51, *SD* = 1.50) was significantly affected by gender ($F_{(1, 69)} = 7.60$, $p = .007$, $d = .68$). For the least relaxing music sample, two pieces were significantly different; these were: 'Feel So Sad' performed by Spiritualized (Males *M* = 4.01, *SD* = 1.39; females *M* = 5.13, *SD* = 1.27); (F (1, 70) = 10.91, *p* = 0.02, *d* = .84) and 'Agog in the Ether' (Male *M* = 4.76, *SD* = 1.86; Female *M* = 5.46, *SD* = 1.13); ($F_{(1, 70)}$ = 3.99, *p* = .49, *d* = .45). Note: 'Feel So Sad' was not present in the main sample.

When the means of the most relaxing sample and least relaxing sample were compared, significant differences were present for both the male sample (t (83) = -20.77, *p* <.001) and the female sample (t (83) = -23.10, *p* <.001), thus indicating clear differences between the most and least relaxing music samples. Six relaxing pieces were common to both gender samples. Overall, the music selections for males and females showed a high degree of consistency between one and another and with the main sample. Only one of the most relaxing and two of the least relaxing selections received significantly different relaxation quotients.

Level of Music Knowledge: Regarding level of music knowledge samples, for low music knowledge, the eight most relaxing pieces ranged from *M* = 2.77 (*SD* = 1.43) to *M* = 3.17 (*SD* = 1.38). The seven least relaxing pieces ranged from *M* = 4.94 (*SD* = 1.25) to *M* = 5.60 (*SD* = 1.09). There were sixteen pieces below the median value and fourteen above. For the high music knowledge, the most relaxing pieces ranged from *M* = 2.13 (*SD* = 1.27) to *M* = 2.90 (*SD* = 1.49) and for the least relaxing, the means ranged from *M* = 4.96 (*SD* = 1.35) to *M* = 5.87 (*SD* = 1.40). There were seventeen pieces below the median and thirteen above. Comparing the relaxation quotients for the individual tracks (in total eleven were analysed from the most relaxing selections and eight from the least relaxing selections) by level of music knowledge, the MANOVA revealed that three of the most relaxing pieces received significantly different relaxation quotients; these were: ‘At the River’ performed by Groove Armada (high music knowledge *M* = 2.83, *SD* = 1.26; low music knowledge *M* = 3.62, *SD* = 1.57); ($F_{(1, 53)}$ = 6.57, p =.007, *d* = .55); ‘Adagietto’ (high music knowledge M = 2.44, SD = 1.62; low music knowledge *M* = 3.50, *SD* = 1.45); ($F_{(1, 53)}$ = 4.99, *p* = .03, *d* = .78) and ‘Adagio for Strings’ (high music knowledge *M* = 2.36, *SD* = 1.45; low music knowledge *M* = 3.30, *SD* = 1.70); ($F_{(1, 53)}$ = 9.94, *p* = .03, *d* = .59). All were considered to be more relaxing by the high music knowledge sample. There were no significant differences for the least relaxing pieces. Note: ‘At the River’ was not present in the main sample.

When the most relaxing music sample was compared to the least relaxing, there was a significant difference for the high music knowledge group (t (65) = -17.65, *p* <.001) and the low music knowledge (t (83) = -23.57, *p* <.001). Overall, the music selections for level of music knowledge showed a reasonably high degree of consistency between one and another and with the main sample. Five compositions were common to the level of music knowledge samples. These pieces were also present in the main sample. Only three of the most relaxing pieces received significantly different relaxation quotients.

Compositions common to all samples: ‘Watermark’; ‘Orchestral Suite #3 In D, Air - On The G String’ (Bach); ‘Rainbird’; ‘Symphony No. 5 in C Sharp Minor: IV. Adagietto’ (Mahler) and ‘The Flower Duet (Dome Epios) from Lakme’ (Debiles).

Music genre

Of the compositions selected, for the main sample, the most relaxing tracks included four classical pieces, two new age and two popular chill-out. For the least relaxing tracks, two were classical, two space rock, two new age and one popular chill-out. For males, there were four classical, three new age and one popular chill-out compositions in the most relaxing sample. For females it was three popular chill-out, three classical and two new age. Although the analysis for gender showed that the most relaxing pieces did not receive significantly different scores, an inspection of the mean rank order data suggests that females tended to perceive popular chill-out as being the most relaxing genre, whereas for males it was classical. For the least relaxing pieces, in the male sample there were three classical, two space rock, one new age and one popular chill-out. For females, three space rock, two new age, one classical and one popular chill-out were selected.

For level of music knowledge, the most relaxing sample for the low music knowledge group contained three popular chill-out, two classical and three new age compositions. In the least relaxing music sample it was two classical, two space rock, one popular chill-out, one ambient and one new age. For high music knowledge there were four classical compositions, three popular chill-out and one new age in the most relaxing sample. The least relaxing sample contained two classical, two space rock, two new age and one popular chill-out. Rank order analysis revealed that the low knowledge group tended to rate the popular chill-out compositions as most relaxing, whilst for the high knowledge group it was classical. However, as stated, only two of the classical pieces received significantly higher relaxation quotients. In this instance, the two Classical pieces were considered to be significantly more relaxing by the high music knowledge group.

Emotional labels

For the most relaxing music, the most frequent labels in the main sample were: ‘peaceful’ (n = 374); ‘serenity’ (n = 208); ‘sadness’(n = 171) and ‘joy’ (n = 116). Presented as a percentage of total responses, the values are 22.5%, 12.5%, 8.8% and 5%. For males, the most frequent emotional labels were: ‘peaceful’ (n = 216); ‘serenity’ (n = 143); ‘sadness’ (n = 105) and ‘joy’ (n = 62). In terms of percentage of overall responses, the figures are 18.4%, 12.2%, 8.9% and 5.3% respectively. For females the frequencies were: ‘peaceful’ (n = 126); ‘serenity’ (n = 61); ‘sadness’ (n = 40) and ‘joy’ (n = 20). Presented as a percentage of total responses, the values are 27.2%, 13.1%, 8.6% and 4.3% respectively. For level of musical knowledge, the most frequent labels were for the high musical knowledge group were: ‘peaceful’ (n = 141); ‘serenity’ (n = 57); ‘sadness’ (n = 55) and ‘joy’ (n = 52). As a percentage of total responses, the values are 28%, 11.3%, 10.9% and 10.3% respectively. Lastly, for the high musical knowledge group, the most frequent emotional labels were: ‘peaceful’ (n = 161); ‘serenity’ (n = 113); ‘sadness’ (n = 69) and ‘joy’ (n = 56). For percentage of total responses, the figures are 23.5%, 16.5%, 10% and 8.1% respectively.

Table 2: Shows the main sample importance ratings for each music component. These are displayed as rank order, mean values and standard deviations.

Importance Rating	Component	Mean/SD
1st	Tempo	1.87 (1.36)
2nd	Melody	1.60 (1.42)
3rd	Beat	1.51 (1.45)
4th	Harmony	1.19 (1.47)
5th	Rhythm	1.20 (1.47)
6th	Liking	1.02 (1.92)
7th	Complexity	0.95 (1.75)
8th	Key	0.87 (1.57)
9th	Scale	0.70 (1.29)
10th	Articulation	0.50 (1.24)
11th	Interval	0.49 (1.66)
12th	Melodic Range	0.42 (1.58)
13th	Familiarity	-1.23 (1.84)

Note: Importance rating refers to level of influence each music component has on the relaxing qualities of music.

Musical components importance rating

Table 2 shows the importance value placed upon each music component in the main sample. Because this section included a 'not sure' option, the prevalence of this response was also calculated. In ascending order, it was found that 28%, 28%, 37%

and 45% respectively, applied the ‘not sure’ option for key, melodic range, articulation and scale. This suggests that a significant proportion did not completely understand these concepts as it relates to relaxation. For gender (table 3), the only significant difference was for rhythm, ($F_{(1, 77)} = 4.59$, $p = 0.035$). For level of music knowledge (table 4) significant differences were evident for melody ($F_{(1, 63)} = 3.94$, $p = .05$) and scale ($F_{(1, 63)} = 3.97$, $p = .05$).

Table 3: Shows the gender sample importance ratings for each music component. These are displayed as rank order, mean values and standard deviations.

Importance Rating	Male	Mean/SD	Female	Mean/ SD
1st	Melody	1.82 (1.24)	Tempo	1.96 (1.01)
2nd	Tempo	1.81 (1.53)	Beat	1.65 (1.07)
3rd	Rhythm	1.42 (1.49)	Harmony	1.20 (1.26)
4th	Beat	1.41 (1.63)	Melody	1.13 (1.61)
5th	Harmony	1.17 (1.58)	Complexity	1.07 (1.08)
6th	Liking	1.01 (2.02)	Liking	0.96 (1.88)
7th	Key	0.88 (1.77)	Interval	0.92 (0.85)
8th	Complexity	0.86 (2.03)	Rhythm	0.75 (1.37)
9th	Scale	0.76 (1.42)	Key	0.75 (1.12)
10th	Articulation	0.51 (1.37)	Melodic Range	0.62 (1.17)
11th	Interval	0.34 (1.89)	Scale	0.55 (1.02)
12th	Melodic Range	0.32 (1.79)	Articulation	0.44 (0.90)
13th	Familiarity	-1.24 (1.90)	Familiarity	-1.20 (1.80)

Table 4: Shows the music knowledge sample importance ratings for each music component: Rank order, mean values and standard deviations.

Importance Rating	Low Music Knowledge	Mean/ SD	High Music Knowledge	Mean/ SD
1st	Tempo	2.00 (1.18)	Melody	2.03 (1.18)
2nd	Beat	1.60 (1.11)	Tempo	2.00 (1.59)
3rd	Melody	1.37 (1.45)	Complexity	1.13 (1.86)
4th	Liking	1.34 (1.45)	Beat	1.35 (1.85)
5th	Harmony	1.31 (1.92)	Rhythm	1.30 (1.51)
6th	Rhythm	1.20 (1.36)	Liking	1.19 (1.86)
7th	Key	0.97 (1.42)	Scale	1.66 (1.41)
8th	Complexity	0.71 (1.58)	Harmony	1.00 (1.83)
9th	Scale	0.51 (1.22)	Key	0.79 (1.91)
10th	Melodic Range	0.48 (1.19)	Articulation	0.56 (1.43)
11th	Articulation	0.40 (1.11)	Interval	0.53 (1.92)
12th	Interval	0.37 (1.43)	Melodic range	0.30 (1.82)
13th	Familiarity	-0.94 (1.84)	Familiarity	-1.58 (1.52)

Open Ended Responses

For each composition, participants were asked to state whether they felt any particular factors impacted (positively or negatively) upon relaxation. It should be noted that many of the participants did not fully utilise this option and those that did tended to provide little functional detail. Nevertheless, some interesting details emerged from those who did respond. The most common responses were those that referred to tempo (*n* = 548). Music that was too fast or too slow hampered relaxation; music that was 'too slow' was perceived as boring. For some of the participants, the beat of the music was also an influential aspect, with 'loud' and/or 'heavy' drum beats being detrimental to relaxation (*n* = 40). This was most evident for those pieces classified as popular chill-out. Melody was mentioned frequently (*n* = 279), although few specific details were offered. Harmony was mentioned less frequently (*n* = 64). Instrumentation was also mentioned often (*n* = 409), with piano and strings being rated as being relaxing. Voice, vocals and lyrics were frequently mentioned (*n* = 322); a recurrent theme being that soft, quiet voices of either sex, were thought to be relaxing.

Other frequent, albeit less so than those mentioned above, responses included musical dynamics (*n* = 46). Fluctuations in volume and prominent crescendos were perceived as being too lively. For Musical complexity (*n* = 99), low complexity was considered conducive to relaxation, whereas high complexity was detrimental to this state. An issue specific to those selections that were classified as being 'new age' related to the fact that some of these tracks included natural noises (e.g. water flowing, animal calls). Opinion was divided on this, some stated that the sound of running water was peaceful (*n* = 22), however, some found this annoying (*n* = 17). The pieces that contained animal noises tended to be perceived negatively (*n* = 26) as they could induce a sense of fear or anticipation. Lastly, for a minority there was an issue regarding extra-musical association. Specifically, a few of the compositions had been used as either film soundtracks (two of the compositions featured in war films) and two in commercial adverts (one was associated with a high street retail company, the other with an International airline). Some found these associations to be a distraction from relaxation (*n* = 16). It is interesting to note that a perceived association, that is when a participant believed incorrectly that a direct association existed, also had a negative impact upon how relaxing music was rated. No major differences were found between the male and female sub-samples. However, with regard to level of musical knowledge, there was a greater tendency for the high music knowledge participants to cite stringed instruments (high music knowledge, n = 43; low music knowledge n = 18) and harmony (high music knowledge, n =46; low music knowledge n = 18) than the low knowledge individuals. The low music knowledge group were more likely to allude to the melodic aspects than the high knowledge group (high music knowledge, n = 88; low music knowledge, n = 191). Although reference to the vocal aspects of music were evident in both groups, the low knowledge participants were more likely to make specific reference to lyrical content and singing (low music knowledge, n = 217; high music knowledge, n = 115).

2.3.3. Summary

The main music rating procedure has achieved its aims. From a sample consisting of mainly non-musicians, some important details have emerged. It has been found that music described as being relaxing by external agents (e.g. record companies), is not necessarily perceived so. As such, relaxing music for anxiety control cannot be selected simply on the basis of any descriptive label that might be attached. Similarly, it appears that particular music genres (e.g. classical and new age) are again, not always conducive to relaxation. As to emotional labels, relaxing music can induce many, however the most prevalent were ‘peaceful’, ‘serenity’, ‘sadness’ and ‘joy’. Participants were presented with thirteen music components and asked to rate how important each was to relaxation. Clear differences did emerge. This information will allow those selecting music for anxiety control purposes to focus upon those components that exert the greatest influence upon music's relaxing properties. It was also found that many of the outcomes were only marginally affected by gender and level of music knowledge.

Part 1 was less successful when it came to providing details about the specific characteristics of relaxing music for anxiety control. Although participants were given the opportunity to provide details on which structural aspects were most, or least conducive to relaxation, many chose not to utilise this option. Those that did generally failed to offer any substantive information. This highlights the need for further exploration through a focus group of music experts.

Focus Group

2.4.0. Method

Participants

Participants were six final year music-teacher students (male *n* = 2, female *n* = 4) aged between 20 – 21 years (*M* = 20.56yrs, *SD* = 0.61). As part of their degree course, all had received extensive tutoring in both music theory and practice, and all were considered by their tutor to be 'very proficient' students. Furthermore, all the participants claimed to have been trained to a high standard of music competence prior to attending University. All participants were 'White British'.

Procedure

Because of the commonalities between the gender and level of music knowledge samples and the main sample, the music selections presented to the focus group were taken from the main sample. During the focus group session participants were provided with an information sheet that contained those music components that were to be discussed (eleven of those used in the music rating procedure; familiarity and liking were omitted). Also included were some of the prevalent comments obtained via the 'open-ended' questionnaire responses obtained from Part 1. Once participants were familiar with the information sheet and the aim of the session, the most relaxing music pieces were presented. The group were asked to listen to the compositions with a particular focus upon what they felt were common features of each. The same procedure was applied to the least relaxing tracks. Throughout this process, the author acted as moderator, directing the group to discuss those music components that were common to each sample. After this discussion the participants were asked to turn their attention to the differences between the relaxing and non-relaxing samples. During the session, the group was encouraged to identify any features that may not have been addressed in Study 1. Notes were taken by the moderator throughout. The procedure was terminated once a consensus of opinion was reached between the focus group participants. The moderator then presented the outcomes of the discussion to the focus group and the participants were asked if they agreed with the conclusions drawn. This process lasted for approximately one hour. The session was recorded for later analysis.

Threats to Validity

A number of measures were taken to improve the validity of the focus group proceedings. First, it has been suggested that focus groups are more productive when participants are acquainted; the suggestion being that familiarity makes those involved more willing to express their thoughts freely (Rabiee, 2004; Onwuegbuzie, Dickinson, Leech and Zoran, 2009). The focus group participants were known to one and other, having completed three years of University study together. Second, to reduce the likelihood of free riding, participants were informed that all contributions were equally important and that all suggestions were considered to be useful (Fern, 2001). As stated previously, participants were also provided with guidance hand-outs (Appendix 4) on which they were able to provide personal, written contributions. It was hoped that this provision would also reduce the likelihood of normative influence, that is, feeling compelled to agree with other members of the focus group (Edmunds, 1999). Third, in an effort to limit the influence of 'self-appointed experts' (Litosseliti, 2003), directed questioning was used (Stewart, Shamdasan and Rook, 2007). Fourth, for some, communicating in group settings can be a source of embarrassment (Onwuegbuzie et al., 2009). As such, Onwuegbuzie et al. (2009) recommend that group size should be limited to between 6-10 participants; in this case, the focus group comprised of six participants. Lastly, concerns have been raised regarding the effects of moderator bias (Edmunds, 1999). In this instance, moderator influence was not considered to be an issue. The focus group was assembled precisely because it was recognised that the input for music experts was essential if the characteristics of relaxing music for anxiety control were to be formulated. It was considered unlikely that the moderator's views would influence the group music specialists. Furthermore, given the nature of the investigation, it was of utmost importance that it was the views expressed by the focus group that prevailed.

Data analysis Strategy

Generally, when focus group sessions have been audio recorded, full transcription is recommended (Edmunds, 1999; Stewart et al., 2007; Onwuegbuzie et al., 2009). However, it is recognised that the transcription process is not always required if conclusions can be drawn from the moderator notes (Edmunds, 1999; Stewart, 2006). In such cases, note-based analysis is considered to be acceptable (Onwuegbuzie et al., 2009). Note-based analysis is a process which involves the scrutiny of the descriptive statements taken during the session (Rabiee, 2004). Utilising this method, the moderator notes, along with those taken from the participants, were analysed for prominent themes. A discussion summary was created based upon representative statements (Jones, 1996; Fern, 2001; Robson, 2002; Wilkinson, 2004). This applied to both the most and least relaxing music selections. In this instance, the audio recordings were used to verify the statements of interest (Onwuegbuzie et al., 2009).

2.4.1. Results

Table 5: Shows the agreed outcomes of the focus group discussion session for each of the music components discussed.

