Creating Pressurised Training Environments in Elite Sport

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Abstract

Pressure training (PT) is indicated to be an intervention for preventing self-focus and distraction methods of choking that could be more effective (Oudejans & Pijpers, 2010), ecological (cf. Lawrence et al., 2014), and popular (Bell, Hardy, & Beattie, 2013; Sarkar, Fletcher, & Brown, 2014) than more widely recognised approaches (Hill, Hanton, Matthews, & Fleming, 2010a) such as implicit (Mullen, Hardy, & Oldhan, 2007) and analogy learning (Masters, 2000). However, whilst research has exemplified stressors being used to create pressure (e.g., Lawrence et al., 2014) and provided extensive detail on methods that could be useful for conducting the pre-exposure stages of PT (e.g., Johnston & Cannon-Bowers, 1996), there was an absence of research investigating how to systematically create pressurised training environments in sport. This notion suggested that PT was being practiced in elite sport in the absence of comprehensive theoretical underpinnings. To address this, study one explored how 11 elite coaches systematically created and exposed athletes to PT environments. The emergent framework suggested that coaches manipulated two key areas: demands of training, which considered the nature of physical and cognitive demands directly related to a training exercise, and consequences of training, which concerned performance-contingent outcomes. Demands were organised via manipulating task, performer, and environmental stressors, and consequences were shaped using forfeit, reward, and judgment stressors. To test the efficacy of this framework, study two examined the effects of manipulating demands and consequences on experiences of pressure in elite Netball. To further extend knowledge, study three examined the impact of each individual demand (i.e., task, performer and environmental) and consequence (i.e., reward, forfeit and judgment) stressor on pressure in elite Disability Shooting. Study three's results were synonymous with those of study two in indicating that perceived pressure only increased in conditions where consequences were introduced. This result suggested that these stressors were essential for increasing pressure. Moreover, study three indicated that the judgment stressor had the greatest influence of all stressors and, thus, presented coaches with the most effective means for maximising pressure. Across both studies, manipulating demands in isolation did not influence pressure in any condition. Yet, these stressors always negatively impacted performance. Hence, collectively the findings support and build on the framework by indicating that demands and consequences have distinct roles when PT; demand stressors could be critical for shaping performance whereas consequences appear essential for producing pressure. These findings have important applied implications. Firstly, previous research suggested that coaches may rely on demands, in place of consequences, to produce pressure (cf. Weinberg, Butt, & Culp, 2011). Secondly, literature has predominantly indicated consequences are important, but not essential, when creating pressure (e.g., Oudejans & Pijpers, 2009). Therefore, there may be a need to expand knowledge in applied and scientific arenas regarding the distinct roles of demands and consequences when PT. In light of these points, the present thesis contributes findings to underpin methods for systematically creating and exposing athletes to PT environments. These findings combine with previous literature relating to the pre-exposure stages of PT (e.g., Johnston & Cannon-Bowers, 1996) to enable the documentation of a more comprehensive account of how to perform all the stages involved in PT. Accordingly, an epilogue in chapter seven outlines such an account and serves as a guide for practitioners and coaches conducting PT.

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Peer Reviewed Work Related To This Thesis

Blind Refereed Publications

Stoker, M., Lindsay, P., Butt, J., Bawden, M. & Maynard, I. (2016). Elite coaches' experiences of creating pressure training environments. *International Journal of Sport Psychology, 47(3), 262-281.*

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Blind Refereed Presentations

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Glossary of Abbreviations and Definitions

Abbreviation	Definition
	Competition stress: an ongoing transaction between an individual and the environmental demands associated primarily and directly with the competition within which he or she is operating (Mellalieu, Hanton, & Fletcher, 2006). Competition stressors: the environmental demands (i.e. stimuli) associated primarily and directly with the competition within which an individual is operating (Mellalieu, et al., 2006). Performance anxiety: an unpleasant psychological state in reaction to perceived threat concerning the performance of a task under pressure (Cheng & Hardy, 2016). Performance pressure: the desire to perform well in sporting situations (Baumeister, 1984). Choking: sub-optimal performance under pressure, given ones skill level (Beilock & Gray, 2007). Coping: the thoughts and behaviours used to manage the internal and external demands of stressful situations (Ito & Matsushima, 2016). Stressor-exposure programmes: All approaches that aim to enhance functioning by strategically exposing individuals to stressors.
SIT	Stress inoculation training: a stressor-exposure programme that specifically focuses on developing ones' ability to cope under stress by strategically exposing individuals to stressful environments (Meichenbaum, 2007).
SET	Stress exposure training: a stressor-exposure programme that specifically focusses on developing ones' ability to cope and perform under stress by strategically exposing individuals to stressful environments (Driskell & Johnston, 1998).
PT	Pressure training: a stressor-exposure programme that specifically focusses on reducing choking and developing performance under pressure by strategically exposing individuals to pressurised environments.
IAMS	Immediate Anxiety Measurement Scale (Thomas, Hanton, & Jones, 2002).

CHAPTER I

1.0 Introduction

1.1 Pressure and Sports Performance

The desire to perform well in high-stake sporting situations is thought to create performance pressure (Beilock & Carr, 2001). Performance pressure, defined as, “any factor or combination of factors that increases the importance of performing well on a particular occasion” (Baumeister, 1984; p. 610), has been shown to cause sub-optimal performance in both real world (e.g., Dandy, Brewer, & Tottman, 2001; Dohmen, 2008) and laboratory settings (e.g., Beilock & Gray, 2007). Thus, research has investigated performance under pressure so as to provide insights on how to avoid sub-standard performance (Hill, Hanton, Matthews, & Fleming, 2010a).

1.2 Choking Under Pressure

Research has been dedicated to investigating the mechanisms that underpin choking, defined as sub-optimal performance under pressure, given ones skill level (Beilock & Gray, 2007). Attentional disturbance theories are the leading explanations and two primary attentional theories have emerged (DeCaro, Thomas, Albert, & Beilock, 2011): distraction (Carver & Scheier, 1981) and self-focus (Baumeister, 1984). Distraction theories propose that anxiety, induced by pressure, causes performance to decrease due to working memory becoming over-loaded with task-irrelevant stimuli (Sarason, 1988). Self-focus theories, on the other hand, highlight that pressure increases anxiety which in turn increases self-consciousness about performing (Baumeister, 1984). This rise in self-consciousness causes attention to be focused inwardly, whereby the performer consciously monitors their skill-execution, thus causing a choke.

1.3 Preventative Interventions

As well as investigating the underpinning mechanisms of choking, research has also examined interventions for preventing choking, such as implicit (Mullen, Hardy, & Oldham, 2007) and analogy learning (Masters, 2000). While analogy learning requires the use of biomechanical metaphors to teach complex actions (e.g., hitting a table tennis backhand as if 'throwing a Frisbee'; Berry & Dienes, 1993), implicit learning involves learning a skill without intention (Masters, 1992). In a review of current interventions for reducing choking, these two interventions have been recognised as the most suitable and effective solutions (Hill et al., 2010a). However, they have been critiqued for being difficult to generalise (Bennett, 2000), lacking ecological validity, not providing a solution to elite performers, and for not preventing both distraction and self-focus theories of choking (Hill et al., 2010a). Due to this, coaches, practitioners and athletes have been reluctant to adopt these preventative interventions (Liao & Masters, 2001; Poolton, Masters, & Maxwell, 2006), and stressor-exposure programmes may provide a more effective alternative.

1.4 Pressure Training

Recent research indicates that stressor-exposure programmes (Saunders, Driskell, Johnston, & Salas, 1996), in particular pressure training (Bell, Hardy, & Beattie, 2013), could provide a more suitable intervention than implicit (Mullen, Hardy, & Oldhan, 2007) and analogy learning for preventing choking. Specifically, previous stressor-exposure literature has indicated stressor-exposure interventions to have a strong overall effect for reducing performance anxiety, and a moderate effect for enhancing performance enhancement (Saunders et al., 1996). More recently, pressure training has been highlighted as an effective intervention for preventing self-focus (Reeves, Tenenbaum, & Lidor, 2007) and distraction

(Oudejans & Pijpers, 2009) methods of choking that could be more ecological (cf. Lawrence et al., 2014), popular (Beaumont, Maynard, & Butt, 2015; Bell et al., 2013; Sarkar, Fletcher, & Brown, 2014) and helpful for both novices and expert sporting performers (Oudejans & Pijpers, 2009; 2010).

1.5 Purpose of this Thesis

Despite these early indications of success for pressure training there is an absence of research investigating how to systematically create and expose athletes to pressurised training environments in sport. Specifically, research has exemplified specific stressors being used to create pressure in studies examining performance (Oudejans & Pijpers, 2010; Reeves et al., 2007). However, there is no research examining how to systematically create pressurised training environments across sports. Thus, while there are specific examples of stressors that may be useful for generating pressure in specific environments, there is a lack of theory indicating a method for to systematically producing and exposing athletes to pressure across sports. In addition, literature has provided extensive detail on methods that could be used to conduct the pre-exposure stages of a stressor-exposure programme (e.g., Johnston & Cannon-Bowers, 1996). However, this literature lacks detail on how to design and implement the stressor-exposure stage. As such, there is an absence of empirical information that can be taken from the stressor-exposure literature and used to expose athletes to pressurised training environments. Therefore, there is an indication that pressure training is currently being practiced, in applied and research contexts (Beaumont et al., 2015; Sarkar et al., 2014), in the absence of comprehensive theoretical frameworks. With this in mind, the purpose of the thesis was to address this absence of theory regarding how pressure training environments can be systematically created across sport settings. In investigating this area, it is

intended that the results contribute towards the development of an empirically derived theoretical framework for creating pressure in research and applied sporting contexts.

1.6 Structure of this Thesis

This thesis is comprised of six further chapters, within which the purpose and goals of this programme of research are addressed. Previous literature providing the rationale for study one is considered extensively within the main review of literature in chapter two. Consequently, to avoid repetition, the chapter associated with this study provides only a brief account of this preceding literature.

Chapter three (study one) explores how 11 elite coaches develop pressure training environments for the performance enhancement of their athletes. A qualitative approach is used and this research generates a framework which identifies that two key areas are manipulated by coaches to create pressurised training environments: demands of training; and consequences of training. Regarding the demands of training, coaches manipulated task (e.g., the rules of play), performer (e.g., the physical and psychological capabilities of an athlete) and environmental stressors (e.g., external surroundings) to influence the difficulty and types of challenges that athletes faced. For the consequences of training, coaches organised reward (e.g., the potential to win something positive), forfeit (e.g., the potential to receive something negative/lose something positive), and judgment (e.g., being evaluated) to expose athletes to meaningful performance-contingent outcomes. However, in consideration of the need to expand theory on methods for systematically producing pressurised training environments in elite sport, this study indicates that future research should investigate the efficacy of the coaches' methods.

Chapter four (study two) examines the efficacy of this pressure training framework by exploring the effects of manipulating these different categories of stressors on experiences of pressure and performance. Specifically, the study examines fifteen elite Netballers performing a Netball exercise in a randomized, within subject design with four conditions: a control, consequences, demands, and demands plus consequences condition. Compared with the control, self-reported pressure is reported as significantly higher in the consequences and demands plus consequences condition, but not in the demands condition. The findings provide mixed support for manipulating demands and strong support for manipulating consequences as a means for producing pressure. It is also highlighted that increasing demand stressors in isolation affects performance. Thus, there is an indication that demand stressors could be important when PT as a means for challenging performance. In light of the mixed findings, study two indicates that future research is needed to further clarify the role of consequence and demand stressors when creating pressurised training environments. As such, it is suggested that a potentially effective way to develop the findings is to explore the specific impact of each individual demand and consequence stressor on pressure and performance.

Chapter five (study three) explores the specific impact of each individual demand (i.e., task, performer and environmental) and consequence (i.e., reward, forfeit and judgment) stressor on performance and perceived pressure in Elite Disability Shooting. Specifically, a randomized, within subject design was used whereby six international shooters performed a shooting task while exposed to a single demand (e.g., environmental) or consequence (e.g., reward) stressor. The results are synonymous with those of study two in indicating that perceived pressure

only increases in conditions where consequences are introduced. This result suggests that these stressors are essential for increasing pressure. Moreover, study three indicates that the judgment stressor has the greatest influence of all stressors and, thus, may present coaches with the most effective means for maximising pressure. As was the case in study two, it is found in study three that manipulating demands does not affect pressure, yet they do negatively impact performance. Hence, collectively the findings support and build on study one's framework by indicating that demands and consequences have distinct roles when PT; demand stressors could be critical for shaping performance whereas consequences appear essential for producing pressure

Chapter six (general discussion) summarises the findings of the research programme and discusses the theoretical and practical applied implications. This chapter also highlights future research directions before the strengths and weaknesses associated with the thesis are described and conclusions drawn.

Chapter seven (epilogue) combines previous literature relating to the pre-exposure stages of PT (e.g., Johnston & Cannon-Bowers, 1996) with the findings of the present thesis regarding methods for systematically creating and exposing athletes to PT environments. In uniting these findings, the epilogue documents a comprehensive account of how to perform all the stages involved in PT. It is intended that this account serves as a guide for practitioners and coaches conducting PT.

CHAPTER II

2.0 Review of Literature

2.1 Introduction

The impact of stress on performance is perhaps greater now than at any other time (Fletcher & Arnold, 2016). Consequently, understanding the negative effects of stress on performance is critical in any domain where the goal is to maintain a high level of performance (Driskell, et al., 2014). Sport is one such arena as optimal performance is the goal of all athletes (Maxwell, Masters, & Poolton, 2006).

The term stress derives from the Latin *stringere,* which means to draw tight (or strain; Salas et al., 1996). Accordingly, this early definition provides an indication as to what stress means: it taxes, it strains, and it restricts (Driskell et al., 2014). In a sports context, stress is commonly conceptualised as a transaction. Lazarus and Folkman (1984) defined it as a "particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her wellbeing" (p. 19). This appraisal process does not have to result in perceptions of threat and negative reactions, because the individual may appraise the situation as one in which he or she can meet the demands faced (Fletcher, Hanton, & Mellalieu, 2006). However, this transaction can lead to undesirable physiological, psychological, behavioural, or social outcomes (Salas et al., 1996). Accordingly, an impressive body of research has accumulated on stress in competitive sports (see Fletcher et al., 2006; Neil, Hanton, Mellalieu, & Fletcher, 2011; Rumbold, Fletcher, & Daniels, 2012). Central to this literature is research examining interventions for preventing sub-optimal performance under pressure (cf. Hill, Hanton, Mathews, & Fleming, 2010b).

The purpose of this chapter is to report a review of the literature relating to underperformance in pressurised sporting environments. The reader is directed through an evaluation of what might cause sub-optimal performance under pressure

and the possible underlying mechanisms, before examining interventions for preventing underperformance. Following this, the review identifies areas of future study, thus providing the rationale for the programme of research undertaken within this thesis.

2.2 Choking Under Pressure

It has been argued that performance pressure, defined as "any factor or combination of factors that increases the importance of performing well on a particular occasion" (p. 610; Baumeister, 1984), often causes people to perform below their actual abilities (DeCaro et al., 2011). The desire to perform as well as possible is thought to create performance pressure (Beilock & Carr, 2001). Infamous historical examples of athletes performing sub-optimally under pressure can be found across different sports. For example, Jean Van de Velde is known for his demise on the last hole at the 1999 British Open Golf competition (Clark, 2002) and the English National Football team, having lost all but one penalty shootout since 1982, are perceived to have a record of underperforming when taking penalties (Jordet, 2009).

This process of performing sub-optimally, given one's skill level, under performance pressure is called "choking" (Beilock & Gray, 2007). Specifically, choking is a metaphorical expression (Baumeister, 1984) and, while there is some debate in the literature (Hill et al., 2010a), it is generally defined as "the occurrence of inferior performance despite striving and incentives for superior performance'" (Baumeister & Showers, 1986, p. 361). Choking can be distinguished from other types of performance failure, such as the 'yips', slump, and panic. Specifically, when choking under pressure, Clark, Tofler and Lardon (2005) suggested that athletes are able to identify the correct decision but cannot execute it because of intervening

psychological factors. In comparison, a panic was described as occurring as a consequence of an athlete being unable to make correct decisions, due to thinking irrationally. Similarly, they also highlighted how the yips can be distinguished from choking and panic as it involves focal dystonia which concerns involuntary muscle contractions. Choking has also been differentiated from the slump, which consists of sub-optimal performance for an extended period of time that is not necessarily triggered by pressure (Grove, 2004).

2.2.1 The mechanisms of choking. Given that choking does occur, and that the goal in sport is to maintain a high level of performance in pressurised situations (Driskell et al., 2014), research has focused on the mechanisms of choking, as findings could indicate how to prevent sub-optimal performance (cf. Beilock & Carr, 2001). While the choke, 'yips', slump and panic all result in performance failure, research indicates that their underlying mechanisms differ (Hill et al., 2010a). With this in mind, explanations of the mechanisms that underpin choking can be split into two categories: drive theories and attentional theories.

2.2.1.1 Drive theories. Drive theorists report that increased levels of arousal/drive, produced by the desire to perform well under pressure, can negatively impact performance (Spence & Spence, 1966). The exact way in which drive affects performance has been debated, and two primary explanations have emerged. The Inverted-U Model (Yerkes & Dodson, 1908) was the first explanation to report that intermediate levels of drive, as opposed to high or low levels, result in optimal performance. The second position, Dominant Response Theory, reports that drive causes athletes to produce their dominant response under pressure, whereby the elite athletes' performance enhances whilst the novices' worsens (Zajonc, 1965). It has been suggested that these explanations cannot account for all examples of

choking as athletes have performed well whilst experiencing high levels of drive and elite performers have choked whilst under pressure (Hill et al., 2010a).

Addressing these criticisms, the Cusp Catastrophe Model (Hardy, 1996) has been highlighted as a drive theory that offers more comprehensive insights into choking under pressure (Beilock & Gray, 2007). In accordance with this model, when levels of cognitive anxiety and physiological arousal are both high, a catastrophic dip in performance (i.e., a choke) will ensue. Somewhat supporting this theory, Vickers and Williams (2007) discovered that high cognitive anxiety and physiological arousal did lead to choking in certain athletes, but not others. However, research applying the Cusp Catastrophe Model to choking is scarce and literature indicates that self-confidence (Hardy, Woodman, & Carrington, 2004) and perceived control (Edwards, Kingston, Hardy, & Gould, 2002) may affect the relationship between cognitive anxiety, physiological arousal and catastrophic performance outcomes.

2.2.1.2 Attentional theories. Attentional theories concern the second category of choking theories and have received more support as explanations of choking (Hill et al., 2010b). Two primary attentional theories exist: distraction (Carver & Scheier, 1981) and self-focus theories (Baumeister, 1984). Distraction theories propose that anxiety, induced by pressure, causes performance to decrease due to working memory becoming over-loaded with task-irrelevant stimuli (Sarason, 1988). The task irrelevant stimuli, comprised of anxiety-related thoughts such as worries about the consequences, compete with the attention needed to execute the task at hand and this inefficient processing leads to choking. One recognised distraction theory, Processing Efficiency Theory (PET; Eysenck & Calvo, 1992), highlights that inefficient processing will impact performance, unless the athlete responds with increased effort (Murray & Janelle, 2003; Wilson, 2008). Yet, it has been expressed

that effort alone cannot overcome some critically high intensities of anxiety and working memory processing inefficiency (Williams, Vickers, & Rodrigues, 2002) and, in such circumstances, choking will ensue (Smith, Bellamy, Collins, & Newell, 2001).

Self-focus theories, on the other hand, propose that pressure increases anxiety, which in turn increases self-consciousness about performing (Baumeister, 1984). This rise in self-consciousness causes attention to be focused inwardly, whereby the performer consciously monitors their skill-execution, thereby causing a choke. Self-focus theories have been closely linked with literature on the stages of learning (e.g., Fitts & Posner, 1967). Specifically, this literature highlights that novice performers focus on explicit rule-based declarative knowledge during skill-execution and process it through working memory. Following the learning of a skill, it is executed outside of working memory as implicit, procedural knowledge. This literature is linked to self-focus theories via research highlighting skilled athletes, when experiencing increased intensities of self-consciousness under pressure, break the task down into its original parts and consciously process, using their working memory (Hill et al., 2010a). In this way, the expert reinvests in the execution of the skill, processing it in an effortful way like a novice would. With these additional demands on working memory, task-relevant information is processed slower and consequently choking becomes more likely (Masters & Maxwell, 2008).

The Explicit Monitoring Hypothesis (Beilock & Carr, 2001) and the Consciousness Processing Hypothesis (Masters, 1992) are recognised as similar self-focus theories of choking with one distinctive difference. Specifically, the Explicit Monitoring Hypothesis proposes that step-by-step *monitoring* of skill-execution causes performance detriments, while the Consciousness Processing Hypothesis suggests that performance suffers due to the performer consciously *controlling* the

skill-execution (Hill et al., 2010a). Supporting both of these approaches, research suggests that explicit monitoring can have a general negative impact on performance and the conscious control of a skill can have an additional harmful effect (Jackson, Ashford, & Norsworthy, 2006).

Support for the self-focus explanation of choking can be seen in research on elite golfers (Beilock, Carr, MacMahon, & Starkes, 2002). The participants completed a distracting dual-task exercise whereby they responded to various audible tones whilst putting. It was found that performance was maintained because the dual-task prevented explicit monitoring. This finding was corroborated further because results also revealed that performance dropped significantly when self-focus was heightened. These results are supported in wider research (e.g., Beilock & Carr, 2001; Gray, 2004; Gucciardi & Dimmock, 2008; Hardy, Mullen, & Martin, 2001; Jackson et al., 2006), however, there are also criticisms of this literature to consider. For example, it has been proposed that much of the supporting research lacks relevant manipulation checks and, consequently, it is uncertain whether the self-focused condition was responsible for causing participants to explicitly monitor the task (Wilson, Chattington, Marple-Horvat, & Smith, 2007). This research further highlighted that the distracting dual-task may have actually overwhelmed working memory, and thus caused choking via distraction.

In retort to such concerns, literature has examined novice and expert participants completing a skill in distracting dual-task and self-focus conditions (e.g., Beilock & Carr, 2001; Beilock et al., 2002; Gray, 2004) and highlighted that the novices' performance would have decreased in both conditions if it were the case that the cognitive demands of the self-focus task were over-whelming. However, this was not the case. Rather, novices' performance increased in self-focused conditions

and deteriorated in dual-task conditions. This finding indicates that the self-focus tasks did not overwhelm working memory and cause distraction; rather, the self-focus task provoked explicit control of the skill. While more concerns exist regarding the self-focused theory of choking (see Wilson et al., 2007; Wilson, Smith, & Holmes, 2007), currently, existing research supports this theory as the most likely cause of choking in sport (Hill et al., 2010a) while recognising that distraction evidently has an impact (Mullen, Hardy, & Tattersall, 2005).

2.2.2 Potential moderators of choking. Research has highlighted a number of different mediators of choking in sport. Such factors include an audience (Wallace, Baumeister, & Vohs, 2005), coping style (Wang, Marchant, & Morris, 2004), skill level (Beilock & Carr, 2001), dispositional reinvestment (Masters et al., 1993), task properties (Beilock & Carr, 2001), trait anxiety (Baumeister & Showers, 1986), self-confidence (Baumeister, Hamilton, & Tice, 1985), self-consciousness (Baumeister, 1984), and stereotype threat (Chalabaev, Sarrazin, Stone, & Cury, 2008). The potential effect of these mediators are considered below.

2.2.2.1 Audience presence. It is generally accepted that the presence of an audience can mediate choking (for a review see, Pollard, 2006), although its effect is reliant on other moderating variables and it is uncertain if the effect is positive or negative. In detail, Wallace and colleagues (2005) indicated that a supportive audience would engender self-focus choking due to increased anxiety, yet literature has also highlighted the “home advantage” effect. This theory has indicated that supportive audiences can facilitate an enhanced performance under pressure (Neville & Holder, 1999; Thomas, Reeves, & Bell, 2008).

2.2.2.2 Coping style. Contemporary research has suggested that coping styles are potential influencers of choking. Specifically, Wang and colleagues (2004)

intimated that an approach coping style and/or an escapist-regulatory coping style (Jordet, 2009) is likely to increase susceptibility to choking. However, as empirical investigations are lacking, a definitive conclusions on the precise role of coping style are yet to be reached.

2.2.2.3 Skill level and task properties. Skill level and task properties have been suggested as potential mediators of choking. Specifically, researchers have highlighted that novice performers are more likely to choke from distraction because they process task relevant information through working memory and have limited capacity to cope with additional demands (Beilock & Carr, 2001). Along these lines, most studies suggest that a novice's performance is consistent or improved under self-focus (e.g., Beilock et al., 2002), while experts choke due to processing their well-learnt skill outside of working memory (Beilock & Carr, 2001; Gray, 2004). Nevertheless, highlighting the influence of task properties, complex skill of a declarative nature is recognised as likely to break down regardless of skill level through distraction, since these types of tasks place overwhelming demands on attention capacity (Williams et al., 2002). Moreover, because procedural knowledge tasks are processed without executive working memory, they are more likely to engender self-focused choking (Baumeister & Showers, 1986; Beilock & Carr, 2001).

2.2.2.4 Dispositional reinvestment. Research has highlighted that those more likely to reinvest (i.e., consciously control a well-learned skill under pressure; Masters et al., 1993) are increasingly susceptible to choking when compared to low 'reinvesters' (Jackson et al., 2006; Poolton, Maxwell, & Masters, 2004). While such dispositional reinvestment literature is promising, it has been proposed that further exploration of the topic is required (Hill et al., 2010a).

2.2.2.5 Trait anxiety and confidence. Trait anxiety and confidence have been examined as potential influencers of choking and, although there is scarce literature on the subject, the available research suggests that high trait anxiety and low confidence increase the likelihood of a choke (Baumeister et al., 1985; Baumeister & Showers, 1986). It has been indicated that this is due to high trait anxiety causing more frequent high levels of state anxiety which, in turn, leads to processing inefficiency and then choking (Wilson et al., 2007; Wilson, 2008). Similarly, high trait anxiety can increase dispositional reinvestment, making a self-focus choke more likely (Masters et al. 1993). Regarding confidence, lower levels are associated with a decrease in the use of effortful strategies that counter the effects of this processing inefficiency (Wilson et al., 2007). Consequently, a choke is more likely.

2.2.2.6 Self-consciousness. It has been indicated that performers with high dispositional self-consciousness are less likely to be susceptible to choking, as they are frequently inwardly focused under pressure and thus more accustomed to the negative impact of self-focus (Baumeister, 1984; Beilock & Carr, 2001; Lewis & Linder, 1997). However, studies have identified that increases in self-consciousness were associated with increases in choking because self-focus was more likely (e.g., Liao & Masters, 2002; Poolton et al., 2004; Wang, Marchant, & Gibbs, 2004). These contrasting arguments could be explained by confounding variables, such as task complexity and skill level (Wang et al., 2004).

2.2.2.7 Stereotype threat. It has also been documented that women may choke when performing mathematical tasks if told beforehand that their gender increases their likelihood of failure (Spencer, Steele, & Quinn, 1999). Research, such as this, indicates that stereotype threat may mediate the probability of choking

(Beilock & McConnell, 2004). As compared with academic and social research, studies of this threat in sport are less common; however, the extant research is promising. For instance, using a negative stereotype that Caucasians have poor natural athletic ability and African Americans have poor sports intelligence, Stone, Lynch, Sjomeling, and Darley (1999) examined golf-putting and choking under pressure in Caucasian and African American athletes. If told beforehand that the task was an indication of natural athletic ability, the Caucasians choked whereas, when told the task was an indication of sports intelligence, the African Americans choked. It was argued that the negative-stereotype information provided prior to the task influenced choking and these findings are supported in wider literature (e.g., Beilock, Jellison, Rydell, McConnell, & Carr, 2006; Stone, 2002).

2.3 Interventions to Prevent Choking

The inconsistent research on the factors that influence choking may explain why there is limited literature regarding how to prevent choking in sport. Of this literature, implicit and analogy learning (Masters, 1992, 2000; Mullen et al., 2007) and process cues (Gucciardi & Dimmock, 2008) have been proposed as effective preventative measures. Below, these preventative interventions are discussed.

2.3.1 Implicit learning. Research has highlighted that learning a skill implicitly (i.e., without intention) can prevent choking. This type of learning prevents explicit rule-based knowledge from amassing and, consequently, buffers self-focus and thus choking, as there is no explicit knowledge to reinvest (Masters, 1992, 2000). However, while this preventative measure has received much support (e.g., Koedijker, Oudejans, & Beek, 2007; Mullen et al., 2007), the validity of this support and the applicability of the intervention has been critiqued. One such criticism concerns how the supporting data is underpinned by investigations where the

participants have performed a distracting dual-task whilst learning a novel skill (Baddeley, 1966). Specifically, the distracting tasks used across studies have varied and so has their effectiveness (Bennett, 2000), thus reducing generalisability and validity. Moreover, the amount of explicit knowledge accrued by the participants prior to each investigation was not always accounted for (Bennett, 2000). Notably, one study found that the "explicit group" had accumulated less explicit knowledge than the control, regardless of having received extensive technical instruction that was not provided to the control (Hardy, Mullen & Jones, 1996). Implicit learning has also received criticism for is applicability due to the speed at which learning takes place (Maxwell, Masters, & Eves, 2000). In detail, because the learning is not explicit, the process can be slow and thus inefficacious. Furthermore, this intervention has been argued to potentially restrict self-correcting mechanisms and lack support for skilled and elite athletes who already have explicit knowledge (Bennett, 2000).

2.3.2 Analogy learning. Analogy learning has also been offered as an intervention to prevent choking (Masters, 2000). In this approach, the athlete learns how to perform complex actions via biomechanical metaphors (e.g., hitting a table tennis backhand as if 'throwing a Frisbee'; Berry & Dienes, 1993). This approach differs from implicit learning as the performer intends to learn the skill. For example, in a study documenting this approach, one group of participants learnt a forehand table tennis shot via explicit instruction while another was taught using analogy learning (Liao & Masters, 2001). It was found that the performance of the group who received analogy learning was maintained under a subsequent pressurised test, whereas the other group choked under these conditions. Notably, the analogy learning group in this study amassed less explicit knowledge than the alternative group. Further studies have replicated and extended this research as it has been

highlighted that skills requiring complicated decision-making processes are resilient under pressure, if acquired through analogy learning (Lam, Maxwell, & Masters, 2009; Law, Masters, Bray, Eves, & Bardswell, 2003; Poolton et al., 2006). This resilience is thought to be a result of the acquired skills being processed and stored in a visual form outside of central executive working memory, thus, providing working memory with the necessary capacity to perform complex decisions.

While analogy learning proposes a potentially more ecological intervention that implicit learning, this approach has limitations and additional research is needed (Hill et al., 2010a). One such criticism is that supporting research has used the table tennis shot, or a similarly modified sporting skill (e.g., Lam et al., 2009; Liao & Masters, 2001; Masters et al., 2008; Poolton et al., 2006) and, thus, investigations spanning a wider range of complex skills are needed to provide ecological validity. Moreover, there are limitations within implicit learning research which may also apply to analogy learning interventions. Specifically, it remains unclear whether athletes who develop a skill via analogy are capable of self-correcting, and, whether skilled or elite performers already in attainment of explicit knowledge benefit from analogy learning.

2.3.3 Process cues. Process cues have been investigated as a means for preventing skilled performers from choking. For example, Gucciardi and Dimmock (2008) conducted a study with elite golfers. The participants focused on explicit technical information, an irrelevant thought, or a process cue, in the form of a swing thought (e.g., smooth, slow) whilst performing a putting task. It was found that performance improved when focusing on the process cue and that the participants choked when they focused on the explicit technical information. These findings were

used to argue that self-focus choking was reduced due to the process cue engaging attentional processes that facilitated higher level, meta-cognitive roles.

Regarding interventions to prevent choking, implicit learning and analogy learning have been explicitly recognised within the literature as the most notable suggestions (Hill et al., 2010a). However, as highlighted, literature supporting these approaches has been criticised for being difficult to generalise (Bennett, 2000), and difficult to apply (Maxwell et al., 2000), as well as lacking ecological validity, the ability to help skilled performers, and a preventative solution for both distraction and self-focus theories of choking (Hill et al., 2010a). Consequently, coaches, practitioners and athletes have been reluctant to adopt this intervention (Liao & Masters, 2001; Poolton et al., 2006). With this in mind, there is a need for alternative interventions to be advanced. Along these lines, recent research (Bell et al., 2013; Lawrence et al., 2014; Sarkar et al., 2014) indicates that stressor-exposure programmes could be distinguished as a more ecological, popular, and effective preventative intervention that overcomes many of these limitations. The following section explores this suggestion by examining the extant stressor-exposure literature.

2.4 Stressor-Exposure Programmes

Stressor-exposure programmes for enhancing performance are evident as far back, and possibly prior to, the Roman times of gladiatorial fighting (129-216 A.D). Mirroring sporting systems of the 21st century, during this era there were state-funded gladiator schools with supporting coaches, physicians, dieticians and the like (Winter, 2008). In gladiator schools, athletes would train daily, often fighting one another (Jacobelli, 2003). In this respect, the coaches created pressurised training environments where athletes were exposed to stressors and pressures that

emulated their competition environment (i.e., fighting in an Amphitheatre). In modern literature, however, stressor-exposure programmes can be traced back to the medical practice of virus immunisation via inoculation. The development of this modern literature will now be discussed, before its effectiveness as a preventative intervention for choking in sport is considered.