Component	Relaxing Characteristics	Non-relaxing Characteristics
Tempo	Tempo should fall between approximately 80-100 beats per minute.	Tempi outside the 80-100 beats per minute parameter are generally not considered to be relaxing. An accentuated tempo was, in general, not conducive to relaxation; in other words, when the tempo was made immediately audible via a prominent drum beat.
Melody	Melodies should be strong and secure, as one participant explained "they would be easy to hum to". The notes played tended to progress from low to high.	Melodies that were weak and less obvious were not conducive to relaxation.
Beat	The relaxing music contained constant, regular pulse with a 4/4 time signature.	Some of the least relaxing tracks had irregular, odd drum patterns. Regarding time signature, 4/3s were perceived as being 'less relaxing'.
Harmony	The harmonies of the most relaxing pieces utilised standard tonal progressions and the common triadic harmony that is popular in Western music. The most relaxing pieces were not perceived as containing discordant elements. In other words, the harmonic instrumentation and vocal arrangements "blended together well', "sounded pleasing to the ear" and complemented the melody well.	For two of the least relaxing pieces, dissonance was explicit. That is, the harmonic accompaniment "did not sound right" and were "grating".
Rhythm	Simple, constant, and relatively subtle rhythms were present in the most relaxing compositions.	Stronger rhythms were not particularly relaxing as they had a greater potential to produce physical movement in the listener.

Complexity	The most relaxing music possessed relatively few or similar sounding, instruments that were harmonious, "fit together" well. The music was relatively constant, having few unexpected changes in volume, melody and key, and had a regular beat.	Complex music was considered to be detrimental to relaxation. For example, dramatic, and/or unexpected changes in volume, melody, key and beat.
Key	The key in which a piece was written did not necessarily impact upon its relaxing qualities. It was stated that major keys tended to be perceived as 'happy' and minor as 'sad', but either could be conducive or detrimental to relaxation, and other characteristics were thought to have a greater influence.	
Scale	Narrow note sequences were more apparent in the relaxing selections.	For two of the 'least relaxing' pieces, wide spaced note sequences were evident.
Articulation	In general, for relaxing music, the notes were smooth and connected; no periods of silence between note transitions (legato).	Short, detached and unconnected notes (staccato) were more evident in the least relaxing music.
Interval	As described previously (see melody), a narrow note range was conducive to relaxing music.	*No comments were made*
Melodic Range	The difference between the highest and lowest pitches tended to be narrow in the relaxing pieces.	If the difference between the highest and lowest pitched was wide, this had a negative impact upon relaxation.
Voice	Only one of the relaxing compositions contained a vocal element. In this instance it was deemed to be "soft, quiet, smooth and connected". The 'singing' in this particular piece was choral in nature. Lyrical content may not necessarily be too influential.	*No comments were made*

Instruments	The most common instruments in the relaxing sample were piano and strings.	The least relaxing compositions tended to include guitars, bass, drum and percussion. Two of the least relaxing tracks did contain strings, but these tended to be played in staccato and were accompanied with trumpet parts that were 'militaristic'.
Dynamics	Relaxing music tended to have a relatively constant volume.	Some of the least relaxing compositions possessed 'dynamic' changes in volume.
Character	The most relaxing selections possessed a 'tranquil' character.	If the music was 'too lively' it was classified as less relaxing.

2.4.2. Summary

Whilst Part 1 of this study was successful in many respects, details pertaining to the specific characteristics of relaxing music were in most instances, limited. The focus group session addressed this. The group members highlighted clear structural differences between the most and least relaxing music selections. It was suggested that relaxing music for anxiety control should possess a tempo range of between 80-100 bpm, have strong and secure melodies, combined with simple, constant and relatively subtle rhythms. These should be built around a regular 4/4 time structure. Harmonies should be perceived as consonant and be void of explicit discord, and both the melodic and harmonic aspects should be legato in nature. A narrow note range was considered beneficial in terms of interval, scale and melodic range. Key was considered to be of minimal consequence. Additional details were provided for some music components not considered in Part 1. The focus group felt that soft, quite voices were conducive to relaxation, as were particular instruments, for example, piano and strings. For music dynamics, it was suggested that these be relatively constant and that the character of music should be 'tranquil'. Overall, the focus group has provided a detailed set of criteria on which to base the selection of relaxing music for anxiety control.

2.4.3. Discussion

This investigation attempted to objectively clarify what constitutes relaxing music for anxiety control, with the aim of directing future research and making the subsequent practical application more effective. The music rating procedure (Part 1) showed that music pieces described in terms that are suggestive of relaxation (e.g. relaxing, chilled, peaceful, ambient) are not necessarily perceived as such. Of the thirty musical pieces selected for this investigation, only eight from the main sample received a relaxation quotient of less than three; thus classifying the pieces as relaxing. In the male sample it was also eight pieces and five pieces in the female sample. For level of music knowledge, nine pieces were classified as relaxing by the high knowledge group and five by the low knowledge group (although to maintain consistency the eight most relaxing pieces from all samples were considered in the analysis). This highlights the importance of basing the relaxing qualities of a music piece on a more valid and objective criteria than any descriptive label that may be attached. Furthermore, many of the studies into the effects of music upon anxiety have used particular music styles (e.g. classical or new age) in the belief that these particular idioms are conducive to relaxation. Again, the current results demonstrate that a selection process that is based upon such superficial criteria is limited. For example, ten of the compositions were classical pieces, yet in the main sample for example, only three of these were deemed to be relaxing, and two were positioned in the least relaxing category. For clarity, the subsequent discussion will first present the analysis, recommendations and implications from the main sample data. The effects of gender and level of music knowledge upon the outcomes is then considered.

The main aims of this study were to provide detailed information regarding the characteristics of relaxing music for anxiety control and to determine which music components had the greatest influence on music's relaxing qualities. Both the 'importance ratings' and the 'open ended responses' indicated that tempo was considered to be the most influential component. This supports previous views that have suggested that tempo plays a critical role in shaping the listening experience (Holbrook and Anand, 1990; Karageorghis and Terry, 1997). It is suggested that 'slow' music should be used to induce relaxation (Thompson, Schellenberg and Husain, 2001; Wolfe et al., 2002), however, in this instance participants indicated that if a composition was 'too slow' then it was classified as boring, and thus inappropriate for the intended application. The focus group determined that for maximum effect, tempo should be between 80-100 beats per minute. It is worth stating that an accentuated tempo, that is, a pronounced pulse (e.g. like that found in dance-club music) was not necessarily detrimental to relaxation. Although no such tracks were rated as highly relaxing, four chilled-dance pieces did receive a relaxing quotient below the median value. Given the associations accentuated tempo has with modern dance music, this is rather surprising. It is possible that participant factors influenced this particular outcome. Musical liking has been shown to influence perceptions of relaxation (Davis and Thaut, 1989; North and Hargreaves, 1997a) and it has been found that the most popular music styles of those in full-time education tend to be those in which accentuated beats are present (North and Hargreaves, 2007). It is therefore possible that the positive responses towards chilled-dance music are specific to this population group. On this finding, caution is recommended if selecting music for other populations. Regarding musical liking, although less consequential than many of the internal musical components, it was nevertheless considered to be somewhat important. This concurs with the views of researchers such as Davis and Thaut (1989); Karageorghis et al. (1999); Wolfe et al. (2002) and Walworth (2003), who have stated that if extra-musical effects are to be forthcoming, then a degree of liking is required.

For beat, the results indicated that music that was ‘too up beat’, or which contained a ‘heavy beat’ was not conducive to relaxation. The most relaxing compositions were void of these elements. As to the time signature, the focus group revealed that the most relaxing tracks possessed a regular ‘four-beats-in-a-bar’ structure. Although the majority of the music used in this study also contained this time signature, some pieces were composed with a three-beats-in-a-bar structure, and these were assigned to the least relaxing category. Rhythm is believed to be the element of music that elicits physical movement (Hohler, 1989; Clarke, 1999; Karageorghis et al., 1999). It was found that for relaxing music for anxiety control, rhythms should be subtle, relatively simple and somewhat repetitive. This finding is not surprising, given that any instinctive physical motion that may result from a strong rhythm would likely be detrimental to the intended response. Because rhythm, tempo and beat are closely related, considering them holistically when selecting relaxing for anxiety control is advised.

Melody (tune) was considered to have a powerful influence upon music’s relaxing qualities. However, there were very few details regarding the melodic factors that might require consideration. Attempts to address this with the focus group were initially unproductive; ‘it should be easy to hum to’ being the only consistent recommendation. One participant did provide some additional suggestions.

Specifically, in relaxing pieces, the melodic progressions were more likely to ascend (progress from low notes to high) and contain a narrow interval. For example, playing one white piano key to the next, or skipping one white key are examples of narrow intervals. This supports the views of Gabrielsson and Lindstrom (2001). Despite the value placed on harmony, participants involved in Part 1 again failed to provide much in the way of tangible details. However, the focus group did elaborate indicating that relaxing pieces were those in which the combination of parts (i.e. instrumentation and vocal components) 'blended together well', without discord. In other words, the sounds were harmonious. Although it is recognised that most of the pieces could be considered to be harmonious, the tracks that were not, particularly those in which discord was evident (harsh, confused and unpleasant sounds), were rated as being 'un-relaxing'.

Regarding complexity, Finnas (1989) has described complex music as that which contains unusual harmonies, irregular tempi and rhythms, unexpected sounds and variations in volume (dynamics). Music complexity can impact upon arousal levels, the suggestion being that when individuals are aroused, simple compositions can be used to reduce the intensity of this response (North and Hargreaves, 1999). In the current study, participants were instructed to imagine themselves in an anxiety-producing situation, thus, it could be assumed that the most relaxing compositions would be those of low complexity. This was not the case. It was found that simple music containing a high degree of repetition and very few structural changes was not considered to aid relaxation. It was also found that those compositions that could be considered complex, including multiple (e.g. temporal, melodic) and/or unanticipated changes, and stops (thus were lacking continuity), playing off, and behind the beat were also rated as non-relaxing. The most relaxing tracks were those of medium complexity; these being relatively constant, with few ‘dramatic’ changes in volume, melody and key, but nevertheless including some structural changes. They also possessed a regular beat and were considered to be harmonious.

It is possible to explain this outcome through the relationship of music complexity and liking (North and Hargreaves, 1997). Both highly complex and low complex music tends to be disliked (inverted-U relationship), with compositions of a medium complexity generally being preferred. Given this, it can be argued that because liking was considered to have some importance, it is conceivable that both complex and simple pieces were disliked. This suggestion is supported by the findings, as the simple pieces did receive comments to alluding to them being ‘boring’, whilst the highly complex pieces were often described as ‘irritating’ or ‘annoying’. Another possibility as to why simple compositions were classified as inappropriate relates directly to the fact that they were perceived as boring. If in an anxious state, perhaps simple, hence boring, music pieces fail to distract ones attention from the negative cognitions associated with anxiety. This will be discussed in further detail in Chapter 4. Relating again to the description of complex music advanced by Finnas (1989), in Part 1 reference was also made to dynamics. This was expanded upon by the focus group, which claimed that if music was overly dynamic (many variations in volume and/or crescendos) it was thought to be exciting, and thus not conducive to relaxation.

Those who participated in the music rating procedure did not rate articulation as being important. However, this finding concerned members of the focus group. They maintained that articulation did have a substantial impact, claiming that a common feature of the most relaxing compositions was that they all contained smooth, connected notes and few periods of silence (legato). In contrast, many of the least relaxing pieces had short, unconnected and detached notes (staccato). It is possible that this discrepancy was manifest because like melodic range, scale and key, articulation was considered to be a relatively difficult concept by the participants involved in Part 1. It is conceivable that despite inadequate knowledge of these concepts, social desirability compelled some of the non-musical participants to rate these anyway.

Attending briefly to the less important characteristics, it was found that the key in which music was played had relatively little influence. Music written in both major ('happy' key') or minor ('sad') key (Hoshino, 1996), could be regarded as relaxing. The emotional labels that were attached to the pieces of music supported this finding. For scale, narrow note sequences in an ascending order were thought to be beneficial. As mentioned previously, for both key and scale many of the participants involved in the music rating procedure did not fully understand these concepts, however, in this instance the focus group agreed with the importance value attached to these components. Additionally, piano and string arrangement were deemed to be particularly conducive to relaxation, whereas brass instruments such as horns and trumpets tended to lessen this effect. The focus group felt that this may be less to do with the instrument *per se* but rather the associations attached, as it was claimed that in the music samples presented, the brass instrumentation was equated with 'war movies'. Lyrical content was judged to have limited influence. For example, although the majority of the most relaxing compositions, and indeed the least relaxing, did not contain vocals, a vocal arrangement was present on two of the most relaxing compositions. Interestingly, one of these was sung in Latin whilst the other was sang in English and described the murder of a loved one. Some participants did say that the ‘sad’ lyrics detracted from relaxation; however, similar numbers claimed that the emotive content was actually beneficial.

Some theorists have extolled the importance of familiarity because of its association with liking (North and Hargreaves, 1995). Put simply, for a piece of music to be liked, the listener needs to be familiar with it. Unfamiliar music is generally disliked. Although in the present study liking was less consequential than many of the internal music components, an importance rating of sixth, does suggest that attention to this is warranted when selecting music for relaxation. However, the current findings suggest that for relaxing music at least, familiarity is not of major importance; an outcome that was also apparent in the Wolfe et al. (2002) investigation. This suggests that for relaxing music for anxiety control, the familiarity/liking relationship is relatively weak. The relationship between familiarity of, and liking for music can be explained through Zajonc’s (1968 cited in Moreland and Topolinski, 2010, p.330) Mere Exposure Phenomenon. According to Zajonc (1968), repeated exposure to an object, or stimulus, results in more favourable attitudes. It is suggested that repeated exposure produces a processing fluency effect (Moreland and Topolinski, 2010). That is, information can be processed without undue cognitive effort. The fluency effect is also associated with embodiment. Embodiment occurs when exposure to a recognisable stimulus provokes covert simulation of the associated sensory-motor response. For example, listening to familiar music may not only reduce processing demands, but might also trigger responses that are associated with this familiarity, e.g. physical movement. It is possible that the preceding example might explain why familiar music is not necessary for relaxing music for anxiety control. If, familiar music does indeed induce a covert sensory-motor ‘movement’ response, then this is likely to be detrimental to relaxation. Alternatively, perhaps familiarity was considered unimportant simply because many of the pieces were unfamiliar. If familiar pieces had been included in the sample to contrast with the unfamiliar, then the importance of this component might have risen. Another explanation for the lack of importance ascribed to familiarity might be specifically related to the reduction in the processing demands. Perhaps in terms of music for anxiety control, a degree of effortful processing is required to distract (See Chapter 4) the listener from the symptoms of competitive state anxiety. This area needs to be considered further in future research.

Addressing the emotional labels attached to the pieces, participants were provided with a list of 23 emotions and were asked to select those that they felt each piece induced. The most common labels for the relaxing tracks were, ‘peaceful’, ‘serenity’, ‘sadness’ and ‘joy’. This implies that as well as brining about a relaxing state, music should also provoke feelings that are generally associated with an increase in arousal (Gross, 2005). Both positively toned (joy) and negatively toned (sadness) emotions were mentioned for the relaxing sample. This supports recent research which suggest the co-existence of positive and negative emotions in for example, stressful situations (Folkman and Moskowitz , 2004).

Regarding the influence of gender, there was a high degree of consistency between male and female music selections. Nevertheless, some interesting points did emerge. With regard to music genres, the eight most relaxing pieces, as chosen by the male group, contained four classical compositions, whereas for females, three were included. This should not necessarily be taken to suggest that males prefer classical music, especially as first, there were few statistical differences between the relaxation quotients ascribed to the pieces, and second, males also assigned more classical pieces to the least relaxing sample than females. This finding is however rather unexpected as it was assumed, given the importance of preference in musical reactivity (Davis and Thaut, 1989; Karageorghis et al., 1999; Walworth, 2003) that females would gravitate towards the classical pieces (Russell, 1997; Teo, 2005). There was some support for the assertions of Russell (1997) in that females were more likely to consider popular chill-out as being relaxing than did males.

As to level of music knowledge, the low music knowledge participants assigned three popular chill-out and new-age compositions to the most relaxing classification; the popular chill-out selections being considered as most relaxing. For the high knowledge group, four classical pieces were positioned in the most relaxing sample and two of these received a relaxation quotient that was significantly higher than the quotient given by the low music knowledge group. This outcome does support the contentions of Hargreaves (1986), who maintains that a positive relationship exists between level of music knowledge and liking for more complex forms of music (e.g. classical).

The gender and music knowledge sample analysis revealed that the percentage of total responses and rank position of the emotions ascribed to music was maintained. The most frequent emotions were ‘peaceful’, ‘serenity’, ‘sadness’ and ‘joy’ respectively. This result provides support for previous research which has found that the recognition of emotion (Waterman, 1996; Fredrickson and Coggiola, 2003) and the identification emotional episodes (Robazza et al., 1994) is independent of the personal characteristics. Although two of these studies are not directly comparable (i.e. Waterman, 1996; Fredrickson and Coggiola, 2003), as the recognition of emotional occurrences were not actually analysed, these studies, in conjunction with the current findings do imply that for individuals within a particular culture, the emotional interpretation of music might be a universal quality.

Finally, so that those wishing to implement relaxing music for anxiety control could direct their focus towards the most consequential elements, an importance value was ascribed to each of the thirteen music components. A visual inspection of the data did reveal rank order differences. However, when subjected to statistical scrutiny only one component, rhythm, was found to be significantly more important to males than females, perhaps suggesting that it might be worth considering pieces which emphasise the rhythmic elements when selecting music for males. For level of music knowledge, it was found that those with high music knowledge rated melody and scale as more important than those with low music knowledge. This is an intriguing finding as, along with the findings of the current investigation, both Rentz (1992) and Williams (2005) suggest that low knowledge individuals attend to the melodic aspects of music.

Attentional focus during the music listening process appears to be influenced by level of music knowledge; in particular, the melodic, harmonic aspects and instrumentation (Rentz, 1992; Williams, 2005). To assess whether such differences were apparent within the sub-samples, the answers to the question '*is there anything about this song that you found particularly relaxing?*' were analysed. From the responses given, there was some evidence that attentional differences did exist. Specifically, participants with a high level of music knowledge mentioned stringed instruments and harmony to a greater extent than the low knowledge sample. In contrast, reference to melody was relatively limited. The low knowledge group were more inclined to make comments about melody than harmony. In terms of instrumentation, the most commonly referenced in both music knowledge samples was piano. However, the high knowledge group referred to strings more often than the low knowledge group. Another finding concerns the vocal aspects of music. Whilst both groups alluded to vocals to a similar extent, the low knowledge participants appeared to focus more upon the lyrical than the high knowledge participants. The responses were also checked for gender, but no obvious differences were evident. This information only provides indirect evidence that there are some attentional differences and it is possible that alternative explanations exist. For example, it could be that the lower knowledge participants simply do not have the relevant vocabulary to articulate the influence of the harmonic elements of relaxing music.

To summarise, the outcomes of this study show that the characteristics of relaxing music for anxiety control can be quantified. A comprehensive guide has been provided which should allow for the selection of music which will aid relaxation in anxiety producing situations. It has also shown differences in the relative importance of a selection of music components. This ‘order of importance’ will allow those considering the use of music as a relaxation technique to concentrate on those characteristics that have the greatest impact. In terms of emotional labels, music can have emotive content, yet still be considered relaxing; specifically, sad or joyous music can be utilised. Admittedly, the information pertaining to emotional reactions might offer little to those wishing to apply the outcomes within the sport environment, but they could prove useful to a music therapist working with individuals experiencing mood disorders (Grocke and Wigram, 2007; The American Music Therapy Association, 2010). Few gender and level of music knowledge effects were found, nevertheless, the additional details taken from these samples might prove useful when selecting relaxing music for anxiety control. The main differences related to the music genres appearing in the most relaxing music classifications, with the results suggesting that males might have a slight preference for classical selections, whereas for females it is popular chill-out. It was also found that participants with high music knowledge had a propensity for classical music whilst for low music knowledge it was popular chill-out. Also, for the importance ratings, although there was minimal statistical disparity, rank orders did differ. As such, it may be prudent to utilise the appropriate importance ranks if selecting for a particular gender.

In terms of application, it should be acknowledged that these results were gathered from participants who were required to imagine themselves in a mild anxiety producing situation. In this study the most frequently cited situations were prior to sports performance and prior to an exam. It is unclear as to whether these findings are applicable to other situations, for example music therapy or medical procedures. However, it could be argued that it is the level of anxiety that is important, and not the specific situation; participants were only asked for the context to be recorded so that the option to exclude, if required, any participant that might have chosen a situation which could be considered to be inappropriate for this study (e.g. serious medical procedures) was available. As such, unless proved otherwise these outcomes should also be applicable to music therapists and those working within some medical settings.

This study does have a number of limitations. First, it is acknowledged that some of the characteristics may be difficult for some to comprehend. This has implications for both the internal validity of the investigation, and external validity. For practitioners and researchers, this problem may be circumnavigated by using the importance ratings. For example, if one understands concepts such as tempo, harmony and melody, then it may still be possible to select music that is, to some degree, relaxing. Also, the number of compositions used in this investigation was somewhat limited, hence possibly impacting upon the validity of the outcomes. It is recognised that recommendations become complicated when interactions between gender or levels of music knowledge are considered. In this study only the main effects for each sub-group were considered. The rational for this was twofold. First, the results from gender by level of music knowledge interactions were of limited value given the insubstantial participant numbers present in some of the samples. Secondly, adopting such a procedure would have added an extra layer of variables, thus making the analysis, discussion and recommendations unduly tortuous. This decision does however have ramifications, for whilst advice can be offered, with a degree of certainty, for gender and level of music knowledge as independent groups, definitive guidelines for the interrelationships cannot currently be provided. However, the following guidelines can be offered. When selecting the appropriate music genres, if the gender and level of musical knowledge are unknown, or there is a mix of gender and knowledge levels, following the suggestions for the main sample is advised. However, if the gender of the listener/s is the only known, then the associated gender specific outcomes can be used. With level of music knowledge, if this is apparent, then for a mixed gender group utilising the level of music knowledge outcomes is recommended. Unfortunately, given the focus upon main effects, advice cannot be offered for individuals/groups when both gender and level of music knowledge is apparent. In this instance it would be again be prudent to utilise the suggestions offered for the main sample. Future researchers who are able to ensure that participant numbers are sufficient to allow interaction effects to be analysed, should consider this circumstance. Notwithstanding these limitations, it is hoped that these findings will make the use of music to control anxiety more productive, and also allow researchers to select appropriate pieces for further investigation.

This study has provided comprehensive criteria upon which to select music to control competitive state anxiety. However, as yet it is unclear as to whether relaxing music for anxiety control actually provides any anxiolytic benefit. Unlike Wolfe et al.

(2002), who failed to examine whether ‘music for relaxation’ initiated the expected response, this thesis will now utilise the information gleaned from this study to select and test the effects of relaxing music for anxiety control in a competitive sport environment.

Chapter 3: The Effects of Relaxing Music for Anxiety Control on Competitive State Anxiety

Study Considerations

3.1.0. Anxiety Rating Inventory

The Competitive State Anxiety Inventory-2 (CSAI-2) was developed by Martens et al. (1990b) to assess the multidimensional components of competitive state anxiety. Although the CSAI-2 has been used extensively within the field of sport anxiety research (Craft et al., 2003), concerns have been raised about the validity of this instrument. In particular, Lane, Sewell, Terry, Bartram and Nesti (1999) re-evaluated the CSAI-2 and found that data failed to fit the hypothesised factor structure. They concluded that the inventory is psychometrically unsound. Specific issues were raised regarding the use of the term ‘concerned’ in the items related to cognitive anxiety. Lane et al. (1999) argued that this term was not necessarily synonymous with anxiety and instead suggested the use of the term ‘worried’. Lane at al. (1999) were also critical of the use of Exploratory Factor Analysis, which according to Biddle, Markland, Gilbourne, Chatzisarantis and Sparkes (2001) and Lane, Harwood and Nevill (2005) relies heavily on subjective judgements; although it should be noted that others do not necessarily agree with this assertion and still advocate its use (e.g. Field, 2005; Costello and Osborne, 2005; Child, 2006; Tabachnick and Fidell, 2007). Nevertheless, Lane et al. (1999), claim that Confirmatory Factor Analysis is the preferred method for determining factor structure. It is these psychometric shortcomings that have been blamed for the lack of a recognised performance-anxiety relationship (Craft et al., 2003). Cox, Martens and Russell (2003) have also raised concerns over the CASI-2. Using Confirmatory Factor Analysis to reanalyse the factor structure of the original inventory, Cox et al. (2003) found that by removing of ten of the CSAI-2 items, the psychometric properties were improved. Particular concerns were related to items that were loaded on more than one sub-scale. For example, item 14 was loaded on both somatic anxiety and self-confidence. In response, Cox et al. (2003) developed the CSAI-2R, a shortened version of the original inventory which they claim has stronger psychometric properties**.** Raudsepp and Kais (2008) have confirmed the factorial validity of the CSAI-2R.

Alternatives to both the CSAI-2 and CSAI-2R are available. The Anxiety Rating Scale (ARS) was developed by Cox, Russell and Robb (1998; 1999) as a short form alternative to the CSAI-2, and it has been found to be moderately correlated with the CSAI-2 sub-scales (0.6 - 0.7). However, according to Russell and Cox (2000) there has been criticism of the ARS, with the suggestion that scale items measure more than one psychological construct. Cox et al. (2000) therefore amended the original ARS and produced the ARS-2. This version was found to be slightly more valid that the original version with sub-scale coefficients of between 0.67 - 0.75. The ARS-2 has the advantage of offering a reasonably valid means of assessing multidimensional anxiety when time is an issue (Russell and Cox, 2000). However, although scale brevity would be advantageous to the current investigation, issues still surround the ARS-2. Despite this improvement over the original ARS, Russell and Cox (2000) recognised that sub-scale coefficients were still relatively weak.

The most viable option for the current study appears to be the CSAI-2R. Cox et al. (2003) and Raudsepp and Kais (2008) all advocate the use of the CSAI-2R, with Cox et al. (2003) suggesting that it should take precedence over the original CSAI-2. This instrument, given that it is a shortened version of the CSAI-2, should also reduce completion times. Time for completion could be an issue because this might actually become an alternative source of distraction if participants are concentrating on completing an instrument for an extended period. As such, it is the CSAI-2R that will be utilised to examine the effects of relaxing music for anxiety control. This scale provides improved psychometric properties over the original, and has the added benefit of relative brevity.

3.1.2. The Motor Task

This investigation is primarily concerned with the effects of relaxing music for anxiety control on state anxiety measures. It might nevertheless be interesting to examine whether any subsequent alterations in competitive state anxiety actually impact upon the performance of a motor skill. A number of factors were considered when selecting an appropriate skill. First, it is generally accepted that physiological component of somatic anxiety has a greater debilitative effect on tasks requiring fine motor control (Oxendine, 1970, 1984; Mellalieu et al., 2004). Second, the influence of prior learning could have ramifications because well learned skills are less susceptible to the effects of anxiety (Raglin and Hanin, 2000). Third, it must be possible to objectively measure the effects of anxiety on skill performance.

3.1.3. Temporal Considerations

It has been consistently argued by the current author that music can provide a more succinct alternative to some of the more protracted ‘traditional’ methods of relaxation. Previous investigations into the anxiolytic effects of music have opted to utilise relatively lengthy intervention periods. For example, in the studies of Davis and Thaut (1989), Burns et al. (1999), Knight and Rickard (2001) and Burns et al. (2002) the music interventions were between 20-35 minutes in duration. Unfortunately, the authors failed to offer any explanation as to why such time frames were considered appropriate. Referring to Lichstein's (1998) definition of 'on-the-spot' relaxation, it is suggested that techniques should be relatively brief. The time periods used in the aforementioned studies do not conform to this specification. Indeed, they are similar in length to the methods (e.g. PR, meditation) previously criticised for being impractical. For this investigation, the music, and the control, conditions will be 10-minutes in duration.

3.1.4. General or Specific Recommendations

Study 2 has provided both general, and population-specific (gender and level of music knowledge) recommendations for the selection of relaxing music for anxiety control. Although the characteristics of relaxing music for anxiety control were considered to be stable, some slight differences were evident for preferred music genre and the importance attached to particular music components. It was however suggested that when selecting music for mixed groups, in terms of gender and music knowledge, the general recommendations be utilised. Mixed groups are expected and as such, it is the general recommendations that will be utilised.

3.1.5. Deception

In order to successfully meet the research aim, Study 3 required a level of deception. Although ethical approval was obtained, it is worth considering some of the issues surrounding deception and why this was deemed necessary. Deception has been defined as the deliberate withholding of, or misinforming about certain characteristics of a research investigation (Kimmel, 1990). Deception can be problematic because it denies participants the right to self-determination and can lead to contempt for the scientific process (Sieber, 1992). Despite the ethical issues surrounding deception, both Kimmel (1990) and Sieber (1992) recognise that it is sometimes warranted, and go on to state that deception can be acceptable if risks are minimised. The decision to use deception was not taken lightly; however, it was felt to be necessary in this instance.

To allow the effects of relaxing music for anxiety control to be uncovered, it was imperative that participants were exposed to an anxiety-producing situation. Sport competition, by its nature, can provoke anxiety because of the demands it places upon the participant, particularly when there is a perceived imbalance between the demands of the situation and response capability (Weinberg and Gould, 2007). Furthermore, sport competition also provides the platform for social evaluation (Cox, 1989), which can further increase the intensity of the anxiety response. However, a significant mediator of sport anxiety is event importance (Marchant, Morris and Anderson, 1998). Given the contrived nature of the competitive task being used, there were concerns that a lack of perceived importance might limit the anxiety response. If this were to occur, it would be difficult to ascertain the effects of the music interventions. Fear of evaluation (Bray, Martin and Widmeyer, 2000) and uncertainty (Martens et al., 1990b) have been shown to increase competitive-state anxiety, and as such, this study attempted to manipulate these variables. One way to increase fear of evaluation is by making participants compete with an audience present. Unfortunately, due to issues of practicality, this approach is not feasible. Therefore, participants were informed that they might be required to perform in front of an audience. To reinforce this notion, seating was set out in the competition area. Also on display was video-recording equipment; participants were informed that they might be recorded for later evaluation. Neither of these statements is strictly true. None of the competitive sessions were recorded nor evaluated. Similarly, no audience was present during the procedures; although co-actors were present, participants were arranged in manner that limited co-actor observation. The belief that an audience might be present should also help induce feelings of uncertainty.

In a further step, on display were a range of different motor tasks. Participants were told that they were required to complete one of these in a competitive manner and that this decision was not to be made known until immediately before the contest begins. Again, this was not the case, as all participants were required to perform the same skill. It was hoped that these measures would provoke significant increases in anxiety. Reviewing this course of action, to ensure that the required anxiety response was forthcoming, deception is deemed to be necessary. However, in this instance, the risks associated with deception appeared minimal. Nevertheless, during the competition process, a research assistant was on hand to provide support to any individual experiencing adverse reactions to the deception. Furthermore, all participants were provided with the contact details of the University of Cumbria; Dean of Research, and all were offered a debriefing session.

3.1.6. Operational Definition of Anxiety

Competitive State Anxiety is that which is transient in nature and manifests in response to a competitive situation (Gould et al., 2002). Competitive State Anxiety is multidimensional, consisting of two independent yet, interrelated components (Martens et al., 1990a). Cognitive anxiety is the mental aspect and is characterised by worry, lack of concentration, intrusive thoughts and unpleasant feeling states. Somatic anxiety, which is similar to the concept of arousal, refers to the physiological-affective aspects of anxiety. Responses include autonomic reactions such as sweating, increased HR and muscular tension.

The Effects of Relaxing Music for Anxiety Control on Competitive State Anxiety

3.2.0. Introduction

Those involved in competitive sport often experience competitive state anxiety (Naylor et al., 2002). Numerous relaxation methods (e.g. progressive relaxation, meditation, biofeedback, breath control and autogenic training are available) can be prescribed to help the sports practitioner alleviate the negative symptoms associated with this state (Onestak, 1991; Gill and Williams, 2008). However, the implementation of such techniques can be problematic. If the aims of these methods are to be achieved, athletes will need to devote time to their mastery (Patel, 1991; Payne, 2000; Cox, 2002). Furthermore, the processes can be relatively lengthy (Patel, 1991) and they tend to induce a state of deep relaxation; something that is not necessarily beneficial to sports performance (Crocker, et al., 2002). It is perhaps because of such constraints that these relaxation methods are not readily adopted by the sporting community (Gould et al., 1993; Ryska, 1998; Park, 2000; Holt and Hogg, 2002).

Recognising some of the aforementioned issues, Payne (2000) suggests the use of on-the-spot relaxation techniques. According to Lichstein (1988), such procedures need to be portable, relatively brief, convenient and unobtrusive. Another important aspect of these methods is that rather than inducing deep relaxation, they reduce superfluous tension (Payne, 2000). That is, rather than being detached from the environment, they provide relaxation whilst allowing the individual to maintain a degree of alertness. Payne (2000) considers self- talk and imagery to be procedures that conform to the description offered by Lichstein (1998). However, although less laborious, these techniques still require practice (Guillot and Collet, 2008; Williams et al., 2010). Another strategy that fulfils Lichstein's criteria, and requires no practice, is music listening.

Within sport, music as a means of controlling anxiety has received little attention, however, within medical settings there have been numerous investigations into its use. Although evidence suggests that music does have potential as a relaxation aid, not all research has been supportive (Evans, 2002; Pelletier, 2004; Nilsson, 2008). Responding to this, the current author has suggested that methodological weakness might have contributed to the equivocal findings. Specifically, the music utilised for anxiety control research has generally been selected upon limited criteria with little acknowledgement of the music characteristics that might influence relaxation. As part of this thesis (Chapter 2), a comprehensive set of criteria upon which to select relaxing music for anxiety control has been developed. It has been claimed that selecting music on this basis would provide stronger and more consistent outcomes. However, this selection criterion has yet to be applied to practical settings. Therefore, the aim of this investigation was to assess the validity of relaxing music for anxiety control as a means of alleviating multidimensional competitive state anxiety. Specifically, this investigation examined the effects of relaxing music for anxiety control upon somatic and cognitive anxiety, self-confidence, subjective relaxation and HR. Also under scrutiny was whether any subsequent alterations in psychophysical state impact upon motor performance. Similar to the studies of Knight and Rickard (2001) and Burns et al. (2002), gender will be also considered as an independent variable. For comparative purposes this study also includes a no music control and a non-relaxing music condition.

Based on previous research findings (Evans, 2002; Pelletier, 2004; Nilsson, 2008) a number of hypotheses can be advanced. Firstly, listening to both non-relaxing music and relaxing music for anxiety control would provide anxiolytic benefit. However, it was hypothesised that relaxing music for anxiety control would produce the strongest effects. It was also hypothesised that listening to music would improve performance during a motor task competition (Martens et al.,1990a; Jerome and Williams, 2000; Woodman and Hardy, 2003). It was anticipated that this effect would be greater for those exposed to relaxing music for anxiety control. Given the findings of Knight and Rickard (2001) and Burns et al. (2002), and the fact that gender neutral recommendations were used to select the compositions for the experimental conditions, no gender differences were expected.

3.2.1. Method

Participants

Participants were 72 undergraduate students (male n = 44; female n = 28) aged between 18 and 28 years (M age = 19.42 years, SD = 1.9) and currently attending a University in the North of the UK. To ensure that a proportionate number of males and females were allocated to each condition, gender strata were created and participants were randomly allocated to conditions on this basis. The conditions were, relaxing music for anxiety control (n = 26), non-relaxing music (n = 24) and no music control (n = 22). The University Ethics Committee approved the study and all the participants completed written informed consent. Participation was strictly voluntary and right to withdraw procedures were in place.

Measures

Competitive State Anxiety: The Revised Competitive Sport Anxiety Inventory-2 (CSAI-2R) was used to assess competitive state anxiety (Cox et al., 2003). The scale purports to measure cognitive state anxiety, somatic state anxiety and state self-confidence. The CSAI-2R is a 17-item questionnaire and respondents are required to indicate how they currently feel. All items are scored on a 4-point scale (*1 = not at all, 2 = somewhat, 3 = moderately so and 4 = very much so*).

Subjective Relaxation: Following Davis and Thaut (1989) and Burns et al. (2002) subjective relaxation was assessed using a 7-point likert item. Participants were asked to respond to the question 'how relaxed do you currently feel?' (*1 = very relaxed and 7 = very stressed*).

Heart Rate (HR): Kantor, Endler, Heslegrave and Kocovski (2001) claim that physiological measures of anxiety should be combined with self-report assessment. HR has been shown to be correlated to somatic activation (Thayer, 1970) and anxiety (Tenenbaum and Milgram, 1978; Kantor et al., 2001). Polar FS3 HR monitors were used to collect HR data.

Procedure

Anxiety Inducing Protocol: A number of strategies were adopted to induce state anxiety. First, participants were told that they would be involved in a competitive motor task and that scores would be recorded and made available to others. To provoke evaluation apprehension (Martens et al., 1990b) seating provisions and video equipment were visible and participants were informed that they might be competing in front of an audience (Dunn and Nielsen, 1996) and/or be filmed for later evaluation; this was not actually the case, no audience or filming were involved. To increase uncertainty (Martens et al., 1990b) participants were shown four possible competitive tasks (basketball throw, plyometrics/agility, strength and underarm throwing task) and informed that they would be required to partake in one of these. They were told that this was to be determined after the intervention period. The task was completed on an individual basis (Zeng, 2003).

Motor Task: The participants were required to execute a relatively novel, fine motor control task. This was an underarm beanbag throw to a target set at a distance of 7m. Participants took fifteen throws, the objective being to land the projectile in a 1m diameter hoop laid on the floor. Participants received one point for landing the beanbag in the target. The number of points was summated to give an overall task score.