In recent times, pressure training has its roots in Stress Inoculation Training and Stress Exposure Training and, as previously described, these stressor-exposure programmes evolved from the process of medical vaccination. In medicine, inoculation is the process of exposing an individual to a small amount of a virus (i.e., a vaccine) to build immunity to it (Meichenbaum, 1977). Specifically, antibodies are formed in reaction to moderate exposures and these antibodies fend off future attacks from the virus. Based on this notion, in the 1950's Wolpe (1959) transmuted this medical concept into a psychological intervention. Termed Systematic Desensitisation, this approach aimed to alleviate conditioned phobias in clinical populations by exposing individuals to anxiety-arousing environments containing their phobia. Although it incorporated relaxation strategies, Wolpe's programme did not attempt to tackle any of the underlying cognitive mechanisms connected to the phobia and anxiety. Consequently, by the 1970's researchers were considering how to develop this approach to incorporate new modifications that also addressed underpinning psychological issues (Meichenbaum, 1985). Subsequently, methods of clinical stressor-exposure were developed that were designed to reduce anxiety and the associated irrational and negative thoughts and feelings (Johnston & Cannon-Bowers, 1996). Out of these developments, a "renaissance" in modern stressor-exposure programmes took place (Driskell, Salas, Johnston & Wollert, 2008); Stress Inoculation Training (Meichenbaum, 1975) and Stress Exposure Training (Driskell et

al., 2008) materialised and these programmes led to the adoption of stressor-exposure training in sport settings.

2.4.1 Stress inoculation training. Pioneered for over 30 years by Meichenbaum (1975; 1976; 1977; 1985; 2007; Meichenbaum, & Deffenbacher, 1996), Stress Inoculation Training (SIT) was significant in endorsing a multi-modal approach to intervention. A strength of SIT is that it did not presume any single coping technique (i.e. relaxation) to be applicable to all stressors (Johnston & Cannon-Bowers, 1996). Rather, it commonly encouraged a combination of imagery, self-talk, and/or relaxation (Thomas, Mellalieu, & Hanton, 2009).

2.4.1.1 Phases of SIT. Highlighted by Meichenbaum (2007), SIT consists of a three phased programme: a conceptual and educational phase, a skills acquisition and consolidation phase, and an application and follow-through phase. In phase one, the objectives are to provide individuals with information regarding the nature of their identified problem (e.g., anger, anxiety), and to understand the impact of the body's stress response. These objectives are achieved through methods that can include Socratic dialogue where the trainer uses "curious" questions, and the creation of a collaborative relationship between the trainer and client that serves as the stable foundation. To help the client foster a sense of awareness and mastery, techniques such as psychological testing, constructive feedback, style of responding, focussing on signs of resilience, self-monitoring, bibliotherapy, and exposure to modelling films are often used. This phase continues right through from SIT initiation to completion, with the educational topics changing in accordance with the challenges that clients face.

Phase two, the skills acquisition and consolidation phase, focuses on removing unhealthy barriers to stress management, whilst developing and

consolidating intra- and interpersonal coping skills. Objectives include dispelling overwhelming, uncontrollable, unpredictable and debilitating thoughts, and fostering a sense of “learned resourcefulness”. These objectives are achieved through a number of methods including progressive relaxation, deep breathing, guided imagery, semantic desensitisation, cognitive restructuring, stretching, modelling and role-play (Meichenbaum, 2007; Wertkin, 1985). The trainer builds the technology of generalisation into the training protocol, creating a specialised learning environment that allows learnt coping mechanisms to be transferred from practice environments to realistic and stressful training scenarios (Meichenbaum, 2007).

Phase three is the application and follow-through phase, and this concerns the generalising process mentioned above, where individuals are gradually exposed to stressors. The objective is to progressively increment the demands and fidelity of training environments, until individuals are eventually practicing their coping skills in vivo. The trainer increments exposure at a pace that encourages the individual to utilise their coping techniques, develop resilience, and negate regression. Follow up “booster training” sessions extend into the future to ensure continued stress management is achieved. In the clinical setting, SIT will typically consist of 8-15 sessions excluding boosters and follow ups, and be conducted over a 3 to 12 month period. Sessions can vary from brief 20-minute pre-surgery interventions, to 40 one-hour weekly sessions for individuals with chronic medical problems (Turk, Meichenbaum, & Genest, 1983). Within a given intervention the specific amount of time spent and the content covered in each phase will differ depending on the clients’ needs (Meichenbaum, 2007).

2.4.1.2 SIT interventions. Due to the success of SIT as a stressor-exposure programme for enhancing functioning in clinical settings, this approach was

subsequently adopted in applied environments (cf. LeBlanc, 2009). To date, is has been applied in military, law enforcement (Novaco, 1975; 1977) and medical settings (Kendall, 1983). Following this, the approach was adopted in sport and exercise settings (Kirschenbaum, Wittrock, Smith, & Monson, 1984; Mace & Carroll, 1985; Smith, 1980). For example, Mace and Carroll (1986) conducted a SIT study in squash. In this investigation, during phase two the participants' were up-skilled in relaxation, visualisation and positive self-statements. During phase three, these skills were practiced in pressurised conditions which included a monetary incentive. In a post-intervention test under pressure, a decrease in self-reported anxiety was found and self-reported performance improved. Thus, it is indicated that choking and performance may have improved due to the interventions impact on anxiety. Further studies were conducted by Mace and his research team (e.g., Mace & Carroll, 1985; Mace et al., 1986; Mace et al., 1986) which also echoed these findings.

2.4.2 Stress Exposure Training. In line with the literature highlighted above, there is evidence of SIT being used to effectively reduce anxiety and improve performance. This evidence spans a diverse range of environments, including clinical (Holcomb, 1986), occupational (Novaco, 1975; 1977), and sporting (Mace & Carroll, 1986) domains. However, because SIT was designed with clinical environments in mind, certain researchers believed that SIT should be adapted to better cater for interventions with normal training populations in applied settings (Driskell et al., 2014; Johnston & Cannon-Bowers, 1996). Specifically, it was argued that several underlying clinical assumptions may limit the applicability of SIT in applied training situations and these included: (a) the intensive therapeutic involvement of a skilled facilitator; (b) one-on-one individualised treatment; and (c) a primary emphasis on reducing anxiety, depression, and anger (Johnston & Cannon-

Bowers, 1996). Stress Exposure Training (SET) was developed in the 1990's to address these concerns. The adaptations included the addition of three objectives: to enhance familiarity with the stress environment, to build skills that maintain effective performance under stress, and to boost confidence in the ability to perform (Driskell, Hughes, Hall, & Salas, 1992).

2.4.2.1 Phases of SET. In line with being an evolution of SIT, SET also had three phases: information provision, skills acquisition, and application and practice (Driskell et al., 2008). In phase one, two important principles are indoctrination, and the provision of preparatory information. Regarding indoctrination, it is important that individuals increase their attention and motivation towards the program. The method to achieve this concerns discussing why stressor-exposure is important and how it impacts on performance. Regarding preparatory information, sensory, procedural and instrumental information about the stress environment is provided to reduce negative reactions in three different ways. Firstly, a preview of the stress environment makes the task at hand become less novel, and familiarity enhances self-efficacy and performance (Locke, Frederick, Lee & Bobko, 1984). Secondly, knowledge of an event also increases predictability, thus decreasing attentional demands and the distraction caused by having to make sense of novel events in real-time (Cohen & Lambie, 1978). Thirdly, controllability may be enhanced through the provision of information via the development of instrumental means to respond to the stress (Driskell et al., 2008).

As highlighted by Driskell and Johnston (1998), phase two, the skill acquisition phase, incorporates the building of performance skills to maintain effective performance under stress. This goal is achieved through the utilisation of a number of methods, including cognitive control, mental practice, overlearning and

task specific decision making skills, as well as metacognitive, psychomotor and physiological control skills. Similar to SIT, the goal of phase three is to facilitate stressor-exposure whilst individuals practice the coping skills they developed in phase two. Stressor-exposure should be phased-in gradually (Keinan & Friedland, 1996) until, eventually, event-based training is practiced. Event-based training is where the environment you are training to perform in becomes the curriculum contained in training (Driskell et al., 2008).

2.4.2.2 SET interventions. In a study investigating participants' performance in piloting an aircraft, thirty participants with no flying experience were randomly assigned to a SET or control group (McClernon et al., 2011). The intervention consisted of an educational phase advising participants on how to react to the stress exposure, a skills acquisition phase where coping skills were rehearsed in the presence of stressors, and an application phase where participants trained in a flight simulator under stress. The stressor was a cold pressor which is similar to an icebox and limbs are immersed in cold water to create discomfort. In a post-intervention test, the participants were exposed to the pressure of having to fly a Piper Archer aircraft. Although self-reported anxiety intensity did not differ between the groups, it was found that those in the experimental condition flew more smoothly and generally better, as identified by aircraft telemetry data and a flight instructor. Other studies have illustrated similar findings in other applied domains, including law enforcement (Driskell et al., 2008) and firefighting (Baumann, Gohm, & Bonner, 2011).

2.4.3 Evaluating SIT and SET. Newman and Beehr (1979) proposed that supportive evidence for these approaches lacked rigorous evaluation, and that much of the investigations were comprised of case studies, non-empirical reports, and research lacking appropriate controls. Wexley and Latham (1991) agreed,

highlighting that the ambivalent nature of evidence makes it hard to discern the effectiveness of a programme such as SIT. Illustrating this point, Whitmarsh and Alderman (1993) studied athletes' performance in a wall sit challenge and found that, although participants in the SET group significantly improved their pain tolerance, this improvement was no more than another treatment group that was given an intervention consisting only of phase one of SET. As another example, Long (1984) gave community residents either an intervention involving SIT, or a jogging intervention and it was found that the SIT intervention was no better at reducing self-reported stress. In line with this inconsistency, it was argued that the overall effectiveness of these interventions has not been clearly established (Johnston & Cannon-Bowers, 1996) and that the training methodology may be limited due to research being narrowly focussed (Saunders et al., 1996).

In addition, stressor-exposure literature lacks guidance on how to design and implement stressors in phase three (the stressor-exposure phase). Specifically, objectives and the methods required to achieve these objectives are exemplified for phases one and two (e.g., Driskell & Johnston, 1998). However, while the objectives are made clear for phase three, it is indicated that such methods to achieve these objectives cannot be exemplified as stressors must be developed accordingly to each specific performance environment (Driskell et al., 2008). Accordingly, this limits applicability.

Addressing the ambivalent nature of supporting evidence, Saunders and colleagues (1996), and Johnston and Cannon-Bowers (1996) completed two separate meta-analyses. Saunders and colleagues' (1996) analysis examined 37 studies and it was found that the interventions had a strong overall effect for reducing performance anxiety, and moderate effect on performance enhancement.

Commenting on these results, Staal (2004) proposed that the effect sizes from the misanalysis were substantial compared to the effects of other training interventions, such as mental practice (Driskell, Copper, & Moran, 1994) or overlearning (Driskell, Willis, & Copper, 1992). Sanders et al., (1996) concluded that SIT and SET interventions were an effective means for reducing state anxiety, reducing skill-specific anxiety, and enhancing the ability to perform in environments containing stressors. Supporting this, Johnston and Cannon-Bowers (1996) concluded that two-thirds (67%) of the studies examined in their meta-analysis demonstrated that SET significantly improved performance. In light of this literature, there is an indication that stressor-exposure programmes may be effective for improving choking and performance under pressure via their impact on performance anxiety.

2.4.4 Pressure training. The previous research highlighted above shows moderate to strong support for the impact of stressor-exposure programmes as a means for enhancing functioning. However, recently stressor-exposure programmes have developed into interventions specifically aiming to expose individuals to performance pressure (e.g., Kinrade, Jackson, & Ashford, 2010; 2015; Lawrence et al., 2014 Oudejans & Pijpers, 2009, 2010; Reeves et al., 2007). Termed pressure training (e.g., Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2014), recent research into this approach may provide a more effective intervention for reducing choking and enhancing performance in sport than implicit learning, analogy learning, and process thinking.

Building on the successes of SIT and SET, pressure training involves exposing individuals to stressors as they train with an aim of allowing them to practice whilst under pressure (cf. Bell et al., 2013). It has been proposed that it may reduce self-focus methods of choking by allowing athletes to develop the coping

skills necessary to perform, despite heightened self-monitoring (Reeves et al., 2007). In addition, it may reduce distraction methods of choking by enhancing one's ability to manage task irrelevant stimuli. Specifically, the task irrelevant stimuli (i.e., worries) that pressure produces can be offset by a stream of processes involving increased effort towards task-relevant stimuli (cf. Eysenck & Calvo, 1992). Thus, there is an indication that pressure training develops one's ability to perform these counterbalancing processes and consequently enhance performance under pressure (Oudejans & Pijpers, 2010). Due to the ability for pressure training to affect these developments, it has been argued that training with pressure increases the likelihood of smoothly transferring skills to realistic, competition contexts (Zakay & Wooler, 1984).

2.4.4.1 Pressure training interventions. Reeves and her colleagues (2007) studied the effects on an intervention that exposed soccer players to pressure in the form of external evaluation, video-taping and reward. In a post-intervention soccer test, two control groups who did not undergo pressure training experienced performance decrements under high-pressure conditions. The experimental condition, on the other hand, improved performance under high-pressure situations. These results were argued to offer a method of preventing self-focus methods of chocking under pressure.

Oudejans and Pijpers (2009) examined the impact of a pressure training intervention in two experiments, one on expert basketball and one on expert dart players. In the study on basketballers, the participants were exposed to two pre-tests; one with pressure and one without. A five week training protocol followed where several stressors were used to train the experimental group under pressure, including a monetary reward, being video recorded and evaluated by a coach. In a

post-test it was found the control groups still choked under pressure as their performance deteriorated. However, the experimental groups' performance no longer deteriorated, indicating an improvement in the participants' ability to perform under pressure. The experiment on expert dart players reported comparable results, as it was found that only after training under pressure was performance maintained during the pressurised post-test. Indeed, this was found despite higher levels of anxiety and heart-rate. It was concluded that training in this way can prevent distraction methods of choking in expert perceptual–motor performance, by acclimating to the specific processes accompanying anxiety.

Bell et al. (2013) investigated the impact of pressure training on mental toughness in a longitudinal study. In the experimental group, elite youth cricketers participated in a pressure training intervention involving exposure to several stressors during training over several months. Results showed that the experimental group made significant improvements in objective and subjective mental toughness scores and performance, indicating an improvement in their ability to perform under pressure.

More recently, Lawrence and colleagues (2014) examined the impact of training under pressure on novices learning a golf-putting skill. In detail, the experimental groups were exposed to pressure, in the form of alleged judgment, rewards and forfeits at different stages during their learning of the golf-putt, before later being tested on their skills under pressure. The study found that the intervention eliminated choking for the experimental group as performance only deteriorated for those trained without pressure. Lawrence et al. (2014) concluded that the intervention should be adopted as a process for eliminating choking.

2.4.4.2 Evaluating pressure training. The extant literature highlights support for pressure training, however there exists several limitations. For instance, unlike older stressor-exposure research, there are relatively fewer studies which limits more definitive conclusions being drawn. In addition, in creating pressure, this approach is actively exposing individuals to anxiety arousing situations involving physical consequences such as punishment (e.g., Bell et al., 2013). Along these lines, it is indicated that potential negative implications could include reduced self-efficacy, increased anxiety (Albrecht, 2009), reduced intrinsic motivation (Vallerand, Gauvin, & Halliwell, 1986), and learned helplessness (Maier & Seligman, 1976). However, responding to these criticisms, Bell and his colleagues (2013) highlight that punishment is a "taboo" subject in sport psychology (e.g., Albrecht, 2009) and that most concerns are based on misconceptions that consequences are going to be administered randomly or inappropriately (Seifried, 2008). As they argue, their research findings suggest that consequences can lead to enhanced performance under pressure when presented in a transformational manner. This proposition is supported by evidence from other fields where it has been highlighted that appropriately administered consequences can result in improvements in adolescent delinquent behaviour (Morris & Gibson, 2011), decreases in a variety of phobias and neuroses (cf., Deffenbacher & Suinn, 1988), and improvements in performance in organisational settings (cf., Arvey & Ivancevich, 1980). There is also preliminary evidence that the active use of consequences is positively associated with improvements in a variety of attitudinal variables, including self-esteem and satisfaction, in military training recruits (Arthur, Hardy, & Wagstaff, 2010).

In consideration of the extant literature, while there have been criticisms of pressure training, primarily around ethics, there appears to be a growing body of

support indicating it to be an effective approach for preventing choking and enhancing performance under pressure. Moreover, research indicates that pressure training may overcome many of the criticisms that other notable and recognised interventions for preventing choking face. Specifically, explicit learning, analogy learning and process cues have been critiqued for being difficult to generalise (Bennett, 2000), and lacking ecological validity, the ability to help skilled performers, and a preventative solution for both distraction and self-focus theories of choking (Hill et al., 2010a). In providing a training framework that incorporates specificity of practice principles, pressure training is indicated to enhance generalisability and ecological validity (cf. Lawrence et al., 2014). In addition, evidence suggests that pressure training interventions provide both skilled and novice performers with performance benefits and a solution for both distraction and self-focus theories of choking (e.g., Oudejans & Pijpers, 2009; 2010; Reeves et al., 2007). Furthermore, while coaches, practitioners and athletes have been reluctant to adopt these other preventative interventions (Liao & Masters, 2001; Poolton et al., 2006), pressure training has proved popular amongst these demographics (e.g., Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2014). With this in mind, there is a suggestion that pressure training should be distinguished as a more ecological, popular, and effective intervention for preventing choking and enhancing performance in sport.

2.5 Future Research

In light of the developing interest in and early success of pressure training research (cf.; Oudejans & Pijpers, 2009; Sarkar et al., 2014), it is surprising that there is an absence of research investigating how to systematically design stressors to create pressure in sport. In detail, while there are examples of pressure training being conducted and specific stressors being used (e.g., monetary reward, being

observed or physical punishment) (Bell et al., 2013; Oudejans & Pijpers, 2010), no research has investigated a method for systematically producing stressors to create pressure. Compounding this issue, previous stressor-exposure research also lacks information on this subject. Specifically, the three-phased stressor-exposure models of SIT and SET highlighted in extensive detail the methods involved in the preparatory phases (i.e., phase one and two) that precede stressor-exposure (e.g., Driskell et al., 2008; Meichenbaum, 2007). However, concerning phase three, the stressor exposure phase, there is an absence of detail (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996; Meichenbaum, 2007). Rather, it is indicated that the process for developing stressors should be bespoke for each specific applied environment (Driskell et al., 2008; Driskell et al., 2014). Hence, there is also a lack of theory that can be taken from SIT and SET literature and used to inform methods for systematically creating pressure in sport.

This gap in knowledge is significant given that exposing athletes to pressure is one of, if not the most, essential components of pressure training (e.g., Bell et al., 2013; Reeves et al., 2007). Indeed, it indicates that pressure training is currently being practiced and encouraged, in applied and research contexts (cf., Beaumont et al., 2015; Bell et al., 2013; Fletcher & Sarkar, 2016; Sarkar et al., 2015), in the absence of comprehensive and empirically supported underpinning frameworks on how to effectively produce and expose individuals to pressurised training environment. In consideration of these issues, and previous literature highlighting the importance of developing bespoke stressor-exposure frameworks for the specific environment in which they will be applied (Johnston & Cannon-Bowers, 1996), there is a critical need to address this gap in literature (cf. Beaumont et al., 2015).

2.6 Summary and Purpose of Thesis

This literature review has provided a critical overview of research regarding interventions for preventing choking and enhancing performance in sport. The review has directed the reader through an evaluation of what can cause choking in sport and the possible underlying mechanisms, before attention was turned to examining interventions recognised as notable methods for preventing choking (i.e., implicit learning, analogy learning, and process cues). Stressor-exposure programmes and, specifically, pressure training, were then evaluated and the suitability for this approach to be recognised as another notable intervention was considered.

Following this critical overview, research indicates that pressure training provides a more popular and effective intervention for preventing choking and enhancing performance. However, there remains a significant absence of research detailing how to systematically design stressors and produce a pressurised training environment, indicating that pressure training is currently being utilised without a comprehensive theoretical underpinning. With this in mind, the purpose of this thesis was to investigate how pressurised training environments can be systematically produced in elite sport.

The thesis is concerned with investigating this topic within an elite setting due to the prevalence of pressure training in elite sport (cf. Bell et al., 2013), the intensity of these pressures, and the need to develop methods for helping elite athletes manage these pressures (Hill et al., 2010a; 2010b). It is intended that the findings will provide conceptual clarity to the area and insights that can be used to underpin future applied or research-based pressure training endeavours.

CHAPTER III

3.0 Study One

Elite Coaches' Experiences of Producing Pressurised Training Environments[1]

3.1 Introduction

Real-world (Dandy, Brewer, & Tottman, 2001) and laboratory evidence (Beilock & Gray, 2007) indicates that the pressure to attain success often causes people to perform below their actual abilities (i.e., choke) (DeCar et al., 2011). There are two primary explanations for how choking occurs: distraction and skill-focus theories (Hill et al., 2010b). Distraction theories have proposed that high-pressure situations cause performance to decrease due to working memory becoming over-loaded with task-irrelevant stimuli. The task irrelevant stimuli, comprised of thoughts such as worries about the consequences, compete with the attention needed to execute the task at hand. Contrastingly, skill-focus theories suggest that pressure increases self-consciousness about performing (Baumeister, 1984). This self-consciousness causes performers to focus their attention on skill-execution to ensure an optimal outcome. By disrupting the learning and execution of proceduralised processes that normally run outside of conscious awareness (Hill et al., 2010a), choking ensues.

Research has developed interventions for preventing choking and implicit and analogy learning have been proposed as the two most recognised and effective solutions (Hill et al., 2010a). However, these approaches have been criticised for being difficult to generalise (Bennett, 2000), lacking ecological validity, not providing

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a solution to elite performers, and for failing to deliver solutions for both distraction and self-focus theories of choking (Hill et al., 2010a). In line with this, coaches, practitioners and athletes have been reluctant to adopt these other preventative interventions (Liao & Masters, 2001; Poolton et al., 2006), and researchers have encouraged the development of new approaches (cf. Hill et al., 2010b). However, recent research indicates that stressor-exposure interventions (Saunders, et al., 1996) could be an effective alternative to implicit and analogy learning.

Stressor-exposure programmes typically adopt a three phased approach (Johnston & Cannon-Bowers, 1996). The first two phases focus on preparing for stressor-exposure while the third phase involves individuals being exposed to stressors as they perform. Research has shown that stressor-exposure interventions have a strong overall effect for reducing performance anxiety and moderate effects for enhancing performance enhancement (Saunders et al., 1996). Moreover, research on pressure training (PT) indicates that it may be a particularly effective modern stressor-exposure programme for preventing choking. For example, Oudejans and Pijpers (2009) examined the impact of PT intervention on expert basketball players and found that, in a post-intervention test, an experimental groups' performance no longer deteriorated under pressure. Extending this line of research, Bell et al. (2013) conducted an experiment examining how PT developed mental toughness and found that an experimental group made significant improvements in their ability to perform under pressure. Similarly, resilience literature has highlighted comparable findings. Fletcher and Sarkar (2012) investigated Olympians' experiences and identified that all of the participants described prolonged periods of time in which they were required to withstand pressure. The results suggested that these prolonged experiences of pressure contributed to the

development of resilience. These findings are echoed in wider resilience literature which seems to indicate that adverse experiences, involving periods of pressure, help individuals develop resilience in the face of future pressurised situations (Seery, 2011).

Pressure training research is limited and it has been suggested that it could be considered unethical and unhelpful if practiced without careful planning (cf. Albrecht, 2009; Maier & Seligman, 1976; Vallerand et al., 1986). Nevertheless, there is an indication that planned and strategic PT could be more effective for preventing self-focus (Reeves et al., 2007) and distraction (Oudejans & Pijpers, 2009) methods of choking, whilst also more ecological (cf. Lawrence et al., 2014), popular (Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2014) and helpful for novices and experts (Oudejans & Pijpers, 2009; Oudejans & Pijpers, 2010) than implicit and analogy learning.

However, despite the developing interest and early success of PT (cf. Bell et al., 2013; Sarkar et al., 2015), it is surprising that there is an absence of research on how to systematically produce a pressurised training environment in sport. Specifically, while there are examples within pressure training literature of specific stressors being used when pressure training (e.g., Bell et al., 2013; Oudejans & Pijpers, 2010), no studies have investigated how to systematically create stressors that produce pressure in sport. The extant stressor-exposure literature also lacks detail on how to subject individuals to stressors, thus further compounding this issue. In detail, SIT and SET research has provided little guidance on how to produce stressors, instead highlighting that the method for producing stressors should be developed according to the applied context they are intended for (Driskell et al., 2008; Driskell et al., 2014). Thus, there is also a lack of information that can be taken

from stressor-exposure literature and used to inform the production of pressure in elite sport. Therefore, in light of this gap in knowledge, it appears that PT environments are currently being utilised and encouraged, in applied and research contexts (cf., Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2015), in the absence of comprehensive and empirically supported underpinning frameworks.

3.1.1 Aims of study one. In consideration of these issues, and previous literature highlighting the importance of developing bespoke stressor-exposure frameworks for specific environments (Johnston & Cannon-Bowers, 1996), there is a need to explore sport-specific methods for systematically manufacturing a pressure training environment. Accordingly, the present study addressed this need by examining how coaches produced pressure training environments in elite sport. A qualitative approach was selected for several reasons. Firstly, research indicates this method of research to be appropriate when knowledge is lacking in the area being investigated (Braun & Clarke, 2006). Secondly, previous explorations of performance under pressure have highlighted the importance of moving away from the predominant experimental approach of current research and toward a more qualitative and ecologically valid design (Gucciardi & Dimmock, 2008; Mesagno, Marchant, & Morris, 2009). In addition, elite coaches were chosen as the sample population given that they are responsible for designing and managing training sessions and currently practice PT (cf. Beaumont et al., 2015; Bell et al., 2013).

3.2 Method

3.2.1 Participants and sampling. With institutional ethics approval[2], 11 professional, full-time coaches (1 female, 10 male) were included in the sample. The coaches resided in the United Kingdom and were aged between 30 and 53 years

[2] See Appendix 1 for ethics forms

(M_{age} 41.1; SD = 7.5 years). The criteria for inclusion of the coaches were that they had to have worked in elite sport (Olympic or International level) for a minimum of four years (cf., Olusoga, Maynard, Hays, & Butt, 2012). In addition, coaches had to perceive themselves to be successfully integrating pressure into training for performance enhancement. To identify these criteria, the following question was used: “Do you perceive yourself to successfully and effectively use pressure training and if so, why?”. A coach’s expertise was then discussed amongst the wider research team to evaluate their suitability for participation in the study. These criteria ensured that the sampled population had expertise specifically relating to the research aims. Expert purposive sampling (Patton, 2002) was used to identify and recruit participants that met the specific criteria detailed above. The coaches came from Badminton, Table Tennis, Rugby Union, Rugby League, Taekwondo, Diving, Paralympic Cycling, Judo, Cricket and Speed Skating. Collectively the participants had accumulated 106 years of experience (M_{exp} 9.6; SD = 5.2) coaching at the elite level and had worked in male and female, team and individual, disability and able-bodied, adolescent and adult elite training environments. At the time of data collection, coaches were at different stages of their competitive season.

3.2.2 Procedure. Initial contact was made with a number of Olympic and Elite Sport Governing Bodies. Coaches were then pre-interviewed either face-to-face or over the phone. This process provided an opportunity for the coaches to enquire into the nature of the study and for the principle investigator to assess whether the participants met the criteria for inclusion. Once informed consent was granted from the coach and the Performance Director (PD; the chief performance leader for the Sport Governing Body), an interview was scheduled. Over the course of the study, 20 Sport Bodies were contacted and there were 16 pre-interviews. At the start of

each interview an explanation of the study aims were provided and confidentiality agreed. An electronic Dictaphone was used to record the interview. The interview guide was pilot tested with two coaches and some refinements were made to the phrasing of questions.

3.2.3 Interview guide[3]. Based on existing literature concerning PT (Bell et al., 2013; Oudejans & Pijpers, 2009) a semi-structured interview guide was developed. A conversational tone was used to create a natural flow of discussion and the coaches were encouraged to elaborate unreservedly on their experiences (Patton, 2002). Interviews began with introductory questions on coaches' current and previous coaching experiences. Following this introduction, the coaches' broader experiences of pressure in elite training environments were discussed (e.g., "What do you think pressure is?", "How does pressure training affect performance?"). Afterwards, the interview questions focused on the specific methods coaches used to create pressure in training sessions (e.g., "Can you tell me what you do to create pressure training environments?"). In the final section, the coaches were encouraged to expand on, discuss, and question any related points. Probes were used to stimulate elaboration and clarification (Patton, 2002). All interviews were conducted in person by the lead researcher.

3.2.4 Data analysis and trustworthiness. Detailed interviews were conducted (M_{mins} = 68.82) and transcribed verbatim by the principle investigator. The purpose of the thematic analysis (Braun & Clarke, 2006) was to build an organised system of themes that explained how elite coaches created PT environments (Vallée & Bloom, 2005). To achieve this, analysis began with an initial inductive sweep of the transcripts (Braun & Clarke, 2006). This sweep involved the identification and

[3] See Appendix 2 for a copy of the interview guide used in study one.

annotation of meaningful raw data units (i.e., quotes that represented a specific aspect of the coaches' experiences of developing pressure). The raw data was then assessed for commonalities, which led to the development of lower-order themes. For example, the theme of "reward" was developed via the grouping of emergent raw data units concerning how coaches incentivised their PT sessions. These lower-order themes were then assessed for their similarities and differences as higher-order themes were generated. At this final stage, the analysis of the relationships between themes produced a framework that represented coaches' experiences of creating pressure.

To ensure trustworthiness, three researchers outside of the primary research team independently analysed the transcripts to make recommendations for the inclusion, removal, or adaptation of raw data and lower and higher-order themes (Patton, 2002). This process led to several reorganisations of the raw data units and lower-order themes. At each stage of the investigation, transcripts, methods, data analysis, and decision-making processes were presented to and explored by the primary research team for scrutiny (Gucciardi, Gordon, & Dimmock, 2008). Following this stage, a formal presentation of the content of the framework was delivered to a wider research panel and audience; this resulted in critical debate but no further changes. This process has been successfully used in previous sport psychology research (Fletcher & Sarkar, 2012). Member checking consisted of emailing the participants their transcripts prior to analysis and the resultant themes and framework post analysis. At both stages, coaches were encouraged to comment and feedback was received over the phone or in person to help verify the results.

3.3 Results

The raw-data themes were coalesced into six lower-order and four higher-order themes (see Figure 2). These higher-order themes regarded the demands of training, the consequences of training, individual differences and pressure. The demands and consequences of training were themes which highlighted how produced pressurised training environments. The demands of training concerned the difficulty of the training session, and the consequences of training regarded performance-contingent outcomes. The six lower-order themes highlighted types of stressors that coaches manipulated to shape the demands and consequences of training. Specifically, coaches altered task, performer and environmental stressors to influence the demands of training, and forfeit, reward and judgment stressors to shape the consequences of training.

Coaches also highlighted that athletes responded individually to stressors. Hence, coaches tailored manipulation of the demands and consequences of training to suit specific individual differences. Through the management of these themes, coaches created a pressurised training environment. Pressure was defined as the perception that it is important to perform exceptionally. In moving past the descriptive, the analysis process generated a framework (see Figure 3) conceptualising how coaches created pressure. The findings are reported anonymously to respect the wishes of the sporting bodies involved.