Experimental Procedure: In groups of four, participants were asked to attend the testing location at a predetermined time, whereupon they were asked to read, and if willing, sign the informed consent document. Participants were led to the testing area. This was a screened section of a sports hall. The testing area was where the anxiety measures were taken and the participants were presented with either, one of the music interventions or silence. Seating was arranged to limit observation and restrict communication between participants. The experimental team were situated in a secluded region of the testing area. For the baseline anxiety measures, the experimental team made efforts to put the participants at ease. Once seated, each participant was asked to attach a polar heart rate monitor. They were then asked to complete the CSAI-2R, subjective relaxation scale and also record their HR. Once the initial measures were taken participants were led into the competition area and introduced to the various tasks. After this, the volunteers were led back into the testing area and again asked to complete the CSAI-2R, subjective relaxation scale and record their HR. Depending on the condition (relaxing music for anxiety control, non-relaxing music, no music control) the relevant intervention was presented. When the 10-minute period was over, participants were again asked to complete CSAI-2R, subjective relaxation scale and HR. With all the measures taken, the participants were reallocated to the competition area and competed in the under-arm throwing task; this was performed in the presence of the research team and the participant co-actors.

Music Selection: For the relaxing music for anxiety control condition, three pieces were selected which complied with the corresponding recommendations. For example, tempi ranged between 80-100 beats per minute, rhythms were relatively subtle, simple and constant, melodies were strong and secure and harmonies were consonant. The sample consisted of the following genres, one classical, one popular chill-out and one ambient. The non-relaxing pieces were from similar music classifications yet did not conform to the recommendations for the selection of music for anxiety control. It should be noted that in this instance, the term should not be taken to mean that such music is void of anxiolytic properties just that it does not conform to the criteria for relaxing music for anxiety control. The genres were, one classical, one space-rock and one ambient; this feature should reduce the likelihood of response bias as it will not be overly clear which music condition is expected to provoke changes in anxiety. Each sample was 10-minutes in duration. All music was recorded onto CD-R and played through a portable Bush CD player. To eliminate order effects the compositions were played in a counter-balanced manner. Volume was set to 70 decibels (Staum and Brotons, 2000).

Data Analysis Strategy: Mixed-design factorial MANOVA (condition × gender × time: baseline, pre-to post intervention) was used to examine main effects, condition × time and condition × gender × time. When significant main effects were found, pairwise comparisons with Bonferroni correction factor were used. If significant condition × time effects were found, differences were to be uncovered using dependent t-tests; p-value set at .016 (Field, 2005). Condition × gender effects were to be uncovered using independent t-test; p-value set at .05. Condition × gender × time interactions were examined using dependent t-test; p-value set at .016.

To assess practical significance, and in accordance with the recommendations of Marshall (2005), Field (2005), Batterham and Hopkins (2006) and The American Psychological Association (2009), effect sizes (ES), mean differences and 90% Confidence Intervals (CI) were calculated for pre-to post-intervention raw scores for each of the DVs; the latter showing the likely range of the true value in the population from which the sample was drawn (Stuart, Hopkins, Cook and Cairns, 2005). An effect was deemed beneficial if the 90% CIs were positive (Batterham and Hopkins, 2006). Collectively, these additional procedures allowed the magnitude of the treatments to be determined. To calculate ES, Cohen's d for within-subjects was employed (Morris and DeShon, 2002). ES, mean differences and 90% CI were calculated for the sample as a whole and for the sample split by gender. Finally, to assess the whether there was any impact of condition upon motor task performance, total motor task scores were examined via 3 × 2 Factorial ANOVA (condition ×

gender). Pairwise comparisons with Bonferroni correction factor were used to uncover differences.

3.2.2. Results

Descriptive Statistics

The means, standard deviations, ES, mean differences and 90% CIs for each of the pre-to post-intervention anxiety measures can be found in tables 6, 7 and 8. The means and standard deviations for the pre-to post-intervention change-scores are presented in table 9.

The Effects of Condition, Gender and Time on Anxiety Scores -

The mixed-design factorial MANOVA showed that that the assumption of sphericity had been violated for somatic anxiety (X^2 (2) = 6.90, p =.031), self-confidence (X^2 (2) = 10.48, p <.001) subjective relaxation X^2 (2) = 6.97, p =.031) and HR (X^2 (2) = 9.94, p =.007) and as such the Greenhouse-Geisser estimates of sphericity were applied for these DVs. The sphericity assumption was met for cognitive anxiety (X^2 (2) = 2.72, p =.25). The MANOVA procedure revealed that there was a significant main effect for time (Pillai's Trace = $F_{(10, 234)} = 8.16$, $p <$ .001). Univariate tests showed that a significant main effect was present for somatic anxiety ($F_{(2, 120)} = 26.32$, $p < .001$), cognitive anxiety ($F_{(2, 120)} = 31.54$, $p < .001$), subjective relaxation ($F_{(2, 120)} =33.89$, $p < .001$) and HR ($F_{(2, 120)} = 5.66$, $p = .004$) but not for self-confidence ($F_{(2, 120)} = 2.66$, $p = .82$). Post-hoc tests showed that somatic anxiety increased significantly from baseline (*M* = 15.20, *SD* = 4.54) to pre-intervention (*M* = 19.94, *SD* = 6.63), p <.001 and decreased significantly from pre-to post-intervention (*M* = 16.29, *SD* = 6.03), p <.001. Baseline and post-intervention levels were not significantly different, *p* =.30. For cognitive anxiety there was a significant increase from baseline (*M* = 16.42, *SD* = 5.48) to pre-intervention (*M* = 21.71, *SD* = 7.43), *p* <.001, between pre-and post-intervention (18.73, SD = 7.02), *p* <.001 and between post-intervention and baseline, *p* =.006. Subjective relaxation (note: *1 = very relaxed and 7 = very stressed*) decreased significantly from baseline (*M* = 2.90, *SD* = 1.01) to pre-intervention (*M* = 4.02, *SD* = 1.22), *p* <.001, and increased significantly from pre-to post-intervention (*M* = 3.20, *SD* = 1.31), *p* <.001. Post-intervention levels were not significantly different to baseline, *p* =.09. For HR there was a significant increase from baseline (*M* = 76.30, *SD* = 13.11) to pre-intervention (*M* = 78.61, *SD* = 13.09), *p* =.02, and a significant decrease from pre-to post-interventions (*M* = 76.53, *SD* = 12.92), *p* =.04. Differences between baseline and post-intervention were not significant, *p* =1.

Significant condition × time interactions were found (Pillai's Trace = $F_{(20, 476)}$ = 1.72, *p* = .026). Univariate analysis revealed that subjective relaxation exhibited a significant condition × time interaction ($F_{(4, 120)}$ = 2.73, *p* = .032). Post-hoc procedures revealed that for relaxing music for anxiety control there were significant differences in subjective relaxation between baseline and pre-intervention, *p* <.001, between pre-to post-intervention, *p* <.001, but not between baseline and post-intervention, *p* =.88. For the non-relaxing music condition, significant differences were present between baseline and pre-intervention, *p* =.006, pre-and post-intervention, *p* =.003, but not between baseline and post-intervention, *p* =.05. In the no music condition there was a significant difference between baseline and pre-intervention, *p* =.002, but not between pre-to post-intervention, *p* =.13, nor baseline and post-intervention, *p* =.11. No other condition × time interactions were found.

There were no significant condition × gender × time effects (Pillai's Trace = F $(_{20, 476})$ = 1.31, *p* =.166). There was a significant effect for time × gender (Phillai's Trace = F $(_{20, 234})$ = 2.36, *p* = .11). Univariate analysis showed that significant effects for somatic anxiety (F $(_{2, 120})$ = 4.67, p = .011) and HR (F $(_{2, 120})$ = 4.20, p = .016). Post-hoc tests showed that pre-intervention levels of both somatic anxiety and HR were significantly higher for females; somatic anxiety (t (70) = -2.3, *p* = .024) and HR (t (67) = -2.1, *p* = .037).

Table 6: Shows condition pre-to post-intervention means, standard deviations, Cohen's *d* Effect Size and 90% CI for somatic anxiety, cognitive anxiety, self-confidence, subjective relaxation, and HR for the total sample.

	Pre-intervention	**Post-intervention**	**Cohen's d**	**Mean Difference**	**90% CI**
SomaticA RM	M = 20.34, SD = 7.58	M = 14.53, SD = 5.14	1.05	5.81	3.82-7.79
SomaticA NRM	M = 20.08, SD = 6.53	M = 16.99, SD = 5.93	0.64	3.09	1.41-4.78
SomaticA No	M = 19.41, SD = 5.73	M = 17.35, SD = 6.88	0.43	2.05	0.26-3.84
CognitiveA RM	M = 21.69, SD = 8.36	M = 17.84, SD = 7.69	0.64	3.84	1.88-5.80
CognitiveA NRM	M = 22.08, SD = 7.03	M = 20.45, SD = 7.02	0.34	1.62	-0.53-3.30
CognitiveA No	M =21.36, SD = 6.99	M = 17.9, SD = 6.09	0.74	3.45	2.01-4.88
Relaxation RM	M = 4.03, SD = 1.42	M = 2.61, SD = 1.29	1.13	1.42	1.00-1.83

	Pre-intervention	Post-intervention	Cohen's d	Mean Difference	90% CI
Relaxation NRM	M = 4.16, SD = 1.2	M = 3.54, SD = 1.06	0.67	0.62	0.30-0.94
Relaxation No	M = 3.86, SD = 0.99	M = 3.54, SD= 16.06	0.36	0.31	-0.28-0.66
HR RM	M = 79.12, SD= 13.02	M = 75.4, SD = 13.78	0.46	3.72	1.07-6.36
HR NRM	M = 78.86, SD = 10.4	M = 76.52, SD = 8.49	0.14	0.90	-1.52-3.33
HR No	M = 77.42, SD =16.06	M = 76.73, SD =15.79.	0.13	1.61	-0.53-3.79

Key: RM = relaxing music for anxiety control; NRM = non-relaxing music; No = no music control.

Pre-to Post-Intervention, ES, Mean-Difference and 90% CI

The ES in the relaxing music for anxiety control condition ranged from 'medium' (cognitive anxiety and HR) to 'large' (somatic anxiety and subjective relaxation). In all cases the 90% CIs revealed a positive effect. For non-relaxing music, the ES ranged from 'small' (cognitive anxiety and HR) to 'medium' (somatic anxiety and subjective relaxation). The 90% CIs showed that values for somatic anxiety and subjective relaxation were positive. As to the no music control, in general the smallest effects were found in this condition with ES ranging also ranging from 'small' (somatic anxiety, subjective relaxation and HR) to 'medium' (cognitive anxiety). The 90% CIs showed that only cognitive anxiety was deemed to produce a positive effect (see table 6).

When examined by gender (see tables 7 and 8), for males in the relaxing music for anxiety control condition, ES ranged from 'medium' (cognitive anxiety and HR) to ‘large’ (somatic anxiety and subjective relaxation). The mean differences were also largest in this condition and the 90% CI showed that all of the DVs were positive. In the non-relaxing music condition, ES ranged from ‘small’ (cognitive anxiety) to ‘medium’ (somatic anxiety and subjective relaxation). In this instance ES were not calculated for HR as this was shown to increase pre-to post-intervention. The 90% CI revealed that the effect for somatic anxiety and subjective relaxation were considered to be positive. As to the no music control, ES ranged from ‘small’ (HR) to ‘medium’ (subjective relaxation, cognitive and somatic anxiety). Only somatic and cognitive and somatic anxiety were considered to have a positive effect. For females, ES in the relaxing music for anxiety control condition ranged from ‘large’ (cognitive anxiety) to ‘very large’ (somatic anxiety, subjective relaxation and HR). All the DVs were considered to have a positive effect. In the non-relaxing music condition ES ranged from ‘small’ (subjective relaxation) to ‘medium’ (cognitive anxiety, somatic anxiety and HR). The 90% CI showed that positive effects were present for all but cognitive anxiety. In the control, ES for females ranged from ‘small’ (subjective relaxation) through ‘medium’ (somatic anxiety) through ‘very large’ (cognitive anxiety and HR). The effects for cognitive anxiety and HR were considered positive (see figures 1, 2, 3 and 4).

Table 7: Shows condition pre-to post-intervention means, standard deviations, Cohen's *d* Effect Size and 90% CI for somatic anxiety, cognitive anxiety, self-confidence, subjective relaxation, and HR for the male sample.

	Pre-intervention	**Post-intervention**	**Cohen's d**	**Mean Difference**	**90% CI**
SomaticA RM	M = 18.68, SD = 7.69	M = 14.33, SD = 5.22	0.77	4.35	1.88-6.82
SomaticA NRM	M = 18.76, SD = 4.74	M = 15.54, SD = 5.94	0.58	3.21	.17-6.26
SomaticA No	M = 18.30, SD = 5.22	M = 15.96, SD = 6.33	0.53	2.34	0.29-4.40
CognitiveA RM	M = 21.22, SD = 8.68	M = 18.55, SD = 7.96	0.47	2.66	.31-5.02
CognitiveA NRM	M = 20.18 SD = 7.50	M = 19.00, SD = 6.11	0.23	1.18	-1.73-4.10
CognitiveA No	M = 18.93, SD = 5.59	M = 16.26, SD = 5.79	0.67	2.66	0.99-4.33
Relaxation RM	M = 3..83, SD = 1.58	M = 2.72, SD = 1.31	0.96	1.11	.62-1.59
Relaxation NRM	M = 3.90, SD = 1.30	M = 3.27, SD = 1.00	0.63	0.63	0.07-1.19
Relaxation No	M = 3.53, SD = 0.83	M = 3.20, SD = 1.37	0.46	0.33	-0.07-0.74
HR RM	M = 79.12, SD = 13.02	M = 75.4, SD = 13.78	0.56	1.47	1.12-4.23
HR NRM	M = 75.18, SD = 9.07	M = 77.45, SD = 8.81	N/A	-2.27	-5.56-1.01
HR No	M = 75.84, SD= 18.12	M = 75.00, SD =17.44	0.12	0.84	-2.32-4.01

Key: RM = relaxing music for anxiety control; NRM = non-relaxing music; No = no music control.

Table 8: Shows condition pre-to post-intervention means, standard deviations, Cohen's *d* Effect Size and 90% CI for somatic anxiety, cognitive anxiety, self-confidence, subjective relaxation, and HR for the female sample.

	Pre-intervention	**Post-intervention**	**Cohen's d**	**Mean Difference**	**90% CI**
SomaticA RM	M = 24.07, SD = 6.20	M = 14.98, SD = 5.28	2.07	9.08	6.12-12.05
SomaticA NRM	M = 21.27, SD = 7.75	M = 18.21, SD = 5.87	0.77	2.99	0.86-5.12
SomaticA No	M = 21.78, SD = 6.46	M = 20.35, SD = 7.55	0.41	1.41	-2.94-5.79
CognitiveA RM	M = 22.75, SD = 8.06	M = 16.25, SD = 7.28	1.17	6.50	2.79-10.20
CognitiveA NRM	M = 23.69, SD = 6.47	M = 21.69, SD = 7.73	0.45	2.00	-0.21-4.21
CognitiveA No	M = 26.57, SD = 7.18	M = 21.42, SD = 5.50	1.81	5.14	2.10-8.18
Relaxation RM	M = 4.50, SD = 0.92	M = 2.37, SD = 1.30	1.98	2.12	1.37-2.87
Relaxation NRM	M = 4.38, SD = 1.12	M = 3.76, SD = 1.09	0.32	0.61	0.18-1.04
Relaxation No	M = 4.57, SD = 0.97	M = 4.28, SD = 1.11	0.26	0.28	-0.53-1.10
HR RM	M = 82.62, SD = 10.51	M = 74.12, SD = 17.32	2.63	8.50	2.96-14.03
HR NRM	M = 81.54, SD = 10.96	M = 77.45, SD = 8.59	0.76	4.09	0.91-7.26
HR No	M = 83.83, SD = 12.28	M = 80.50, SD = 11.94	1.94	3.33	1.89-4.77

Key: RM = relaxing music for anxiety control; NRM = non-relaxing music; No = no music control.

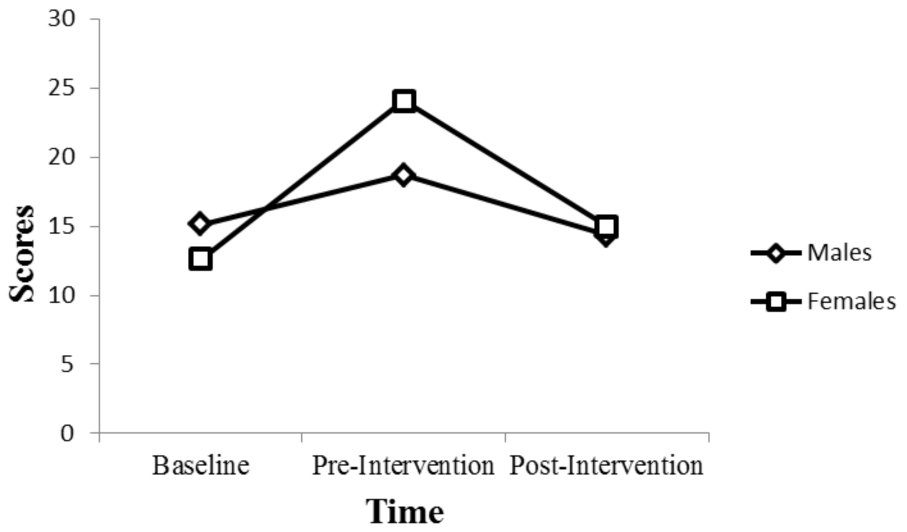

Figure 1: Shows changes over time for somatic anxiety in the relaxing music for anxiety control condition.

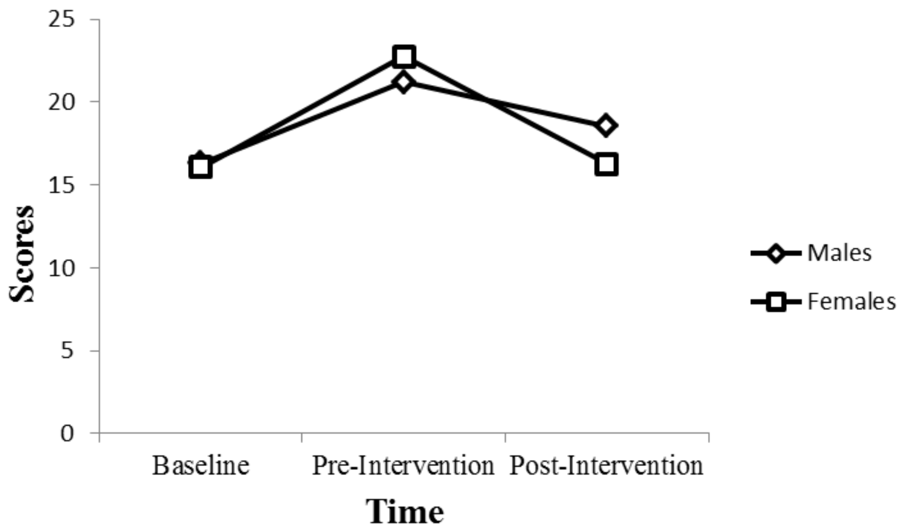

Figure 2: Shows changes over time for cognitive anxiety in the relaxing music for anxiety control condition.

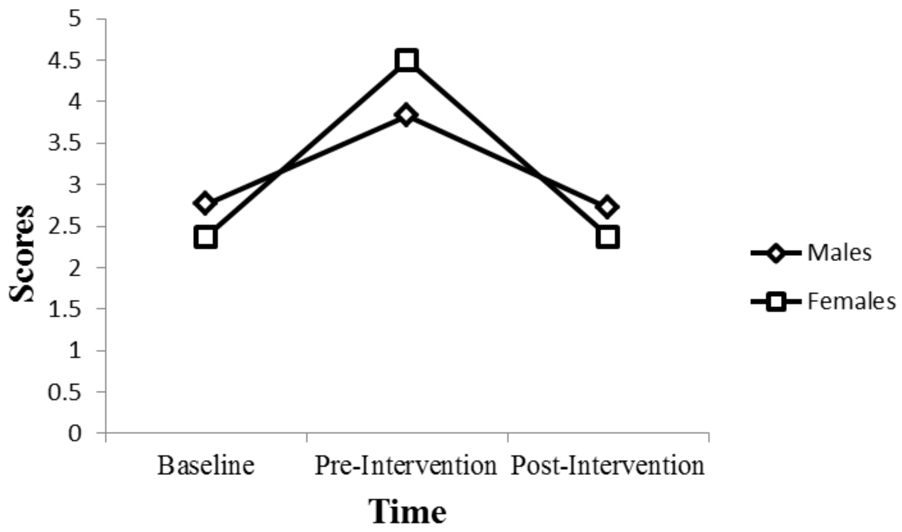

Figure 3: Shows changes over time for subjective relaxation in the relaxing music for anxiety control condition.

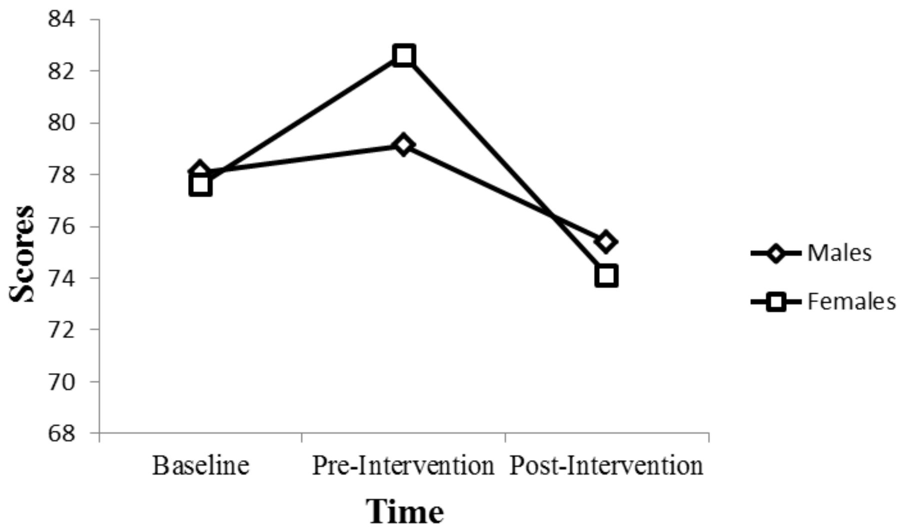

Figure 4: Shows changes over time for HR in the relaxing music for anxiety control condition.

Motor Task Performance

The task scores for each condition were: relaxing music for anxiety-control (*M* = 5.57, *SD* = 2.41), non-relaxing music (*M* = 4.75, *SD* = 1.72) and no-music (*M* = 5.22, *SD* = 2.33) conditions. The Factorial ANOVA did not show any significant differences in performance for condition ($F_{(2, 66)}$ = .18, *p* =.50) nor for condition × gender ($F_{(2, 66)}$ = .75, *p* =.47).

3.2.3. Discussion

The aims of this investigation were to examine the effects of two music types on measures of competitive state anxiety, and to determine whether any changes in state anxiety impacted upon simple motor task performance. Given the stated aims, it is important first to consider the efficacy of the anxiety producing stimuli. A failure in this respect would have made subsequent analysis meaningless. The main effect data showed significant baseline to pre-intervention elevations in somatic anxiety, cognitive anxiety and HR. These changes were accompanied by significant reductions in ratings of subjective relaxation. There was additional evidence for effectiveness of the anxiety-producing stimuli. Hanson and Gould (1988) list a number of behavioural manifestations of competitive state anxiety, for example, breathing irregularities, changes in facial expression, yawning, trembling, changes in behavioural patterns and nail biting. Many of these behaviours were observed preceding the introduction to the competitive task. Some participants exhibited pacing behaviours and also trembling when completing the CASI-2R. Fidgeting was also apparent, as was yawning and head shaking.

Regarding self-confidence, no alterations were evident. Addressing the stability of self-confidence, although Martens et al. (1990b) have claimed that increases in competitive state anxiety should be accompanied by decrements in self-confidence, this supposition has not been universally accepted, with some suggesting that they instead work as independent factors (Woodman and Hardy, 2003). The relative simplicity of the competitive tasks incorporated into the anxiety-producing procedures might account for the stability of self-confidence. Mangos and Steele-Johnson (2001) contend that a negative relationship exists between interpretations of task difficulty and self-efficacy. If participants believed that they could, at the least, complete the tasks, then self-confidence would likely remain unaffected. Despite the issues surrounding self-confidence, overall, the anxiety-producing stimuli produced the desired effects. Therefore, further analysis was warranted; however, because self-confidence was unaffected it will receive no further consideration.

Addressing the main study aims, first, it was hypothesised that both music types would prove to be effective at reducing measures of state anxiety whilst also increasing perceptions of relaxation (e.g. Evans, 2002; Pelletier, 2004; Nilsson, 2008). Second, it was hypothesised that relaxing music for anxiety control would be a more effective than non-relaxing music. Attending to the main effects data for the sample as a whole, mixed-design factorial MANOVA revealed significant pre-to post-intervention reductions in somatic and cognitive anxiety, subjective relaxation and HR; providing some support for the first hypothesis. As to the second hypothesis, there were no significant condition × time interactions for somatic anxiety, cognitive anxiety and HR. Importantly this suggests that condition had no significant impact upon pre-to post-intervention levels for any of these DVs. Only ratings of subjective relaxation were influenced by the type of intervention, with participants in both the relaxing music for anxiety control and non-relaxing music conditions experiencing significant pre-to post-intervention increases. As anticipated, the mixed-design factorial MANOVA also showed that no gender × condition × time differences were evident for any of DVs.

It is unclear as to why sitting in silence provided anxiolytic benefit. A similar effect has been observed in studies by Burns et al. (1999) and Burns et al. (2002) who found that it was the participants in the no music control conditions that experienced the largest pre-to post intervention increases in perceptions of relaxation. Unfortunately, these authors made no attempt to explain this particular outcome. In the current investigation, it is possible, given the participant profile (i.e. sport students), that some were able to use the period of silence to utilise previously learned strategies. Without corroborating evidence this particularly explanation cannot be verified, however, future research should attempt to minimise the use of personal anxiety control strategies, or at least, make efforts to assess whether such techniques are being utilised.

From what has been presented so far, when compared to a period of silence, it appears that neither music type offers much additional benefit to those experiencing competitive state anxiety. All three interventions had a statistically significant effect on within-group, pre-to post-intervention levels of somatic anxiety, cognitive anxiety, HR. As stated, only subjective relaxation was influenced by music listening. Despite there being what could be considered a limited statistical effect, when examined for practical significance there was some tentative support for the application of relaxing music for anxiety control.

When the magnitude of the effects were measured (ES, mean-difference and 90% CI), the largest pre-to post-intervention ES were observed in the relaxing music for anxiety control condition; ES ranged from medium (cognitive anxiety and HR) to large (somatic anxiety and subjective relaxation) in this condition. In all cases the

90% CIs revealed a positive effect. From a practical perspective, these outcomes do suggest that relaxing music for anxiety control provides greater anxiolytic benefit than non-relaxing music and sitting in silence. It also appears that the effect was stronger for somatic anxiety and subjective relaxation.

The lack of statistical effect for gender also implied that males and females responded similarly to the interventions; this was the expected. However, the ES, mean-differences and 90% CI data did suggest that reactivity to musical stimuli in anxiety producing situations is greater in females. Whilst stressing that the practical significance results do not invalidate the outcomes of the main analysis, the difference in the magnitude of effect between genders is interesting. However explaining the outcomes is difficult. First, the compositions used in the relaxing music for anxiety control condition were considered to be gender neutral. Second, there is little in the literature to suggest that females in particular might respond in this manner.

Although the primary aim of this investigation was to study the effects of relaxing music for anxiety control upon measures of competitive state anxiety, its impact on motor performance was also examined. Based upon Martens et al's (1990b) assertion of a negative relationship between anxiety and motor performance, it was hypothesised that any reductions in anxiety would lead to improved motor task performance. This hypothesis is difficult to assess. As stated, the mixed-design factorial MANOVA analysis showed that all three interventions were similarly effective at reducing levels of competitive state anxiety; post-intervention anxiety measures (somatic anxiety, cognitive anxiety and HR) were not deemed to be significantly different between the conditions. As such, differences in performance should perhaps not be expected. Alternatively, if the findings of the supplementary analyses (i.e. ES, change-scores, mean-differences and 90% CI) are taken to show a greater effect for relaxing music for anxiety control, then this implies that reductions in competitive state anxiety are not accompanied by fine motor skill improvements. If the latter explanation is accepted, then it is possible that the performance-anxiety relationship proposed by Martens et al. (1990b) is, at best, mediocre (Jerome and Williams, 2000; Craft et al., 2003). As such, this hypothesis might have been misguided. The inclusion of a baseline measure of performance might have provided some useful information on this. Specifically, after being introduced to the anxiety-producing stimulus, motor performance could have been assessed. Then baseline and post-intervention scores could have been compared. Unfortunately, this action might have compromised levels of uncertainly, hence the ability of the anxiety-producing stimulus to evoke the desired effect. It is also possible that the motor skill was simply not difficult enough, as perhaps evidenced by the self-confidence outcomes, to detect the proposed anxiety-performance relationship.

In conclusion, the results of this study indicated that all three interventions provoked statistically significant pre-to post-intervention reductions in somatic anxiety, cognitive anxiety and HR. Only levels of subjective relaxation were positively affected by music. No significant differences were evident between the two music conditions. These finding suggests that relaxing music for anxiety control offers little additional benefit to listening to non-relaxing music or sitting in silence. However, whilst it acknowledged that the data concerning practical significance do not invalidate the outcomes of the main analysis, the ES, mean-difference and 90% CI analysis does offer some tentative support for the application of relaxing music for anxiety control. The largest pre-to post-intervention effects were observed in this condition, and all of the 90% CIs revealed a positive effect (Stuart, Hopkins, Cook and Cairns, 2005; Batterham and Hopkins, 2006). This data also suggested that relaxing music for anxiety control has a greater influence on the somatic component of anxiety. Relating these findings to the Matching Hypothesis, although the main analysis indicates that all three interventions were effective at controlling multidimensional competitive state anxiety, the supplementary analysis did reveal that the effects appeared to be greater for somatic anxiety. As to the effects of gender, again there was also a lack of statistical effect, however, the ES, mean-difference and 90% data showed that listening to relaxing music for anxiety control might be more effective at reducing anxiety levels in females. Caution is however advised when interpreting these particular outcomes and it is recommended that they not be used to invalidate the main statistical analysis.

This study was limited in some respects. First, the competitive situation was contrived. In future, researchers should consider applying relaxing music for anxiety control in an authentic field environment. Second, participant numbers were rather limited. Third, this investigation has considered anxiety as debilitative. However, given that many assert that anxiety can also be facilitative (e.g. Ntoumanis & Jones, 1998; Jones & Hanton, 1996), future research should consider whether listening to relaxing music for anxiety control influences the directional aspects of competitive state anxiety. Fourth, to conform to Lichstein's (1988) recommendation that on-the-spot relaxation strategies must be brief, this investigation utilised an intervention period of 10-minutes. It is possible that the brevity of the music exposure was insufficient to allow music's anxiolytic properties to fully manifest. It might therefore be worth examining music's effect on anxiety over a longer period; although this might be considered to be at odds with Lichstein's (1988) guidance.

3.2.4. Chapter Summary

Utilising the recommendations presented in Chapter 2, this study has examined whether music, and in particular relaxing music for anxiety control, can be utilised to alleviate competitive state anxiety. Whilst relaxing music for anxiety control did have the desired effect, the main analysis (mixed-design factorial MANOVA) revealed that it provides little additional benefit when compared to listening to non-relaxing music and sitting in silence. All three interventions provoked significant reductions in somatic anxiety, cognitive anxiety and HR. Subjective relaxation was influenced by condition, with both music types eliciting significant pre-to post-intervention elevations. To determine practical significance, ES, mean-difference and 90% CI were calculated. This data showed that the largest effects were found in those assigned to the relaxing music for anxiety control condition. It also appeared that females were more responsive to the anxiolytic benefits of music than males. Practitioners might wish to consider these outcomes if contemplating the use of music to control competitive state anxiety. However, it must be reiterated, the ES, mean-difference and 90% CI results should not be taken to mean the hypotheses were fully supported.

Overall, there was some, albeit limited, evidence to support the application of relaxing music for anxiety control in the competitive environment. With this in mind, the next chapter will consider some of the mechanisms that might be responsible for music's anxiolytic properties.

Chapter 4: Relaxing Music for Anxiety Control - The Theory behind the Effect

4.1.0. Introduction

Chapter 3 showed that relaxing music for anxiety control, non-relaxing music and sitting in silence all provided anxiolytic benefit. In all three conditions, the main analysis revealed significant pre-to post-intervention reductions in somatic anxiety, cognitive anxiety and HR. Only pre-to post-intervention levels of subjective relaxation were influenced by condition. In this instance, both music conditions caused significant increases in this response. Although these outcomes indicate that relaxing music for anxiety control offered little additional benefit to non-relaxing music and a period of silence, there was nevertheless evidence to support its application in anxiety inducing competitive environments. When the ES, mean-difference and 90% CI data was examined (Marshall, 2005; Field, 2005; Stuart et al., 2005; Batterham and Hopkins, 2006; The American Psychological Association, 2009), it revealed that the largest pre-to post-intervention effects were in the relaxing music for anxiety control condition. As stated previously, these particular data should be interpreted with caution; however, it does appear that relaxing music for anxiety control provides the greatest anxiolytic benefit.

When all the results are considered, an examination of the mechanisms behind music's relaxation effect is warranted. As part of this thesis, an exhaustive review of literature pertaining to music and anxiety was conducted. However, despite there being an ample pool of research from which to explore music's anxiolytic properties, very little detail relating to why music might have this effect is available. Despite the lack of specific information, by examining music theory in general, it should be possible to provide some insight into this phenomenon. This chapter will present and scrutinise the relevant theory with aim of providing some insight into why music can affect the human organism in this manner. It should be recognised, that without empirical support, they remain as purely theoretical ideas.

4.2.0. Dissociation

Cognitive anxiety is the thought aspect of competitive state anxiety, and is associated with negative situational appraisals, disruptive thought patterns and worry (Burton, 1988; Martens et al., 1990a; Gould et al., 2003). Given the proposed interdependence of the MAT, increases in cognitive anxiety might also provoke corresponding increases in somatic anxiety and reductions in self-confidence (Martens et al, 1990b). As such, the disruption of these potentially damaging thought processes should, in theory, help to reduce the intensity of multidimensional competitive state anxiety.

Dissociation is a cognitive strategy in which an individual is focuses upon task-irrelevant cues, thereby restricting the flow of sensory information to the brain (Baghurst, Thierry and Holder, 1999). Explained by theories of limited attention capacity (e.g. Rejeski's (1985) Parallel Processing Model), it is claimed that the amount of information that can be processed at a given time is finite. Accordingly, directing attention to one stimulus (e.g. music) can prevent the processing of another (e.g. negative thoughts or the physiological symptoms of somatic anxiety). Dissociation strategies have proved effective at diverting attention from unpleasant stimuli. For example, Buck and Morley (2006) showed that dissociation could reduce the intensity of cancer induced pain. Likewise, Mitchell, MacDonald and Brodie (2006) found that the diverting of attention could diminish the perception of experimentally-induced cold pressure pain. Importantly, one of the distraction methods employed by Mitchell et al. (2006), was music listening.

Within the athletic community, dissociation strategies have been employed to disrupt the negative sensations (e.g. fatigue) associated with physical exercise (Karageorghis, 1997; Stevenson and Biddle, 1999; Scott, Scott, Bedic and Dowd, 1999; Elliott et al., 2004; Elliott et al., 2005). In many instances, the distraction of choice has been music (Karageorghis, 1997; Scott et al., 1999; Elliott et al., 2004; Elliott et al., 2005). Taken together, these studies show that dissociation, using either music or some other stimuli (e.g. focusing upon environmental stimuli), can allow an individual to divert attention from unpleasant physical sensations. As such, it is conceivable that music listening could reduce the flow of somatic information into the processing centres of the brain, and so reduce the symptoms of somatic anxiety.

With regard to actual thought processes, research appears limited. What is available concerns the distracting effect of music within the educational environment. Of particular relevance to the current area of research are those studies which have shown music to have a detrimental effect on learning. For example, Moreno and Mayer (2000) examined the effect of music listening on an e-learning task. It was revealed that such aural stimuli not only impeded the ability to follow instructional messages, but also reduced memory retention and problem solving ability. Applying the theory of limited attention capability, the authors hypothesised that listening to music placed an additional demand upon limited cognitive assets and so diverted attention from the learning task. Huk, Bieber, Ohrmann, and Weigel (2004) have presented similar findings; again the authors attributed the music's detrimental influence on learning to an increase in processing demands.

Whilst the preceding examples show that music can indeed interfere with cognitive processing, it needs to be recognised that the studies of Moreno and Mayer (2000) and Huk et al. (2004) were not concerned with negative thought processes.