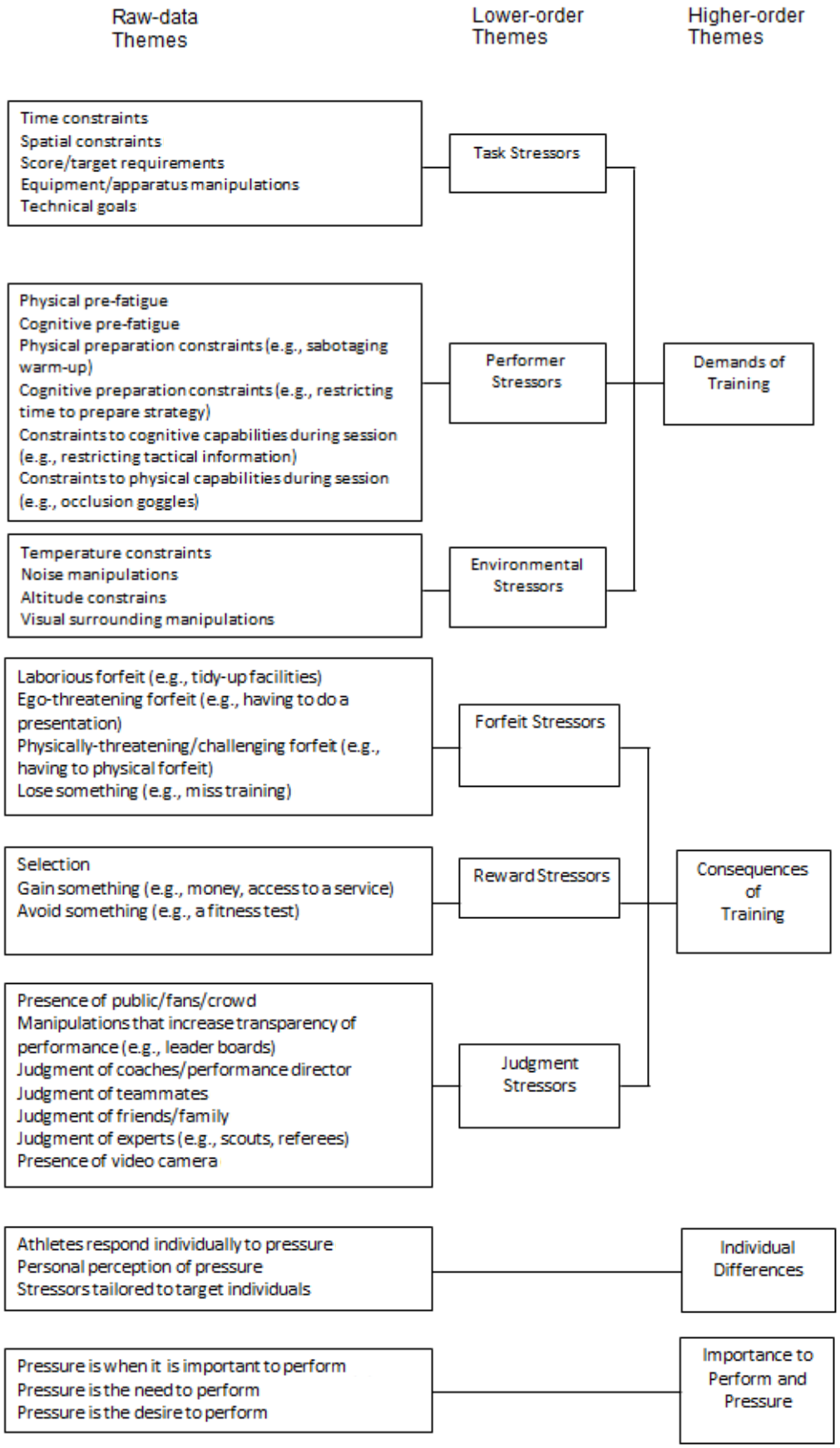

Figure 1: Higher- and lower-order themes.

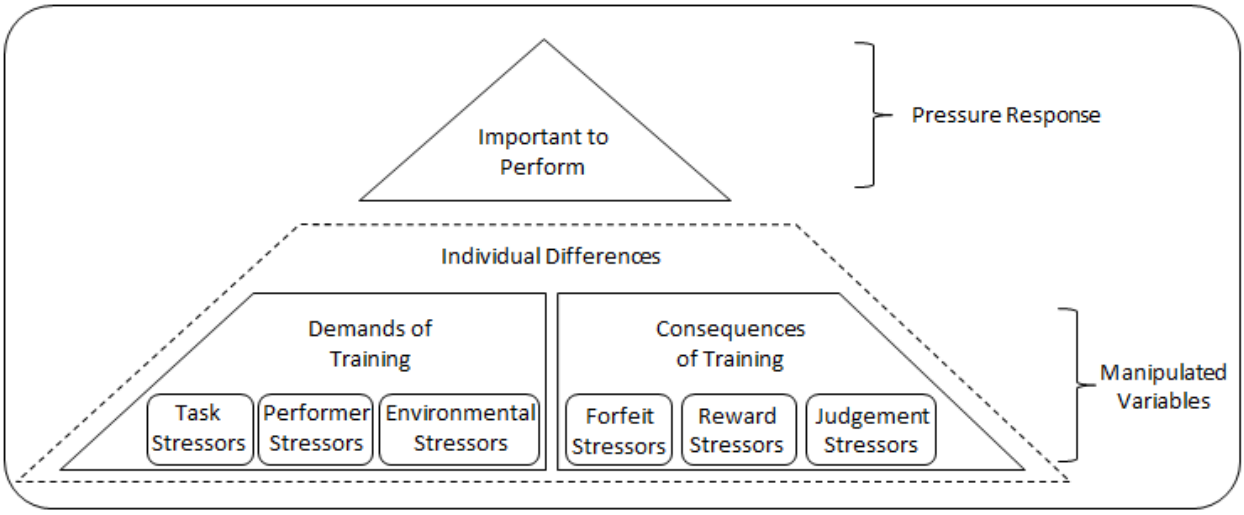

Figure 2. Framework illustrating how elite coaches created pressure training environments.

3.3.1 Demands of training. The demands of training was a higher-order theme concerning the nature of the physical and cognitive demands directly related to the training exercise. The coaches constructed the demands of training to present athletes with sport-specific cognitive and physical challenges and believed that doing so produced a pressurised training environment. The quote below highlighted one coach's comments regarding this theme and illustrated how pressure was developed by continually adjusting the difficulty of the training demands:

We do apply pressure because we continually ask them [the athlete] to go faster and faster for longer and longer, and therefore the training demands become a pressure in themselves. And because we set milestones as coaches do, those milestones are pressure points that are reflective of what they'll need to do in competition… So they are challenged with difficult scenarios - to develop skills they'll need for competition anyway.

This higher-order theme was comprised of three lower-order themes: task, performer, and environmental stressors. Coaches manipulated these three areas to influence the demands of training and thus shape the difficulty of a PT session.

3.3.1.1 Task stressors. Coaches spoke of task stressors as guidelines, conditions, and equipment used within a PT session. Accordingly, examples of these stressors included the rules of play, special parameters, time constraints and physical apparatus/materials. The following quote details a coach describing task constraints and how they might be manipulated:

I might turn around and say, "Right, we're going to do six pressure plays"… "The rules are defence can't have the ball… I'm going to allow you two stoppages in the game. If you have two stoppages, I'll allow you to pull the group in together [for a team talk]". I'll give them thirty seconds, no more, to

make it hard… So they're practicing under pressure the ability to actually communicate what it is they need to say to each other.

3.3.1.2 Performer stressors. Performer stressors were stressors that impacted on the physical and psychological functioning of an athlete. Another popular physical performer stressor was physical pre-fatigue; however, coaches also opted for cognitively fatiguing athletes, which was classified as a psychological performer stressor. By pre-fatiguing an athlete, a coach could increase the difficulty of a training session as the individual would have a reduced ability to perform to their maximum. Other performer stressors included withholding helpful information or providing misleading information. This latter example was an approach favoured by certain coaches as it influenced tactics, strategy and decision-making. The following quote illustrated this:

> So sometimes we'll do a lot of situational stuff like sudden death which forces them into pressure because they're almost pigeon-holed into a situation. Sometimes we'll do it where there are secret situations. Team A over there with another coach, and team B will come to me and I'll tell them a strategy, or a tactical move to apply. And then team A are in the background thinking, "what is it?". And you see the people who panic and almost think too much; "what is he trying to do to me!?".

3.3.1.3 Environmental stressors. Environmental stressors were variables in the environment that affected performance. These stressors could be influenced via manipulating sounds, temperature, lighting, the visual surroundings, location, and altitude. In the following quote, a coach explained how they chose to train at altitude in order to make the training demands tough when PT:

> We went [abroad] last year and we're going again this year. That for me is the best way because at that altitude level we can train for less time at a very intense level and keep the load off the players… And that is, for what we've done as the England programme, that is probably one of the biggest pressures we can achieve. Because it's tough out there.

Environmental stressors were commonly manipulated to replicate the conditions of competitions. Illustrating this, one coach noted that, "If you know you're going to a hot competition, we can do something with the heating… It's really that easy yet you'd be surprised at how little coaches might do it."

3.3.2 Consequences of training. The consequences of training was a second higher-order theme to emerge as an important component when creating a pressurised training environment. Specifically, training consequences were positive or negative outcomes that would be awarded to an individual based on how athletes managed the demands of training and/or performed overall. Illustrated below is a quote exemplifying one coach's explanation of the role of consequences in developing pressurised training environment:

> In training, I'd say it [pressure] is also anything outcome-based or where people are always being watched, or assessed. That usually creates some kind of apprehension or anxiety which either makes their heart-rate go higher or they make more mistakes and they don't deliver when they should do. Which is usually what we try to get to at the top end because, at the Olympics, everyone's watching them and obviously it's outcome-based… Whether that be [sport specific tool] allowing them to see their scoring, or whether there's an outcome-based on it, as in it is for selection.

Three lower-order themes made up the consequences of training; forfeit, reward and judgment. These three particular kinds of stressors were manufactured by coaches to establish the consequences of training.

3.3.2.1 Forfeit stressors. Forfeit stressors included the potential to receive something negative, such as a physical or ego punishment, or losing something positive, such as having to forgo a training session or temporarily lose access to a perk. The following quote illustrates one coach's description of the ways forfeits were used to create pressure.

> At the end of some of the pressure training we would have consequences that the players know about before they start… [It] might be missing an afternoon's training that they really want to do. So they would see that as four hours of valued time they're missing. And they've got to work with the winning team. So they're not the lap dogs, but they're… not actually going to have a go… So there are a number of ways of doing it. We set consequences, they also set consequences. Some of those can be very physical, and some of those can be taking things away.

Coaches also highlighted the need for caution and planning when utilising forfeits. Regarding missing training, one coach commented, "Restricting contact time and giving it to somebody else can create that kind of idea of pressure… Though I think that it's difficult and can backfire. If you do that and it goes the wrong way you've damaged a relationship."

3.3.2.2 Reward stressors. Reward stressors were a second lower-order theme that coaches manufactured to shape the consequences of training. These stressors represented the potential to win something positive and the following quote highlights one coach's use of selection as a reward stressor:

> And they're playing for places in the team as well… Selection… [keeps] it competitive. You've kept the ones who think they might be playing [in the competition] training really well. You've got the ones who think they've got a chance of competing [training] really well, which increases the quality of your sessions for longer… Selection. That has to be the biggest pressure going.

It is interesting to note that, while most coaches spoke of selection as a reward, two coaches mentioned how some athletes could experience this stressor as a forfeit. Such an experience could occur when an athlete believes that they are almost certainly going to be selected unless they underperform considerably. In this instance, having to perform in a specific pressure training session for selection represents the potential to lose something they already perceive themselves to have attained, and thus represents a forfeit. This exemplifies the variability in how consequence stressors can be experienced based on how an individual identifies with its meaning.

While some reward stressors were common, such as selection, there were examples of sport specific, innovative ones. For example, one coach utilised the reward of being able to influence how the training programme was organisationally structured. In this instance, the coach highlighted that athletes were rewarded for performing well as it allowed them to utilise resources, such as extra coaching time. In the coaches' words, "What [the athletes] see is the benefits from being at the top of the tree at the end of the session. Whether that's the ability to access all services. Whether that's the ability to dictate the pathway of our programme, as well."

3.3.2.3 Judgment stressors. Judgment stressors, a lower-order theme, regarded being watched by an observer. These stressors contributed to the shaping of the consequences of training by enabling the athlete to be positively or negatively

judged based on their performance. Coaches highlighted that the more important the athlete viewed the observer to be, the more likely that this stressor would lead to pressure. For example, the presence of a coach or PD would often be a powerful judgment stressor, while being observed by a nutritionist may not be as meaningful. Illustrating this, one coach described how peer judgments can come from the PD as well as teammates or coaches:

> If we stood everyone down and put them in a circle around two people who are being watched, just by their team mates, the difference is phenomenal. The pressure switch is on... Obviously you can go further if you've got the ability to bring other people in like spectators or family members, or the PD of the programme, who will assess them and at the end it could influence his opinion.

The impact of a judgment stressor could be emphasised by the observer talking explicitly with the athlete about their expectations. Discussing this, one coach commented, “So actually the pressure is applied when you say, ‘This is what you're doing, by your own volition, and actually you're not hitting the mark. So you need to change something in this session’. By saying that we’d be clear about the consequences of their actions and that’d bring the pressure”.

3.3.3 Individual differences. The higher-order theme of individual differences regarded how coaches believed that athletes saw varied meaning in stressors and responded individually. Coaches believed that athletes reacted differently due to individual differences, highlighting that what generated pressure for one athlete may not for another. The following example highlights one coach’s explanation on how individuals differed in their assessment of stressors:

> And I think it's really specific to the individual - so what pushes some peoples' buttons really doesn't push other peoples'… It's usually different depending on the individual, as much as a fingerprint. Obviously because of the way we all take in information.

In understanding this variation, coaches could strategically engineer stressors to target specific athletes. On one hand, stressors that influenced the demands of training could be managed to alter how difficult the training was for certain athletes. On the other hand, stressors that defined the consequences of training could be tailored to alter the severity of the consequence of not performing well.

Illustrating this theme, many coaches highlighted the impact of manufacturing difficult training demands with meaningful consequences; however, other coaches spoke of the impact of utilising easy training demands. For example, one coach described an athlete who experienced more pressure when they were observed performing an easy task. In this instance, the coach would require the athlete to perform a simple skill and these easy training demands created pressure for the athlete due to an increased perception of expectation:

> [There's] more [pressure] because there is more "should". "I should get this right; I should be able to do it well". She'd put more pressure on herself because it's an easy [skill] and therefore she should be able to do it well. She'd probably put less pressure on herself on a harder one because a lot of people drop that. That would be her thinking.

3.3.4 The Importance of Performing. The importance of performing was a higher-order theme which regarded coaches' beliefs regarding what athletes experienced when under pressure. Coaches defined pressure as the perception of

knowing that it is important to perform ones best. Illustrating this theme, the following quote highlights one coach's perception of pressure:

> I think that pressure is the stress of knowing you have to perform due to the outcome being very important to the game, particularly, and due to the challenges ahead of you…You're trying to determine what you need to do and how much it matters.

It was believed that PT developed coping mechanisms and performance by providing athletes with the opportunity to practice delivering their skills whilst experiencing a pressure response. In practicing this way, athletes could develop necessary, competition relevant skills that could withstand pressure. In line with this, the coaches often replicated the same demands found at competition, thus influencing the type of skills the athletes learnt. Contrastingly, many competition consequences were deemed impossible to replicate due to their nature (i.e., prize money, thousands of spectators). However, the coaches stated that it was not necessary to replicate competition consequences as long as the stressors used in their place engendered a comparable amount of pressure. Coaches ensured that stressors engendered such levels of pressure by ensuring that PT consequences were as close as possible to being as meaningful as competition consequences. In line with this, considering individual differences was essential to ensuring that athletes identified strongly with the consequences of training. The following quote exemplifies one coach's perceptions regarding the importance of replication when it comes to training demands and consequences, and the role of PT as a means for enhancing performance.

> I think there are definitely certain things that can be done to replicate things that go on in [competition] and one hundred percent there are things you can

never replicate. Like the penalty shoot-out in a football match, let's say... You can replicate the shooting task, but not crowd, so you think of other ways to make it meaningful… you're aiming for the athlete to practice pressure management. If you have the skill sorted within that pressure training environment, so that it withstands, then it should prevail [at competition]. So there are ways of putting your team under pressure constructively within training.

3.4 Discussion

Literature has indicated that PT may be an effective intervention for preventing choking (e.g., Bell et al., 2013; Oudejans & Pijpers, 2009); however, there is a need to develop a sport-specific framework for systematically creating a pressurised training environment. To further knowledge in this area, the current investigation examined the methods used by coaches to create pressure training environments in elite sport.

It was found that the coaches manufactured task, performer, and environmental stressors to shape the demands of training, and forfeit, reward, and judgment stressors to establish consequences of training. Individual differences were also found to be important when PT, as coaches considered stressors to affect athletes differently. With this in mind, coaches would consider these differences in order to tailor stressors. Through this process of stressor management, coaches produced pressurised environments where athletes perceived it to be important to perform. These findings have been represented in a conceptual framework (Figure 3).

Manipulating task, performer, and environmental stressors to create challenging training demands was highlighted to be essential when striving to create

a pressurised training environment. Regarding manipulating task, performer and environmental stressors to influence the difficulty of a training exercise, support for this finding can be seen in research applying Newell's (1986) model of constraints in sport. For example, Pinder, Davids, Renshaw and Araújo (2011a) utilised Newell's (1986) model when investigating how to create representative training environments (i.e., training demands that replicate the pressures and demands found at competition). In their study, cricketers were exposed to three different bowling training scenarios involving a "live" bowler, a ball projection machine, and a near life-size video. The results highlighted that each distinct combination of constraints influenced the difficulty of the exercise and how representative of competition the training exercise was. In regards to training demands playing an important role in generating pressure, Oudejans and Pijpers (2009; 2010) utilised a dart-throwing PT intervention which involved manipulating task and environmental stressors as a means to increase the difficulty of the exercise and generate pressure. Specifically, these stressors were organised so that participants threw darts from different heights on a climbing wall and it was found that these manipulations impacted performance, thus indicating changes in the difficulty of the exercise, and contributed to varying degrees of anxiety.

Oudejans and Pijpers' (2009; 2010) studies also highlight the use of performance-contingent outcomes when PT, thus supporting the present study findings regarding the consequences of training. For example, in one such investigation the impact of pressure on expert basketball players' free throw performances was studied (Oudejans & Pijpers, 2009). In this intervention, the experimental group trained under pressure, partly induced via the presence of a 25 Euro reward for the individual with the best shooting percentage. Judgment stressors

were also used in this study, whereby the players were filmed and informed that their performances would be evaluated by experts. It was found that the anxiety increased in the experimental conditions, indicating that these consequence stressors contributed to a rise in pressure. Bell and colleagues' (2013) highlight further support for the importance of consequences in their investigation of elite cricketers. Specifically, during a mental toughness intervention, PT was used which included judgment stressors in the form of having to re-perform a failed test in front of the training group, and forfeits in the form of having to forgo a training session. As can be seen from this literature, previous research supports the present study findings that consequences of training are important when PT.

The findings of the current investigation transcended current literature in revealing novel information concerning which stressors coaches strived to represent competition. In detail, the coaches often organised the demands of training to present challenges that replicated competition scenarios. This finding is supported by previous research which has highlighted the importance of replicating game-day demands when practicing under pressure (Driskell et al., 2014). Indeed, Zakay and Wooler (1984) suggested that, typically, normal training procedures do not provide pre-exposure to the real-world high-demand environment and thus skills do not transfer. Accordingly, athletes must experience high-demand, realistic conditions.

Contrasting these methods, the present study also identified that the consequences of training were not usually constructed to replicate competition stressors. This appeared to be due to the difficulty, and sometimes impossibility, of mobilising such resources, for instance 50,000 spectators or thousands of Pounds in prize money. Rather, the coaches aimed to manufacture stressors that were as meaningful as some of the consequences found at competition and this was

achieved by selecting ones that were deeply desired or unwanted. Exemplifying these findings, coaches highlighted how they might require athletes to defend a score, chase a score, or score the next point to win. However, they also detailed how these training demands might be paired with the performance-contingent consequence of selection. This finding has been reflected in previous stressor-exposure interventions. For example, in Bell and colleagues' (2013) study with elite cricketers, the PT intervention involved punishments such as physical activity or cleaning the locker room. While these consequence stressors do not reflect competition, it was found that the PT intervention nevertheless enhanced performance under competition pressure. Additionally, commenting on SET interventions, Driskell and Johnston (1998) noted that absolute stressor fidelity is not required as "stressors introduced at a moderate level of fidelity during training can provide an effective and realistic representation (p. 213). Thus, in light of the present study findings and previous literature, there is support for the notion that consequences do not need to replicate competition.

These findings have implications for those conducting PT in applied sport and indicate that vast resources might not need to be spent trying to manifest consequences that replicate competition, such as large monetary prizes. However, they highlight an issue on the subject of transferability. Specifically, they raise the question as to whether developed skills will transfer from training to competition if learnt whilst exposed to consequence stressors that don't replicate a competitive environment. Previous research has illustrated mixed findings on the matter. On one hand there is a literature base proposing that representative demands (Brunswik, 1956) and action fidelity between the training and competition environment is key for promoting transferability (Pinder, Davids, Renshaw, & Araújo, 2011b). On the other

hand, there is research illustrating that this might not be necessary such as Bell and colleagues' study highlighted above. As there is contrasting evidence, additional research is required to clarify the relationship between replicative training demands and consequences, and transferability of skills under pressure.

The present study also revealed original findings regarding coaches' perceptions of why and how PT improved performance. Specifically, coaches believed PT developed coping mechanisms and performance by providing athletes with the opportunity to practice delivering their skills whilst experiencing a pressure response. Training in this way ensured athletes could develop their ability to make decisions and perform specific skills whilst under pressure. These performance gains were then transferred to competition. Wider literature examining performance under pressure supports the coaches' perceptions and provides an insight into the functions that might underpin this process at a cognitive level (Baumeister, 1984; Eysenck & Calvo, 1992). In detail, literature concerning explicit monitoring theories of choking has highlighted that athletes who are often self-focused under pressure are less likely to choke because they become immune to the effects of explicit monitoring (Baumeister, 1984). Concerning distraction theories, it has been argued that the adverse effects of anxiety can be avoided when individuals perform a second stream of processes involving an increase in effort towards the task (Eysenck & Calvo, 1992). Oudejans and Pijpers (2010) indicate that it is these secondary self-regulatory processes which develop as a result of being exposed to stressors. As these processes improve, pressure management improves. Accordingly, the present study findings combine with wider literature in indicating PT to be an effective means for preventing choking and enhancing performance under pressure.

3.4.1 Applied implications. The findings offer some implications for practitioners desiring to conduct PT. Specifically, training demands can be constructed, via the manipulation of task, performer and environmental stressors, to shape the challenges that athletes face when PT. In the present study, examples of these stressors being organised included the altering of rules, the implementation of pre-fatigue, or training at altitude. Individuals adopting these stressors should look to identify how these types of stressors are available in their sport and which ones are most appropriate for utilisation. The results also indicate that it is important to manufacture forfeits, rewards, and judgment stressors as a means for creating performance-contingent consequences. Physical punishment was common, and selection and the evaluation of the PD were valued highly. In addition, there were examples of coaches using innovative consequences specific to their sport, so practitioners should be encouraged to identify consequences that are particular to their sport. Moreover, the results identify that, when designing the demands of training, coaches should look to create challenges that are replicative of competition. Consequences of training, however, should be highly meaningful, desired or unwanted, and not necessarily representative of competition.

To ensure that stressors are highly meaningful, as well as effective, the present study findings also highlight the importance of considering individual differences. This finding supports previous literature highlighting the importance of this theme when considering how to design stressors (cf. Johnston & Cannon-Bowers, 1996). These considerations could concern how the athlete responds to specific demands of training, such as what they are good or bad at, as well as how they attribute meaning to specific rewards, forfeits and judgments. Information about individual differences may also be critical once athletes are exposed to pressure, as

this information, combined with their performance data, indicates whether PT is calibrated and graduated appropriately.

Regarding the gathering of information on individual differences, the coaches in the present study used their subjective perceptions and athletes' verbal reports. With this in mind, and given the importance of understanding individual differences, applied practitioners are encouraged to consider the merits of progressing additional techniques that go beyond that of verbal report and subjective perception. For example, information could be collected regarding how susceptible an athlete is to a particular kind of choke. The Movement-Specific Reinvestment Scale (Masters, Eves, & Maxwell, 2005) is a tool that could be used to provide information on an individuals' reinvestment style, such as how likely they are to become self-conscious under pressure. This information could then inform how stressors are selected and adjusted to facilitate the athletes' development. For instance, those who are more likely to choke due to heightened self-consciousness could be tactfully exposed to stressors that, in wider literature, are known to elicit this type of choking (DeCaro et al., 2011). By expanding methods beyond coaches' subjective perception and athletes' verbal reports, practitioners could advance the ability for PT to be efficient, ethical, and meaningful.

3.4.2 Future research. Developing knowledge on a sport-specific framework for systematically creating pressure is important considering that PT is currently being applied in elite sport in the absence of such theoretical insights (cf. Bell et al., 2013; Oudejans & Pijpers, 2010). With this in mind, there is a need to test whether the PT framework identified in the present study effectively creates a pressurised training environment. Testing the efficacy of the framework could be achieved by manipulating the resultant themes, such as the demands and consequences of

training, and examining the impact they have on experiences of pressure in a performance setting. Such a study would highlight how these stressors facilitate the production of sport specific pressurised training environments and could contribute insights on methods for systematically creating pressure.

Two final future research considerations concern development level athletes and the timing of PT. Firstly, it is worthwhile deliberating how suitable PT is for younger athletes, and athletes below the elite level. While the present study did not actively pursue information on this subject, it was evident that coaches put more emphasis on creating challenging demands of training, and purposefully neglected consequences, when working with development level athletes. It could be important for future research to address this area considering the prevalence and indirect promotion of consequences within stressor-exposure literature (cf. Bell et al., 2013). It was also found that coaches believed the timing of PT was vital due to its ability to impact confidence. A number of coaches highlighted that PT had the potential to initially lower confidence, depending on the ability of the athlete. This perception is backed up by research linking pressure to confidence (Hays, Thomas, Maynard, & Bawden, 2009), and could be helpful for future research to investigate this possibility.

3.4.3 Limitations. There are two main limitations to the present study. Firstly, data collected is based on coaches' perceptions and therefore it is not possible to objectively verify the effectiveness of their methods. Measures were taken during the recruitment process to account for this limitation. Specifically, the criteria used to select coaches for inclusion ensured that there was a strict review by the wider research team of each individual coach and their experiences of successful PT. This limitation reinforces the value of future research testing the reliability and ecological validity of the methods reported in this study. The second limitation of the study is

that the coaches were interviewed in relation to their experiences delivering PT to elite adolescent and adults exclusively. Therefore, the findings might not generalise to athletes below elite and to ages below adolescence.

3.4.4 Summary and conclusion. Despite the developing interest in and early success of PT (cf. Bell et al., 2013), there is an absence of research regarding how to systematically create pressure in sport. This lack of information indicates that PT is currently being utilised in applied and research contexts (e.g., Beaumont et al., 2015; Sarkar et al., 2015), without a comprehensive underpinning theory of how to create performance enhancing pressure. In consideration of these issues, the present study explored how elite coaches created a performance enhancing pressurised training environment in elite sport.

Several higher and lower order themes were identified as being important, and these themes are represented in a conceptual framework (Figure 3). In detail, coaches considered individual differences in order to organise task, performer, environmental, forfeit, reward, and judgment stressors. Through manipulating these types of stressors, the coaches influenced the difficulty of the training demands, created performance contingent-consequences of training and, in doing so, created a performance enhancing pressurised training environment.

These findings have practical implications for applied practitioners as they provide an indication of how coaches may go about systematically and methodically PT across varying sports. The results suggest that important components in this process are ensuring training demands replicate competition and designing consequences to be highly meaningful, desired, or unwanted.

In consideration of the necessity to expand knowledge on methods for systematically creating pressure in elite sport, there is a need for future research to

test whether the PT framework identified in the present study effectively creates a pressurised training environment. Testing the efficacy of the framework could be achieved by manipulating the resultant themes, such as the demands and consequences of training, and examining the impact they have on experiences of pressure in a performance setting. Such an investigation could provide insights on the efficacy of the coaches' methods and thus advance information regarding effective means for creating a pressurised training environment in elite sport. As such, study two will address this need and investigate the efficacy of the coaching PT framework.

CHAPTER IV

4.0 Study Two

The Effect of Manipulating Training Demands and Consequences on Experiences of Pressure with England Netball[4]

4.1 Introduction

Study one explored how coaches created a pressurised training environment in elite sport. A resultant conceptual framework highlighted that elite coaches manipulated demands and consequences of training, whilst considering individual differences, to create a pressurised training environment. These findings build on research presented in a more comprehensive review of literature in chapter two of this thesis.

It was identified in chapter two that pressure training (PT) may provide a more effective and popular intervention for preventing choking than the better known approaches of implicit and analogy learning. In detail, while PT research has been criticised for lacking meta-analyses and raising ethical issues (cf. Albrecht, 2009; Maier & Seligman, 1976; Vallerand et al., 1986), there is an indication that planned and strategic PT could be more effective for preventing self-focus (Reeves et al., 2007) and distraction (Oudejans & Pijpers, 2009) methods of choking. In addition, it also appears to be more ecological (cf. Lawrence et al., 2014), popular (Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2014) and helpful for novices and experts (Oudejans & Pijpers, 2009; Oudejans & Pijpers, 2010) than implicit and analogy learning.

For example, Reeves and her colleagues (2007) studied the effects on an intervention that exposed soccer players to pressure in the form of external

[4] The study reported in this chapter is in press: Stoker, M., Maynard, I., Butt, J., Hays, K., Lindsay, P., & Norenberg, D. A. (in press). The Effect of Manipulating Training Demands and Consequences on Experiences of Pressure in Elite Netball. *Journal of Applied Sport Psychology.*

evaluation, video-taping and reward. In a high-pressure post-intervention soccer test, two control groups who did not undergo PT experienced performance decrements. The experimental condition, on the other hand, improved performance. These results were argued to offer a method of preventing self-focus methods of chocking under pressure. These findings have been echoed in PT studies on elite dart throwers and basketballers (Oudejans & Pijpers, 2009), amongst other demographics (cf. Beaumont et al., 2015; Bell et al., 2013).

However, despite the promising research and encouragements for further applied and experimental endeavours (Beaumont et al., 2015; Driskell et al., 2014; Sarkar et al., 2014), a gap in research exists regarding methods for systematically producing stressors and pressure in training environment. Hence, it appears that this form of stressor-exposure training is currently being practiced and encouraged in applied and research contexts (cf., Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2015) in the absence of comprehensive and empirically supported underpinning frameworks.

Study one of this thesis addressed this need by examining how coaches produced pressurised training environments in elite sport. A qualitative approach was used to explore 11 elite coaches' experiences of producing a pressurised training environment. This research generated a framework which identified that two key areas were manipulated by coaches to create pressure across training environments: demands of training; and consequences of training. Regarding the demands of training, coaches manipulated task (e.g., the rules of play), performer (e.g., the physical and psychological capabilities of an athlete) and environmental stressors (e.g., external surroundings) to influence the difficulty and types of challenges that athletes faced. For the consequences of training, coaches organised

reward (e.g., the potential to win something positive), forfeit (e.g., the potential to receive something negative/lose something positive), and judgment (e.g., being evaluated) to expose athletes to meaningful performance-contingent outcomes.

The demands of training were often organised to present challenges that replicated competition scenarios, such as chasing or defending a score. The consequences of training, contrastingly, were not usually replicative (cf. Driskell & Johnston, 1998). This appeared to be due to the difficulty of replicating competition consequences, such as the pressure of knowing one is being watched on TV by thousands, or millions on TV. Rather, the coaches aimed to manufacture stressors that were as meaningful as consequences found at competition. This goal was achieved by selecting ones that were deeply desired or unwanted. For example, selection was a stressor not found at competition but, due to the importance associated with being selected, could be used as a consequence when PT to great effect. In addition, coaches considered the individuality of the recipients to tailor stressors appropriately.

However, in consideration of the need to expand theory on methods for systematically producing pressurised training environments in elite sport, study one suggested that future research should investigate the efficacy of the coaches' methods. This research could be achieved by manipulating the demands and consequences of training and examining the impact they have on experiences of pressure in a performance setting. Such an investigation could provide insights into the efficacy of the coaches' methods and thus advance information regarding effective means for creating a pressurised training environment in elite sport.

4.1.1 Aims of study two. Study one identified a framework for systematically creating pressurised training environments in sport. However, further research is

needed to determine the efficacy of this framework. Accordingly, the aim of the present study was to investigate the effects of manipulating demands and consequences of training on pressure in a sporting exercise. Considering the results of study one, it was hypothesised that hypothesised that introducing challenging demands and meaningful consequences would increase experiences of pressure. In addition, it was hypothesised that introducing challenging demands and meaningful consequences would negatively impact performance. This prediction was based on previous research indicating that performance drops under pressurised test conditions if participants have not received a pressurised training block under (e.g., Lawrence et al., 2014; Oudejans & Pijpers, 2010), as was the case with the present study.

4.2 Method

4.2.1 Participants. The participant pool consisted of fifteen elite netball players who were competing in England's international Squad at the time of the study. After institutional ethics approval was obtained[5], the sample was identified purposively (Patton, 2002) in relation to the aims of the investigation. In building on study one, these specific criteria involved selecting participants of elite/international standard from a sport that was open to and desired PT. It was also important that the team selected were not performing in competition during the data collection period. Finally, a venue that had isolated training facilities was also needed. Regarding the implications of using such a sample, it was anticipated that their elite status may cause them to experience pressure as facilitative and that pressure may therefore positively impact performance (cf. Oudejans & Pijpers, 2009, 2010).

[5] See Appendix 2 for ethics forms

Once the sample was identified, initial contact was made with the Head Coach of England Netball via the team sport psychologist. The research was approved by England Netball management who had previously used consequences to conduct PT with the team and desired to further develop the sport's knowledge of PT principles. With the permission of the PD and Head Coach, players volunteered to take part. Informed consent was then obtained[6]. The participants were aged between 19 and 32 years (M_{age} 26.14; SD = 6.36) and had played for England for an average of 43.07 caps (SD = 33.9). At the time of the study, the team had just finished competing in a Commonwealth Games and was beginning the initial stage of preparing for a World Cup.

4.2.2 Design. Study one generated a framework which highlighted how elite coaches systematically created pressurised training environments in sport. Specifically, task, performer and environmental stressors were manipulated to shape challenging training demands, and forfeit, reward, and judgment stressors were organised to create performance-contingent consequences. In addition, coaches considered the individuality of the recipients to tailor stressors appropriately. Seeking to examine the efficacy of this PT framework, the present study investigated whether manipulating demands and consequences would alter experiences of pressure and performance. It was hypothesised that introducing challenging demands and meaningful consequences would increase experiences of pressure and decrease performance. To implement this examination, a randomised within subject design was used whereby participants performed a netball drill across four conditions: a demands, consequences, demands plus consequences, and a control condition. Eight months were spent building a relationship with the sport and then conducting

[6] See Appendix 2 for consent form

the study. During this time, the lead researcher gradually became embedded in the sport, proposed and then designed the study in close collaboration with the sport's psychologist and coaches.