Dissociation as a distinct anxiety control strategy does not appeared to have received empirical attention. However, some have alluded to this process. For example, Payne (2000) claims that gazing, chanting or breath-watching can reduce the intrusion of competing memories, images or associations. Similarly, Lehrer, Schoicket, Carrington and Woolfolk (1980) believe that performing mantra (the repeating of words) may limit the processing of disruptive cognitions. Wegner (1991) details the use of self-distraction strategies which are in essence, identical to dissociation. Within the context of sport, again, there is little reference to its use as an anxiety control technique.

From the information presented, it might be assumed that dissociation is somehow implicated in the music-induced relaxation response. Wegner (1991) however, claims the opposite. He argues that conscious attempts to limit the occurrence of intruding thoughts can actually be counterproductive. Wegner (1991) believes that attempts to suppress thoughts might actually provoke a rebound effect, that is, the act of suppression eventually increases the frequency of the thoughts one is attempting to dispel. It is important to highlight that Wegner (1991) is referring to what is known as active dissociation. That is, a conscious attempt to repress thoughts by focusing upon an external stimuli. It is perhaps precisely because dissociation efforts are ‘forced’ that rebound effects occur (i.e. the ironic process theory). Music listening can be a much more passive dissociative process whereby the listener can become unconsciously engaged with the stimulus, and so, the likelihood of rebound effects might be minimised.

Wegner (1991) also states that the external distractor itself, can become a cue for detrimental cognitions. In effect, the individual is conditioned to associate the distracter with negative thought patterns. The behaviourist view of learning would support this concern. However, conditioned responses associations could be avoided by utilising a number of compositions. Furthermore, the converse argument should also apply. For example, music is often utilised by advertising agencies to provoke an associated pairing with commercial products (Hargreaves and North, 1997c). As such, a particular musical piece has the potential to become associated with the relaxed state, and so become a cue for relaxation. Continuing with the stimulus-response theme, somatic anxiety is believed to be a conditioned response to environmental cues (Martens et al., 1990b). If these cues are auditory in nature, then listening to music could interrupt the transmission of any external sound cues and so stop a conditioned somatic response. Another criticism levelled by Wegner (1991) relates to the fact that distracters are generally 'uninteresting' and so do not sufficiently divert attention. To support this assertion, Wegner (1991) refers to a lightbulb as a distraction source. This is a weak argument. Attempting to induce a dissociative state by focusing on an object such as a lightbulb will in all likelihood be unsuccessful, precisely because it is a simple, mundane and inanimate object. In contrast, music is a medium that can include numerous layered elements, structural changes and variations in dynamics and so is likely to offer a more interesting source of distraction. Wegner's (1991) ideas about uninteresting stimuli, might however explain why participants involved in Study 2 suggested that simple compositions were boring and so not conducive to relaxation.

From the discussion so far, there is reason to believe that music's anxiolytic properties are, in part, attributable to dissociation. Firstly, acting as an alternative focus of attention, listening to music could disrupt the thought processes associated with cognitive anxiety. Furthermore, that cognitive and somatic anxiety are intertwined, a music-induced reduction in cognitive anxiety may curtail the worry cycle (Gill and Williams, 2008) resulting in reductions in somatic anxiety. Music could also affect somatic anxiety in other ways. Music listening has the potential to divert attention from the associated physical reactions and also eradicate aural cues. However, despite the support for dissociation, it cannot by itself account for music's anxiolytic effects, as one would assume that attending to any musical form, regardless of its inherent characteristics, should in theory aid relaxation. This is not the case. Although it is true that some studies have shown that a wide range of music genres can induce relaxation (e.g. Davis & Thuat 1989; Winter et al., 1994; Macdonald et al., 2003), the intensity of the effect is not consistent. For example Burns et al. (1999) and Burns et al. (2002) have shown that participants listening to classical and self-selected relaxing music reported being more relaxed than those listening to hard rock. The results of Study 2 also provide some evidence for this. Furthermore, music and exercise research (e.g. Karageorghis and Jones, 2002; Elliott et al., 2004; Elliott et al., 2005; Elliott, 2007) has shown that music-induced dissociation can be accompanied by ergogenic effects (i.e. increases in exercise intensity). This could suggest that certain music types have the ability to energise the human organism. Such findings indicate that music's anxiolytic effects cannot be explained through dissociation alone and as such, alternative theories need to be considered.

4.2.1. Music and Mental Imagery

Osborne (1981) asked participants to listen to music under relaxed conditions and report the frequency of thoughts, emotions and mental images. Participants reported that 'spacy' music, whilst not actually provoking an increase in the number of thoughts, or altering emotional tone, did cause an increase in the frequency of mental images. It is the latter finding that might be implicated in the music induced relaxation response. Practitioners such as Payne (2000) and Bourne (2002) advocate the use of imagery as a means of anxiety control. They claim that there is a direct relationship between the area of the brain that is involved mental imagery and the ANS. Although advocates of the dualist perspective of ‘body’ and ‘mind’ propose that the two components are separate, cognitive neuroscientists believe this Cartesian dichotomy to be false (Murphy and Martin, 2002). That is, ‘mind’ and ‘body’ are inseparable; hence, activity in one has the potential to influence activity in the other. According to Atkinson, Atkinson, Smith and Bem (1993), mental imagery involves the same representations and processes as visual perception. As such, ‘mental images’ and ‘real’ images can provoke similar autonomic reactions. If one assumes that ‘real’ images can induce relaxation, then it can also be assumed that ‘mental’ images will cause a similar effect. It should be stated that there appears to be no empirical evidence to show that ‘real’ images can cause this reaction, however there is support for mental imagery as a relaxation procedure (e.g. Guillot and Collet, 2008; Williams et al., 2010). Perhaps relaxing music evokes similarly relaxing images. So rather than being dissociative, music is in fact associative.

There is support for this idea, as discussed in Chapter 1; Sloboda and Juslin (2001) believe that music can influence emotion through iconic relationships. Such associations were highlighted by Osborne (1981); recurrent themes whilst listening to ‘spacy’ music included the sun, sky, ocean, floating, cosmic journeys and religious images. Based on this finding, it is indeed possible that listening to relaxing music provokes relaxing mental imagery, which in turn induces a relaxation response. Sloboda and Juslin (2001) also refer to associative relationships. In effect, this is a stimulus-response relationship whereby a particular composition triggers past memories. This theory is supported by Scherer and Zentner (2002) who have claimed that music can act as a powerful cue in retrieving emotional experiences from the long-term memory. As such, a particular musical composition may have an association with a particular event, which provokes a mental image of the event, and subsequently the corresponding emotional label (i.e. relaxed). Applying the associative relationship theory to the outcomes of this thesis is somewhat problematic. Familiarity was not considered to be an important constituent of relaxing music for anxiety control, and although this was not actually tested, it is probable that many of the compositions used were not known to the participants. Yet many were classified as relaxing. So, if mental imagery is to be advanced to explain the anxiolytic effects of music, in this instance at least, iconic relationships are the more likely. However, the lack empirical support means that this theory is fragile, and so cannot be accepted unreservedly. That said, music induced imagery might offer some insight into how music promotes relaxation.

4.2.2. Music and the Brain

Whilst still in its infancy, the neural mapping of music perception has begun to offer some insights into how music might influence emotion (Trainor and Schmidt, 2003). It has been found for example, that music can stimulate the limbic regions of the brain, and that music induced emotional experiences are identical to those felt in other contexts (Trainor and Schmidt, 2003). This being the case, music perceived as being relaxing could trigger the corresponding emotional response (serenity). Dissonance in music might have implications (Blood, Zatorre, Bermudez and Evans, 1999). Blood et al. (1999) have shown that dissonance in music is generally considered to be unpleasant. Importantly, Blood et al. (1999) also found that auditory discord was processed in both the limbic centres, and in brain regions related to memory and selective attention. Applying these findings to the current context, discord in music might cause attentional reorientation and cue memory retrieval.

Given that dissonance is deemed as unpleasant, it is possible that the associated memories would be considered similarly. Music has also been found to alter brain-wave activity. During periods of 'wakeful' relaxation there is an increase in alpha brain wave activity (Dworetzky, 1993). Krause, Porn, Lang and Laine, (1999) revealed that listening to particular music genres (i.e classical) can promote alpha wave activity within the band associated with wakeful relaxation (Krause et al., 1999).

Given the complexity of research relating to neurophysiology, this particular discussion has been kept purposefully brief. Nevertheless, it does seem that music might not only have the ability to induce relaxation indirectly, through mechanisms such as dissociation and imagery, but also directly, by activating the emotional brain regions and/or altering alpha wave activity.

4.2.3. Cognitive Labelling

According to Schachter and Singer's (1962) Cognitive Labelling Theory, emotions are product of the appraisal process. Schachter and Singer (1962) showed that individuals experiencing the same somatic symptoms could differ in their emotional experiences. It was suggested that people make judgements about the cause of the emotion based upon the information available to them. As such, the same physiological reactions can be interpreted differently; in the case of Schachter and Singer (1962) this was either euphoria or anger. In theory then, if an individual experiencing competitive state anxiety was offered an alternative explanation for the symptoms, anxiety could be relabelled as something more facilitative (e.g. excitement). Music might provide this alternative source. It is unlikely that relaxing music for anxiety control would cause such a relabelling as by its nature, it would not be perceived as arousal producing. However, it is conceivable that increases in arousal could be attributed to other music types, e.g. loud, exciting music. Thus, although the relabelling of emotions might not have occurred in Study 3, it could explain why the investigations by Burns et al. (1999) and Burns et al. (2002) showed increase in perceived relaxation after listening to hard rock music.

4.3.0. Music Factors

A number of specific music components have been implicated in music's ability to aid relaxation. These will now be summarised.

4.3.1. Tempo

The results of Study 2 indicated that tempo had the strongest influence on the relaxing qualities of music; an outcome also supported by Wolfe et al. (2002). Although it is generally accepted that slow music enhances relaxation (Husain, Thompson and Schellenberg, 2000), there is nothing definitive in the literature to explain why this might be so. One possible explanation relates to the fact that tempo is directly related to music preference. According to Iwanaga (1995), when HR is congruent with musical tempo, high preference ratings ensue. As such, as individuals become more relaxed, there should be preference shift towards music of slower tempi. Whilst this hypothesis has been accepted by some (e.g. Karageorghis et al., 1999), it has not met with universal approval. Leblanc, Colmen, McCrary, Sherril and Malin (1988) disagree with Iwanaga (1995), proposing instead a positive relationship between music preference and tempo. Thus slow tempo music should not receive an overly positive appraisal. The results from Study 2 appear to contradict this, as 'liking' was deemed to be important component of relaxing music for anxiety control. Presumably, those compositions deemed to be most relaxing were well received.

The work of Konecni (1982) might provide some additional direction on this. According to Konecni (1982) the listening context must be considered before tempo-preference predictions are made. The view of Konecni (1982) has received support from Holbrook and Anand (1990), who examined the effects of tempo and situational arousal upon perceptual responses to music. They found that under low arousal conditions there was a preference for slow tempo music. This offers some support for the assertions of Iwanaga (1995). The importance placed upon tempo might explain why both music types (relaxing music for anxiety control and non-relaxing music) produced reductions in competitive state anxiety; both types were of a similar tempo range. Before concluding this section, it does have to be remembered that Study 2 revealed that music that was considered to be 'too slow' was not conducive to relaxation. So, whilst slow music is preferred for relaxation, music that is 'too slow' might not have the desired effect.

4.3.2. Rhythm

The rhythmic elements of music contain the beat, tempo, accent and note groupings (Webster's Master Encyclopaedia, 2002). It is this component of music that elicits physical movement.

> "with its deep seated association in the history of music and human action, it is hardly surprising that music with a periodic rhythmic structure tends to elicit accompanying movements, whether these are explicitly dance movements or less formalised responses" (Clarke, 1999, p 495).

The outcomes of Study 2, in conjunction with those of Wolfe et al. (2002), suggest that the rhythmic elements do have important consequences for the relaxing qualities of music. In particular, the evidence from Study 2 showed that the most relaxing pieces contained relatively consistent, subtle 4/4 rhythms and were devoid of accentuated pulse (e.g. pronounced drum beats). Given that rhythm's association with physical movement it should not be surprising that heavy and pronounced rhythmic elements are not considered conducive to relaxation.

4.3.3. Instrumentation

Study 2 also highlighted the importance of particular instruments. The most relaxing tracks tended to be void of heavy bass tracks. According to Anderton (2002), the bass guitar provides music with 'kick' and 'energy'. As such, if emphasised the bass would likely have a detrimental impact upon perceptions of relaxation. Piano and strings were also noted for their relaxing qualities. The piano's role in relaxation has also been mentioned by Wedin (1972), who found that when piano was played in a 'legato' manner it was considered relaxing. This particular finding might provide an insight into why certain instruments were perceived this way. In musical terms, 'legato' means smooth and even. There was a tendency for the instrumentation (e.g. keyboard, piano and strings) in the most relaxing pieces to be played in this fashion. Even the relaxing pieces that contained staccato (detached notes) instrumentation were harmonised legato. This relationship between articulation and emotion has been recognised by others. For example, Kamenetsky, Hill and Trehub (1997) state that staccato articulation is generally perceived as 'lively', whereas legato is sensed as 'peaceful' and 'gentle'.

4.3.4. Music Complexity

Complex music is that which contains unusual harmonies, irregular tempi and rhythms, unexpected sounds, variations in volume (dynamics) and unpredictability

(Finnas, 1989; Hargreaves and North, 1995). In contrast, music of low complexity is predictable, simple, and uniform (Hargreaves and North, 1995). It was found that structural complexity did have some influence upon the relaxing qualities of music. There are a number of plausible explanations for this. Hargreaves and North (1995) have claimed that subjective interpretation of music complexity and music liking should follow an inverted 'U' relationship. That is, individuals are inclined to prefer music of a medium complexity; although this relationship moves slightly to the right for those with musical training. As previously stated, because liking is an important factor in music's functional capabilities, it is conceivable that music preference, and by association complexity, plays some role in mediating anxiety. However, of greater importance is the suggestion that music complexity is directly related to its arousal potential.

The Expectant Attention Theory (LaBerge, 1995) postulates that when listening to music, the arrangement and inherent structure of a composition can induce expectancies about upcoming structural arrangements. It is hypothesised that expectancies, generalisations stored in long-term memory, reduce the level of active processing when listening to music. As such, when the expected features of a composition correspond with the actual, there is a reduction in cortical activity. In contrast, unexpected stimuli, particularly when highly intense, interfere with ongoing cognitive processes, resulting in an increase in cortical activity and attentional reorientation. Furthermore, given that hyper-distractibility is one of the consequences of anxiety (Martens et al., 1990a), it is possible that constant attentional shifts resulting from unexpected musical events could be misinterpreted and labelled as anxiety (e.g. Schachter and Singer, 1962). On a related note, high levels of arousal often provoke a narrowing of attention (Nideffer, 1976), thus complex musical stimuli, if actively listened to in an anxious state, will compete for limited available attentional capacity. This could 'overload' the attentional capacity of the listener (Konecni and Sargent-Pollock, 1976). It is probably for these reasons that music that includes variations in dynamics, crescendos, unorthodox drum beats, staccato articulation, wide melodic ranges etc. (Gabrielsson and Lindstrom, 2001; Wolfe et al., 2002) is considered as non-relaxing, as the structural features are less predictable.

Addressing low-complexity music, according to North and Hargreaves (1997), when individuals are aroused, listening to simple compositions can reduce the intensity of this response. This can be explained by the fact that music can divert attention from internal sensations and also because predictable and simple musical structures would, according to LaBerge (1995), conform to one's expectancies, and so cause decreases in cortical arousal. However, the results from Study 2 challenge this assertion as it was found that simple compositions were not considered conducive to relaxation. It needs to be recognised that when North and Hargreaves (1999) made this claim they were referring to arousal, not anxiety. It is this distinction that provides some insight into why simple compositions were not considered appropriate for anxiety control. Unlike arousal, anxiety has a cognitive component which generally comprises of negative thought patterns (Martens et al., 1990a). Referring back to the discussion on dissociation, external stimuli can divert attention from the internal thought processes, however as previously argued, for this to occur the stimulus must be reasonably engaging. Simple compositions, by definition, would lack variation, so as with Wegner's (1991) lightbulb example, would provide little distraction. Hence, music of a moderate complexity would not only receive a reasonably positive appraisal, it would also be sufficient to divert attention, but not overload or cause persistent attentional reorientation.

4.3.5. Melody and Harmony

Both melody and harmony were considered to be important constituents of relaxing music for anxiety control. Again, the importance of these components was highlighted by Wolfe et al. (2002). However, despite their influence, an exhaustive literature search provided little insight into why these components might impact upon relaxation. Gabrielsson and Lindstrom (2001) have implicated melodic range, suggesting that this should be narrow and that the motion should be stepwise. Unfortunately, no attempt was made to explain why these melodic characteristics would be conducive to relaxation. It is possible that narrow melodic range and stepwise progressions conform to the listeners' expectancies and so limit cortical arousal. The most relaxing pieces from Study 2 contained reasonably strong and clear melodies. The New Grove Dictionary of Music and Musicians (Sadie, 2001) defines 'clear melody' as that which the listener might hear and appreciate with intermediate perception. In other words, clear melody should draw attention but not overload the senses. This could be related to dissociation, in that melodies must be strong and clear enough to provide an alternative distraction source. Simple melodies, if perceived as boring might not be sufficient to cause directional reorientation. In contrast, complex melodies might cause cortical overload and/or excessive reorientation. Melody is also the component that shapes the character of music, so perhaps individuals simply prefer music in which these components are reasonably explicit.

As to harmony, the major finding was that this element should be perceived to be largely consonant with limited use of dissonance. There remains some confusion concerning how musical dissonance should be defined (Tenney, 1988; Shapira-Lots and Stone, 2008; Dellacherie, Roy, Hugueville, Peretz and Samson, 2011). In general, many of the available descriptions allude to dissonance as being a component of music that the listener finds displeasing, inharmonious, harsh, unstable and disagreeable (Tenney, 1988). It is well evidenced that dissonant music is, in general, perceived unfavourably (Dellacherie et al., 2011) and that it elicits feelings of unpleasantness (Zentner and Kagan, 1998).

A number of theories have been advance to explain the apparent aversion to dissonance in music. Some believe that disinclination towards dissonance is a learned aesthetic preference, built up over time within a particular culture (Hargreaves, 1986; Fishman, Volkov, Noh, Garell, Bakken, Arezzo, Howard and Steinschneider, 2001; Dellacherie et al., 2011). This is perhaps evidenced by the fact that Eastern monophonic music is often perceived as dissonant to the Western audience (Werbock, 2011). Further support for this particular view comes from the fact that Western children do not develop a preference for consonance until approximately 10-years of age (Hargreaves, 1986). Thus, the perception of dissonance as being unpleasant appears to be consequence of musical acculturation. This might explain why level of musical experience has been found to moderate responses to auditory dissonance. According to Dellacherie et al. (2011), a positive correlation exists between degree of music training and aversion to discord. Explaining this, Dellacherie et al. (2011) suggest that musical training might reinforce a negativity bias towards dissonance in music. That is, music training might reinforce the association between dissonance and unpleasant emotions. Alternatively, those with music training might be more adept at processing discord within music; thus dissonance, and the associated affective reeponse, becomes more apparent to the experienced listener (Dellacherie et al., 2011).

The preceding argument implies that aversion to dissonance is a conditioned response. However, this view fails to explain why those who have not undergone any acculturation process (i.e. babies) have also been found to favour consonance in music (Gosselin, Samson, Adolphs, Noulhaine, Roy, Hasboun, Baulac and Petetz, 2006). Furthermore, dissonance in music does appear to have a psychophysiological explanation. In particular, Blood et al. (1999) have shown that dissonance is processed within the brain regions associated with the perception of negative stimuli; although this finding might not necessarily preclude an acculturation effect.

So far, the discussion on dissonance has tended to suggest that it is somehow inherently unpleasant. As stated previously, Eastern music is often considered dissonant to the Western ear, but not so to those from that particular cultural background (Werbock, 2011). Also, many composers use discord to convey emotion and movement in music (Machlis, 1990). In fact, most music includes some degree of discord; this can range from subtle to blatant. As Machlis (1990) states, music devoid of discord is likely to be rather boring; a factor that might explain why some of the pieces were considered inappropriate to relaxing. It is likely that some degree of discord is required if the listener is to be distracted from anxiety producing cues and negative thought patterns that can manifest at various times throughout the competitive period.

Relating the preceding information to the current findings, it is clear that the members of the focus group and the music rating procedure perceived dissonance to be detrimental to relaxation. It should be remembered however, that dissonance within music did not necessarily mean that it was perceived negatively, rather that it was considered inappropriate for anxiety control. A number of possibilities can be advanced to explain this. First, the discord within some of the least relaxing pieces was considered explicit. Relating this to The Expectant Attention Theory (LaBerge, 1995), according to Palisca and Moore (2011), consonant music tends to conform with learned expectations about musical structure, dissonant music does not. As mentioned, music which deviates from the expected course can elevate cortical activity, thus arousal. This particular view is supported by Bigand, Parncutt and Lerdahl (1996) who suggest that the degree and tension or relaxation within music is governed by whether it conforms to the listeners' expectancies. Explicit discord might have made these deviations from the 'expected' more obvious to the listener/s. Second, although there was no evidence to suggest that the pieces perceived as being dissonant were disliked, given the terms applied to dissonance in this study (e.g. 'grating' and 'did not sound right') and in general (e.g. unpleasant, displeasing), it is possible that consonant music was simply appraised more positively. Liking was considered important by those involved in the music rating procedure (Study 2), so perhaps appropriateness for anxiety control might be guided by liking. Third, that dissonance is often used within music to create tension implies that it is unlikely, by its very nature, to be conducive to relaxation. Fourth, given the suggestion that the musically trained might be more sensitive to dissonance, perhaps the focus group members overstated its effect. Research needs to examine further whether level of music expertise is correlated with negative perceptions of dissonance in music and also whether with a propensity for discord might impact upon its appropriateness for relaxation purposes. To conclude this section, it is acknowledged that dissonance should not necessarily be considered as unpleasant. However, in this instance, perceived dissonance was considered as being detrimental to relaxation. Hence, for relaxing music for anxiety control, regardless of whether any aversion to discord is innate, or developed via cultural acclimatisation, it does appear that those selecting music for this purpose should avoid music which tends to feature explicit dissonance.

4.3.6. Volume

During this thesis, music stimuli were presented at a volume of 70 decibels (dB). This decision was based on the recommendations of Staum and Brotons (2000) who suggested that individuals preferred relaxing music when played at a relatively low volume. However, Staum and Brotons (2000) also found that whilst a preference for low volume music did exist, music played at moderate and loud amplitude was still perceived to be relaxing. In fact, some of the participants stated that louder music was actually more conducive to dissociation. Similar suggestions have been made by North, Hargreaves and Heath (1998). According to North et al. (1998), when music is conveyed at louder volumes, the salient sensory information becomes more explicit and so provokes attentional reorientation toward the stimulus. So, whilst low volumes are preferred, volume must be high enough to allow for dissociation. Staum and Brotons (2000) classified 70dB as borderline low to median amplitude.

From the available information it appears that music amplitude should be at least 70 dB. As to whether music of a higher volume facilitates dissociation and so relaxation, remains unclear. However, it should be considered that The UK Health and Safety Executive (2005) recommend ear protection be worn when noise levels exceed 85 dB. Furthermore, the sound distortion that can present when music is played at loud volume can induce unpleasant feelings (Iakovides, Iliadou, Bizeli, Kaprinis, Fountoulakis and Kaprinis, 2004) and is unlikely to be conducive to the relaxed state.

4.3.7. Conclusion

To conclude, in an attempt to uncover the mechanisms responsible for music's anxiolytic effects, a number of theories have been explored. The first, dissociation, does appear to have some merit. Despite the protestations of Wegner (1991), distraction has been shown to reduce pain perception and divert attention from learning tasks. It is therefore reasonable to assume that listening to music might also have a similar effect upon the thought processes associated with cognitive anxiety. The second, music-induced imagery is currently less credible. This is not to say that this hypothesis should be ignored, rather that more research is needed to determine whether music induced-imagery indeed plays a significant role in relaxation. As to the effects of music on brain centres, this is an area which is in its infancy. Nevertheless, that music might directly influence the brain regions associated with relaxation suggests that this might play significant role in music's anxiety reducing effects. Although the mechanisms discussed so far might well be implicated, they cannot fully account for music's relaxing properties. As such, it is probable that particular intrinsic music factors also exert some influence. Study 2 has indeed shown that a particular criteria needs to be met if music is to be considered relaxing. Some of these characteristics have been discussed in relation to how they might induce relaxation. It is acknowledged that the suggestions made are somewhat speculative and so cannot currently be accepted with any certainty. This is because there have been very few attempts by others to uncover the processes involved, thus confirmatory evidence is lacking. Furthermore, it is possible that there are factors not considered in this thesis that could account for music's anxiolytic properties.

Relating these theories to the outcomes of Study 3, it must again be reiterated that the main support for music, and in particular relaxing music for anxiety control, was gleaned from the ES, mean-difference and 90% CI outcomes, and not the main analyses. The supplementary data did however suggest that it was relaxing music for anxiety control music that provided the greatest anxiolytic benefit. This data also revealed that effects tended to be stronger for somatic anxiety and subjective relaxation than for cognitive anxiety and HR. With this in mind, a cautious effort to apply the theories to the outcomes of Study 3 is made.

Regarding dissociation, this does appear credible in this instance. Listening to either music type would likely act as an external distractions source, and so would compete with limited attentional recourses, leading to a reduction of the negative thought patterns associated with cognitive anxiety. This in turn might cause reciprocal reductions in somatic symptoms and also increases in perceptions of relaxation. As argued, because of the structural characteristics of relaxing music for anxiety control, iconic mental associations would be more likely when listening to this music type. Likewise, alpha wave activation would also be more probable when listening to relaxing music for anxiety control. As to the involvement of the limbic centres, again, both music types would likely cause emotional reactions. However, the structure of relaxing music for anxiety control would make it more probable that the corresponding emotional response would be associated with relaxation. A number of music factors (e.g. consonance, complexity, harmony, rhythm) have been discussed in relation to reduced neural activation; this should cause deactivation of sympathetic division and a corresponding activation of the parasympathetic of the ANS (see Chapter 1). These structural components would primarily reduce the intensity of somatic anxiety (e.g. cortisol arousal, HR and muscle tension); although they would have a subsequent effect on the cognitive aspect. Explaining the stronger outcomes for somatic anxiety, it is possible that there was an additive effect for this component.

That is, somatic reductions caused by dissociation were combined with those related to the structural aspects of the music, thus the effects for somatic anxiety were larger than those for cognitive. Taken together, it is possible that dissociation mental imagery, alpha wave activity, limbic activation, and parasympathetic involvement are all implicated, thus creating a multidimensional relaxed state.

Chapter 5: General Discussion

5.1.0. Introduction

Anxiety is an emotional reaction that can be detrimental to the sports practitioner (Martens et al., 1990a). To help individuals cope with competitive state anxiety, methods such as PR, mediation and self-talk are often recommended (e.g. Onestak, 1991; Cox, 2002; Gill and Williams, 2008). However, although potentially beneficial, as has been argued, these techniques are constrained by issues of practicality. It has been contended that ‘on-the-spot’ relaxation strategies might be better suited to the sport environment. Music listening has been the method under investigation. Evidence suggests that music does have the potential to provide anxiolytic benefit; unfortunately, to date, research outcomes have been somewhat equivocal (Evans, 2002; Pelletier, 2004; Nilsson, 2008). Despite this, it has been argued that music might prove to be a valid relaxation technique if methodological weaknesses in research design were addressed. In particular, it was suggested that in most cases, researchers have failed to acknowledge those music characteristics that may be conducive to relaxation. Instead, music appears to have been selected based solely upon subjective interpretation, either by the investigator/s or the participant.

These approaches are problematic for a number of reasons. First, when ‘relaxing’ music is selected by the experimental team, there needs to be some verification that the participants hold an identical interpretation, failure to do this compromises internal validity. Second, without designated criteria, selecting compositions in this ad hoc manner compromises external validity in that findings are composition specific and so generalisations cannot be made. Third, even if the required response is forthcoming, it is always possible that other pieces might induce an even stronger effect. Whilst being critical of this approach, the current author recognises that music and anxiety researchers have been hampered in the selection process because there have been few attempts to clarify the characteristics of relaxing music. Although some efforts have been made (i.e. Gabrielsson and Lindstrom, 2001; Wofle et al., 2002; Gomez and Danuser, 2007), the information provided is generally of limited value because it lacks functional detail. Also, these suggestions pertain to music for general relaxation, and not relaxation for anxiety control. Furthermore, in the study of Wolfe et al. (2002), and that of Karageorghis et al. (1999) in which the motivational qualities of music were formulated, there appeared to be no attempt to determine whether participants possessed the knowledge to make informed responses. This is a serious omission as it could have led to satisficing. This thesis set out to address these issues.

5.2.0. Current Findings

Study 1 (Music Knowledge Test) was conducted to ascertain whether participants did indeed possess sufficient levels of requisite knowledge. The results suggested that individuals with no, or limited, musical background could understand, and rate the importance of a selected number of music components. This confirmed that the characteristics of relaxing music for anxiety control could be examined using the anticipated sample (sports students).

The aim of Study 2 was to determine the actual characteristics of relaxing music for anxiety control. Employing questionnaire data and the input from focus group members, the study has set out the first comprehensive criteria from which to select music for the purposes of anxiety control. Furthermore, the relative importance of a predetermined number of music components has been presented. It is hoped that this 'order of importance' will provide some further direction to those selecting music for relaxation. Study 2 has also specified the likely emotional responses to relaxing music for anxiety control. Admittedly, such detail might be of little value to sports practitioners, but it might prove to be useful for those working in other contexts, in particular, music therapists. On the later point, it was the original intention to focus only upon the use of relaxing music to control competitive state anxiety, however, given that these outcomes should be transferrable to other environments (e.g. medical, music therapy), it seemed illogical to restrict the findings to sport.

As an additional measure, recommendations were also formulated for some specific populations (i.e. male/female, high/low levels of music knowledge). The inclusion of this information might appear to be somewhat puzzling, particularly as these results were not utilised in the final experiment (Study 3). However, from the outset, this thesis aimed to provide a comprehensive set of recommendations for the selection of relaxing music for anxiety control. As such, it was considered worthwhile to explore as many moderators as was possible. Although the results from sub-sample analysis showed an acceptable degree of consistency, some interesting differences did emerge. For example, it was shown that males appear to place greater importance on rhythm and melody than do females. It was also found that females, and those with a low level of music knowledge, tended to consider popular chill-out music as being the most relaxing genre of music. In contrast, for both males and individuals with a high level of music knowledge there was bias towards classical pieces.

It could be argued that the recommendations would be of little practical value if relaxing music for anxiety control failed to induce the desired response. Study 3 examined this. Participants were introduced to a competitive sport task and then assigned to one of three conditions (relaxing music for anxiety control, non-relaxing music and no-music). Whilst relaxing music for anxiety control did appear to be more effective than non-relaxing music and a period of silence, this effect was only uncovered through ES, mean-difference and 90% CI outcomes. The main analysis (mixed-design factorial MANOVA) showed that all three interventions were similarly effective at controlling somatic and cognitive anxiety and HR. Addressing the lack of statistical difference between the music conditions, it must be remembered that it was hypothesised that both music types would provide some relief from competitive state anxiety. As such, directionally similar trends were expected. Hence, it is perhaps a little optimistic to expect significant differences between the two music types. From the outset, this study programme merely aimed to show that stronger, and more consistent research outcomes would be forthcoming if music was selected through an objectively created standard. There was some support for this. Hopefully, future research will confirm the superiority of relaxing music for anxiety control, and at the same time provide support for consistency of effect.

It was also hypothesised that reductions in competitive state anxiety would be accompanied by performance improvements (Martens et al., 1990b). This hypothesis is difficult to assess. The main analysis revealed that post-intervention levels of anxiety were statistically similar between the conditions. Thus, one would not expect performance differences. The additional analysis did however reveal that post-intervention anxiety levels were lowest for the participants in the relaxing music for anxiety control condition. If these findings are accepted, then they suggest that reductions in competitive state anxiety did not affect performance. Explaining this, tentatively, it is possible that the performance-anxiety relationship proposed by Martens et al. (1990b) is, at best, weak (Jerome and Williams, 2000; Craft et al., 2003). Alternately, it could be that the motor task was inappropriate. Tasks requiring greater fine motor control and/or cognitive requirements might be required to uncover the performance effects of competitive state anxiety.

In view of the fact that the initial research aims were, tentatively, met, the final part of this thesis discussed some of those factors that might be responsible for music's anxiolytic effects. Mechanisms such as dissociation, imagery and cortical activation were considered, but it was concluded that none of these mechanisms could fully account for music's anxiolytic capabilities. Because of this conclusion, the role of some the music characteristics highlighted in Study 2 were discussed. Unfortunately, due to a lack of confirmatory information, much of what was presented is currently speculative. Empirical research is needed to confirm the suggestions made.

5.3.0. Limitations

Study 2 in particular was limited in some respects. First, during the music rating procedure, participants were directed to focus on the relative importance of just thirteen music components. It is of course possible that other components might have a bearing upon music's relaxing qualities. That said, the open-ended responses and the focus group discussion, did allow participants to explore an unbounded number of influences. Another potential shortcoming regards the fact that the number of compositions presented for evaluation was limited to thirty. This decision might have undermined external validity, although conversely, an increase in this number might have compromised internal validity. Regarding the sub-sample analysis, due to the nature of the data, statistical comparisons to the main sample findings were not viable. Furthermore, due to low participant numbers, only the main effects for gender and level of music knowledge could be considered. An examination of the various interactions would have provided some useful information. On a final note, the validity of Study 2 as a whole was partially dependent on the participants' ability to understand music theory. Although efforts were made to ensure that those involved did possess sufficient prerequisite knowledge, it nevertheless remains possible that some satisficing took place.

Study 3 also had limitations. As stated previously, the motor task selected to uncover the physical effects of competitive state anxiety might have been unsuitable. Furthermore, sample numbers were rather low. Although in total there were seventy-two participants, when placed in the corresponding conditions there were approximately twenty-two in each group. Greater participant numbers might have increased the statistical power of Study 3. It is also possible that the time-frame of 10-minutes did not allow music's anxiolytic effects to fully manifest; although, it could be argued that longer than 10-minutes could have compromised the practicality of music as a relaxation aid. Future research should address the limitations presented.

5.4.0. Future Directions

As to future directions, many study options are available. First, given the trends seen in Study 3, the first and most obvious course of action would be to rerun this study with a lager sample size (Gore and Altman, 1982). An increase in participant numbers might well provide statistically significant pre-to-post-intervention results. Furthermore, a larger sample would perhaps allow a more informative examination of whether personal factors such as gender or level of music knowledge would influence the effects of relaxing music for anxiety control. This option could also include an examination of the directional aspects of competitive state anxiety. Second, it would be worth examining whether matching participants and the population specific recommendations would produce even stronger effects. Although a credible line of enquiry, the need for a relatively large sample might be problematic. For example, such an investigation should include four conditions; 'no-music', 'matched relaxing music for anxiety control', 'non-matched relaxing music for anxiety control' and 'non-relaxing music'. Therefore, to examine gender only, at least 80 females and, or 80 males would be required. A third option would be to study the effects of relaxing music for anxiety control in a field setting. This could be achieved by utilising a simple ABCABC design, however, this process is might suffer from participant mortality.

If any of the preceding options actually provide stronger support for the application of relaxing music for anxiety control, then a fourth option relates to the use of musical imagery. This thesis has considered the use of music as a means of controlling competitive state anxiety during the time leading up to an event. However, the aim of many anxiety control methods is to induce relaxation almost spontaneously so that they can be utilised not only before and/or after competition, but also during (Hardy et al. 1996); this being particular true for Ost's (1987) AR. Some sports, (e.g. tennis and golf) include break periods, so it is conceivable that music could be used during these times. However, in many instances this would not be a viable option; given that playback equipment cannot be used 'in-play' for most sports. The use of musical imagery (Bailes, 2007) might be a viable alternative; musical imagery being defined as being able to hear without the corresponding stimulus. In theory, it should be possible for an athlete, given sufficient training in the technique (Balies, 2007) to 'imagine' a song and so induce relaxation. This would be an interesting line of enquiry. A fifth option relates to Lacey's (1967) theory of directional fractionation. Similar to the studies of Davis and Thaut (1989), Burns et al. (1999) and Burns et al. (2002) it an examination could be made of the various forms of arousal using EMG, skin conductance and temperature. It might also be useful to measure alpha wave activity via EEG; this could offer confirmation of the assertions made in Chapter 4.

There is also scope to rerun Study 2, this time with a focus on other population groups, for example, individuals from non-Western cultural backgrounds. Cultural differences in music preference have been examined by Darrow, Haack and Kuribayashi (1987). It was found that although both American and Japanese college students had a preference for Western music, the Japanese sample were more receptive than their American counterparts to Eastern music styles. Likewise, Ho (2004) showed that Eastern students, although possessing a liking for Western music styles, nevertheless preferred ‘local’ music. Cultural differences have also been studied in relation to music selected for pain relief purposes (Good, Picot, Salem, Chin, Picot and Lane, 2000). Good et al. (2000) showed that the music selected was influenced by the cultural background of the listener. Such cultural preferences might, in part, reflect differences in music structure. For example, in Western music the major mode is associated with happy emotions, and the minor mode sad. Certain Eastern music styles (i.e. Indian) do not utilise these modes (Bowling, Sundararajan, Han and Purves, 2012), using instead *raga* tone collections; these also differ in that they do not emphasis harmony nor chord progressions (Schmidt-Jones, 2012). Given the existence of cultural differences in music preference, it is possible that the characteristics of relaxing music for anxiety control might also be culturally shaped. Similarly, the classification of the characteristics of relaxing music in non-anxiety contexts, e.g. massage, yoga, could be considered. These options would be reasonably straight forward as they would simply require some minor amendments to be made to the original music rating scale.