***4.2.2.1 Conditions*.** Across the four conditions, participants performed the same netball specific drill. All the players were familiar with the drill as the coaching staff regularly used it as a throwing accuracy exercise. In the control condition, no manipulations were made to the exercise demands and there were no consequences to performance. In the demands condition, the exercise demands were increased and there were no manipulations of the consequences of training. In the consequences condition, there were also no adjustments to the demands of the training drill, however consequences were applied. In the demands plus consequences condition the demands and consequences were both increased.

Study one highlighted that coaches tailored stressors for recipients by considering individual differences (cf. Fletcher et al., 2006). Accordingly, to ensure individual differences were considered when stressors and conditions were being designed, the participants, coaches, and wider support team were collaborated with closely. Specifically, consequence stressors were identified through initial detailed discussions with the participants. In these interviews the participants discussed what consequences create pressure in training, competition, social, and professional situations. The information that came out of these interviews was then discussed in meetings with the coaches and support staff before the final stressors were agreed upon.

The demand stressors and the netball exercise were designed so that, in the conditions where demands weren't manipulated, the participants faced a moderately easy level of challenge. In the two conditions where the demands were manipulated,

these were designed to present a moderately difficult level of challenge, as rated by the coaches. This design process took place over numerous meetings between the coaches and researchers. Specifically, first the coaches selected the netball exercise based on the experimental requirements. The coaches had extensive experience of running the chosen exercise with the participants. Then, to ensure the training demands presented the desired level of challenge, this expertise was used to facilitate the designing of the task, performer, and environmental stressors. In detail, potential demand stressors were discussed individually and collectively until there was agreement. Following this, the exercise, demand and consequence stressors were piloted with university netball players to gather information on the reliability and validity of the stressors. These stressors were found to be appropriate for use in the experiment.

4.2.2.2 Netball exercise. The exercise selected consisted of throwing 12 one-arm shoulder passes at three targets on the wall (see Figure 4). The throwing position was 4 metres away from the wall, and the targets were positioned 4 metres off the ground and were 1 metre apart. The targets had an outer area of 12x12 inches and, at the centre, a smaller 6x6 inch target. Targets were numbered “1”, “2”, and “3”, and the participants threw their 12 shots in an ascending and descending sequence (i.e., 1, 2, 3, 3, 2, 1, etc.). Once the ball was thrown, one of the experimenters recorded the accuracy of the shot on a purpose-built scorecard[7] and then returned the ball to the participant. The participants had a total of 5 minutes to complete the exercise. The netball drill was selected by the coaches because all of the players were equally competent at, and familiar with, the exercise. The time limit,

[7] See Appendix 2 for scorecards

along with the arrangements of the targets and the shooting distance, resulted in a level of difficulty which the coaches perceived to be moderately easy.

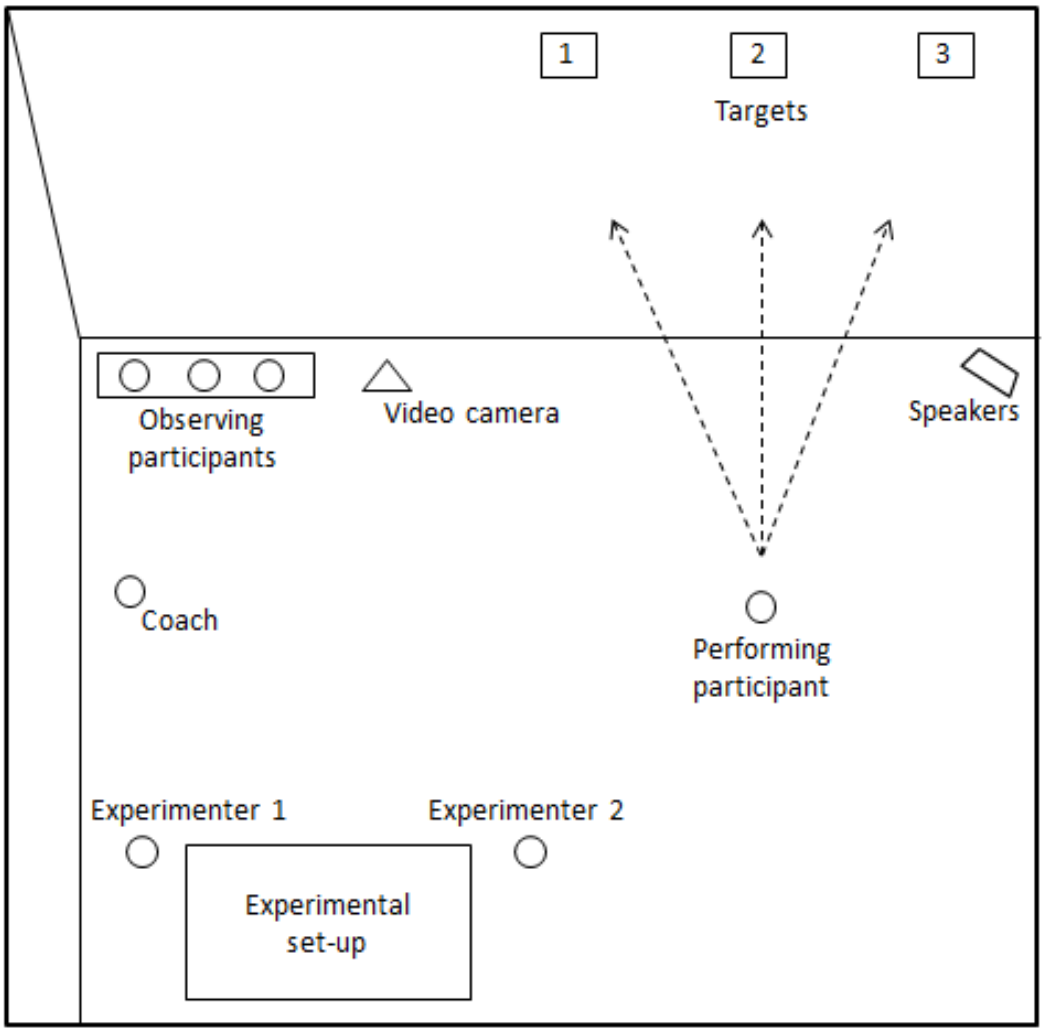

Figure 3: Experimental set-up

***4.2.2.2 Stressors*.** The framework generated in study one was used to guide the defining and designing of stressors. Accordingly, in conditions where consequence stressors were introduced, this was achieved via manipulating judgment, forfeit, and reward stressors (cf. Bell, et al., 2013; Driskell et al., 2014; Lawrence et al., 2014; Oudejans & Pijpers, 2009, 2010) (see Figure 4). Judgment stressors consisted of requiring the athletes to perform the exercise in front of 2 or 3 of their peers, the Head Coach (also the acting PD), and a video camera. The observing teammates sat in a designated area and watched the athlete complete the exercise. In addition, the performer was aware that the Head Coach was using a document to evaluate them on the following: ability to handle the pressure of the task, ability to focus on the task, and motivations towards the task[8]. Furthermore, the athletes were informed that the video camera would film their performance and that this footage would be analysed at a later date by the ex-Head Coach of another national team. This individual, who is internationally known for their coaching success, was visiting and working with England Netball for the duration of the experiment. A forfeit stressor was also applied, whereby the participant with the lowest score was video recorded completing a one-minute presentation on one of four topics. The video recording was immediately uploaded onto a popular social media website and remained there for two weeks. To ensure that each athlete wanted to avoid the forfeit, a Jungian personality preference framework was used to guide the creation of the four topics (Beauchamp, Lothian, & Timson, 2008; for reliability and validity coefficients see Benton, Schurink, & Desson, 2005). This framework categorises preferences into four factors and indicates to what extent an individual prefers and avoids each factor. The theory has been used previously to

[8] See Appendix 2 for judgment card

understand what tasks athletes might favour or avoid (e.g., Beauchamp et al., 2008). Using this framework, four forfeits were purposefully selected so that there was a task that each of the four Jungian preference types would want to avoid. Accordingly, each athlete would find at least one of the tasks challenging and thus want to avoid receiving the forfeit. The player with the lowest score received the forfeit and selected one of the topics blindly out of a hat. The four topics were: perform a comedy sketch, talk about who you admired most on the team and why, talk about why your skills could make you the best in the world, or count backwards, in 17's, from 1013. In addition to receiving this forfeit, the lowest scorer also had to select one of the other participants in the condition to do one of the four tasks (they could not choose the winner of the condition). Given that the participants all played for the same team, this responsibility was highly undesirable. The reward stressor was a £50 monetary voucher (cf. Oudejans & Pijpers, 2010), as well as immunity from being selected, by the participant with the lowest score, to receive a forfeit. This reward was presented to the athlete who achieved the highest score.

In conditions where the exercise demands were increased, this was achieved via manipulating task, performer, and environmental stressors (cf. Pinder et al., 2011a). Task stressors were manipulated by randomising the shot sequence and requiring the participants to release each shot within three seconds of receiving the ball. In addition, the participants were informed they could only accrue points by hitting the smaller 6x6 targets and that no points would be awarded for hitting the larger 12x12 target. When shot sequencing was randomised, one of the experimenters called out a randomised number sequence, shot by shot. The performer stressor was not allowed to include cognitive or mental pre-fatigue due to the elite sample being on a training camp. Also, it was required that the performer

stressor did not interfere with, and thus alter, the physical technique required to perform the closed-skill netball exercise. Based on previous literature supporting the use of this tool in applied scenarios (e.g., Starkes, Edwards, Dissanayake, & Dunn, 1995), the performer stressor involved the participants performing while wearing occlusion goggles. Eye dominance was determined for each subject using the Miles test (Miles, 1930) and the goggles completely eliminated vision in the less dominant eye. A number of environmental stressors were considered ecologically valid. For example, as the participants occasionally competed abroad with heightened temperature, and as lighting conditions can vary slightly from venue to venue, heat and light manipulations were considered. However, given that there are always indiscriminate auditory distractions at competition (cf. Mellalieu & Hanton, 2008), a sound stressor was considered to be the most ecologically valid. Sound stressors have been used in previous stressor-exposure studies (e.g., Driskell et al., 2001). Thus, environmental stressors were managed via the addition of a noise distraction in the form of a repeating beep. A sound system was placed 8 feet away from the performer and played the beep repeatedly at a volume of 80 decibels (cf. Karageorghis & Terry, 1997). This stressor was used over the sound of a crowd, or music, so as to reduce confounding variables as a crowd stressor could be interpreted as a judgment (consequence) stressor and music could differentially impact motivation.

The experiment took place outside of a laboratory and in an applied setting so specific steps were taken to reduce confounding variables. The experiment took place in an England Netball hall that was completely secluded and, hence, bereft of bystander observation. Excluding the conditions where consequences were manipulated, only the lead researcher and the teams' sport psychologist were

present during the conditions. Athletes were asked not to discuss their experiences with fellow participants until the study was complete. All the conditions took place at times that were in the athletes' normal training hours. In the consequence conditions where athletes were grouped, groups were selected by the coaches to ensure an equal level of competency within each cohort.

4.2.3 Measures. To assess experiences under pressure several measures were used. Pressure and anxiety were directly measured via a self-report method and heart-rate was assessed via a heart-rate monitor. These methods were adopted based on the methods utilised in previous studies examining performance under pressure. Specifically, previous studies have assessed perceptions of pressure in a basketball exercise via a 7-point Likert-type scale (Kinrade et al., 2015; cf. Reeves et al., 2007). This scale has also been adopted by the same researchers outside of sport in cognitive and motor tasks (Kinrade et al., 2010). Regarding anxiety and heart-rate, these measures have been used across different activities to provide additional insights into participants' experiences under pressure. For example, Oudejans and Pijpers (2009; 2010) examined anxiety via heart-rate and self-reported anxiety in two dart throwing studies, as did Mace and Carroll (1985) and Mace, Carroll and Eastman (1986) in two investigations in abseiling. In addition, Malhotra, Poolton, Wilson, Ngo and Masters (2012) assessed these measures in a surgical task under pressure.

Based on the literature highlighted previously, perceptions of pressure were examined via asking participants to rate how much pressure they felt they were under on a 7-point Likert-type scale[9] (Kinrade et al., 2010; 2015). On this scale 1 represented "no pressure" and 7 represented "extreme pressure". Heart-rate data

[9] See Appendix 2 for pressure form

were monitored using a Nexus-4 encoder (MindMedia, Roermond-Herten, the Netherlands) and captured via Bluetooth to a laptop running Mind Media's Biotrace+ software. A Nexus-4 dedicated electrocardiogram (ECG) lead with silver nitride electrodes was positioned on the participants' skin in accordance with lead II chest placement guidelines (Mindmedia). The electrodes plugged into the Nexus-4 encoder, which was positioned on the athletes' waist bands. Raw data were collected at a sampling rate of 2000Hz and the average heart beats per minute (bpm) were calculated using Biotrace+ functions. Participants' average bpm was calculated for the period of time from the start signal to when the last shot was thrown. For contextualisation, previous research has highlighted average resting heart-rate to be 50-90 bpm in normal populations (Spodick, 1993).

Previous literature has demonstrated that self-reported state anxiety is a reliable indicator of pressure to perform (Gucciardi, Longbottom, Jackson & Dimmock, 2010; Mesagno & Mullane-Grant, 2010). Specifically, anxiety has been measured via both short (Oudejans & Pijpers, 2009; 2010) and full version (Kinrade et al., 2015) questionnaires. While short and full version questionnaires have received criticism (Chamberlain & Hale, 2007), abbreviated scales receive consistent support when expediency is paramount (e.g., Williams, Cumming, & Balanos, 2010). As the current study was conducted in the applied setting, there was a necessity for accuracy and expediency. Accordingly, anxiety was measured via a short questionnaire, the Immediate Anxiety Measurement Scale[10] (IAMS; Thomas, Hanton, & Jones, 2002), which has been identified as a valid and reliable method for assessing state cognitive and somatic anxiety and self-confidence intensity and direction (Williams et al., 2010). This questionnaire is composed of three items

[10] See Appendix 2 for IAMS form

measuring the intensity and direction of cognitive anxiety and somatic anxiety, as well as self-confidence. The scale contained one item for each of these constructs that included: “I am cognitively anxious”, “I am somatically anxious”, and “I am confident”. Participants rated their experience of each of these items on a seven-point Likert scale ranging from 1 (not at all) to 7 (extremely). Respondents also rated the degree to which they perceived the intensity of each symptom to be either facilitative (+3) or debilitative (-3) towards performance.

Regarding performance, each throw was registered using a purpose-built scorecard that allowed the researchers to mark where each shot landed in relation to both the large and small targets by drawing an “X”. The points system was established so that hitting the smaller 6x6 target area was worth 2 points and the larger 12x12 target area was worth 1 point. Performance accuracy was calculated by adding up all the points.

4.2.4 Procedure. Prior to partaking in the conditions, a group session took place with all the participants. The study brief was provided to the athletes, and consent was obtained. The IAMS items were discussed with the performers to establish that they understood what each item represented (cf. Neil, Wilson, Mellalieu, Hanton, & Taylor, 2012). Details regarding biofeedback measures were also discussed. A script[11] was used throughout the completion of each condition. Upon arrival, the performing athlete was plugged up to the Nexus-4 encoder. The participant would then have the exercise explained to them. They completed the IAMS and reported their perceived pressure immediately prior to performing the exercise. This procedure was repeated across conditions, with some added components in conditions with increased demands and consequences. In conditions

[11] See Appendix 2 for scripts

with consequences, following an explanation of the exercise and consequences, the order of participation was randomised. Then, the first performer was connected to the heart-rate monitor while their peers took a seat in the observation area. To ensure that the athletes weren't aware of each other's score, the observation area faced away from the targets and towards the performer. The performer filled out the IAMS and reported their perceived pressure before completing the exercise.

Once finished, the next player was connected to the heart-rate monitor. This process was repeated until all the athletes had performed the exercise. The order of athletes within each group was randomised. Performance was then calculated based on score, before the results were announced and the forfeit and reward administered. In conditions with increased demands, the participants wore the occlusion goggles and the noise stressor started immediately prior to completion of the IAMS and netball exercise. These stressors remained constant for the duration of the exercise. Following the completion of the condition, all participants were instructed not to discuss the experiment with their peers until after the end of the study.

4.2.5 Data analysis. The independent variables were the demands and consequence stressors manipulated across the conditions. The dependent variables were heart-rate, performance, self-reported pressure, anxiety and confidence. The quantitative data collected was classed as parametric. The distribution and sphericity of the data was checked. A one-way repeated measures analysis of variance (ANOVA) with pairwise comparisons (alpha level <0.05) was performed to identify significant differences in heart-rate, self-reported anxiety, confidence and performance between each pressure condition. Bonferroni corrections were used to control for Type I error.

4.3 Results

Mean self-reported perceived pressure, heart-rate (bpm), self-reported cognitive and somatic intensity and direction, self-reported confidence intensity and direction, and performance accuracy data are reported in Table 1.

4.3.1 Pressure and heart-rate. A significant main effect was found for self-reported pressure ($F(3, 42) = 16.34$, $P > .000$; $\eta^2 = .54$). Pairwise comparisons indicated that self-reported pressure was significantly higher in the demands plus consequence (m = 5.07) and the consequences condition (m = 5.07) than the control (m = 2.73) and the demands (3.53) condition. The heart-rate results from the one-way repeated measures ANOVA indicated that there was a significant difference between the conditions ($F(3, 42 = 3.85$, $P = .016$) with a partial eta squared effect size of $\eta^2 = .22$. This difference was quadratic. Pairwise comparisons indicated that participants had significantly higher heart-rate in the consequences condition (m = 113.74 bpm) and the demands plus consequences condition (m = 112.97 bpm) as compared with the control condition (m = 103.87 bpm).

Table 1: Mean scores across the control, demands, consequences, and demands plus consequences condition.

Measure	Experimental Condition			
	Control Condition	Demands Condition	Consequences Condition	Demands plus Consequences Condition
Perceived Pressure	2.73	3.53	5.07	5.07
Heart-rate	103.87	108.97	113.74	112.97
Cognitive Anxiety Intensity	2.33	2.87	3.47	3.40
Cognitive Anxiety Direction	.13	-.07	.13	-.13
Somatic Anxiety Intensity	2.40	2.33	3.33	2.93
Somatic Anxiety Direction	.27	.27	.13	.13
Confidence Intensity	4.73	4.07	4.07	3.73
Confidence Direction	.53	.20	.40	.20
Performance Accuracy	10.07	7.00	9.27	6.47

4.3.2 Self-reported anxiety and confidence. A significant main effect was found for self-reported cognitive anxiety intensity ($F(3, 42) = 5.94$, $P = .002$; $\eta^2 = .30$). Pairwise comparisons indicated that self-reported cognitive anxiety intensity was significantly higher in the consequences condition (m = 3.47) and the demands plus consequences condition (m = 3.40) as compared with the control condition (2.33). There was also a significant main effect for self-reported somatic anxiety intensity ($F(3, 42) = 6.48$, $P = .001$; $\eta^2 = .32$) and pairwise comparisons highlighted that the mean score in the consequences condition was 3.33, which was significantly higher than the mean score in the control condition (2.40). A significant difference was also found for self-reported confidence intensity ($F(3, 42) = 3.01$, $P = .041$; $\eta^2 = .18$). Mean scores in the control, consequences, demands, and demands plus consequences condition were 4.73, 4.07, 4.00 and 3.73, respectively. However, due to Bonferroni adjustments in sensitivity, there were no significant differences in the pairwise comparisons across both these measures. There was no main effect for self-reported cognitive anxiety direction, self-reported somatic anxiety direction or self-reported confidence direction.

4.3.3 Performance. A significant main effect was found for the performance accuracy ($F(3, 42) = 17.08$, $P < .000$; $\eta^2 = .55$). Pairwise comparisons showed that performance accuracy was significantly lower in the demands condition (m = 7.00) and the demands plus consequences condition (m = 6.47) than the consequences condition (m = 9.27) and the control condition (m = 10.07).

4.4 Discussion

The present study tested the efficacy of the PT framework developed in study one by investigating whether manipulating training demands and consequences would alter experiences of pressure. In line with previous research, self-reported

pressure (Kinrade et al., 2015), heart-rate, and self-reported anxiety (Mace & Carroll, 1985; Oudejans & Pijpers, 2009) were measured as a means of understanding how athletes experienced the pressurised conditions. It was hypothesised that introducing challenging demands and meaningful consequences would increase experiences of pressure and decrease performance.

It was found that perceptions of pressure were significantly higher in the demands plus consequences condition and the consequences condition, as compared with the control and the demands condition. It was also discovered that participants had significantly higher heart-rate in the consequences condition and the demands plus consequences condition, when compared with the control condition. In addition, when compared with the control condition, self-reported somatic anxiety was significantly higher in the consequences condition and self-reported cognitive anxiety was significantly higher in the consequences and the demands plus consequences condition. As can be seen, given the results of the demands plus consequences condition, the present study findings do not establish that training demands are redundant in generating pressure. However, the consequences alone condition resulted in significantly greater pressure, anxiety, and heart-rate compared to control condition, and the addition of more difficult demand stressors did not change this pattern of results. Thus, in relation to testing the efficacy of the coaching methods identified in study one, there is mixed support for the effects of demand stressors and preliminary evidence that consequences may be more influential for creating pressure.

The present study also discovered that performance accuracy significantly decreased in both the demands and the demands plus consequences condition, as compared with the control and the consequences conditions. This finding suggests

that more difficult training demands, in the form of a time constraint, a noise distraction, and visual occlusion, can impede performance. Visual motor control literature provides research that can be seen to explain this finding, as it has shown that binocular vision provides better information about the size and location of objects, and thus, makes important contributions to both the planning and control of skilled movements (Servos & Goodale, 1994). Hence, the monocular vision stressor used in the present study may have impaired performance due to the impact it had on the quality of information the participants were able to acquire. In addition, SIT research has highlighted that athletes perceived noise distractions and time stressors to impede performance, which offers support for the finding regarding the effects of the task and environmental stressors (Driskell et al., 2014). The introduction of a time constraint has also been connected with reduced performance in a study on surgeons' performance (Malhotra et al., 2012). Thus, there is an indication that demand stressors could be an essential component of PT due to their ability to influence performance. It is also important to note the results regarding self-confidence intensity. While a significant main effect was found for self-confidence intensity, the post hoc analyses did not reveal significant differences. However, observation of mean scores did demonstrate a trend in direction where confidence was lower in conditions where performance was significantly reduced. Specifically, the trend indicates that confidence was lower in both conditions where demands were increased (demands condition = 4.00; demands plus consequences condition = 3.73), as compared with the conditions where demands were not manipulated (control condition = 4.73; consequences condition = 4.07). Further research is needed before definitive conclusions can be made but the trend in the data adds

some support for the proposal that demand stressors could also be important when PT due to a potential ability to mediate confidence.

In contrast to previous research (e.g., DeCaro et al., 2011) indicating that performance can drop in the presence of pressure, a unique finding of the present study was that perceived pressure was higher in the consequence condition yet performance accuracy was unaffected. This finding suggests that performance was not impacted by the introduction of consequences and increased pressure. It is possible that this finding could be due to the sample used for the study. Specifically, their previous experience in managing pressure at international competitions may have resulted in the players perceiving pressure as a necessary feature of their sporting environment that is neither helpful nor unhelpful. This notion is supported in that there were no significant differences in the directional effects of cognitive and somatic anxiety, indicating that increases in anxiety were neither debilitative nor facilitative. Thus, given that state anxiety is a reliable indicator of pressure (Gucciardi et al., 2010), it is plausible that perceived pressure was also experienced as neutral.

The findings regarding the effects of demands and consequences on performance also differ from previous research (i.e., Bell et al., 2013; Lawrence et al., 2014; Oudejans & Pijpers, 2009) whereby stressors in these particular studies have been seen to impact positively on performance. This contrast could be explained by differences in study designs. Specifically, previous literature examined the effects of PT on subsequent performance under test conditions. Oudejans and Pijpers (2009) used pre-tests, Lawrence and colleagues (2014) incorporated trials, and Bell et al. (2013) utilised training blocks, whereby participants were trained whilst exposed to stressors for a period of time prior to being tested under pressure. Moreover, in Bell and colleagues' (2013) study, the participants underwent 46 days

of training before subsequent testing. The present study, in contrast, investigated the impact the specific coaching PT framework developed in study one and, in accordance with this aim, the participants were exposed to four test conditions only and not a training phase. Thus, performances in the present study may not have been enhanced under pressure due to the absence of a training phase.

4.4.1 Applied implications. In the present study, ego punishment, coach and peer judgment, and a financial coupon were used amongst other stressors. In study one, examples included selection and physical or ego consequences, and these punishments have also been documented in wider literature. For example, forfeits used previously have included cleaning up the changing room or missing a training session (Bell et al., 2013). In addition, rewards have taken the form of monetary incentives (Oudejans & Pijpers, 2009). Thus, the results of study one, the present study, and wider literature suggest that introducing consequences, such as forfeit, reward, and judgment, may be an effective approach to employ when seeking to create a pressurised training environment.

The findings of the present study provide mixed support for the ability of training demands to impact pressure. Specifically, pressure significantly increased in the demands plus consequences and thus there is a suggestion that demand stressors could play a role in influencing pressure. With this in mind, those creating pressurised training environments may benefit from manipulating training demands such as time constraints, noise distractions, or visual occlusion. Stronger support, however, can be seen regarding the impact that demands have on performance as it was discovered that increasing these stressors reduced performance. In addition, there is an indication that demand stressors could be an essential component of PT due to their ability to impact performance and potentially mediate self-belief. This

substantial finding is worth rumination given the importance of encouraging positive experiences, attitudes, and self-belief when PT.

The primary researcher of the present study conducted interviews and held meetings with the athletes, coaches and support staff to refine which consequences would be used. This process was critical for developing an understanding of individual differences and designing consequences that were meaningful. It is important to recognise, however, that the process of identifying and designing personalised stressors is time, money, and resource dependent. While it may be possible in certain sports to tailor stressors for specific athletes, this may often be difficult, especially with large teams. A solution to this problem could be to utilise "blanket" consequences, i.e., stressors that create pressure for the whole group. Specifically, in the present study, a series of consequences were used to target the whole team. Study one identified that certain stressors, such as selection, can also be used to this effect and this finding is echoed in wider literature (cf. Bell et al., 2013). With this in mind, coaches who desire to PT but don't want to personalise each consequence, perhaps those working with a large group or team, may benefit from appraising their environment to see what blanket stressors are available. Considering the evidence indicating that some athletes respond to high demands whilst others respond to low, coaches could accommodate these differences by accompanying blanket stressors with a split-training programme that allows some athlete to train with high demands and others with low.

When PT, study one identified that elite coaches did not commonly look to utilise consequences that replicated competition (cf. Driskell & Johnston, 1998). Specifically, by selecting stressors as close as possible to being as meaningful as competition consequences, the coaches could nevertheless generate a pressure

response comparable to what athletes experience at competition. With this in mind, when designing the conditions of the present study, the lead researcher and the sport's psychologist, support staff and coaches considered the consequences that the participants were exposed to at competition. During this process it was identified that the participants were accustomed to managing substantial consequences, such as performing on television with an audience in the hundreds of thousands, and reward stressors, such as performing for a world title. Performing these considerations resulted in, on a number of occasions, consequences that had been identified for potential use being substituted for more meaningful ones. In taking these steps, it was possible to ensure that the final consequences selected for use in the study were appropriate and individually tailored for the sample. This process could be important for applied practitioners and coaches to consider. Explicitly, it could be effective to identify the consequences that athletes face at competition in ones' sport and how meaningful they are. If an athlete is expected to manage such consequences then it may be important for PT to eventually expose them to stressors of a comparable intensity. Notably, these stressors don't necessarily need to be replicative but should be graduated, as indicated in study one and wider literature (Driskell & Johnston, 1998; Keinan & Friedland, 1996).

4.4.2 Future research. While the present study findings do not establish that training demands are redundant in generating pressure, there is an indication that consequences may be more influential than demands in generating pressure in elite sport. As such, there is mixed support for the role of demand stressors in creating pressure and, as research strives to develop a comprehensive theoretical underpinning model for PT, these initial findings require additional exploration. This research could be achieved by exploring the specific impact of each individual

demand (i.e., task, performer, environmental) and consequence (i.e., forfeit, reward, judgment) stressor on pressure. Such research could clarify knowledge regarding the precise roles of training demands and consequences, and thus develop knowledge on how pressure creation can become more systematic. Also, research of this type might be helpful in identifying which stressors coaches should manipulate in order to maximise their time and resources.

As PT continues to evolve and grow in popularity in elite sport (cf. Beaumont et al., 2015; Sarkar et al., 2014), it will be important to develop a systematic means to quickly and accurately survey athletes' individual differences. Specifically, currently there is no standardised approach for eliciting information from athletes regarding their disposition towards specific consequences and training demands. However, this information is crucial to gather prior to PT. Currently, as was the case in this investigation, those conducting PT may have to rely on an unstandardised material gathering such information. Developing insight on how a specific questionnaire, or a purpose-built one, could be used to collect this information could facilitate a more standardised, safe and effective approach.

4.4.3 Limitations. Although every action was taken to remove confounding stressors from each condition, the presence of the experimenters may have provided an element of judgment. However, this limitation was counterbalanced by ensuring that experimenters conducting the conditions remained consistent and that their behaviour, facilitated via the use of a script, was constant across all the conditions. An additional potential limitation is that the participants discussed each condition with one-another. To reduce this possibility, a clause was included in the consent form that asked participants not to discuss their experiences, and this message was reinforced at the end of each condition. Also, the captain agreed to continually and

proactively reinforce this clause. Another potential limitation is that the study was conducted with a specific sports team and specific athletes. Considering study one, which detailed the importance of understanding individual differences when PT, one should reflect on the implications of directly generalising the results to other sports, teams or individuals. A final potential limitation concerns bias. Specifically, evidence has indicated that adolescents may be biased in their self-reporting of psychological distress such as anxiety (e.g., Logan, Claar & Scharff, 2008). Accordingly, it is possible that social desirability may have affected self-reporting of anxiety, and perhaps pressure. This limitation was offset by taking an objective measure in the form of heart-rate.

4.4.4 Conclusion. Study one addressed an absence of research concerning how pressurised training environments are systematically created. A conceptual framework was developed in study one which identified that elite coaches manipulated demands and consequences of training to create PT environments. The present study tested the efficacy of this framework and hypothesised that introducing challenging demands and meaningful consequences would increase experiences of pressure.

Concerning pressure creation, it was discovered that pressure, cognitive anxiety and heart-rate were significantly higher in the consequences and the consequences plus demands condition, as compared with the control. Given the results of the demands plus consequences condition, the present study findings do not establish that training demands are redundant in generating pressure. However, the consequences alone condition resulted in significantly greater pressure, anxiety, and heart-rate compared to control condition, and the addition of more difficult demand stressors did not change this pattern of results. It was also discovered that

manipulating training demands impacted accuracy, thus indicating that these stressors could be important when PT as a means for influencing performance.

Collectively, the present study findings offer support the hypothesis, and the PT framework developed in study one, by finding support for the notion that both training demands and consequences are effective components for creating PT environments. However, there is an indication that consequences could be more influential in generating pressure, but additional research is required especially in light of our observations that the anxiety values did not significantly differ between the consequences and the demands only group. This research could be pursued by exploring the specific impact of each individual demand and consequence stressor (i.e., task, environmental, forfeit) on pressure. Such research could clarify knowledge regarding the precise impact of demands and consequences stressors and thus advance insight on how pressure creation can become more systematic and theoretically supported. In addition, research of this type might be helpful in identifying which stressors coaches should manipulate in order to maximise their time and resources. As such, study three will address this need by examining the effect of each individual demand (i.e., task, performer, and environmental) and consequence (i.e., reward, forfeit, and judgment) stressor on experiences of pressure.

CHAPTER V

5.0 Study Three

The Effect of Manipulating Individual Consequences and Training Demands on Experiences of Pressure with British Disability Shooting[12]

5.1 Introduction

It was identified in chapter two that pressure training (PT) may provide a more effective and popular intervention for preventing choking than the better known approaches of implicit and analogy learning (cf. Bell et al., 2013; Lawrence et al., 2014; Reeves et al., 2007;Oudejans & Pijpers, 2009; Sarkar et al., 2014). However, despite the promising research and encouragements for further applied and experimental endeavours (Beaumont et al., 2015; Driskell et al., 2014; Sarkar et al., 2014), a gap in literature exists regarding how to actually design stressors and create a pressurised training environment. Considering that creating pressure is the goal of PT (cf. Bell et al., 2013; Reeves et al., 2007), it appears that pressure training is currently being practiced and encouraged, in applied and research contexts (cf., Beaumont et al., 2015; Bell et al., 2013; Sarkar et al., 2015), in the absence of comprehensive and empirically supported underpinning frameworks.

Addressing this, study one of this thesis examined how 11 coaches created a pressurised training environment in elite sport. This research generated a framework which identified that there were two key areas manipulated by coaches to create a pressurised training in elite sport: demands of training; and consequences of training. Regarding the demands of training, coaches manipulated task (e.g., the rules of play), performer (e.g., the physical and psychological capabilities of an athlete) and environmental stressors (e.g., external surroundings) to influence the

[12] The study reported in this chapter has been submitted for publication: Stoker, M., Maynard, I., Butt, J., Hays, K., Hughes, P. (2017). The Effect of Manipulating Individual Consequences and Training Demands on Experiences of Pressure with Elite Disability Shooters.

difficulty and types of challenges that athletes faced. For the consequences of training, coaches organised reward (e.g., the potential to win something positive), forfeit (e.g., the potential to receive something negative/lose something positive), and judgment (e.g., being evaluated) to expose athletes to meaningful performance-contingent outcomes.

Study one suggested that future research should investigate the effects of demand and consequence stressors on pressure. As such, the aim of study two was to investigate the effects of manipulating demands and consequences of training on experiences of pressure in a sporting exercise. Also, given the mixed support found in study two for the impact of consequences on performance, an additional aim was to examine the effects of introducing consequences on performance. Individual differences were considered to tailor the stressors for the recipients and it was hypothesised that introducing challenging demands and meaningful consequences would increase experiences of pressure.

Regarding the production of pressure, study two revealed that the introduction of consequences, in the absence of changes to training demands, resulted in significantly greater pressure. Supporting this finding, introducing consequences also significantly heightened anxiety and heart-rate. On the other hand, increasing training demands without consequences did not have any significant effect. However, in line with the hypothesis, pressure, cognitive anxiety and heart-rate were significantly higher when demands were increased alongside the introduction of consequences. Therefore, there was mixed support for the effects of demand stressors and strong support for the influence of consequences on pressure. It was also found that increasing demand stressors, such as time, in isolation affected

performance. Thus, there was an indication that demand stressors could be important when PT as a means for challenging performance.

In light of these results, collectively the findings of study two corroborate the PT framework developed in study one by finding some support that both training demands and consequences are effective components for creating PT environments. However, there is an suggestion that consequences could be more influential in generating pressure, although additional research is required. A potentially effective way to develop the findings would be to explore the specific impact of each individual demand and consequence stressor (i.e., task, environmental, or forfeit) on pressure. Such a study could refine knowledge regarding the precise impact of demands and consequences, and thus advance insight, on how pressure creation can become more systematic and theoretically supported. In addition, research of this type might be helpful in identifying which specific stressors coaches should manipulate in order to maximise their time and resources when PT. In addition, as study two provided mixed support for the effect of consequences on performance, it would also be beneficial to further examine and clarity the specific impact of consequences on performance.

5.1.1 Aims of study three. In accordance with the arguments highlighted above, study three will address the need to further explore the efficacy the PT framework developed in study one. This will be achieved by examining the effect of manipulating each individual demand (i.e., task, performer, and environmental) and consequence (i.e., reward, forfeit, and judgment) stressor on performance and experiences of pressure. The first hypothesis is that each individual demand and consequence stressor would increase experiences of pressure. The second hypothesis is that each individual stressor would negatively impact performance.

5.2 Method

5.2.1 Participants. After institutional ethics approval was obtained[13], the sample was identified purposively (Patton, 2002) in relation to the aims of the investigation. In accordance with studies one and two, these requirements included recruiting participants: (i) of elite/international standard; (ii) that belonged to a sporting program that wanted to PT; (iii) that were not in a competition phase; (iv) that met regularly for training; (v) and that used a venue with isolated training facilities.

In line with these requirements, six elite athletes from the Great Britain disability shooting team were invited to participate in the study. Initial contact was made with the sport's PD via the team Sport Psychologist. The research study was approved due to the sports' desire to develop the teams' knowledge and experience of PT. Athletes volunteered to participate following permission from the PD, and informed consent[14] was then obtained from each athlete. The participants were aged between 20 and 41 years (M_{age} 28.67; SD = 8.82) and had performed at the elite level for an average of 9.83 years (SD = 6.34). At the time of the study, the team was beginning the initial stage of preparation for a World Cup tournament.

It was expected that the participants' relatively high level of international experience might mean that they experience pressure as facilitative, thus, pressure might positively impact performance (cf. Oudejans & Pijpers, 2009, 2010). For this same reason, it was anticipated that it might be challenging to identify stressors that are meaningful enough to generate high levels of pressure in their elite sample.

5.2.2 Design. The PT framework developed in study one was adopted to examine the effects of individually manipulating a task, performer, environmental,

[13] See Appendix 3 for ethics forms
[14] See Appendix 3 for consent form

forfeit, reward, or judgment stressor on the athletes' experiences of pressure. A randomised, within subject design was used with 7 conditions: baseline, task, performer, environmental, forfeit, reward, and judgment conditions. Across all conditions, the participants performed a moderately easy shooting exercise that replicated competition. There were no manipulations to the training demands of the exercise or the consequences in the baseline conditions. One stressor was manipulated in isolation across all the experimental conditions (i.e., in the task condition, one task stressor was manipulated). In the three demand conditions (the task, performer and environmental conditions), the manipulation of stressors were designed to make the training demands moderately difficult. In the three consequences conditions (the forfeit, reward and judgment conditions), the manipulation of stressors were designed to increase the perception of meaningful performance-contingent outcomes.

5.2.2.2 Experimental design. Prior to data collection, the lead experimenter spent seven months becoming embedded in, and learning about, the sport of Disability Shooting. This process was facilitated by the team's sport psychologist. The study was designed in collaboration with the NGB and conducted over a seven month period. Specifically, training camps and competitions were regularly attended and close relationships were established with the athletes, coaches, management and support staff.

Regarding the identification and selection of consequences, meetings were held with the participants where they were asked to identify consequences that created pressure in training, competition, social, and professional situations. The PT framework generated in study one was used to guide the discussions and this ensured questions identified specific reward, forfeit, and judgment stressors.

Following these meetings, the resultant stressors were categorised into reward, forfeits, and judgments and this list of stressors were then presented and discussed in a meeting with the coaches, PD and support staff. This meeting served to refine the consequences until the final experimental stressors were agreed. The participants were not told which of the stressors would be used in the conditions.

Using the extensive knowledge they had of the athletes' ability, the demand stressors and shooting exercise were designed by the coaches. Finally, the exercise, demand and consequence stressors were piloted with athletes on the team not participating in the study, to check the reliability and validity of the stressors. None of the stressors were modified for the experiment. In the running of the experiment, participation in the conditions was randomised so that each participant experienced the conditions in a different sequence.

5.2.2.3 Shooting exercise. In each condition, participants performed an exercise that involved shooting a string of 10 shots, on a 10m range, within 10 minutes. Participants shot from either the standing, prone, or kneeling position, depending on which category they competed in. Five participants were rifle shooters, and one performed with a pistol. In conditions without consequences (i.e., the baseline, task, performer and environmental condition), the participants were not given a performance score that they were required to achieve. In the consequence conditions (i.e., the forfeit, reward, and judgment condition), the consequences were performance-contingent so it was necessary to introduce a required score. The score was calculated by taking each athletes' mean score obtained from their last three competitions. This method of score calculation ensured comparability across the different skill levels, disability classes, shooting positions, and guns. At competition, athletes are required to shoot strings of 10 shots on a 10m range.

5.2.2.4 Conditions. In accordance with the resultant framework from study one, task, performer, and environmental variables were manipulated to shape stressors relating to the demands of training. Regarding the task stressor, in the elite competition environment, as is the case in elite shooting, athletes regularly have to manage time constraints (see Driskell et al., 2014). Thus, a time stressor was used in the task condition. Specifically, as designed by the coaches, participants were given only six minutes to take their 10 shots.

Due to the range of athletes' disabilities, and the differential effect that physical stressors may have on athletes' functional capabilities, performer stressors were required to be cognitive in nature. For example, physical pre-fatigue was omitted, as were stressors concerning physical apparatus, clothing and equipment. However, the coaches identified that cognitive pre-fatigue was a suitable performer stressors to utilise for the experiment. Following deliberation of several potential cognitive pre-fatigue stressors, the coaches selected the Stroop test (Stroop, 1935). This stressor was selected due to its ability to expose athletes to increased stress and mental fatigue (Provost & Woodward, 1991) that is replicative of competition (c.f., Knicker, Renshaw, Oldham, & Cairns, 2011). Additionally, previous research supports its use as a stressor in sport (Williams, Tonymon, & Andersen, 1991). Athletes were screened for dyslexia.

Several environmental stressors were considered as ecologically valid by the coaching team. For example, the athletes occasionally competed abroad with heightened temperature, and regularly competed in different venues with varied lighting conditions. Consequently, heat and light manipulations were considered. However, given that there are consistently indiscriminate auditory distractions at competition (cf. Driskell et al., 2014; Mellalieu & Hanton, 2008), and that a sound

stressor has been successfully used in study two and wider stressor-exposure research (e.g., Driskell et al., 2001), this stressor was selected by the coaches as the most suitable and ecologically valid option. This stressor consisted of a repeating beep that was produced from a sound system was placed 8 feet away from the performers and played at a volume of 80 decibels (cf. Karageorghis & Terry, 1997).

In conditions where consequence stressors were introduced, this was achieved via manipulating forfeit, judgment and reward stressors (cf. Bell, et al., 2013; Driskell et al., 2014; Lawrence et al., 2014; Oudejans & Pijpers, 2009, 2010). In the forfeit condition, the participants were required to perform a staged media conference if they did not achieve their required score. During this forfeit, the athlete was required to answer questions for five minutes in front of a "media" audience consisting of the PD, coaches, and some members of the management team. The questions related to why they had failed to hit their required score, and the audience were primed and provided with a list of "stock" questions created by the coaches, such as "why do you think you failed the challenge?", to help ensure that there was a consistently tough but supportive climate (cf. Bell et al., 2013) across the interviews.

In the reward condition, the participants performed knowing that the participant with the highest score across all of the reward conditions received £200 at the end of the experiment (Oudejans & Pijpers, 2009). In the judgement condition, the PD was present during the exercise and was positioned six feet away, facing the athlete. Alike study two, participants were shown a card[15] which was used by the PD to evaluate them (scores out of 10) on their ability to handle the pressure of the task, ability to focus on the task, and motivation towards the task.

[15] See Appendix 3 for judgment card

5.2.3 Measures. To assess players' experiences under pressure, a variety of measures were used. These measures included perceptions of pressure, cognitive and somatic anxiety intensity and direction, heart-rate, and performance.

***5.2.3.1 Pressure and performance*.** Previous research within and outside of sport settings (e.g., Kinrade et al., 2010; 2015; Reeves et al., 2007) has assessed perceptions of performance pressure using a self-report, Likert-type scale. In line with this research, and study two, a self-report scale was adopted in the present study where 1 indicated "no pressure" and 7 indicated "extreme pressure" [16]. Regarding performance, a Sius Ascor electronic system (SA 921, Sius Ascor, Effretikon, Switzerland) was used to measure the accuracy of each shot in relation to the centre of the target.

***5.2.3.2 Anxiety and heart-rate*.** In accordance with the second study and previous research (e.g., Mace & Carrol, 1985; Mace et al., 1986; Malhotra et al., 2012; Oudejans & Pijpers, 2009, 2010), heart-rate and self-reported anxiety were also measured to provide an indication of pressure. Heart-rate data was monitored using a Nexus-4 encoder (Mindmedia, 2004) and captured by means of Bluetooth to a laptop running Mind Media's Biotrace+ software. A Nexus-4 dedicated electrocardiogram (ECG) lead with silver nitride electrodes was positioned on the participants' skin in accordance with lead II chest placement guidelines (Mindmedia, 2004). The electrodes were attached to the Nexus-4 encoder, which was positioned on the athlete's waist band. Raw data was collected at a sampling rate of 2000Hz and the average heart beats per minute (bpm) were calculated using Biotrace+ functions. Participants' average bpm was calculated from when the shooting exercise began to when their last shot had been taken, or when time had run out.

[16] See Appendix 3 for pressure form

For contextualisation, previous research has highlighted average resting heart-rate to be 50-90 bpm in normal populations (Spodick, 1993).

Previous literature and study two have highlighted that self-reported state anxiety is a reliable indicator of pressure to perform (Gucciardi et al., 2010; Mesagno & Mullane-Grant, 2010) and that shortened questionnaires assessing this measure are appropriate (Oudejans & Pijpers, 2009; 2010; Williams et al., 2010). Consequently, IAMS[17] (Thomas et al., 2002) was used to measure anxiety in the present study. The IAMS is recognised as a valid and reliable method for assessing state cognitive anxiety, somatic anxiety, and self-confidence (Williams et al., 2010). The instrument contains three items that measure the intensity and direction of cognitive and somatic anxiety, as well as self-confidence. The scale contained one item for each of these constructs that included: "I am cognitively anxious", "I am somatically anxious", and "I am confident". Participants rated their experience of each of these items on a seven-point Likert scale ranging from 1 (not at all) to 7 (extremely). Respondents also rated the degree to which they perceived the intensity of each symptom to be either facilitative (+3) or debilitative (-3) towards performance.

4.2.4 Procedure. Prior to the start of the experiment, a group session took place with all of the participants. The study brief was provided to the athletes and consent was obtained. The IAMS items were discussed with the participants to ensure that they understood what each item represented (cf. Neil et al., 2012), and details regarding biofeedback measures were also discussed. In each condition, the Nexus-4 encoder heart-rate monitor was attached to the participant. It was then explained to the athletes that they would have 10 shots, over 10 minutes, to warm-up. The participants completed an IAMS and reported their perceived pressure

[17] See Appendix 3 for IAMS form

before having their heart-rate data recorded as they performed the warm-up. This warm-up exercise was used to collect baseline scores. Following the warm-up, the participants performed the shooting exercise. Each participant was given an explanation of the specific condition of the exercise, including the stressors they would be exposed to, before they completed another IAMS and reported their perceived pressure. Participants then completed the condition whilst their heart-rate was recorded. In each condition, the participants performed the shooting exercise whilst exposed to the manipulated stressor. According to the condition, some stressors were administered prior to performing the shooting exercise (i.e., the performer stressor), and some were administered during the performance (i.e., the beep from the sound system). In conditions where there were consequences, condition-relevant stressors were delivered immediately following completion of the condition, with the exception of the reward condition. In the reward condition, the reward was administered on the last day of the experiment. This clause was made clear to participants when they received the condition explanation.

The experiment took place outside of a laboratory, in an applied shooting setting, so specific steps had to be taken to reduce confounding variables. The experiment took place in a shooting hall that was completely secluded, and thus bereft of bystander observation. Excluding the judgment condition where the PD was present, the same two researchers were present across all the conditions. Athletes were asked not to discuss their experiences with fellow participants until the study was complete. A script[18] was followed for all conditions, to ensure the same narrative was delivered to each participant. All the conditions took place at times that were

[18] See Appendix 3 for script

within the athletes' normal training hours. Athletes were restricted to completing only one condition per day and the experiment took place over three weeks.

4.2.5 Data analysis. The independent variables were the task, performer, environmental, forfeit, reward, and judgment stressors manipulated across the conditions. The dependent variables were heart-rate and performance, as well as self-reported pressure, anxiety and confidence. The participants' overall baseline for each measure was calculated by averaging their scores across the six warm-ups (i.e., the warm-up in the task condition, the warm-up in the performer condition, etc.). The distribution and sphericity of the data was checked. A one-way ANOVA with repeated measures was used to identify if there were differences amongst the means for pressure, heart-rate, self-reported anxiety (intensity and direction), confidence (intensity and direction) and performance between each pressure condition and the baseline. Pairwise comparisons (alpha level <0.05) were performed to identify the conditions in which significant differences occurred. Bonferroni corrections were used to control for Type I error.

5.3 Results

Mean scores for perceived pressure, cognitive and somatic intensity and direction, self-reported confidence intensity and direction, heart-rate (bpm) and performance data are reported in Table 2.

5.3.1 Pressure and performance. A significant main effect was found for perceived pressure ($F(6, 30) = 10.87$, $P < .000$; $\eta^2 = .69$). Pairwise comparisons indicated that pressure was significantly higher in the forfeit ($m = 4.9$) and judgment condition ($m = 4.5$) as compared with the baseline ($m = 1.83$). In addition, scores in the forfeit condition were significantly higher than scores in the performer condition ($m = 2.8$). A significant main effect was found for performance score ($F(6, 30) = 5.78$,

P = .000; η^2 = .54). Pairwise comparisons showed that scores in the judgment condition (m = 99.48) and the task condition (m = 99.15) were significantly lower than scores in the baseline condition (m = 102.07).

Table 2: Mean scores across the baseline, task, performer, environmental, forfeit, reward and judgment conditions.

	Experimental Condition						
	Baseline	Task	Performer	Environmental	Forfeit	Reward	Judgment
Measure							
Perceived Pressure	1.83	2.42	2.88	2.58	4.92	4.08	4.50
Heart-rate	77.61	78.66	78.66	84.00	88.33	86.83	92.33
Cognitive Anxiety Intensity	1.05	3.17	3.00	2.17	4.17	3.33	4.50
Cognitive Anxiety Direction	.03	-.17	.17	.00	-1.17	-.33	-1.50
Somatic Anxiety Intensity	1.03	3.17	2.83	2.50	2.67	2.83	3.50
Somatic Anxiety Direction	.00	-.67	.17	-.33	-.17	-.33	-.83
Confidence Intensity	4.50	2.83	4.33	4.50	3.83	5.00	4.00
Confidence Direction	2.50	-.17	1.00	1.67	.00	1.50	.00
Performance	102.07	99.15	101.83	101.80	101.15	100.68	99.48

5.3.2 Anxiety, confidence and heart-rate. Results showed that a significant main effect was found for cognitive anxiety intensity ($F(6, 30) = 7.07$, $P < .000$; $\eta^2 = .59$). Pairwise comparisons indicated that scores in the forfeit ($m = 4.17$) and judgment condition ($m = 4.50$) were significantly higher than the baseline condition ($m = 1.05$). A significant main effect was also found for cognitive anxiety direction ($F(6, 30) = 5.07$, $P = .001$; $\eta^2 = .50$). Specifically, with a mean of -1.5, the judgment condition was interpreted as more debilitative than the baseline condition ($m = .027$). In addition, there was a significant main effect for somatic anxiety intensity ($F(6, 30) = 3.33$, $P = .012$; $\eta^2 = .40$), confidence intensity ($F(6, 30) = 2.44$, $P = .049$; $\eta^2 = .74$), and heart-rate ($F(6, 30) = 3.96$, $P = .005$; $\eta^2 = .44$). However, following Bonferroni post hoc analysis, there were no significant differences found in the pairwise comparisons. There was no main effect for somatic anxiety and confidence direction.

5.4 Discussion

The present study aimed to build on the findings of study two, which investigated the efficacy of the PT framework generated in study one. Specifically, study two identified mixed support for the demands stressors and strong support regarding their ability to generate pressurised training environments. Building on the results of study two, the present study investigated the effects of individually manipulating a task, performer and environmental stressors (i.e., demands of training), and forfeit, reward, or judgment stressors (i.e., consequences of training) on performance and experiences of pressure. It was anticipated that such research could clarify whether consequences are indeed more effective than demand stressors, as suggested by study two. This information would further provide insight into methods for systematically creating pressure and could be useful for maximising

a coach's or practitioner's time, efforts, and resources when creating a pressurised training environment.

Regarding whether training demands or consequences are more effective at generating pressure, results revealed that perceived pressure and cognitive anxiety intensity were significantly higher in two of the consequences conditions (i.e., the forfeit and judgment condition), as compared with the baseline condition. In contrast, when the training demands were increased via the manipulation of either a task, performer, or environmental stressor, pressure and anxiety remained unaffected. Also, perceived pressure was significantly lower in the performer condition as compared with the forfeit condition. Thus, the results indicate that introducing specific consequences can be effective for incrementing pressure, whilst manipulating demands without consequences might not.

The effect of manipulating training demands to increase pressure has received mixed support in previous literature. Study one found some support for implementing demands but effects were stronger when demands were combined with consequences. Thus, in consideration of this previous research and the present findings, there is growing support for the importance of the role of manipulating consequences, as opposed to demands, to create pressure in training environments. This finding is notable given that previous research supports the notion that coaches may rely on more demand-based manipulations as a means for creating pressure (e.g., Weinberg, Butt, & Culp, 2011). For example, Weinberg and colleagues (2011) interviewed elite coaches who explained that they manipulated demands (via repetitive practice) to produce pressure. Thus, in suggesting a reliance on manipulating demands, without reference to consequences, this research indicates

there may be a need to expand information for coaches regarding the specific effect of demands, and consequences so as to enhance efficiency when PT.

The present study examined which specific stressor was the most effective at affecting perceptions of pressure. It was found that pressure and cognitive anxiety intensity were significantly higher in the forfeit and judgment condition while changes in the reward condition were not significant. Results therefore highlight that the reward stressor was not as impactful as the other two consequences on experiences of pressure which could have important implications for practitioners when designing pressure training environments. Results also revealed that levels of cognitive anxiety in the judgment condition were interpreted as significantly more debilitating than facilitating towards performance. Therefore, it is possible that manipulating the judgment stressor had the most overall impact, which has important implications for coaches when creating pressurised training environments. The judgment stressor may have had such a substantial effect on perceived pressure due to the fact that the PD (present in the judgement condition) is the primary decision-maker in the sport and governs important decisions such as selection. Thus, it is possible that athletes wanted to make a positive impression and perceived it to be important to perform (i.e., pressure).

In conditions where anxiety intensity was heightened, and these increased levels were interpreted as neutral (neither facilitative nor debilitative), it was found that there was no effect on performance. In contrast, in conditions where anxiety was heightened, and these increased levels were interpreted as debilitative, it was discovered that performance decreased. These findings offer support to previous literature proposing that the directional interpretation of anxiety is a stronger predictor of performance than anxiety intensity (Neil, et al., 2012). There has been

considerable discussion in sport psychology literature regarding positive and negative effects of anxiety intensity and direction (e.g., Jones & Hanton, 2001). Specifically, there has been a view that cognitive anxiety intensity has a negative influence on performance (Martens, Vealey, & Burton, 1990). However, following equivocal findings regarding anxiety and its relationship to sport performance, and the subsequent introduction of the direction dimension, contemporary research tends to support the notion that anxiety direction is a stronger predictor of performance than intensity alone (Neil, et al., 2012). In line with existing literature, results of the present study indicate that anxiety direction provides a more sensitive and accurate explanation of anxiety responses within performance.

When considering which specific stressors impacted performance, it was found that performing in front of the PD significantly decreased shooting accuracy, as compared with the baseline. Previous literature has documented similar findings. For instance, Lawrence et al. (2014) examined golf putts with and without consequences and discovered that the introduction of a monetary and judgment stressor could negatively impact performance. This finding may be an indication that the participants in the present study were unable to manage the increased pressure induced by the consequence and thus performance suffered. Specifically, in the present study, as well as performance being impeded, pressure was significantly increased when the judgment stressor was introduced. Thus, bearing in mind that attempts to cope with pressure can be either successful or unsuccessful (e.g., Wang et al., 2004), it is possible that participants' efforts to manage the increased pressure were not effective. Notably, study two found consequences didn't impact performance. However, the netballers involved in this study had past experience of PT with consequences, whereas the sample in the present study did not. Hence, the

specific experiences of the netballers, as opposed to the shooters in the present study, may have resulted in them being better equipped to manage pressure and thus a better performance. It is possible that the mixed findings seen across the present study, study two and previous literature may be an indication that some participants manage pressure in such a manner that performance is maintained while others do not. Indeed, this is supported by research indicating that stressor familiarity facilitates better coping (Meichenbaum, 2007).

It was also found that the task stressor impacted performance, supporting study two in indicating that demand stressors can be manipulated to affect accuracy. This finding is important as it suggests that demand stressors could be crucial for challenging athletes performance capabilities when PT. Furthermore, the results also corroborate study two in finding some support for the notion that demand stressors mediate confidence. Specifically, in study two, while post hoc analyses did not reveal significant differences of confidence intensity amongst the conditions, a significant main effect was found for self-confidence intensity. In this study, further investigation of the means demonstrated a trend where confidence was lower in conditions where performance was significantly reduced. With this in mind, the present study also found a significant main effect for self-confidence intensity but no significant differences in the post hoc analyses. However, like study two, the observed mean scores also demonstrated a trend in direction whereby the lowest confidence intensity score was observed in the demand condition where performance was significantly reduced. Specifically, the mean in the task condition was 2.83, which can be compared with mean in the baseline (4.50), performer (4.33), environmental (4.50), forfeit (3.83), reward (5.00) and judgment condition (4.00). Although speculative, the present study mirrors previous research in offering some support for

the proposal that demand stressors could also be important when PT due to a potential ability to mediate confidence. In support of this trend, wider research has indicated that performance mediates perceptions of confidence (Skinner, 2013).

5.4.1 Applied implications. The results of the present study build upon the findings of study one and two and the growing body of knowledge supporting the effectiveness of introducing meaningful consequences as a means for creating pressure (e.g., Bell et al., 2013; Driskell et al., 2014; Kinrade et al., 2015; Lawrence et al., 2014). Of all the stressors manipulated, it appears that the judgment stressor had the biggest impact on participant's experiences of anxiety and pressure and therefore suggests that, under certain circumstances, coaches may be able to maximise their effectiveness at producing pressure by manipulating this specific consequence condition. Additionally, while some research has supported the effective use of manipulating demand-type stressors (e.g., Driskell, et al., 2001; Driskell et al., 2014), results of this study suggest manipulating demand stressors is ineffective at producing pressure. Hence, the focus on judgement and forfeit (consequences) to create pressure offers new insights into the literature and applied practice.

Although it was found that the demand stressors did not affect perceptions of pressure, coaches should consider the other important effects that training demands may have when PT. As highlighted above, increasing the demand stressors was found to negatively impact performance. In addition, while post hoc analyses did not reveal significant differences, a significant main effect was found for self-confidence intensity. Means were observed to show that confidence was lower in conditions where performance was significantly reduced. Thus, in line with study two and wider literature (Skinner, 2013), the present study findings suggest demands to be

important when PT for facilitating coaches in their ability to challenge performance and potentially mediate confidence. Moreover, study one identified that coaches used the demands of training to expose athletes to challenges that mirrored what they would face at competition. In this way, training demands may be important for facilitating the development of the ability to perform the specific skills needed for competition under pressure. Furthermore, research has suggested that similarity between training and competition demands can encourage the better transference of skills into the competition environment (Driskell et al., 2001). Thus, training demands appear to be instrumental for encouraging the transfer of skills from PT to competition. Also, literature has highlighted that individuals can lose psychological flexibility if they are repeatedly exposed to the same contextual demands due to the training task encouraging the repetition of a single behaviour (Driskell & Johnston, 1998). This outcome can occur because the athlete learns to persist with a single response, even when the behaviour is no longer correct. Hence, by varying training demands, these stressors can be used to promote adaptability and psychological flexibility while PT. Therefore, collectively, demand stressors may be a critical component for influencing transferability, psychological flexibility, challenging performance and, potentially, mediating confidence when PT. However, further research on confidence is needed so as to provide a definitive conclusion.

5.4.2 Future research. In sport, research on PT is in its infancy (cf. Lawrence et al. 2014; Oudejans & Pijpers, 2009; 2010; Reeves et al., 2007). While the present study results contribute findings that address this issue, more research on PT, and how to perform it most effectively, is essential. Notably, there is extensive previous literature relating to performing the pre-exposure phases and the study contributes findings regarding systematically performing the exposure phase of PT. Thus, in

combining the present study findings with this previous literature, future research could outline a programme for performing all the stages of PT that is underpinned more comprehensively with research. Such a programme could then be used to facilitate further PT investigations, such as the performance effects of longitudinal interventions, of which research is sparse (cf. Bell et al., 2012).

It would be beneficial for future research to investigate if the findings are consistent in less skilled participants (non-elite). Such research could provide additional information into the characteristics of demands and consequences, and also on methods for using PT to create performance improvements with non-elite individuals. This information could be important given that a strength of PT over other choking preventative interventions (e.g., implicit or analogy learning; Hill et al., 2010a) is that PT is indicated to be an effective approach for both elite and novice athletes (Oudejans & Pijpers, 2009; 2010; Reeves et al., 2007). Such research would expand insight on this proposition.

Study one also reported that a coach perceived their athlete to experience more pressure when they pressure trained with easy training demands. Being watched while performing with easier demands increased expectation, and thus pressure, more than performing with difficult demands. Hence, this coach indicated that the amount of pressure the individual experiences from performing while being watched (the consequence stressor) can be accentuated or diminished by how difficult the task is (the training demands). The collective results of study two and three suggest that it is ineffective to create pressure by manipulating training demands unless consequences are simultaneously introduced. However, this finding from study one suggests that there may be an interactive relationship between

consequences, demand stressors and pressure. This possible interaction warrants further investigation.

5.4.3 Limitations. Due to the difficulties associated with using an elite sample, such as limited access because of their training responsibilities, only six athletes participated in the study. Thus, the statistical manipulation will have been constrained by the small sample size. Another limitation of the study is that the conditions and stressors used were carefully designed with the specific participants in mind. Thus, caution should be taken when generalising the findings to other participants or sports. An additional limitation of the study was that the time of day that the conditions took place varied. Consequently, circumstances may have led to athletes performing a condition first thing in the morning or at the end of the day. This scheduling challenge may have created variance in the physiological and psychological state that athletes experienced across the conditions. However, it was planned that this limitation would be counterbalanced by recording a baseline for each condition and using the average across these six conditions to form the final baseline. Likewise, athletes can be asked to compete at unusual times in major competitions, hence this variable also reflects the reality of elite sport.

5.4.4 Conclusion. Alongside previous research (cf. Bell et al., 2013; Oudejans & Pijpers, 2009; 2010), and study two, the present findings strongly emphasise the importance of the role of consequences when creating a pressurised training environment. Additionally, introducing the judgment of the PD while athletes performed led to a significant increase in pressure, decrease in performance, and increase in cognitive anxiety intensity that was perceived as debilitative. No other stressors had this impact. Thus, the results suggest this stressor to be the most effective for influencing pressure and performance when pressure training.

As none of the individual demand stressors significantly increased pressure, the present findings support the argument that demand stressors are ineffective at incrementing pressure. Notably, this result was found in spite of the shooting drill and the training demands presenting a challenge that mirrored competition. These results support and develop the findings of study two, which had identified mixed support for the ability for the demands of training to impact pressure. However, it was found that increasing training demands, specifically a task stressor in the form of a time constraint, impacted performance. This finding echoes the results of study one and previous literature (e.g., Pinder et al., 2011a) and suggests that manipulating training demands is an effective approach for affecting performance and this finding. Corroborating study two, this result provides some support for the notion that training demands are important when PT due to an ability to mediate confidence (cf. Skinner, 2013).

Additionally, one of the consequences (i.e., the judgment stressor) also negatively affected performance. This finding contrasts with the results of study two, whereby consequence stressors did not affect performance. It is suggested that individual differences (Fletcher, et al., 2006) may likely account for this finding, and indeed for why certain demand stressors impacted performance, thus highlighting the importance of considering individuality when PT.

The results offer support for the PT framework developed in study one which highlights the different approaches coaches' could take for producing a pressurised training environment. Specifically, it appears that manipulating consequences, particularly judgement stressors, may be the most effective stressor when creating pressure. However, the findings also build on the framework by suggesting that consequences and demands may have distinct roles when PT. In detail, while

manipulating demand stressors may not influence the generation of pressure, these stressors may still be important when PT for helping coaches challenge performance and mediate confidence. Hence, demands may be important for challenging performance, and consequences may be essential for producing pressure; Thus, these two different types of stressors may best serve different purposes when PT.

These present study findings, and the results of studies one and two, provide novel insights on a system for creating pressurised training environments across different sports. However, literature on this subject is still in its infancy and additional theory must be developed to ensure applied PT research is underpinned with comprehensive, empirical evidence (Beaumont et al., 2015). Important in this process could be approaches that combine the findings of the present study, regarding exposing athletes to pressure, and wider literature relevant to performing the pre-exposure stages (e.g., Johnston & Cannon-Bowers, 1996), to produce comprehensive interventions that can be used to prevent choking in elite sport.

CHAPTER VI

6.0 General Discussion

6.1 Introduction

This chapter begins with a summary of the research findings. Following this, these findings are discussed within the context of the literature and, in doing so, theoretical and applied implications are considered. Finally, directions for future research are considered before the strengths and weaknesses of the thesis are highlighted.

6.2 Summary of Results

This thesis explored how pressurised training environments can be systematically produced in elite sport with an aim of providing insights that could be used to underpin future applied or research-based pressure training (PT) endeavours. Three empirical research investigations were conducted, whereby a framework for designing and creating a pressurised training environment was proposed.

The purpose of study one was to explore coaches' experiences of designing and creating pressurised training environments in elite sport. Using semi-structured interviews and subsequent thematic analysis, a framework was proposed which suggested that coaches manipulated training demands (e.g., task, performer and environmental stressors) and consequences (e.g., forfeit, reward, and judgment stressors) to systematically construct PT environments. Furthermore, coaches considered athletes' personal characteristics to create individualised stressors that were highly meaningful.

To test the efficacy of this PT framework, study two investigated the effects of manipulating training demands and consequences on experiences of pressure in elite sport. In accordance with the findings from study one, individual differences were considered and stressors were appropriately tailored for the sample. It was

hypothesised that increased training demands and meaningful consequences would heighten perceived pressure and impede performance. In support of the hypothesis, pressure, cognitive anxiety intensity and heart-rate were significantly higher, as compared to baseline, when demand and consequence stressors were introduced. However, the introduction of consequences alone, without increased demand stressors, also resulted in significantly higher pressure, cognitive anxiety intensity and heart-rate. Furthermore, increased training demands without the presence of meaningful consequences did not have any significant effect. Thus, there was mixed support for the effects of demand stressors and strong support for the influence of consequences on pressure.