Conclusion

This thesis has achieved its aims. Study 2 has supplied the first comprehensive set of recommendations for the selection of music to control anxiety. Recommendations have been presented regarding those music characteristics considered to be conducive to relaxing. Also provided are importance ratings for a selection of music components, and common emotional labels. The study has also considered the influence of gender and level of music knowledge. Study 3, as far as is known, is the first to examine the use of music to control competitive state anxiety. The results showed that all three interventions (relaxing music for anxiety control, non-relaxing music and no music) led to reductions in competitive state anxiety. Between-condition differences were, in the main, not statistically significant. Only levels subjective relaxation were affected by music listening; this change was evident in both music conditions. These outcomes suggest that all three interventions were, in main, equally affected of controlling competitive state anxiety. However, in terms of practical significance, the additional measures (ES, mean-difference and 90% CI) did show that relaxing music for anxiety control produced the largest pre-to post-intervention effects. These outcomes do offer some tentative support for the application of relaxing music for anxiety control in competitive sport environments. As such, practitioners might wish to consider these results when selecting music for the purpose of anxiety control. Lastly, by drawing on information from a range of disciplines, this thesis presents the first attempt to provide some explanation for music's anxiolytic properties. In some respects this programme of study has been limited by necessity (e.g. the contrived competitive situation, limitations in participant numbers). Nevertheless, whilst recognising that more research is required, the results from this thesis do suggest that relaxing music for anxiety control has the *potential* to become of valid relaxation aid. However, more research is required to verify the efficacy of this method.

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Appendix 1: Music Knowledge Test

In an upcoming investigation, a team of researchers from the University of Cumbria and the University of Central Lancashire intend to examine the use of 'relaxing music' as a means of alleviating anxiety. Before this goal can be achieved, the team will make attempts to classify some of the musical components that may be conducive to the relaxing properties of music. In order to do this we would like to investigate the degree of musical knowledge within the general population.

Below are a number of terms that are relevant to music structure. We would like to assess your understanding of these terms.

PLEASE NOTE: this is not a test so please answer the questions as honestly as possible.

PART A

Below is a selection of musical terms, for each you are being asked:

1. To rate your current understanding of each term.

2. To provide, if you can, a description for those terms you feel that you comprehend.

   If you cannot do this, please write NOT SURE

	Very much so				*Not at all*
I understand the concept of **Tempo**	1	2	3	4	5

My description of **tempo** is:..

I understand the concept of **Beat**	1	2	3	4	5

My description of **Beat** is:...

I understand the concept of **Notes**	1	2	3	4	5

My description of **Notes** is:...

I understand the concept of **Key**	1	2	3	4	5

My description of **Key** is:...

I understand the concept of **Rhythm**	1	2	3	4	5

My description of **rhythm** is:...

I understand the concept of **Melody**	1	2	3	4	5

My description of **melody** is: ……………………………………………………………...

I understand the concept of **Melodic range**	1	2	3	4	5

My description of **melodic range** is:…………………………………………………….....

I understand the concept of **Scale** 1 2 3 4 5

My description of **Scale** is: ……………………………………………………………....

I understand the concept of **Harmony** 1 2 3 4 5

My description of **harmony** is: ……………………………………………………………

I understand the concept of **Articulation** 1 2 3 4 5

My description of **articulation** is: …………………………………………………..

I understand the concept of **Interval** 1 2 3 4 5

My description of **Interval** is: ……………………………………………………...

PART B

In this section we will present you with the **definitions** for each of the preceding musical components.

We would like to know if being supplied with these definitions helps your understanding of musical concepts.

AGAIN, this is not a test. Please answer the statements as honestly as possible.

	Very much so				*Not at all*

Tempo: The speed at which the music moves.

I understand the concept of **Tempo**	1	2	3	4	5
I feel I would be able to rate the impact of **tempo** on the relaxing qualities of music	1	2	3	4	5

Beat: The basic pulse which underlines most music; when you tap along to music it is usually the beat you tap out.

I understand the concept of **Beat**	1	2	3	4	5
I feel I would be able to rate the impact of **Beat** on the relaxing qualities of music	1	2	3	4	5

Key: a note that is considered most important and to which all other notes relate.

I understand the concept of **Key**	1	2	3	4	5
I feel I would be able to rate the impact of **Key** on the relaxing qualities of music	1	2	3	4	5

Rhythm: the pattern of long and short sounds and silences which for around the beat

(If you clapped out 2-4-6-8- who do we appreciate, this would be an example of rhythm)

I understand the concept of **Rhythm**	1	2	3	4	5
I feel I would be able to rate the impact of **Rhythm** on the relaxing qualities of music	1	2	3	4	5

Melody: the tune, the part that you may whistle or sing.

I understand the concept of **Melody**	1	2	3	4	5
I feel I would be able to rate the impact of **Melody** on the relaxing qualities of music	1	2	3	4	5

Melodic range: the distance between the lowest and highest pitches of a melody

I understand the concept of **Melodic range**	1	2	3	4	5
I feel I would be able to rate the impact of **melodic Range** on the relaxing qualities of music	1	2	3	4	5

Scale: structures group of notes which form a regular pattern; normally heard as minor/major scale.

I understand the concept of **Scale**	1	2	3	4	5
I feel I would be able to rate the impact of **Scale** on the relaxing qualities of music	1	2	3	4	5

Harmony: two or more notes sung or played together

I understand the concept of **Harmony**	1	2	3	4	5
I feel I would be able to rate the impact of **harmony** on the relaxing qualities of music	1	2	3	4	5

Articulation: the separation of successive notes from one and other. How notes are distinguished from each other.

I understand the concept of **Articulation**	1	2	3	4	5

I feel I would be able to rate the impact of **articulation** on the relaxing qualities of music	1	2	3	4	5

Interval: The distance between one note and another

I understand the concept of **Interval**	1	2	3	4	5
I feel I would be able to rate the impact of **interval** on the relaxing qualities of music	1	2	3	4	5

Appendix 2: Track Listings

Watermark, Enya. *Watermark*, Warner Music: CD 2292-43875-2, 1988.

Orchestral Suite #3 In D,Air "On The G String" (Bach), The Stuttgart Chamber Orchestra, *Album details unknown*: 1985.

Rainbird , Artist Details Unknown, *Pure Ambience and Relaxation (Eye of the Storm)*, MusicBank: CD 6665: 2006.

Adagio for Strings Op.11(Barber), The London Festival Orchestra, *Album details unknown*: 2008.

The Flower Duet from *Lakme* (Debiles), The Vard Sisters, *Album details unknown*: 1997.

Symphony No. 5 in C Sharp Minor: IV. Adagietto (Mahler), The Chicago Symphony Orchestra, *Classical Chillout Gold*, Decadence Recordings: CD 005, 2002.

Blue Creature, Artist Details Unknown, *Pure Ambience and Relaxation (Oceania)*, MusicBank: CD 6664, 2006.

First Tide, Artist Details Unknown, *Pure Ambience and Relaxation (Dawn of Time)*, MusicBank: CD 6666, 2006.

Moonlight Shadow, Groove Coverage. *Covergirl*, EQ Music: CD 70356, 2003.

At The River, Groove Armada. *The Classic Chillout Album*, Sony Music Entertainment: CD 115, 2001.

Closer, Artist Details Unknown, *Pure Ambience and Relaxation (State of Mind)*, MusicBank: CD 6683, 2006.

God Only Knows, Jodie. *The Best of Classic Chillout*, Sony Music Entertainment: CD 159, 2002.

The Slide Song, Spiritualized, *Pure Phase*, Dedicated: CD 017, 1999.

Slip Into Something More Comfortable, Kinobe. *The Classic Chillout Album*, Sony Music Entertainment: CD 115, 2001.

World Looking In, Morcheeba. *The Classic Chillout Album*, Sony Music Entertainment: CD 115, 2001.

Blue Planet, The BBC Concert Orchestra. *The Best of Classic Chillout,* Sony Music Entertainment: CD 159, 2002.

Lascia Ch'io Pianga (Handel), Cecilia Bortoli. *No further details available.*

Tree of Life, The Walt Disney Music Company. *No further details available.*

Guna, Artist Details Unknown, *Pure Ambience and Relaxation (Sukhmana),* MusicBank: CD 6678, 2006.

Feel So Sad, Spacemen 3. *Recurring*, Space Age Recordings: CD 23, 1991.

Solomon - Arrival Of The Queen Of Sheba (Handel), The Academy Of St. Martin In The Fields. *Album details unknown*, 1964.

Life Force, Artist Details Unknown. *Pure Ambience and Relaxation (Okolu-na)*, MusicBank: CD 6675, 2006.

Agog in the Ether, The Ozric Tentacles. *Pungent Effulgent'*, Snapper Music: CD 545, 1998.

633 Squadron (Goodwin), The City of Prague Orchestra. *Classic Ads,* Decca: CD number unavailable, 2002.

En Csak Azt Csodalom (Lullabye For Katharine), Márta Sebestyén. *The Karma Collection*, Ministry of Sound: CD 30, 2002.

The Ride Of The Valkyries (Wagner), The Royal Philharmonic Orchestra. *No further details available.*

Little Fluffy Clouds, The Orb. *Cool: Chillout,* Universal International Music: CD number unavailable, 2009.

Chai, The Ozric Tentacles. *Waterfall Cities,* Snapper Music: CD 154, 2002.

O-I, The Ozric Tentacles. *Pungent Effulgent,* Snapper Music: CD 545, 1998.

Appendix 3: Music Rating inventory (SAMPLE)

Relaxing Music Questionnaire

Please note that this questionnaire must be completed independently.

<u>Level of music knowledge</u>

How would you rate your level of musical understanding?

Very Knowledgeable Not at all knowledgeable

1 2 3 4 5 6 7

<u>Setting the context</u>

We would like you to imagine that you are in a situation that produces a relatively mild state of anxiety. For example, prior to a sports competition, prior to an exam, in the dentists waiting room.

Please state on the dotted line below which situation you have selected (e.g. exam, sport competition etc.)

Please bear this context in mind whilst you rate the following songs for their degree of relaxation.

Relaxation Defined

For the purpose of this investigation relaxing has been defined as 'making one less tense, calming and soothing'

Song 1

	very relaxing						not at all relaxing
▪ How relaxing did you find this song?	1	2	3	4	5	6	7

Below is a list of emotions. Could you please circle those (you can select more than one) that you felt were evoked by the song you have just heard. (These are also displayed on the board).

Annoyance	*Anger*	*Rage*	*Boredom*	*Disgust*	*Loathing*
Grief	*Sadness*	*Pensiveness*	*Surprised*	*Amazement*	*Distraction*
Terror	*Fear*	*Trust*	*Ecstasy*	*Joy*	*Serenity*
Anticipation	*Interest*	*Vigilance*	*Apprehension*	*Peaceful*	

- Was there anything about this song that you found particularly relaxing?

  (e.g. tempo, instrumentation, tune, song complexity, lyrical content)

  Please write you responses below

- Was there anything about this song that you found to be not relaxing?

  (e.g. tempo, instrumentation, tune, song complexity, lyrical content)

  Please write your responses below

Now that you have heard all of the musical compositions we would like to rate a number a statements that relate to factors that may influence how relaxing a piece of music is.

You will be asked to rate each statement on a 7-point scale with a score of + 3 meaning you very much so and a - 3 means not at all. The mid-point 0 means that you are not sure.

REMEMBER you can use any of the numbers that best represents your view.

	not at all			**not sure**			**very much so**
For a piece of music to be relaxing, you must like it.	-3	-2	-1	0	1	2	3
For a piece of music to be relaxing, you must be familiar with it.	-3	-2	-1	0	1	2	3

You will now be asked whether certain music components influence the relaxing nature of a musical composition.

To help you complete this section, we have provided you with definitions of the relevant musical concepts. Please answer this section as honestly as possible. IF you do not understand a concept or are not sure whether it influences the relaxing nature of music, please select NOT SURE.

	not at all			**not sure**			**very much so**

Tempo: The speed at which the music moves.

I feel that tempo influences how relaxing a piece of music is	-3	-2	-1	0	1	2	3

Beat: The basic pulse which underlines most music; when you tap along to music it is usually the beat you tap out.

I feel that beat influences how relaxing a piece of music is	-3	-2	-1	0	1	2	3

Key: a note that is considered most important and to which all other notes relate.

I feel that the key influences how

relaxing a piece of music is -3 -2 -1 0 1 2 3

Rhythm: the pattern of long and short sounds and silences which for around the beat

(If you clapped out 2-4-6-8- who do we appreciate, this would be an example of rhythm)

I feel that rhythm influences how

relaxing a piece of music is -3 -2 -1 0 1 2 3

Melody: the tune, the part that you may whistle or sing.

I feel that melody influences how

relaxing a piece of music is -3 -2 -1 0 1 2 3

Melodic range: the distance between the lowest and highest pitches of a melody

I feel that melodic range influences how

relaxing a piece of music is -3 -2 -1 0 1 2 3

Scale: structures group of notes which form a regular pattern; normally heard as minor/major scale.

I feel that the scale influences how

relaxing a piece of music is -3 -2 -1 0 1 2 3

Harmony: two or more notes sung or played together

I feel that harmony influences how relaxing a piece of music is	-3	-2	-1	0	1	2	3

Articulation: the separation of successive notes from one and other. How notes are distinguished from each other.

I feel that the articulation influences how relaxing a piece of music is	-3	-2	-1	0	1	2	3

Interval: The distance between one note and another

I feel that the interval influences how relaxing a piece of music is	-3	-2	-1	0	1	2	3

Complexity

I feel that the complexity of a piece of music influences how relaxing it is	-3	-2	-1	0	1	2	3

Appendix 4: Focus Group Hand-out

Importance Rating

**** = many participants were not sure of these terms**

1. **Tempo**: The speed at which the music moves. *(not relaxing if too fast or too slow, accentuation)*

2. **Melody**: the tune, the part that you may whistle or sing.

3. **Beat:** The basic pulse which underlines most music; when you tap along to music it is usually the beat you tap out *(heavy beats not relaxing)*

4. **Harmony:** two or more notes sung or played together.

5. **Rhythm:** the pattern of long and short sounds and silences which for around the beat (If you clapped out 2-4-6-8- who do we appreciate, this would be an example of rhythm)

6. **Liking**

7. **Complexity:** unusual harmonies, timbres, irregular rhythm and tempi, unexpected tones and changes.

(not relaxing if too complex or too simple - too many sudden changes, too much repetition)

8. **Key:** a note that is considered most important and to which all other notes relate.

9. ****Scale**: structures group of notes which form a regular pattern; normally heard as minor/major scale.

10. ****Articulation:** the separation of successive notes from one and other. How notes are distinguished from each

11. Interval: The distance between one note and another

12. **Melodic range: the distance between the lowest and highest pitches of a melody

Appendix 5: Participant Information Sheet for Study 2

University of Cumbria

The effect of pre-competition anxiety reduction strategies on anxiety and sports performance.

Participant Information Sheet

You are being invited to take part in a research study. Before you decide to take part or not, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish.

Purpose of the study

To examine the effect of some simple intervention strategies on pre-sports competition anxiety. These could include self-talk, imagery or dissociation.

Why have I been chosen?

Because you are a sport participant who has had experience of competition and may benefit from our findings.

Do I have to take part?

No, it is up to you to decide whether or not to take part. If you do, you will be given this information sheet to keep and be asked to sign a consent form. You are still free to withdraw at any time and without giving a reason.

What will happen to me if I take part?

The experiment should not take more than 20 minutes and the main procedure will be as follow: Sit down for 10 minutes, during which time we will take measures of heart rate and anxiety. Anxiety will be measured through the use of a short questionnaire. After the 'sit down' period you will be asked to participate in a simple motor task. During the 'sit down' period you may be asked to listen to music. The songs you may be required to listen to are:

1.
2.
3.

What if there is a problem?

Any issues about the way you have been dealt with during the study or any possible harm you might suffer will be addressed. The details of the Dean of Research are presented below.

Dr Eunice Simmons, Dean for Research
Tel: 01768-893547
Fax: 01524-384385
Email: Eunice.Simmons@cumbria.ac.uk

If you have a concern about any aspect of this study, you should ask to speak with the researcher who will do his best to answer your questions.

Will my taking part in the study be kept confidential?

Yes. All information which is collected about you during the course of the research will be kept strictly confidential.

What will happen to the results of the research study?

This investigation will form part of a PhD study. We also intend to publish the results of this study in scientific journals. Additionally, we will make the results available in a short format to all participants if requested. Note, in no publication will it be possible for participants to be identified.

Who has reviewed the study?

The study has been reviewed by the University of Cumbria, Research Ethic Committee.

Contact details

If you require any further information regarding this research project or any of the questionnaires please call Dave Elliott on 01228 616003, or Remco Polman on 01772 894467. Alternatively you can use contact details below.

Dave Elliott
Department of Physical Education
University of Cumbria
Fusehill Street
Carlisle
david.elliott@cumbria.ac.uk

OR

Professor Remco Polman
Victoria University
Melbourne, Australia.
Remco.Polman@vu.edu.au

Please retain the Participant Information Sheet

University of Cumbria

The effect of pre-competition anxiety reduction strategies on anxiety and sports performance.

PARTICIPANT CONSENT FORM

Researchers: Dave Elliott, lecturer in P.E. University of Cumbria
Professor Remco Polman (chartered psychologist), Victoria University Melbourne, Australia.

Please answer the following questions by circling your responses:

Have you read and understood the information sheet about this study? YES NO

Have you been able to ask questions about this study? YES NO

Have you received enough information about this study? YES NO

Do you understand that you are free to withdraw from this study at any time, and without having to give a reason for withdrawal? YES NO

Your responses will be anonymised before they are analysed.

Do you give permission for members of the research team to have access to your anonymised responses? YES NO

Do you agree to take part in this study? YES NO

Your signature will certify that you have voluntarily decided to take part in this research study having read and understood the information in the sheet for participants. It will also certify that you have had adequate opportunity to discuss the study with an investigator and that all questions have been answered to your satisfaction.

Gender......................

Age...........................

Signature of participant:... **Date:**.................

Name (block letters):...

Signature of investigator:... **Date:**.................