In terms of performance, it was found that increasing demand stressors alone negatively impacted performance. In contrast, increasing consequences in isolation had no such impact. However, performance was significantly impacted in a negative manner when consequences were introduced alongside increased training demands. Therefore, there was strong support for the effect of demand stressors and mixed support for consequences on performance. Thus, when aiming to conduct PT that increases pressure and challenges performance, manipulating demands plus consequences would appear to be the most appropriate method to take. Collectively, there is overall support for the perceptions of elite coaches in study one who utilised both demand and consequence stressors to PT.

Study three aimed to further expand on the mixed results of study two and extend knowledge on how to create pressurised training environments. Specifically, this study explored the specific impact of each individual demand (i.e., task, performer and environmental) and consequence (i.e., reward, forfeit and judgment) stressor on performance and perceived pressure. It was hypothesised that each

individual demand and consequence stressors would increase markers of pressure and that the introduction of stressors would negatively impact performance. Findings revealed that two of the three consequence stressors, namely judgment and forfeit, significantly increased experiences of pressure and cognitive anxiety intensity. Thus, the study's results corroborated the findings of study two in showing strong support for the influence of consequences on pressure. Additionally, introducing the judgment stressor led to significant increases levels of cognitive anxiety intensity that were interpreted as having a debilitative influence on performance. No other stressor had such an impact. Importantly, as none of the individual demand stressors significantly increased pressure or anxiety intensity, the findings of study three were synonymous with those of study two in that manipulating training demands alone was ineffective as a means of creating pressurised training environments.

Regarding performance, it was found that introducing a task stressor, in the form of a time constraint, deteriorated performance (i.e., shooting accuracy). This finding echoes the results of study two and suggests that training demands can be manipulated to impact performance. However, the judgment stressor also negatively impacted performance and this finding contrasted with those of study two, whereby consequences introduced in isolation had no impact on accuracy.

Collectively, the findings of study two and three provided support and built on the PT framework proposed in study one. The findings supported the framework by indicating that consequences are essential for producing pressure. Indeed, judgment stressors were found to be particularly effective in achieving this objective. However, it was discovered that demand stressors impacted performance but not pressure. Thus, in highlighting that consequences are essential for producing pressure yet demands are important for challenging performance, the findings built on the

framework by suggesting that these different types of stressors may have distinct roles to play when PT.

6.3 Discussion

The following section provides a discussion of the main theoretical and practical implications emanating from the three studies. The strengths and limitations of this thesis are then considered, and future research directions identified.

The present thesis explored a gap in literature whereby there has been an absence of research investigating how to create pressurised training environments. Study one utilised a qualitative method to explore how elite coaches created pressurised training environments and two key areas were identified from the emergent themes. Firstly, coaches perceived that training demands, which concern the nature of the physical and cognitive demands directly related to the training exercise, could be manipulated to create pressure. Secondly, the coaches perceived that training consequences, which regarded performance-contingent outcomes, could also be manipulated to increment pressure. Through a process of managing these two areas, the coaches believed they increased athletes' perceptions that it was important to perform and, thus, raised the level of perceived pressure. These findings support previous literature that have outlined performance pressure to be defined as the desire to perform well in sporting situations (cf. Baumeister, 1984).

It was found in study one that consequences were introduced by the coaches via the manipulation of forfeit, reward, and judgment stressors. In support of these methods, previous research has illustrated the use of such stressors in pressurised training settings. For example, forfeits used previously have included cleaning up the changing room or missing a training session (Bell et al., 2013). In addition, rewards and forfeit stressors have been utilised in the form of monetary incentives and being

filmed during performance (Oudejans & Pijpers, 2009). Study one also highlighted that the coaches manipulated task, performer, and environmental stressors to organise the training demands. Previous research has supported the manipulation of these variables as a method for influencing the demands contained within a training exercise. For example, Pinder and colleagues (2011a) utilised Newell's (1986) model of constraints, which regards task, performer and environmental variables, to shape training environments so that they were representative of competition. Also, research can be seen to support the use of training demands as a method for generating pressure. For instance, Oudejans and Pijpers (2009; 2010) explored a dart-throwing PT intervention that manipulated demand stressors, such as changing the height from which darts were released. These studies reported that anxiety was affected and a pressurised environment was created, thus illustrating a link between training demands and pressure.

While study one found consequence and demand stressors to be important when PT, research has suggested that coaches may rely on demand—based manipulations when striving to create pressure (cf. Weinberg et al., 2011). This finding could be due to the fact that a coach's primary responsibility is to manage an athlete's physical (technical and tactical) training routine. Specifically, if coaches are more familiar with manipulating demands, this could explain why coaches would be more likely to rely on these types of stressors to create pressure. Moreover, research indicates that Newell's model of constraints is a popular coaching approach for creating challenges in sporting environments (e.g., Pinder et al., 2011a). Thus, it is possible that the prevalence of this model in elite sport may have further facilitated coaches in orientating towards demand-based manipulations to produce pressure. Furthermore, coaches may be hesitant or skeptical about manipulating

consequences due to misplaced fears of negative repercussions (Bell et al., 2013). This possibility could be a further explanation as to why coaches may orientate towards using demands more than consequences to create pressure.

Studies two and three tested the efficacy of the PT framework described in study one. It was found that pressure and anxiety intensity only significantly increased in conditions where consequences were manipulated, be that in isolation or alongside demand stressors. Contrastingly, across both studies pressure and anxiety intensity did not significantly increase when only demands were manipulated. These studies suggested that introducing consequences was essential and effective for incrementing perceived pressure, while manipulating demands was not. Such findings are important for a number of reasons. In utilising consequences as part of wider interventions, previous research can be seen to indicate that consequences are important in creating pressure (e.g., Behan & Wilson, 2008; Bell et al., 2013; Oudejans & Pijpers, 2009; 2010; Reeves et al., 2007; Vine & Wilson, 2010; Wilson, Vine, & Wood, 2009). However, the present thesis findings suggest consequences are not just important but, rather, an essential component of pressurised environments and thus build on previous research. Also, given that coaches may rely more on demand-based manipulations to produce challenging environments and pressure (cf. Weinberg et al., 2011), the findings suggest that coaches may be utilising ineffective methods to produce pressure. With this in mind, there may be a critical need to educate coaches on the specific functions of demand and consequence stressors when PT.

The primary aim of the thesis was to investigate methods for producing pressurised training environments and it was discovered that manipulating training demands may be an ineffective approach for creating pressure. However,

supplementary findings in study one suggested that these stressors may be important when pressure training for other reasons. Indeed, a theme emerged in the data indicating that elite coaches manipulated demand stressors to develop specific skills that were important for competition. Specifically, by making training demands replicative of competition, coaches believed that athletes learnt specific skills they would need for managing competition stressors, thus promoting the transference of skills from training to the performance environment. Previous literature supports this perception as it has been suggested that the more ecologically valid the training environment, the more likely skills will transfer into the competition environment (Driskell et al., 2001). Therefore, training demands could be instrumental for encouraging the better transfer of pressure trained skills from practice to competition.

As well as study one, findings from studies two and three also provided some support for the importance of demand stressors when PT. In detail, in studies two and three, performance was significantly negatively impacted by increments in the demand stressors. Hence, training demands could be important when PT given that coaches may desire to challenge an athlete and their performance capabilities under pressure. Furthermore, in demand conditions where performance was significantly decreased, mean confidence scores were observed to be lower, although significance was not found. Thus, although speculative, it is possible that demand stressors could mediate confidence levels. Along these lines, in wider research it has been shown that performance facilitates perceptions of confidence (Skinner, 2013). Therefore, if demand stressors can influence confidence, this could be due to their ability to impact performance. Supporting this proposal, it is well documented in literature that confidence can mediate the directional interpretation of anxiety (Mellalieu, Neil, & Hanton, 2006), and anxiety has been highlighted to reflect

experiences of pressure (Gucciardi et al., 2010). In light of these points, if training demands mediate confidence, they could be further instrumental when PT for providing coaches with a means for affecting confidence. However, the role of confidence relative to pressure needs further exploration (Beaumont et al., 2015). In accordance with the research highlighted above, and the collective research of this thesis, while there is support for the framework that emerged from study one, there is also an indication that demand and consequence stressors may be important when PT for different reasons. Specifically, training demands may be critical when PT due to an ability to influence skill transference, performance and confidence, while consequences may be most effective for creating pressure.

When investigating the PT framework generated in study one, studies two and three adopted measures of perceived pressure, competitive anxiety, and heart-rate, as indictors of participants experiences under pressure. These particular measures have been supported in previous research as a means for understanding experiences under pressure (e.g., Gucciardi et al., 2010; Kinrade et al., 2010; 2015; Mace & Carroll, 1985; Mace et al., 1986; Malhotra et al, 2012; Mesagno & Mullane-Grant, 2010; Oudejans & Pijpers, 2009; 2010). It was found in studies two and three that anxiety intensity increased in the same direction as perceptions of pressure (i.e., the same changes in direction occurred under the same manipulated conditions). Specifically, in study two, perceptions of pressure and cognitive anxiety intensity were significantly higher in the demands plus consequences condition as compared with the baseline. In addition, perceived pressure, cognitive and somatic anxiety intensity were all significantly higher in the consequences condition. Furthermore, when exploring the impact of individual demand and consequence stressors in study three, results revealed that perceived pressure and cognitive anxiety intensity were

significantly higher in the forfeit and judgement condition. Hence, in support of previous research (e.g., Gucciardi et al., 2010), the findings of this thesis support the measuring of state anxiety as a means of providing insight into athletes' experiences under pressure. In consideration of these present study findings and previous research, there is an indication that pressure and anxiety share similarities. With this in mind, and given recent research highlighting that anxiety can be understood both in terms of intensity and direction (Chamberlain & Hale, 2007, Neil et al., 2012), it is feasible that pressure could also be comprehended in this way. Applied practitioners and future researchers may wish to explore whether this dimension of pressure can be measured.

Supported by previous research (e.g., Nieuwenhuys, Pijpers, Oudejans, & Bakker, 2008; Oudejans & Pijpers, 2009; 2010), heart-rate was assessed in studies two and three to provide additional insight into athletes' experiences under pressure. In study two, heart-rate and perceived pressure were found to be significantly higher in the consequence condition and the demands plus consequence condition as compared with the control condition, suggesting heart-rate to be an appropriate measure. However, study three showed no significant differences in heart-rate between the conditions. This finding could be explained by the specific physical disabilities of the athletes, given previous research indicating that disability type influences heart-rate response in sport (Barfield, Malone, Collins, & Ruble, 2005). With this in mind, future research is required to further clarify the efficacy of measuring heart-rate when investigating pressure in able-bodied and disabled athletes. Additionally, there is an issue with using heart-rate in exercise studies as it is a measure which is sensitive to changes in physical activity (cf. Haskell et al., 2007). Therefore, considering the complications highlighted above regarding the use

of heart-rate as a measure of pressure, and the benefits outlined previously regarding the use of anxiety, this latter measure may be more suitable when examining pressure.

Individual differences were identified in the first study to be a crucial component when creating pressurised training environments. Specifically, coaches believed that an athlete's response to pressure was as individual as "a finger print" and thus used their understanding of each athlete to tailor stressors to suit their needs. Consequently, PT could be made more effective by understanding individual needs and the stressors that would impact on an individual level. Building on this finding, studies two and three utilised an understanding of individual differences to ensure stressors were tailored for the specific recipients. Collectively, the present thesis demonstrates that individual differences are an important part of the design process and previous research can be seen to support these results. Specifically, Johnston and Cannon-Bowers (1996) have emphasised the importance of assessing individual differences to ensure the stressor-exposure programme is effective. Additionally, in relation to safety, previous research has noted that failing to understand that individuals may differentially appraise the meaning of stressors could result in undesirable repercussions, such as negative reactions (Fletcher et al., 2006). Similarly, previous research has indicated that it may be effective to implement pressure in a graduated manner (Keinan & Friedland, 1996). This proposition highlights that introducing pressure gradually (i.e., in accordance with an individual's capacity with stressors) will ensure safety and effectiveness when utilising a stressor-exposure programme.

6.4 Applied Implications

The findings of the present thesis suggest that, when attempting to create a pressurised training environment, manipulating training consequences, either in isolation or alongside training demands, is essential for producing pressure. Previous research has predominantly indicated that consequences are important, but not essential, when creating pressure (e.g., Oudejans & Pijpers, 2009; 2010). Moreover, the findings also suggest that manipulating training demands is an ineffective approach for generating pressure, yet potentially also important for influencing competition-relevant skill development, performance and confidence when PT. Therefore, the findings of study two and three support and build on the framework from study one by indicating that demand and consequence stressors may have distinct roles to play when PT. Given this previous research highlighted above (e.g., Oudejans & Pijpers, 2009; 2010) and wider literature indicating that coaches may rely more on demand-based manipulations to create tough environments (cf. Weinberg et al., 2011), the present thesis findings have substantial applied implications. Specifically, there may be a strong need to expand knowledge in applied elite training environments and the scientific community regarding the distinct roles that demand and consequence stressors can effectively play when PT.

Based on the findings of this thesis, when introducing consequences, these can be shaped by introducing judgment, reward, or forfeit stressors and, as indicated in study three, the judgment stressor may be the most effective for affective pressure and anxiety intensity and direction. Importantly, as indicated in the findings of study one, consequences need not necessarily replicate the consequence stressors found at competition. Rather, individual differences should be considered to ensure that they are meaningful (i.e., either highly desired or unwanted). From an applied perspective, this is important as coaches may struggle to recreate the consequences

present at competition, such as a filled stadium in a penalty shootout. However, such stressors are not required. Instead, coaches can recreate the pressure response, by utilising consequences that are highly meaningful (i.e., genuinely desired or unwanted rewards, forfeits or judgments), thus allowing athletes to learn how to manage high levels of perceived pressure.

The findings of study one also suggested that elite coaches put more emphasis on creating challenging demands of training, and avoided using consequences, when PT with adolescent populations. Thus, training demands may be more important when PT with younger or less skilled athletes, however, this finding warrants further investigation. In addition, it was also found in study one that elite coaches thought PT should be a programme that is planned far in advance so as to incorporate effectively into the athletic calendar. With this in mind, studies two and three identified that pressure exposure can impact performance, and wider literature indicates that changes in performance can be linked to fluctuations in confidence (Skinner, 2013). Therefore, there is support for the coaches' perceptions in study one whereby PT may need to be planned so it is not in close proximity to a competition so that athletes have the time to develop the required confidence and skills. This has substantial applied implications given the difficulties associated with rebuilding confidence one it has been reduced (cf. Hays et al., 2009; Podlog & Eklund, 2007) and planning around competition schedules (cf. Schreuder, 1980).

There has been much deliberation around the ethics of stressor-exposure programmes (see Bell et al., 2013). Specifically, it has been proposed that such training methods may reduce self-efficacy, increase anxiety (Albrecht, 2009), reduce intrinsic motivation (Vallerand, Gauvin, & Halliwell, 1986), and increase learned helplessness (Maier & Seligman, 1976). Contemporary research has opposed these

propositions, stating that such interventions are effective for enhancing performance under pressure provided that stressors are not administered unfairly or randomly (cf., Bell et al., 2013). Reinforcing this point, in study one of the present thesis, a coach noted that, “it is more unethical to deprive athletes of the opportunity to strategically train under pressure given that their performance environment is full of it”. Indeed, the collective findings of this thesis support the introduction of stressor-exposure programmes in sport, whereby all the coaches involved were strong proponents of PT. Accordingly, based on previous literature (e.g., Bell et al., 2013) and the perceptions of the coaches involved in the present thesis, it is suggested that stressor-exposure training, such as PT, can be an effective method for enhancing performance under pressure. Given the innate pressure found at competition, such a training approach should be considered as a potentially important component of an athlete’s development.

In line with recommendations from previous research (e.g., Johnston & Cannon-Bowers, 1996), in studies two and three of the present thesis, a post intervention review was conducted. Here, the outcomes of the interventions were examined and documents regarding the specific findings of the studies were provided to the sports. This process was important as the arising information was used to enhance both athlete and organisational effectiveness moving forward (cf. Goldstein, 1993). Thus, from an applied perspective, service providers who wish to PT might need to consider the review and debrief process that follows the implementation of an intervention. This debrief process should be planned and agreed with respective sports prior to the implementation of the intervention.

6.4 Future Research

In sport, there had been an absence of research investigating methods for systematically creating stressors and pressure (cf. Driskell & Johnston, 1998; Fletcher & Sarkar, 2016; Oudejans & Pijpers, 2009; 2010). Specifically, research highlighted examples of PT (e.g., Bell et al., 2013; Reeves et al., 2007) and documented how to perform the preparatory components of a stressor-exposure programme (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996). However, guidance on the methods involved in conducting the exposure component is lacking. Addressing this gap in research, the present thesis investigated methods for systematically creating stressors and pressure in sport, providing information on methods for producing pressurised training environments. Hence, the insights gained from this thesis inform a process for implementing the stressor-exposure component of an intervention. However, while these findings contribute to the development of theory on how to conduct stressor-exposure interventions such as PT, research on this topic is still in its infancy. Indeed, research on longitudinal interventions is particularly sparse (cf. Bell et al., 2013) and additional theory must be developed to ensure applied and research based PT is underpinned with comprehensive, empirical research. Therefore, it is suggested that future investigations continue to research methods for conducting PT interventions in sport, especially in a longitudinal context. With this in mind, the present thesis findings regarding creating stressors and pressure could be combined with previous literature on how to perform the preparatory components of a stressor-exposure programme (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996) to produce longitudinal PT investigations.

More research is also required on the specific effects of consequences on particular types of choking in sport (i.e., distraction or self-focus). This research is important given the implications of recent literature outside of sport (Hill et al.,

2010a). Specifically, DeCaro et al. (2011) found that the stressor of being watched by others increased attention to skill processes and subsequently increased self-conscious methods of choking. Alternatively, reward stressors direct attention away from the task and result in distraction forms of choking. Examining this process and revealing information on the association between specific stressors and choking in sport could be important for extending insights that would allow coaches to tailor PT based on an athlete's needs. For example, if an athlete is vulnerable to choking via increased self-consciousness, the individual could be gently exposed in training to stressors that engender this type of choking, such as different judgment stressors. By experiencing stressors which engender the type of choking they are most vulnerable to, athletes could better learn how to manage these types of choking. Thus, expanding insight on the specific type of choking that results from certain stressors could facilitate coaches with the capacity to provide more targeted, effective PT.

This programme of research has identified the importance of understanding individual differences when PT. However, current methods for examining individual attitudes towards stressors and coping styles are limited. Specifically, in study one the coaches used their previous experiences of working with an athlete to guide their tailoring of stressors. In studies two and three, this understanding was achieved via the researcher holding individual meetings with each athlete and discussing their attitudes towards, and experiences of, specific stressors. While this is a useful method to attain such information, it could be beneficial for research purposes to develop and test a standardised questionnaire. For instance, a tool that facilitated the quantifying of how meaningful an athlete perceives a stressor to be could be developed. As another example, the Movement-Specific Reinvestment Scale

(Masters, Eves, & Maxwell, 2005) could be used to elicit information on an individuals' reinvestment style, such as how likely they are to become self-conscious under pressure. Bearing in mind that self-consciousness is linked with choking under pressure (Hill et al., 2010a), this tool could be used to gain a greater understanding of how to assess and manipulate individual differences when PT.

Evaluating how athletes are experiencing and coping with a PT intervention in real time is critical. These evaluations provide information as to whether PT is appropriate, too challenging, or not challenging enough, and thus facilitate the intervention in being safe and effective. Contemporary research on stressor-exposure programmes, and the present thesis, have utilised several such inventories to provide such insight, including: a perceived pressure questionnaire (e.g., Kinrade et al., 2015); subjective measures of anxiety (e.g., Gucciardi et al., 2010); and objective measures of heart-rate (e.g., Oudejans & Pijper, 2009; 2010). However, these methods may be enhanced by advancing more comprehensive subjective tools, or developing research on how psychophysiological, or biofeedback, methods can be used. Indeed, biofeedback is emerging as an increasingly popular tool in elite sport (Beauchamp, Harvey, & Beauchamp, 2012; Gross et al., 2016) and, if further investigated, could provide a means for better assessing responses to pressure. Previous research has found that heart-rate decelerates immediately prior to the execution of a closed-skill, such as golf-putting (Boutcher & Zinsser, 1990) or pistol (Tremayne & Barry, 2001) and rifle shooting (Hatfield, Landers, & Ray, 1987). Lacey and Lacey (1980) theorised that this deceleration, which resulted in a more effective focusing of attention and superior performance, was associated with a decreased amount of feedback to the brain. In contrast, it was also theorised that heart-rate would accelerate if athletes explicitly monitored their skills, such as the movements

of their arms during the putting stroke. With this research in mind, there is an argument for future studies to investigate heart-rate deceleration and self-focus theories of choking under pressure. Further research in this area could provide additional insights into psychophysiological activity and thus advance our understanding of methods for monitoring and managing responses under pressure.

6.5 Strengths and Limitations

There were several strengths to the present thesis. Firstly, the thesis has generated new knowledge on methods for systematically creating pressure and generated a practical framework that is underpinned by research. Secondly, previous research has supported the use of qualitative research methods when there is not a substantial body of literature in a particular area (cf. Strauss & Corbin, 1990). Thus, as little is known about methods for systematically creating pressure (cf. Bell et al., 2013; Oudejans & Pijpers, 2009; 2010; Reeves et al., 2007), it is a strength that the current thesis utilised qualitative methods in study one to obtain in-depth insights. Thirdly, study one was conducted with coaches from male and female, team and individual, disability and able-bodied, adolescent and adult elite sports. This methodology is a strength of the thesis as it supports the generalisability of the findings to a range of elite sport demographics. Fourthly, studies two and three randomised the order in which participants experienced the conditions, thus reducing order effects and strengthening the results. The present programme of research was conducted at training venues and, hence, in the applied field. This design is a further strength as it increases the ecological validity of the thesis.

While the thesis has several strengths, there were also limitations. One such limitation of this thesis is the measure used to assess changes in participants' experiences of pressure. To date, there is not a measure with empirical validity and

reliability coefficients. To overcome this issue, previous research has demonstrated that self-reported state anxiety can be used as an indicator of pressure (Gucciardi et al., 2010; Mesagno & Mullane-Grant, 2010). By including anxiety measures such as the IAMS (Thomas et al., 2002), which has been shown to be reliable and valid (Williams et al., 2010), researchers can still understand experiences of pressure. Thus, in using such a measure, future investigations could overcome these challenges in the absence of a validated measure of pressure.

Another limitation of the present thesis is generalisability. Studies two and three were conducted with two specific sports rather than across a variety. Thus, this restricts the implications of this thesis from being directly applied to wider elite sports. For example, practitioners in specific sport may not necessarily find it effective to adopt a specific stressor used in the present thesis, such as the forfeit of having to perform a verbal task in front of ones' teammates; this stressor may not be suitable in individual sports where athletes do not have teammates. However, the themes that emerged in study one highlighted different categories of stressors (i.e., forfeits, rewards, etc.) that were used by elite coaches from a variety of sports. Thus, although specific stressors used in the present thesis may not transfer, there is an indication that the different categories of stressors can be effectively applied across sports.

6.6 Summary and Concluding Remarks

Pressure training has been highlighted as an intervention for preventing self-focus and distraction methods of choking that could be more effective (Reeves et al., 2007; Oudejans & Pijpers, 2009; 2010), ecological (cf. Lawrence et al., 2014), and popular (Beaumont et al., 2015; Bell et al., 2013; Sarkar, Fletcher, & Brown, 2014) than more widely recognised approaches (Hill et al., 2010a) such as implicit (Mullen

et al., 2007) and analogy learning (Masters, 2000). However, before the commencement of this programme of research, there was no literature investigating methods for systematically producing pressure in sport (cf. Bell et al., 2013; Driskell et al., 2008; Meichenbaum, 2007; Oudejans & Pijpers, 2009; 2010). Specifically, PT literature had documented examples of stressors and pressure being utilised (e.g., Bell et al., 2013; Reeves et al., 2007). However, there was no research investigating how to systematically create stressors and pressure in sport. Moreover, stressor-exposure research had highlighted a three-phased programme for exposing individuals to stressors in applied environments (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996). Yet, while the steps involved in conducting the preparatory phases (i.e., phases one and two) were described in detail, literature was lacking regarding the methods involved in the exposure phase (phase three). Thus, there was limited information that could be taken from the extant stressor-exposure literature and used to inform methods for systematically creating pressure in sport. With this in mind, collectively previous research highlighted examples of stressors being used for PT (e.g., Bell et al., 2013; Reeves et al., 2007), and documented how to perform the preparatory components of stressor-exposure approaches (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996), but lacked research on the methods for systematically creating stressors and producing pressure. This absence of research indicated that stressor-exposure interventions such as PT were currently being utilised in applied sport settings (e.g., Beaumont et al., 2015) without a comprehensive theoretical underpinning.

In light of the literature described above, the aim of this thesis was to investigate methods for creating stressors and pressure in sport. Given the prevalence of pressure training in elite sport (cf. Bell et al., 2013), the intensity of the

pressures experienced by elite athletes (cf. Hill et al., 2010a), and calls to develop methods for helping elite athletes manage them (Hill et al., 2010b), this programme of research was conducted in the area of elite sport. It was identified that including a combination of qualitative and quantitative methods would be important to allow for a holistic exploration of PT environments.

The framework generated in study one contributes original insights on methods for systematically producing pressurised training environments. Subsequent research in studies two and three tested different components of this framework. The findings of these studies supported the application of the framework and expanded insight about methods for systematically producing pressure and conducting PT. While research in this area is still in its infancy and in need of further exploration (cf. Bell et al., 2013; Driskell & Johnston, 1998, Driskell et al., 2008; Johnston & Cannon-Bowers, 1996; Oudejans & Pijpers, 2009; 2010), in expanding insight regarding methods for systematically producing pressure and conducting PT the present thesis findings have substantial applied implications. Specifically, these insights can be combined with previous research highlighting examples of stressors being used for PT (e.g., Bell et al., 2013; Reeves et al., 2007), and research into methods for performing the preparatory phases of stressor-exposure (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996), to outline a more comprehensive account of all the components involved in PT. With this in mind, chapter seven combines the discoveries of the present thesis and previous stressor-exposure literature to provide an epilogue detailing how to conduct a comprehensive PT programme in elite sport.

CHAPTER VII

7.0 Epilogue

Pressure Training: From Theory to Practice

7.1 Introduction

In sport, there had been an absence of research investigating methods for systematically creating stressors and pressure (cf. Driskell & Johnston, 1998; Fletcher & Sarkar, 2016; Oudejans & Pijpers, 2009; 2010). Specifically, PT literature had documented specific examples of stressors and pressure being utilised (e.g., Bell et al., 2013; Reeves et al., 2007). However, there was no research investigating how to systematically create stressors and pressure. Additionally, previous stressor-exposure research had highlighted a three-phased programme for exposing individuals to stressors (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996). Yet, while the steps involved in conducting the preparatory phases (i.e., phases one and two) were outlined in detail, research into the methods required for performing the stressor-exposure phase (phase three) was sparse. Rather, it was highlighted that the process for developing stressors should be done in a bespoke manner according to each specific applied context (Driskell et al., 2008; Driskell et al., 2014). Therefore, there was limited information that could be taken from the extant stressor-exposure literature and used to inform methods for systematically creating pressure in sport. With this literature in mind, the extant research highlighted examples of stressors and pressure being utilised (e.g., Bell et al., 2013; Reeves et al., 2007), and documented how to perform the preparatory components of a stressor-exposure programme (e.g., Driskell et al., 2014; Johnston & Cannon-Bowers, 1996). However, literature into the methods involved in creating stressors and producing pressure was lacking. This absence of research indicated that

stressor-exposure interventions such as PT were being utilised in applied sport settings without a comprehensive theoretical underpinning.

Addressing this gap in research, the present thesis investigated how to systematically create stressors and pressure in sport, expanding knowledge on methods for systematically producing pressure and conducting PT. In this way, the insights gained from this thesis inform a process for implementing the stressor-exposure component of an intervention. Importantly, the research was conducted in applied sport settings, thus satisfying the proposition that the process for developing stressors should be specific for each applied context (Driskell et al., 2008; Driskell et al., 2014). With this in mind, this epilogue will combine the novel findings gained by the present thesis regarding stressor-exposure together with the extant previous literature regarding how to perform the preparatory components of stressor-exposure approaches to underpin the identification of an original comprehensive PT programme. In documenting such a programme, the epilogue is divided into three sections and intended as a guide for coaches and practitioners. The first section focuses on the description of the preparatory stage. The second section outlines the stressor-exposure stage, while the third section details how to conduct the review stage (see Figure 4).

7.2 Stage One: Preparation

The preparation stage has two components, to develop environmental support and to develop coping skills (see Figure 4) (cf. Bell et al., 2013; Driskell & Johnston, 1998). The process for developing environmental support involves two components (cf. Fletcher & Sarkar, 2016).

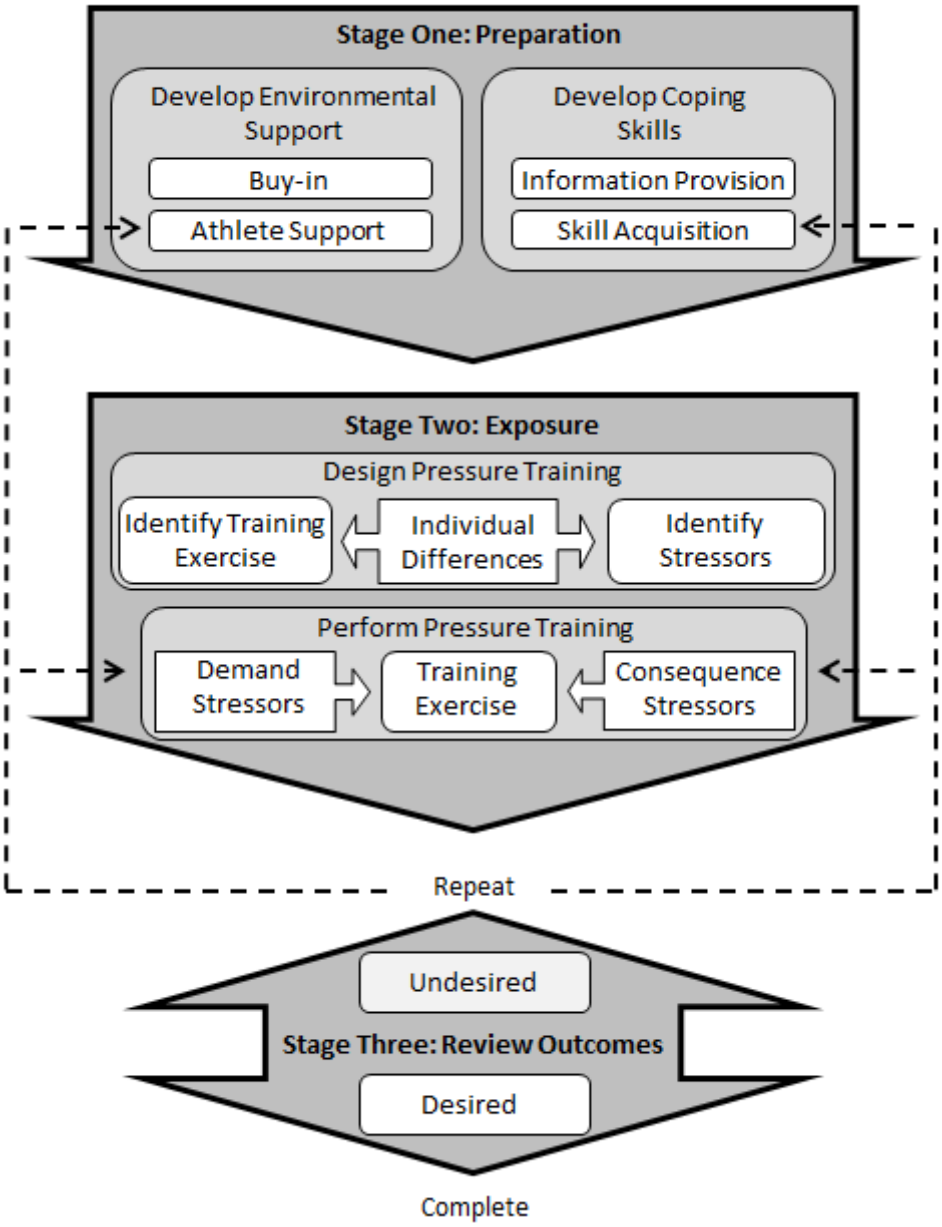

Figure 4: A pressure training programme

7.2.1 Develop environmental support. Research has highlighted the importance of developing a supportive environment when conducting stressor-exposure programmes (cf. Fletcher & Sarkar, 2016). In performing this component it is vital to secure “buy-in” from the key stakeholders of a sport organisation and prepare the environment to provide athletes with the required support to manage the intervention (cf. Bell et al., 2013). Regarding buy-in, previous literature has indicated the importance of ensuring a PT intervention is fully supported by the staff, management, and coaching team. For example, in obtaining the samples for study two and three of this thesis, it was important to ensure the intervention was supported by the key stakeholders of each sport. This initially involved gathering the backing of the PD and Head Coaches. However, in study three it was discovered that there was a need to garner support from all members of staff (e.g., strength and conditioning coach, physiotherapist). Specifically, in preparing one of the studies in this thesis, a coach was initially hesitant about PT and could have restricted access to athletes and thus compromised the intervention. This situation was quickly resolved following a meeting that provided the coach with an in-depth explanation of the precise aim, design, and outcomes of the study. Hence, in performing the PT programme presented in this thesis, the first component to develop environmental support is to secure the backing of the whole sport.

Research has also indicated that, when developing a supportive environment, this should include creating specific athlete support systems (cf. Fletcher & Sarkar, 2016). For example, Bell et al., (2013) utilised transformational leadership to achieve this goal. Specifically, a multidisciplinary team of coaches, ex-international cricketers, medical staff and psychologists delivered the intervention together in a transformational manner by repeatedly articulating an inspirational vision of the

future, expressing belief in the players, and role-modelling appropriate behaviours (e.g., taking responsibility for mistakes). Examples of other support systems include providing athletes with regular meetings with specific members of the Multi-Disciplinary Team, such as the psychologist, or allowing athletes to have a “pause button” during stage two whereby they can take a break, at any point, during stressor-exposure (cf. Wells, White, & Carter, 2010). As can be seen, literature outlines the importance of establishing necessary support systems for athletes participating in PT.

7.2.2 Develop coping skills. The second component of stage one is to cultivate athlete coping skills (see Figure 4). Within this component, the roles of information provision and coping skill acquisition will be presented (Johnston & Cannon-Bowers, 1996). Regarding information provision, research on applied stressor-exposure programmes highlights two important steps in this process. The first step involves the provision of preparatory information to athletes. Such information should be provided prior to stressor-exposure and regard the interaction between stressors and human functioning (Driskell et al., 2008). Specifically, literature indicates that it is first important to deliver “indoctrination” information to athletes to increase motivation towards the intervention (Johnston & Cannon-Bowers, 1996). This process may include relevant case examples of occasions when stressors have significantly impacted on human functioning (Driskell & Johnston, 1998) such as that of Jean Van de Velde performing sub-optimally under pressure on the last hole at the 1999 British Open Golf competition (Clark, 2002). In line with Driskell and colleagues’ (2008) research, the benefits of participating in a PT programme could then be discussed.

Research indicates that receiving preparatory information about a threat can lessen negative reactions to future encounters (Druckman & Swets, 1988; Vineberg, 1965). It has been theorised that this is due to enhanced familiarity, predictability, and controllability (Cohen & Lambie, 1978; Driskell et al., 2008; Locke et al., 1984). With this in mind, literature suggests that a second important step in the information provision process is the delivery of preparatory information about psychophysiological responses (Driskell et al., 2008). Specifically, in previous stressor-exposure literature, sensory (i.e., information about how humans physically react to stressors), procedural (i.e., information about events that are likely to occur) and instrumental (i.e., information regarding what to do to counter the undesirable effects of stressors) knowledge has been provided (Driskell et al., 2008). For example, a discussion of sensory information could include contemporary research, presented in an athlete-friendly format, on the physiological and psychological effects that pressure has on sport performers. This session could include information about how the brain responds under pressure (e.g., Gray & McNaughton, 2000) as well as discussion with athletes who have experience of managing the effects of pressure. A dialogue on procedural information could involve the specific stressors that athletes face in their relative environments as professional, elite performers. This dialogue could concern training, competition, and organisation stressors (cf. Thelwell, Weston, Greenlees, & Hutchings, 2008). Finally, in providing instrumental information, sessions could take place regarding what to do under pressure and these could include discussions about research (e.g., Galli & Vealey, 2008), video footage, or live presentations from athletes who have had to manage the undesirable effects of stressors.

In stage one, to reduce negative responses to stressor-exposure (cf. Gray & McNaughton, 2000), athletes are provided with the means to develop their personal coping skills (see Figure 4) (cf. Gould, Eklund, & Jackson, 1993; Johnston & Cannon-Bowers, 1996). Coping is a complex and multidimensional process, and it is unlikely that any single coping strategy will be effective in all situations (Hardy et al., 1996). Yet, there are some general implications that can be drawn from previous research to guide best practice when performing a PT programme. Specifically, previous literature has supported the development of specific skills such as: cognitive control, physiological control, overlearning, imagery, multitasking training, error training, and self-talk (Driskel et al., 2008; Driskell & Johnston, 1998). For example, it has been proposed that imagery is effective for building personal coping skills in situations where the stressors contained in the performance environment are complex or dangerous (i.e., contact sport), or where the opportunity to experience a particular stressor is limited (i.e., spectators) (cf. Driskell et al., 2008). Utilising such an approach could involve upskilling athletes on how to use imagery to manage stressors and pressure (cf. Crocker, Alderman, & Smith, 1988; see Figure 4). As another example, research has supported the practice of developing self-talk in preparation for stressor-exposure. Specifically, Crocker and colleagues (Crocker et al., 1988) examined the impact of a Stress Exposure Training intervention on volleyball service reception where personally relevant, self-talk statements were developed by the participants prior to stressor-exposure. During this training, a former Canadian National volleyball team member illustrated to the participants how to apply self-talk when serving. In a post-treatment assessment, the participants had superior service reception performance compared to the control group.

In accordance with the research described above, coping skills should be developed prior to stressors exposure. While specific skills have been highlighted in previous literature (Driskell et al., 2008), it is important to note that a range of coping strategies should be encouraged in preparation for stressor-exposure (cf. Gould et al., 1993).

7.3 Stage Two: Exposure

Following the development of environmental support factors, and athlete coping skills in stage one, stage two can be implemented. Largely informed by the insights gained from conducting the present thesis, stage two has two components; the designing and performing of PT (see Figure 4).

7.3.1 Designing PT. The first component of stage two is to design the PT session that athletes will be exposed to. This component involves a consideration of individual differences, identifying a PT exercise, and selecting demand and consequence stressors. Regarding individual differences, the findings of study one indicate that, when performing PT, a consideration of each athlete's characteristics and preferences should facilitate the process. Specifically, study one found that elite coaches believed athletes' responses to pressure could be as individual as "a finger print". In accordance, stressors were tailored for recipients to ensure that they were effective in creating pressure that was calibrated at the appropriate intensity. For example, all the participants in study three suggested that partaking in a post-performance media conference would be a forfeit that would produce high levels of pressure so long as each athletes' specific coach was present. Consequently, a media conference was utilised as a forfeit; however, this information about individual differences was used to mediate the design of the stressor whereby it was ensured that each participants' specific coach was always present. Thus, in line with this

research, the PT programme outlined in this chapter proposes that individual differences are considered throughout the process of PT design and delivery (see Figure 4).

Studies two and three also revealed insights on methods for designing the PT intervention. In these studies, the training exercise was designed prior to the identification of demand or consequence stressors. In study two this was a Netball shoulder pass exercise, and in study three this involved shooting a string of 10 shots at a target 10 meters away. In both of these studies, the training exercise was developed via meetings between the primary researcher and Head Coaches. In these meetings, the coaches use their experience to lead in the identification of an exercise that met the required criteria. For example, in studies two and three, one of the researcher's criteria was that the exercise presented a moderately easy level of challenge, so that it was sensitive to the changes in difficulty that would result when demand stressors were manipulated. Additionally, the exercise needed to facilitate the ability to use the heart-rate measurement apparatus, which restricted certain movement patters. In both studies, one of the criteria of the coaches was that the exercise supported the physical skills that were at that time a focus of development within the larger training programme. Once a training exercise is selected that meets all criteria, specific stressors can be identified.

In studies two and three, after the design of the PT exercise, demand stressors were identified, followed by consequences. These stressors were refined using the PT framework developed in study one. Specifically, demand stressors, which shape the difficulty of the training goals, were identified through a series of meetings with the coaches. In these meetings the framework facilitated conversations on possible task, performer, and environmental stressors that were

available. Following this, different combinations of these stressors were discussed to provide further insight into the different types of challenges that could be designed. This process continued, over several meetings, until the coaches and researcher reached agreement regarding the final demand stressors to be used.

Consequences, which regard performance contingent outcomes, were identified and selected in meetings with the athletes participating in the intervention and then members of staff. In the athlete meetings, the framework developed in study one was used to systematically discuss reward, forfeit, and judgment stressors. Questions on each of these types of stressors were posed with a view to discovering athletes' dispositions towards these consequences in competitive, professional, and social situations. This process led to the identification of a comprehensive list of bespoke stressors and qualitative information regarding their significance. Subsequent meetings were then held with relevant members of the support staff and coaching team. Here, the bespoke stressors were discussed at length and sometimes additional stressors, that the athletes had not mentioned, were identified. On such occasions, it was required to have follow-up conversations with athletes. This process continued until the final stressors were selected and agreed upon by the athletes, staff and coaches.

Based on this research, when designing specific stressors, demands should be identified before consequences. Specific types of stressors are identified utilising the framework developed in study one and through a process of athlete and staff collaboration (see Figure 4).

It should be noted that, in study one, coaches organised the demand stressors to present athletes with situations representative of what they experience in competition, such as chasing or defending a score. This process was perceived to

increase skill transfer from training to the performance environment. Consequences, however, were not manipulated in this way due to the difficulty of mobilising the types of consequences found in competition, such as thousands of pounds of prize money. Literature supports this notion, as it has been previously noted that it is not always required, or desired, to have complete stressor fidelity (Driskell & Johnston, 1998). Secondly, study three indicated that the forfeit and judgment stressors were particularly effective at creating pressure. Thus, specific types of consequences, such as forfeits and judgment stressors, are likely to be particularly effective for creating pressure, and skill transference may be enhanced by structuring the demand stressors to emulate competition.

7.3.2 Performing pressure training. The second component of stage two is to perform PT (see Figure 4). In line with the research conducted for the present thesis, this involves introducing demand and consequence stressors into a specific training exercise.

Study one revealed that elite coaches introduced demand and consequence stressors into a training exercise to create pressurised training environments. Testing the efficacy of this process, studies two and three suggested that demand and consequence stressors may have distinct roles to play when PT. Specifically, introducing consequences (on their own) can be an effective method for incrementing pressure. On the other hand, while manipulating demand stressors in isolation appears effective for affecting performance, and potentially confidence, these stressors may be ineffective at influencing pressure if introduced in isolation. In light of this research, when performing PT, the programme presented in this epilogue proposes the following steps be taken. Initially, the exposure process should begin with the PT exercise, as identified in the design process, without the introduction of

any stressors. After this, demand stressors are slowly introduced to alter the level of difficulty and standard of performance. When the demands are at the required level, consequence stressors can be introduced, also in a graduated manner (cf. Keinan & Friedland, 1996), to gently increase perceived pressure. Once the appropriate level of challenge has been achieved, athletes PT under these conditions whilst outcome measures are collected.

Regarding measures, studies two and three found significant differences when using both perceived pressure and anxiety as a means for collecting information on athletes experiences whilst PT (cf. Kinrade et al., 2010; 2015; Oudejans & Pijpers, 2009; 2010). Concerning stressor interactions, study one provided some qualitative evidence that demand and consequence stressors have an interactive relationship. Specifically, some athletes might experience more pressure when exposed to consequences and difficult demands while others experience more when exposed to consequences and easy demands, due to increased expectation. With these insights in mind, when performing the PT programme presented in this thesis, the possible interactive relationship between certain stressors should be considered, although further research is needed to explore this finding. Moreover, the merits of using multiple forms of measurements, such as anxiety and pressure, also require reflection.

7.4 Stage Three: Review Outcomes

Following stage two (i.e., the design and performing of PT), stage three should be conducted (see Figure 4). Stage three is comprised of one component, and that is the appraisal of the measures so as to determine whether the desired outcomes have been achieved or not. Specifically, research suggests that it is important to conduct a stressor-exposure review (Johnston & Cannon-Bowers,

1996). In conducting such a review, actions can be taken depending on whether outcomes have been met which involve athletes repeating components of the programme (cf. Goldstein, 1993). Previous literature has indicated that this criteria can concern the amount of challenge an athlete should experience and the level performance they should produce (cf. Fletcher & Sarkar, 2016). Studies two and three support this process, whereby specific criteria, relating to levels of challenge and performance, where identified pre-intervention and used post-intervention to facilitate a review. Specifically, the researcher, Head Coaches and PD discussed the outcomes in light of the desired criteria. It had previously been agreed that, depending on the outcomes, athletes would either be finished with or have to repeat components of the intervention as part of further training that would not contribute to the study.

With this literature in mind, performing stage three of the PT programme presented in this thesis involves conducting a review following stressor-exposure. If the desired outcomes have been achieved, the athlete has completed the programme. However, in the case of outcomes not having been met, the following steps should be taken. If an athlete has been under-challenged, the environmental support that was developed in stage one (the preparation stage) can be deceased. For example, athletes could have their “pause button” retracted. Athletes can then repeat stage two with less environmental support, thus increasing the level of challenge. Also, the demand and consequence stressors used in stage two can be increased to present a higher level of challenge. If athletes have been over-challenged, environmental support can be increased, as can individual coping skills. Athletes will then be able to repeat PT equipped with more support and coping skills, and thus with less challenge. Also, stressors can be decreased during PT, so as to

present a lower level of challenge. This process should be repeated until the desired outcomes are accomplished.

7.5 Conclusion

This epilogue has used previous research and the findings of the present thesis to highlight a programme for conducting a PT programme in elite sport. It is intended that this epilogue provides guidance that can be used by applied practitioners and coaches across sports to develop pressurised training environments for preventing choking and, thus, enhancing performance under pressure.

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APPENDICES

Appendix 1: Appendices for Study One

Appendix 1.1: Ethics Application and Approval

CONFIDENTIAL

Sheffield Hallam University

Faculty of Health and Wellbeing
Research Ethics Committee

Sport & Exercise Research Ethics Review Group

APPLICATION FOR ETHICS APPROVAL OF RESEARCH

In designing research involving humans, principal investigators should be able to demonstrate a clear intention of benefit to society and the research should be based on sound principles. These criteria will be considered by the Sport and Exercise Research Ethics Review Group before approving a project. **ALL** of the following details must be provided, either typewritten or word-processed preferably at least in 11 point font.

Please either tick the appropriate box or provide the information required.

1) Date of application	21/1/13
2) Anticipated date of completion of project	October, 2013
3) Title of research	Elite Coaches' beliefs, perceptions and methods of bringing psychological pressure into training.
4) Subject area	Sport Psychology.
5) Principal Investigator	
Name	**Mike Stoker**
Email address @ SHU	**michael.stoker@student.shu.ac.uk**
Telephone/Mobile number	**07977725885**
Student number (if applicable)	B1053527
6) State if this study is: (If the project is undergraduate or postgraduate please state module name and number)	[✓] Research [ ] Undergraduate [ ] Postgraduate **Module name:** **Module number:**
7) Director of Studies/Supervisor/ Tutor name	Ian Maynard
8) Intended duration and timing of	March 2013 – October 2013

project?	

9) Location of project If external to SHU, provide evidence in support (see section 17)	Sport venues. English Institute of Sport establishments will also be used.

10) State if this study is:	[ ] New [ ] Collaborative (please include appropriate agreements in section 17) [ ] Replication of :

11) Purpose and benefit of the research
Statement of the research problem with any necessary background information (no more than 1 side of A4)

The purpose of the research is to explore elite coaches' beliefs, perceptions and methods of bringing psychological pressure into training.

When the phenomenon of training under stress first started in the 1980's, it was under the term stress training (ST). Most ST literature in sport took place in this decade, with the majority of investigations stemming from Mace's research group (e.g., Mace, Eastman & Carroll, 1987). By the 1990's, research in sport had all but tapered off completely, contributing to calls that efforts to apply ST in applied environments were limited and narrowly focussed (Johnston & Cannon-Bowers, 1996). Johnston and Cannon-Bowers (1996) argued, "more work is needed to determine how training for stress exposure can be designed to enhance performance in various task environments" (p.225). The evidence outlined above distinguishes a research problem whereby ST in sport needs development due to current models being too limited.

A further problem is that there is a lack of information explaining how to go about implementing ST in an applied setting. This argument is relevant to the sporting domain, where no framework has ever been designed specifically to explain how athletes can apply pressure in practice. Models have been transferred over from mostly clinical research (e.g., stress inoculation training; Mace, Eastman & Carroll, 1987), though this process has been argued to be problematic due to the underlying assumptions of the adapted model no longer aligning with the environment it is being applied in (Johnston & Cannon-Bowers, 1996). The lack of work around the production of frameworks detailing how different domains might apply ST in their respective fields has been voiced as a concern by Ross, Szalma and Hancock (2004): "little work had been done to integrate research findings into a conceptual framework to guide the development of incorporating stressors into training" (p.2). This argument provides a second problem in sport, outlining a furthering rationale for progressing a ST research in sport, and focuses on the importance of developing a framework that documents exactly how to build stressors into applied training environments.

Research into ST in sport tapered off in the 1990's, until recently when two papers have investigated the impact of training with anxiety on performance. Unlike previous research, these studies do not contain an intervention that includes the explicit teaching of coping mechanisms, choosing instead to encourage improvement via natural/implicit learning (c.f. Oudejans & Pijpers, 2009). This new method of ST is called anxiety training, and the results of this current literature endorse previous notions that ST effectively improves performance (Oudejans & Pijpers, 2009, 2010), warranting further research in order to thoroughly outline how to ST in current sporting environments.

Thus, to address these problems and these rationales for developing a stress training framework in current elite sport, this study will make up the first of four that aim to cultivate a framework. However, instead of using the work stress to outline the phenomenon that athletes' experience, it will be replaced with the work pressure as it better describes the experience. More specifically, when the first ST programmes were created, the word "stress" was used to fit the environments for which they were intended (i.e., clinical domains). In these clinical environments, the focus was on fixing disorders, and not on improving a performance (c.f. Wolpe, 1959). When ST was taken out of the clinical domain and applied in other areas, the term stress continued to be used to describe the constraints encountered in training (c.f. Mace, Eastman & Carroll, 1987). However, using the term stress and ST when referring to sporting performance neglects an aspect that warrants recognition. Namely, in sport, individuals desire to perform their best, and this

has been termed performance pressure (Baumeister, 1984; Beilock & Carr, 2001). Using the term stress indicates the presence of stressors but does not indicate the presence of a desire to perform ones best. The term pressure, on the other hand, outlines the presence of both stressors and a desire for the individual to perform their best, thus making it a more appropriate word to define the phenomenon as it occurs in sport. Accordingly, future research to consider clarifying the terms used to describe ST in different domains, and there is a rationale for future endeavours in sport to adopt the term pressure training (PT).

This study will move towards developing a PT framework by exploring elite coaches' beliefs, perceptions and methods of bringing psychological pressure into training. This information will bring to light the key themes central to building pressure in training, and thus information that will play a pivotal role in developing the framework in study two.

12) Participants	
12.1 Number	Until saturation: Commonly between 14-40
12.2 Rationale for this number (eg calculations of sample size, practical considerations)	In line with previous research, saturation is most commonly a number between 7-20, depending on the population used.
12.3 Criteria for inclusion and exclusion (eg age and sex)	Ages used will be 18+. Both males and females may be used. Coaches are required to have worked with Olympic-standard athletes for a sustained period of time (e.g. a minimum of 5 years; Mills, Butt, Maynard & Harwood, 2012; Olusoga, Maynard, Hays & Butt, 2012), and have implemented a pressure training programme whereby stressors were purposefully incorporated into practice.
12.4 Procedures for recruitment (eg location and methods)	Face-to-face communication, phone calls, and emails will be used to purposively sample. Locations of the face-to-face communications will likely be the sporting venues where athletes and coaches train. Contacts within the English Institute of Sport will be used to acquire the details of athletes and coaches.

12.5 Does the study have *minors or ‡vulnerable adults as participants?	[ ] Yes [✓] No
12.6 Is CRB Disclosure required for the Principal Investigator? (to be determined by Risk Assessment)	[ ] Yes [✓] No If yes, is standard [ ] or enhanced [ ] disclosure required?
12.7 If you ticked 'yes' in 12.5 and 'no' in 12.6 please explain why:	

*Minors are participants under the age of 18 years.
‡Vulnerable adults are participants over the age of 16 years who are likely to exhibit:
a) learning difficulties
b) physical illness/impairment
c) mental illness/impairment
d) advanced age
e) any other condition that might render them vulnerable

13) Details of the research design

13.1 Provide details of intended methodological procedures and data collection. (For MSc students conducting a scientific support project please provide the following information: a. needs analysis; b. potential outcome; c proposed interventions).

Two-to-three pilot interviews will take place in order to test the interview guide. Based on the information received from these interviews, the guide will be amended accordingly. Following this, study 1 data collection will begin.
Data will be collected via semi-structured interviews, conducted by the principal investigator. Participants will be recruited via email/phone/face-to-face and an information letter and consent form will be sent out to them via post/email. The principal investigator will then arrange a convenient date, time and location for the interview to take place. The principal investigator will digitally record interviews and questions will concern the areas highlighted above. Interviews will be semi structured so there is a guide for the interview but discussion is primarily lead by participants.

13.2 Are these "minor" procedures as defined in Appendix 1 of the ethics guidelines?

[✓] Yes [ ] No

13.3 If you answered 'no' in section 13.2, list the procedures that are not minor

13.4 Provide details of the quantitative and qualitative analysis to be used

The information generated will be analysed in order to explore elite athletes' and coaches' beliefs, perceptions, and methods of bringing psychological pressure into training. This will be achieved through thematic analysis of elite coaches' and athletes' narratives. Thematic **analysis (Braun & Clarke, 2006) will be used to highlight recurring/common themes** reported amongst coaches/athletes. Following this, relationships will between themes will be considered, Furthermore, these themes will be summarised and explained in order to highlight how PT is currently used and what factors are important for the future creating of a framework. Thematic analysis will be achieved via following the well-documented steps (i.e. by Braun & Clarke, 2006).

Member checking procedures will also be carried out to ensure that the results accurately represent participants' experiences and the meaning generated. This will involve participants 'checking' the data via presenting the conceptualisation and framework generated from the study, to all participants and making adjustments if necessary (Lincoln & Guba, 1985; Gucciardi et al. 2008).

14) Substances to be administered (refer to Appendix VI of the ethics procedures)

14.1 The protocol does not involve the administration of pharmacologically active substances or nutritional supplements.

Please tick box if this statement applies and go to section 15) [ ]

14.2 Name and state the risk category for each substance. If a COSHH assessment is required state how the risks are to be managed.

n/a

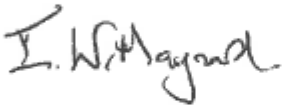
15) Degree of discomfort that participants might experience

Consider the degree of physical and psychological discomfort that will be experienced by the participants. State the details which must be included in the participant information sheet to ensure that the participants are fully informed about any discomfort that they may experience.

Low-level psychological discomfort, as coaches will be considering how they use psychological pressure in training.

16) Outcomes of Risk Assessment Provide details of the risk and explain how the control measures will be implemented to manage the risk.
n/a

17) Attachments	**Tick box**
17.1 Risk assessment (including CRB risk assessment)	☑
17.2 COSHH assessment	
17.3 Participant information sheet (this should be addressed directly to the participant (ie you will etc) and in a language they will understand)	☑
17.4 Informed consent form	☑
17.5 Pre-screening questionnaire	
17.6 Collaboration evidence/support correspondence from the organisation consenting to the research (this must be on letterhead paper and signed) See sections 9 & 10.	
17.7 CRB Disclosure certificate or where not available **CRB application form**	
17.8 Clinical Trails form (FIN 12)	

18. Signature Principal Investigator	Once this application is approved, I will undertake the research study as approved. If circumstances necessitate that changes are made to the approved protocol, I will discuss these with my Project Supervisor. If the supervisor advises that there should be a resubmission to the Sport and Exercise Research Ethics Review Group, I agree that no work will be carried out using the changed protocol until approval has been sought and formally received. _____ Date: 25/3/2013 Principal Investigator signature Name: Mike Stoker _____
19. Approval Project Supervisor to sign **either** box A <u>or</u> box B as applicable (refer to Appendix I and the flowchart in appendix VI of the ethics guidelines)	**Box A:** I confirm that the research proposed is based solely on 'minor' procedures, as outlined in Appendix 1 of the HWB Sport and Exercise Research Ethics Review Group 'Ethics Procedures for Research with Humans as Participants' document, and therefore does not need to be submitted to the HWB Sport and Exercise Research Ethics Review Group. In terms of ethics approval, I agree the 'minor' procedures proposed here and confirm that the Principal Investigator may proceed with the study as designed.  _____ Date: 25/3/2013 Project Supervisor signature Name: Ian Maynard
	Box B: I confirm that the research proposed is <u>not</u> based solely on 'minor' procedures, as outlined in Appendix 1 of the HWB Sport and Exercise Research Ethics Review Group 'Ethics Procedures for Research with Humans as Participants' document, and therefore <u>must</u> be submitted to the HWB Sport and Exercise Research Ethics Review Group for approval. I confirm that the appropriate preparatory work has been undertaken and that this document is in a fit state for submission to the HWB Sport and Exercise Research Ethics Review Group. _____ Date Name :
20. Signature Technician	I confirm that I have seen the full and approved application for ethics approval and technical support will be provided. _____ Date _____ Technician signature Name _____

Appendix 1.2: Risk Assessment

Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

Risk Assessment Pro Forma

****Please ensure that you read the accompanying Risk Assessment Risk Ranking document before completing this form****

Title of research	Elite Coaches' beliefs, perceptions and methods of bringi psychological pressure into training.
Date Assessed	25/03/2013
Assessed by (Principal Investigator)	Mike Stoker

Signed	**Position**
M Stoker	Principal Investigator

Activity	**Risks**	**Control Measures**
• Interviewing: travelling alone/irregular hours, meeting with unfamiliar persons.	Risk of harm caused by interviewing. Risk = C1 X L1 Risk category = **Low.**	The principal investigator shall meet the interviewees alone in a public venue and will make the supervisory team aware of whereabouts and intentions throughout the data collection period.

Risk Evaluation (Overall)
The estimation (of the likelihood (probability), and potential consequences (harm) of a defined hazard) is that the risk is: **LOW**

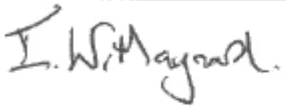
General Control Measures
Is a pre-screen medical questionnaire required? No

Emergency Procedures
N/A

Version 1 March 2011

Monitoring Procedures
N/A

Review Period	March 2013

Reviewed By (Supervisor)	Date
	25/03/2013

Appendix 1.3: Participant Information Sheet

Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

Participant Information Sheet

Project Title	Exploring elite coaches experiences of pressure in training
Supervisor/Director of Studies	Professor Ian Maynard
Principal Investigator	Mike Stoker
Principal Investigator telephone/mobile number	07977725885

Purpose of Study and Brief Description of Procedures
(Not a legal explanation but a simple statement)

Hello, I'm Michael Stoker from The English Institute of Sport and Sheffield Hallam University. Thank you for choosing to participate in this interview study. In this project I am talking to elite coaches from a variety of sports about their experiences of using pressure in training. Broadly speaking, pressure training (PT) is a method of creating stressful training environments for athletes, in order to teach them how to perform in the face of the stress encountered in high performance sport.

The purpose of this study is to gain an insight into coaches' beliefs, perceptions and methods of bringing pressure into training. During the following discussions I am interested in your experiences of coaching [sport], and in hearing about if you think it's possible to create pressure, and if so, how. I'm also interested to see if you think pressure training works, and what your opinion on how athletes learn to cope with pressure.

The information from this study will be used in a number of ways:

1. To contribute towards study 1 of my PhD, with the overall aim of the PhD being to develop a pressure training framework. Study 1, and other parts of the PhD may be published in a peer-reviewed journal.
2. The information that arises from this study may be presented anonymously at workshops, conferences, or other such events.
3. To improve the quality of my applied consultancy with athletes.

I would like to emphasise that all the information you provide me with will remain completely confidential unless you give permission otherwise. In the presentation of the results I may want to use selected quotes from our discussions in order to illustrate important ideas. These will be strictly anonymous and I will ensure your identity is protected. I will be using a digital recording device to get complete and accurate information and to make the research process more efficient. This procedure is also necessary so that I will be able to make a typed transcript for later scrutiny and reference.

As a participant in this study you have several rights. Your participation is entirely voluntary and you are free to decline to answer any questions I will be asking or stop the discussions at any point. There are no right or wrong answers to the questions I will be asking. I want to learn and benefit from your experience and expertise so that I can better understand how pressure training works in

elite sport. I hope, therefore, that you will answer the questions in a candid and straightforward way. If there are any questions that you are not comfortable answering, I would rather you decline to comment than tell me what you think I, or others, might want to hear. So if you would prefer not to answer a question, simply state "no comment" and I will move straight onto the next question. Since you will have to think back in time, you might not be able to immediately remember some things. Take your time as you try to recall the past; pauses are fine. If you cannot remember after trying to think back, then just let me know.

Do you have any questions about what I have talked about so far? If you have any questions as we go along please ask them. Okay, I just need you to sign this written informed consent and then we can begin.

The interview contains several sections covering various issues associated with your views on pressure. At the end of each section there will be an opportunity for you to add anything that you felt was important and not covered in the questions asked.

If necessary continue overleaf

It has been made clear to me that, should I feel that these Regulations are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform Dr Donna Woodhouse, Chair of the Sport & Exercise Research Ethics Review Group (Tel: 0114 225 5670) who will undertake to investigate my complaint.

Exploring elite coaches experiences of pressure in training

Pilot participant number:

Name:

Age:

Gender:

Address:

Telephone number(s):

E-mail(s):

Sport(s) you coach:

Years coaching in current sport:

Years coaching in elite sport:

Current coaching level:

Major achievements:

Interview date:

Time begun:

Time ended:

Duration of interview:

Appendix 1.4: Informed Consent Form

Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

INFORMED CONSENT FORM	
TITLE OF PROJECT: Exploring Elite Coaches' Beliefs, Perceptions and Methods of Bringing Psychological Pressure into Training.	
The participant should complete the whole of this sheet himself/herself	
Have you read the Participant Information Sheet?	YES/NO
Have you had an opportunity to ask questions and discuss this study?	YES/NO
Have you received satisfactory answers to all of your questions?	YES/NO
Have you received enough information about the study?	YES/NO
To whom have you spoken? ..... Do you understand that you are free to withdraw from the study: • at any time • without having to give a reason for withdrawing • and without affecting your future medical care	YES/NO
Have you had sufficient time to consider the nature of this project?	YES/NO
Do you agree to take part in this study?	YES/NO
Signed ..... Date ..... (NAME IN BLOCK LETTERS).....	
Signature of Parent / Guardian in the case of a minor	

Version 1 March 2011

FOR USE WHEN STILL OR MOVING IMAGES WILL BE RECORDED

Consent to scientific illustration

I hereby confirm that I give consent for photographic and/or videotape and sound recordings (the 'material') to be made of me. I confirm that the purpose for which the material would be used has been explained to me in terms which I have understood and I agree to the use of the material in such circumstances. I understand that if the material is required for use in any other way than that explained to me then my consent to this will be specifically sought.

1. I understand that the material will form part of my confidential records and has value in scientific assessment and I agree to this use of the material.

Signed..... Date.....

Signature of Parent / Guardian in the case of a minor

.....

2. I understand the material has value in teaching and I consent to the material being shown to appropriate professional staff for the purpose of education, staff training and professional development.

Signed..... Date.....

Signature of Parent / Guardian in the case of a minor

.....

I hereby give consent for the photographic recording made of me on..... to be published in an appropriate journal or textbook. It is understood that I have the right to withdraw consent at any time prior to publication but that once the images are in the public domain there may be no opportunity for the effective withdrawal of consent.

Signed ..... Date .....

Signature of Parent / Guardian in the case of a minor

.....

Version 1 March 2011

Section Two[2] - Preliminary Rapport Questions

I'd like to start off and ease into this interview by initially asking you some general questions on your sport.

	Interview questions NOT LONG
2.1	What do you enjoy most about coaching your sport?
2.2	What coaching accomplishment are you most proud of?

Section Three – Broad Experience of Pressure Training

Now I'd like to ask you some questions on you're your opinion of what pressure is and where it comes into your sport and training.

	Interview questions NOT LONG	Participant probes
3.1	What do you think pressure is?	• What has informed this definition?
3.2	Do you personally use pressure in training sessions?	• For what reasons?

Section Four – Creating Pressure

I'd like to now ask you some questions on your experience of using pressure in training.

4.1	Can you tell me what you do to create pressure training environments?	• Individual • Task • Environment • Overall, what are we trying to manipulate?
4.2	Can you explain how do you go about designing and producing these things?	•
4.3	How does pressure training impact on performance?	•
4.4	Can you discuss that training has to be of a certain difficulty in order for there to be pressure?	•
4.5	Can you discuss how athletes must desire to perform their best in order to feel pressure?	•

[2] All following sections recorded on tape.

4.6	Before proceeding to the next section, are there any other ways you create pressure that we haven't spoken about?	•

Section Six – Structuring Pressure Training for Development

In this section of the interview and I would like to ask you some questions on how you've structured sessions where you used pressure.

	Interview questions	Participant probes
5.1	Does pressure in training have to be exactly the same as it is in competition?	• Why?
5.2	Who should pressure train?	• Gender, age, personality type? • Can it be bad?
5.3	Can you discuss how you plan for pressure training?	• How is it informed by previous pressure training?
5.4	When in a cycle do you pressure train?	• For how long? One day?
5.5	Can you discuss how you review pressure sessions?	• How does it inform future pressure training?
5.7	When a skill breaks down under pressure, how do you know whether the skill needs to be embedded more, or if the athlete needs to learn how to cope with pressure better?	•

Section Six - Review

	Interview questions
6.1	Did I lead you or influence your responses in any way?
6.2	Is there anything that we haven't talked about that you think is important?
6.3	Have you any comments or suggestions about the interview itself?

Thank you for participating in this study.

Appendix 2: Appendices for Study Two

Appendix 2.1: Ethics Application and Approval

CONFIDENTIAL

Sheffield Hallam University

Faculty of Health and Wellbeing
Research Ethics Committee

Sport & Exercise Research Ethics Review Group

APPLICATION FOR ETHICS APPROVAL OF RESEARCH

In designing research involving humans, principal investigators should be able to demonstrate a clear intention of benefit to society and the research should be based on sound principles. These criteria will be considered by the Sport and Exercise Research Ethics Review Group before approving a project. **ALL** of the following details must be provided, either typewritten or word-processed preferably at least in 11 point font.

Please either tick the appropriate box or provide the information required.

1) Date of application	26/11/14
2) Anticipated date of completion of project	1/11/14
3) Title of research	Testing a Framework for Pressure Training in Elite Netball.
4) Subject area	Sport Psychology
5) Principal Investigator	
Name	Mike Stoker
Email address @ SHU	Michael.stoker@eis2win.co.uk
Telephone/Mobile number	07977725885
Student number (if applicable)	B1053527
6) State if this study is: (If the project is undergraduate or postgraduate please state module name and number)	[ ] Research [ ] Undergraduate [x] Postgraduate Module name: PhD Pressure Training Module number:
7) Director of Studies/Supervisor/ Tutor name	Ian Maynard

8) Intended duration and timing of project?	4 days, over two weeks.

9) Location of project If external to SHU, provide evidence in support (see section 17)	Netball Academy, Bath

10) State if this study is:	[X] New [ ] Collaborative (please include appropriate agreements in section 17) [ ] Replication of :

11) Purpose and benefit of the research

Statement of the research problem with any necessary background information (no more than 1 side of A4)

Evidence indicates that there is a necessity for elite athletes to be able to perform under pressure (Greenleaf, Gould, & Dieffenbach, 2001). One approach that has been shown to advance this ability, linked to the development of mental toughness and resilience, is pressure training (Bell, Hardy & Beattie, 2013; Fletcher & Sarkar, 2012; Gould, Dieffenbach, & Moffett, 2002; Mace & Carroll, 1985; 1986; Oudejans & Pijpers, 2009; 2010). Research has encouraged further exploration of this area (Sarkar, Fletcher, & Brown, in press), and indicates that pressure training can be used to help athletes develop an ability to perform under pressure at competition: "[A]thletes regularly exposed to punishment-conditioned stimuli in the training environment would be expected to cope better with the threatening situations they are likely to face in real competition" (Bell, Hardy & Beattie, 2013, p. 3). However, in order to be able to use pressure training to enhance performance, it is deemed vital that the research community identifies and tests a method for systematically creating pressure.

The results from study one of this PhD research generated a framework that detailed how elite coaches build pressure in practice. This framework provides a foundation from which investigators can methodically examine pressure training. Firstly, however, it is crucial that this framework is tested in relation to reliability and validity in successfully building pressure in practice with performers. The proposed study aims to measure the individual components of creating pressure (as detailed in the framework from study 1), as well as their combined effect, in order to examine whether the framework can be used to systematically create pressure. This research will benefit the literature as it will form the foundation upon which other researchers can use pressure training with athletes' for performance enhancement.

12) Participants	
12.1 Number	16
12.2 Rationale for this number (eg calculations of sample size, practical considerations)	This number of participants means that order effects can be accounted for by placing 4 participants through each condition in 4 different orders.
12.3 Criteria for inclusion and exclusion (eg age and sex)	The study requires the inclusion of athletes who are classed as 'elite performers' in their sport. Therefore participants will be England Netball players aged 14-22.
12.4 Procedures for recruitment (eg location and methods)	The performance director has provided access to the athletes as part of her desire to pressure train over the upcoming months. Further work will take place after this initial testing, which is designed to show the PD what causes the athletes to experience pressure.
12.5 Does the study have *minors or †vulnerable adults as participants?	[X] Yes [ ] No
12.6 Is CRB Disclosure required for the Principal Investigator? (to be determined by Risk Assessment)	[X] Yes [ ] No If yes, is standard [ ] or enhanced [X] disclosure required?
12.7 If you ticked 'yes' in 12.5 and 'no' in 12.6 please explain why:	

*Minors are participants under the age of 18 years.
‡Vulnerable adults are participants over the age of 16 years who are likely to exhibit:
a) learning difficulties
b) physical illness/impairment
c) mental illness/impairment
d) advanced age
e) any other condition that might render them vulnerable

13) Details of the research design

13.1 Provide details of intended methodological procedures and data collection. (For MSc students conducting a scientific support project please provide the following information: a. needs analysis; b. potential outcome; c proposed interventions).

Initially, participants will enter and have the nature of the specific condition explained to them. They will then fill out all appropriate consent forms. Following this, they will have galvanic skin response and heart rate sensors attached to them. Then their baseline measurements will be taken, before they fill out a questionnaire (IAMS). A netball exercise will then be completed, where the athlete have one minute to return a ball fired by a ball machine. They must use a forehand groundstroke and hit into a target area on the opposite side of the court. A within-subject design will be used, whereby participants will experience four conditions; Control, manipulation of the demands of the task, manipulation of the consequences of the task and Both manipulation of demands and consequences.

The condition the athlete is partaking in will alter what the athlete has to do during the Netball exercise. In the Control condition the athlete simply completes the exercise. In the Demands condition, the participant completes the task but the target area where the participants hit the ball gets smaller. Additionally, the participant wears occlusion goggles that block out one eye, and music is played to cause distraction. In the Consequences condition, a coach will be evaluating the athlete as they perform. Additionally, the athlete will be playing against an opponent (another participant). They will not physically watch their opponent or know their score until the end. If the participant beats their opponent, they will receive a reward (a sport T-shirt) at the end, and their participant must take part in a forfeit. This forfeit will involve running the length of the netball hall as quickly as possible. If the participant loses, they must complete the forfeit and their opponent wins the T-shirt. In the both condition, all manipulations outlined in the Demands and Consequences condition are applied.

After the participants have completed the exercise and received the reward or forfeit, a social validation questionnaire will be completed. The athletes can leave once they are unplugged from the measuring equipment.

13.2 Are these "minor" procedures as defined in Appendix 1 of the ethics guidelines?

[X] Yes [ ] No

13.3 If you answered 'no' in section 13.2, list the procedures that are not minor

13.4 Provide details of the quantitative and qualitative analysis to be used

The measures that will be evaluated are: 1) Galvanic skin response, 2) heart rate, 3) netball task score, 4) IAMS questionnaire, 5) Social validation questionnaire.

Participants' galvanic skin response and heart rate measurements will be compared between each condition. The measurements of each condition will be compared with a baseline measurement taken at the start of the day.

Participants' netball exercise and IAMS scores will be compared between each condition.

Qualitative analysis will be used to compare participants' responses to the social validation questionnaire within each condition.

14) Substances to be administered (refer to Appendix VI of the ethics procedures)

14.1 The protocol does not involve the administration of pharmacologically active substances or nutritional supplements.

Please tick box if this statement applies and go to section 15) [X]

14.2 Name and state the risk category for each substance. If a COSHH assessment is required state how the risks are to be managed.

15) Degree of discomfort that participants might experience

Consider the degree of physical and psychological discomfort that will be experienced by the participants. State the details which must be included in the participant information sheet to ensure that the participants are fully informed about any discomfort that they may experience.

The amount of physical discomfort participants will experience will be minimal during the task and the post-test exercise forfeit. The post-test exercise forfeit is an exercise which is part of the athlete's current training programme. All participants are familiar with the exercise and will have completed it on several previous occasions. This test was selected by the coach as an appropriate forfeit, and it involves the athletes running the length of the hall in as short a time as possible. It is short in time and high in intensity. Participants will also have to perform with occlusion goggles on that restrict vision to just one eye. The discomfort this will cause will be minimal.

Regarding psychological discomfort, participants will experience performing with the potential to win a reward (a training T-shirt), or a forfeit (having to run the length of the hall). They will also be evaluated by one of their coaches. The level of discomfort this will cause will be minimal. This is because the reward is meaningful but not perceived as crucial, and the forfeit is a consequence that the participants have become accustomed to because it is currently part of their training programme. The pressure of being evaluated by one of their coaches is also of minimal discomfort as they experience regularly.

16) Outcomes of Risk Assessment

Provide details of the risk and explain how the control measures will be implemented to manage the risk.
There is minimal risk associated with this study. The physical discomfort athletes will experience will be minimal. The control measures put in place are the presence of an on-site sports doctor, as well as the rest of the support team. There will be some psychological pressure experienced, due to the intended goal of the study. However, this will be minimal as the set-up involved will increment a level of pressure that the athletes already currently manage in their programme.

17) Attachments	Tick box
17.1 Risk assessment (including CRB risk assessment)	✓
17.2 COSHH assessment	
17.3 Participant information sheet (this should be addressed directly to the participant (ie you will etc) and in a language they will understand)	✓
17.4 Informed consent form	✓
17.5 Pre-screening questionnaire	✓
17.6 Collaboration evidence/support correspondence from the organisation consenting to the research (this must be on letterhead paper and signed) See sections 9 & 10.	
17.7 CRB Disclosure certificate or where not available **CRB application form**	✓
17.8 Clinical Trails form (FIN 12)	

18. Signature Principal Investigator	 ndertake the research study as at changes are made to the h my Project Supervisor. If the resubmission to the Sport and I agree that no work will be carried oval has been sought and formally _ Mike Stoker_ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Date _ 26/11/14_ _ _ _ _ _ _ Principal Investigator signature Name _ _ _Mike Stoker _
19. Approval Project Supervisor to sign **either** box A **or** box B as applicable (refer to Appendix I and the flowchart in appendix VI of the ethics guidelines)	**Box A:** I confirm that the research proposed is based solely on 'minor' procedures, as outlined in Appendix 1 of the HWB Sport and Exercise Research Ethics Review Group 'Ethics Procedures for Research with Humans as Participants' document, and therefore does not need to be submitted to the HWB Sport and Exercise Research Ethics Review Group. In terms of ethics approval, I agree the 'minor' procedures proposed here and confirm that the Principal Investigator may proceed with the study **as** designed. _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ _ Date _ _ 25.11.14 . Project Supervisor signature Name _ _ IAN MUNRO _ _ _ _ _ _ _ _ _ _ _ _ _
	Box B: I confirm that the research proposed is <u>not</u> based solely on 'minor' procedures, as outlined in Appendix 1 of the HWB Sport and Exercise Research Ethics Review Group 'Ethics Procedures for Research with Humans as Participants' document, and therefore <u>must</u> be submitted to the HWB Sport and Exercise Research Ethics Review Group for approval. I confirm that the appropriate preparatory work has been undertaken and that this document is in a fit state for submission to the HWB Sport and Exercise Research Ethics Review Group. _ Date _ _ _ _ _ _ _ _ _ _ Project Supervisor signature Name _
20. Signature Technician	I confirm that I have seen the full and approved application for ethics approval and technical support will be provided. _ Date _ _ _ _ _ _ _ _ _ _ Technician signature **Name** _

Appendix 2.2: Informed Consent Form

Sheffield Hallam University

Faculty of Health and Wellbeing
Research Ethics Committee
Sport and Exercise Research Ethics Review Group

INFORMED CONSENT FORM	
TITLE OF PROJECT: Testing a Pressure Training Framework in Elite Sport	
The participant should complete the whole of this sheet himself/herself	
Have you read the Participant information Sheet?	YES/NO
Have you had an opportunity to ask questions and discuss this study?	YES/NO
Have you received satisfactory answers to all of your questions?	YES/NO
Have you received enough information about the study?	YES/NO
To whom have you spoken? ..... Do you understand that you are free to withdraw from the study: • at any time • without having to give a reason for withdrawing • and without affecting your future medical care	YES/NO
Have you had sufficient time to consider the nature of this project?	YES/NO
Do you agree to take part in this study?	YES/NO
Signed ..... Date ..... (NAME IN BLOCK LETTERS).....	
Signature of Parent / Guardian in the case of a minor	

Version 1 March 2011

FOR USE WHEN STILL OR MOVING IMAGES WILL BE RECORDED

Consent to scientific illustration
I hereby confirm that I give consent for photographic and/or videotape and sound recordings (the 'material') to be made of me. I confirm that the purpose for which the material would be used has been explained to me in terms which I have understood and I agree to the use of the material in such circumstances. I understand that if the material is required for use in any other way than that explained to me then my consent to this will be specifically sought.
1. I understand that the material will form part of my confidential records and has value in scientific assessment and I agree to this use of the material. Signed..... Date..... Signature of Parent / Guardian in the case of a minor .....
2. I understand the material has value in teaching and I consent to the material being shown to appropriate professional staff for the purpose of education, staff training and professional development. Signed..... Date..... Signature of Parent / Guardian in the case of a minor .....
I hereby give consent for the photographic recording made of me on..... to be published in an appropriate journal or textbook. It is understood that I have the right to withdraw consent at any time prior to publication but that once the images are in the public domain there may be no opportunity for the effective withdrawal of consent. Signed ..... Date ..... Signature of Parent / Guardian in the case of a minor .....

Version 1 March 2011

Appendix 2.3: Pre-Test Medical Questionnaire (U18)

Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

Pre-Test Medical Questionnaire
(for use with under 18 year olds)

Thank you for volunteering to take part in one of our studies. We need to ensure that you will not be exposed to anything that could be harmful so please complete this short questionnaire.

Name: _____

Date of Birth: _____ Boy or Girl: _____

Please answer the following questions by putting a circle round the appropriate response or filling in the blank.

1. How often do you exercise?
   Never / Once a week / 2-3 times a week / every day

2. Are you presently taking any form of pills/tablets or medicine? Yes / No
   If you answered **Yes**, please give details.....
   .....
   .....

3. As far as you are aware, do you suffer or have you ever suffered from?

a Diabetes?	Yes / No	**b** Asthma?	Yes / No
c Epilepsy?	Yes / No	**d** Bronchitis?	Yes / No
e Any form of heart complaint?	Yes / No	**f** Raynaud's Disease?	Yes / No
g Marfan's Syndrome?	Yes / No	**h** Aneurysm/embolism?	Yes / No
i Anaemia?	Yes / No	**j** Renal dysfunction	Yes / No

   Any other medical condition or illness? Yes / No
   If you answered **Yes**, please give details.....
   .....
   .....

4. Is there a history of heart disease in your family? Yes / No

5. Have you ever had any known blood infections? Yes / No

Version 1 March 2011

6. Do you currently have any form of muscle or joint injury / pain? Yes / No
If you answered **Yes**, please give details.....
.....
.....

7. Have you had to stop your normal exercise in the last two weeks? Yes / No
If the answer is **Yes** please give details.....
.....
.....

8. As far as you are aware, is there anything that might prevent you from successfully completing the tests that have been outlined to you? Yes / No

---

As far as I am aware the information I have given is accurate.

Signature: .....

Signature of Parent or Guardian:

.....

Relationship to the participant:

.....

Date: ...../...../.....

Version 1 March 2011

It has been made clear to me that, should I feel that these Regulations are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform Dr Donna Woodhouse, Chair of the Sport & Exercise Research Ethics Review Group (Tel. 0114 225 5670) who will undertake to investigate my complaint.

Version 1 March 2011

Appendix 2.4: Risk Assessment

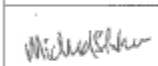
Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

Risk Assessment Pro Forma

****Please ensure that you read the accompanying Risk Assessment Risk Ranking document before completing this form****

Title of research	Testing a Pressure Training Framework in Elite Netball
Date Assessed	26/11/14
Assessed by (Principal Investigator)	Mike Stoker

Signed	**Position**
	Principal Investigator

Activity	Risks	Control Measures
Participants will complete a 1 minute netball task 4 times. Participants have to hit a target 10 times, standing 12 feet away throwing the ball with one hand. The speed of the ball will not be intense. The intensity of play will be medium.	Risk of physical illness caused by exercise = low	On site sports doctor will be present.
Participants will be plugged up to electrodes measuring heart rate and galvanic skin response. The galvanic skin response electrodes go on the finger tips, and the heart rate electrodes go on both collar bones, and the bottom left rib.	Risk of embarrassment caused by invasive procedures = low	All athletes will be given the option to go behind a screen to put the electrodes on.

Version 1 March 2011

A number of variables will be used to manipulate the pressure that athletes experience: 1) There will be a potential reward that athletes can win		The coach who usually takes them through this physical forfeit will be conducting the Coopers Test. An onsite doctor will be present.
2) Participants who lose will have to do a physical exercise as a forfeit. This forfeit is known as the Coopers Run amongst the participants, and is a form of forfeit that they already do and are familiar with.	Risk of physical illness caused by exercise = low	An onsite doctor will be present. Participants have completed this test many times before as it is currently part of their programme.
3) Coaches will be evaluating the athletes performances	Risk of anxiety caused by being observed from coaches = low	Athletes have the option to stop at any moment. The coaches evaluating the athletes are the same coaches who evaluate them in normal training sessions.

Risk Evaluation (Overall)
Low

General Control Measures
Is a pre-screen medical questionnaire required? Yes [ ] No [X]

Emergency Procedures

A sports doctor will be on site. A reception is located close by if any emergency services need to be contacted.

Participants will fill out a Pre-Test Screening Questionnaire, and an informed consent form.

Monitoring Procedures

Participants will start by filling out an informed consent form and a pre-screening questionnaire. Following this, they will have galvanic skin response and heart rate sensors attached to them. Then their baseline measurements will be taken, before they fill out a questionnaire (IAMS). This questionnaire assesses levels of anxiety and confidence. A netball exercise will then be completed, where the athlete have one minute to return a ball fired by a ball machine. Their scores will be noted on a piece of paper.

After the participants have completed the exercise and received the reward or forfeit, a social validation questionnaire is completed.

Review Period	

Reviewed By (Supervisor)	Date

Appendix 2.5: Enhanced Disclosure

Enhanced Disclosure

Page 1 of 2

disclosure

Disclosure Number 001365003339

Date of Issue: 25 MAY 2012

Applicant Personal Details

Surname: STOKER

Forename(s): MICHAEL WILLIAM

Other Names: STOKER, WILLIAM MICHAEL

Date of Birth: 18 OCTOBER 1987

Place of Birth: MANLY AUSTRALIA

Gender: MALE

Employment Details

Position applied for:
QUALIFICATION IN SPORT EXERCIS

Name of Employer:
BRITISH PSYCHOLOGICAL SOCIETY

Countersignatory Details

Registered Person/Body:
NATIONAL CHILDREN'S BUREAU

Countersignatory:
MARY FUGLER

Police Records of Convictions, Cautions, Reprimands and Warnings

NONE RECORDED

Information from the list held under Section 142 of the Education Act 2002

NONE RECORDED

ISA Children's Barred List information

NONE RECORDED

ISA Vulnerable Adults' Barred List information

NONE RECORDED

Other relevant information disclosed at the Chief Police Officer(s) discretion

NONE RECORDED

Enhanced Disclosure

This document is an Enhanced Criminal Record Certificate within the meaning of sections 113B and 116 of the Police Act 1997.

THIS DISCLOSURE IS NOT EVIDENCE OF IDENTITY

PO Box 165, Liverpool, L69 3JD. Helpline: 0870 90 90 844

Continued on page 2

Appendix 2.6: Participant Information

Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

Participant Information Sheet

Project Title	Testing a framework for pressure training in elite sport.
Supervisor/Director of Studies	Professor Ian Maynard
Principal Investigator	Mike Stoker
Principal Investigator telephone/mobile number	07977725885

Purpose of Study and Brief Description of Procedures
(Not a legal explanation but a simple statement)

Hello, and welcome to the test. My name is Mike and I am from Sheffield Hallam University and the English Institute of Sport. Thank you for choosing to participate in this interview study. The test should take 1 minute, but the overall process will take about 15 minutes. The purpose of this study is to explore athletic performance in pressurised training environments. The information from this study will be used in a number of ways:

1. To contribute towards study 2 of my PhD. This study may be published in a peer-reviewed journal.
2. The information that arises from this study may be presented anonymously at workshops, conferences, or other such events.
3. To improve the quality of my applied consultancy with athletes.

I would like to emphasise that all the information and data you provide me with will remain completely confidential unless you give permission otherwise. In the presentation of results I may want to use specific data from the study. These will be strictly anonymous and I will ensure your identity is protected.

As a participant in this study, your participation is entirely voluntary and you can stop participating at any moment by letting me know.

Do you have any questions about what I have talked about so far? If you have any questions as we go along please ask them. I just need you to sign this written informed consent and then we can begin.

If necessary continue overleaf

It has been made clear to me that, should I feel that these Regulations are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform Dr Donna Woodhouse, Chair of the Sport & Exercise Research Ethics Review Group (Tel: 0114 225 5670) who will undertake to investigate my complaint.

Appendix 2.7: Researcher Script

Script 1

Hello, and welcome to the test. The test should take 1 minute, but the overall process will take about 15 minutes.

- IAMS – explain
- Explain Heart-rate, nexus and electrodes
- Ask them to put electrodes, plug them in

Explain the task

- Open programme
- IAMS

Start

- Record new session
- Stop – SAVE, Athlete name, save condition

Script 2 (with consequences)

Hello, and welcome to the test. We are going to call you up and test you one at a time, and the exact specifics of what you will be doing we be explained to each of you individually after we call you up. The test should take 1 minute, but the overall process will take about 15 minutes per person.

- Athlete up
- IAMS – explain
- Explain Heart-rate, nexus and electrodes
- Ask them to put electrodes, plug them in

Explain the task

- Consequences - The coach will be judging and evaluating the person performing using this sheet, and will be assessing these components…Coach score used for development of the team, Norma to watch video, that other athletes will be watching, afterwards to do consequences
- The reward is a Nandos voucher, and that will go to first place
- The person who gets last will have to talk for 1 minute to a camera, in front of the other athletes, doing one of the four following things:
    a. Count down from 476 backwards in multiples of 7 for 1 minute
    b. Talk to the camera doing a comedy sketch for 1 minute
    c. What their strengths are and why they can be the best in the world
    d. Who the love most on the team, and why
- The loser will also have to nominate one of the two people who score in the middle (i.e. not the winner), to do the same challenge.
- Both these two people will have to post the video on facebook and leave it there until the full testing finishes in two weeks
- Open programme
- IAMS

Start

- Record new session
- Stop – SAVE, Athlete name, save condition
- Turn camera off

Repeat with next athlete

- When all done, call back in
- Announce scores
- Give winner voucher
- Have loser choose other person to take forfeit
- Have loser choose task to do out of hat
- Loser does forfeit
- Other person chooses task to do out of hat
- Other person does forfeit

Appendix 2.8: Perceived Pressure and IAMS

I experienced

No pressure 1 2 3 4 5 6 7 "Extreme pressure

I am cognitively anxious

(not at all) 1 2 3 4 5 6 7 (extremely)

Is this feeling

(Very debilitative) -3 -2 -1 0 +1 +2 +3 (Very facilitative)

I am somatically anxious

(not at all) 1 2 3 4 5 6 7 (extremely)

Is this feeling

(Very debilitative) -3 -2 -1 0 +1 +2 +3 (Very facilitative)

I am confident

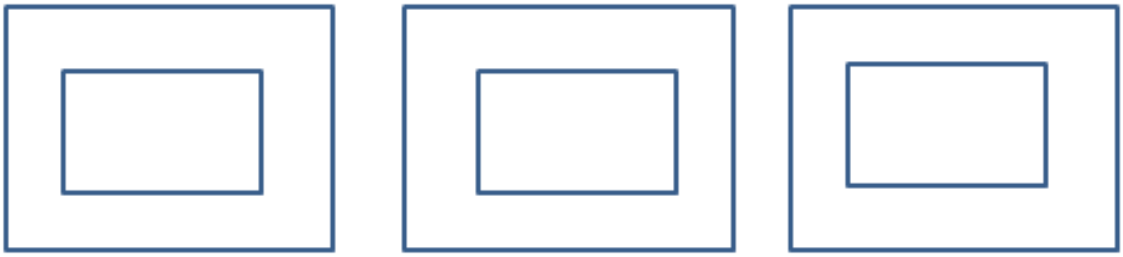
(not at all) 1 2 3 4 5 6 7 (extremely)

Is this feeling

(Very debilitative) -3 -2 -1 0 +1 +2 +3 (Very facilitative)

Appendix 2.9: Score Card

Score Card
Athlete name:
Athlete Score



Appendix 2.10: Coaches Judgment Card

Coaches Judgment Card

Athlete's ability to handle the pressure of the task

Not at all	1	2	3	4	5	6	7	8	9	10	Very well

Athlete's ability to focus on the task

Not at all	1	2	3	4	5	6	7	8	9	10	Very well

Athlete's motivation towards the task

Not at all	1	2	3	4	5	6	7	8	9	10	Very well

Appendix 3: Appendices for Study Three

Appendix 3.1: Ethics Application

CONFIDENTIAL

Sheffield Hallam University

Faculty of Health and Wellbeing
Research Ethics Committee

Sport & Exercise Research Ethics Review Group

APPLICATION FOR ETHICS APPROVAL OF RESEARCH

In designing research involving humans, principal investigators should be able to demonstrate a clear intention of benefit to society and the research should be based on sound principles. These criteria will be considered by the Sport and Exercise Research Ethics Review Group before approving a project. **ALL** of the following details must be provided, either typewritten or word-processed preferably at least in 11 point font.

Please either tick the appropriate box or provide the information required.

1) Date of application	20/5/15
2) Anticipated date of completion of project	1/8/15
3) Title of research	Testing a Framework for Pressure Training in Elite Disability Shooting.
4) Subject area	Sport Psychology
5) Principal Investigator	
Name	Mike Stoker
Email address @ SHU	Michael.stoker@eis2win.co.uk
Telephone/Mobile number	07977725885
Student number (if applicable)	B1053527
6) State if this study is: (If the project is undergraduate or postgraduate please state module name and number)	[ ] Research [ ] Undergraduate [x] Postgraduate Module name: PhD Pressure Training Module number:
7) Director of Studies/Supervisor/ Tutor name	Ian Maynard

8) Intended duration and timing of project?	6 days, over two months.

9) Location of project If external to SHU, provide evidence in support (see section 17)	Disability British Shooting, Stoke Mandeville.

10) State if this study is:	[X] New [ ] Collaborative (please include appropriate agreements in section 17) [ ] Replication of :

11) Purpose and benefit of the research Statement of the research problem with any necessary background information (no more than 1 side of A4)
Evidence indicates that there is a necessity for elite athletes to be able to perform under pressure (Greenleaf, Gould, & Dieffenbach, 2001). One approach that has been shown to advance this ability, linked to the development of mental toughness and resilience, is pressure training (Bell, Hardy & Beattie, 2013; Fletcher & Sarkar, 2012; Gould, Dieffenbach, & Moffett, 2002; Mace & Carroll, 1985; 1986; Oudejans & Pijpers, 2009; 2010). Research has encouraged further exploration of this area (Sarkar, Fletcher, & Brown, in press), and indicates that pressure training can be used to help athletes develop an ability to perform under pressure at competition: "[A]thletes regularly exposed to punishment-conditioned stimuli in the training environment would be expected to cope better with the threatening situations they are likely to face in real competition" (Bell, Hardy & Beattie, 2013, p. 3). However, in order to be able to use pressure training to enhance performance, it is deemed vital that the research community identifies and tests a method for systematically creating pressure. The results from study one of this PhD research generated a framework that detailed how elite coaches build pressure in practice. This framework provides a foundation from which investigators can methodically examine pressure training. In line with this, it was important that this framework is explored in relation to its impact on the generation of pressure. Study two of this PhD applied and explored the framework, examining the relationship between the demand and consequences of training and pressure. It was found that while demands and consequences both significantly increased pressure (as measured by heart rate and anxiety questionnaires), consequences alone also generated pressure. The research being proposed will further investigate the role of demands and consequences in generating pressure. While study two looked at the combined impact of numerous demands and consequences on pressure, study three will examine the precise effect of individual demand, or consequences, on pressure.

12) Participants	
12.1 Number	7
12.2 Rationale for this number (eg calculations of sample size, practical considerations)	A minimum of 6 is needed in order to perform a single subject design. It is likely that 9 athletes will participate.
12.3 Criteria for inclusion and exclusion (eg age and sex)	The athletes included will be selected by the PD of disability shooting.

12.4 Procedures for recruitment (eg location and methods)	The performance director reported their desire to pressure training to the EIS and this led to the recruiting of a sport psychologist. This sport psychologist has asked me to come in and help conduct pressure training, creating the opportunity for this study.
12.5 Does the study have *minors or ǂvulnerable adults as participants?	[X] Yes [ ] No
12.6 Is CRB Disclosure required for the Principal Investigator? (to be determined by Risk Assessment)	[X] Yes [ ] No If yes, is standard [ ] or enhanced [X] disclosure required?
12.7 If you ticked 'yes' in 12.5 and 'no' in 12.6 please explain why:	

*Minors are participants under the age of 18 years.
ǂVulnerable adults are participants over the age of 16 years who are likely to exhibit:
a) learning difficulties
b) physical illness/impairment
c) mental illness/impairment
d) advanced age
e) any other condition that might render them vulnerable

13) Details of the research design **13.1 Provide details of intended methodological procedures and data collection.** (For MSc students conducting a scientific support project please provide the following information: a. needs analysis; b. potential outcome; c proposed interventions).
A single subject design will be used to test six conditions. Participants will first perform a calibration exercise where they are allowed five minutes to adjust their sights. Their heart rate is recorded at this point, as it is prior to them knowing what the subsequent pressure test will involve. After the calibration exercise, the participants are told what their pressure test will involve, and given ten minutes to perform the test. In the test the athletes are required to shoot ten shots and hit a specific target. This target is calculated based on their athlete average

performance over the past three competitions.

The six different conditions are as follows, and based on the framework produced from study one. In condition one, the task is made more difficult by increasing the target the athlete is required to hit by 3%. In condition two, the athlete has to complete a cognitive fatiguing test (stroop test) prior to shooting. In condition three, heaters will be positioned a safe distance away from the athlete for around 12 minutes to act as a distraction. In condition four, the athletes will have to do a forfeit if they don't hit their target. This forfeit involves partaking in a media conference where the athlete will be asked questions regarding their performance by the Disability Shooting wider team and management. In condition five the athletes get entered into the chance to win £200 if they hit their target. The winner of the £200 will be the athlete that surpassed their target by the biggest percentage. In condition six, the athletes have to perform their ten shots while being examined by their Performance Director.

Initially, participants will enter and have the study explained to them. It will be highlighted that they will partake in pressure training and they have the right to withdraw at any time. It will be explained that although the exact nature of the condition can't be explained, they are going to be exposed to various kinds of sporting pressures including difficult taks, cognitive fatigue, distractions, forfeits, rewards, and judgements. They will be asked not to share what they experience with any other athletes on the programme. Participants will then fill out all appropriate consent forms, and put on a heart rate monitor. Following this, they will complete their sighting calibration. They have five minutes to do so, and their heart rate will be measured in this time. Then the exact condition is explained to them. Immediately before taking their ten shots they will complete an anxiety questionnaire (IAMS). Their heart rate will be measured throughout the performance of the ten shots.

After the participants have completed the exercise and received the reward or forfeit, a social validation questionnaire will be completed. The athletes can leave once they are unplugged from the measuring equipment.

13.2 Are these "minor" procedures as defined in Appendix 1 of the ethics guidelines?

[X] Yes [ ] No

13.3 If you answered 'no' in section 13.2, list the procedures that are not minor

13.4 Provide details of the quantitative and qualitative analysis to be used

The measures that will be evaluated are: 1) heart rate, 2) shooting score, 3) Anxiety (IAMS) questionnaire, 4) Social validation questionnaire.

Participants' heart rate measurements will be compared between each condition. The measurements of each condition will be compared with a baseline measurement.

Participants' shooting score and IAMS scores will be compared between each condition.

The social validation questionnaire will be comprised of questions designed into a likert-type scale.

14) Substances to be administered (refer to Appendix VI of the ethics procedures)

14.1 The protocol does not involve the administration of pharmacologically active substances or nutritional supplements.

Please tick box if this statement applies and go to section 15) [X]

14.2 Name and state the risk category for each substance. If a COSHH assessment is required state how the risks are to be managed.

15) Degree of discomfort that participants might experience

Consider the degree of physical and psychological discomfort that will be experienced by the participants. State the details which must be included in the participant information sheet to ensure that the participants are fully informed about any discomfort that they may experience.

The amount of physical discomfort participants will experience will be minimal during the task and the post-test forfeits. In condition two, the athletes will have to complete a stroop test prior to completing the shoot. This will cognitively fatigue them in a way comparable to the cognitive fatigue they experience in competition. In condition three, the athletes will have to complete the ten shots with a heater present. This heater will act to form a distraction and will be placed at a safe distance away. The aim of the heater is to provide heat that may distract them, not warm them up. Continued physical and verbal checks will be made to ensure there is no discomfort. The post-test forfeit is a media conference, where the athlete will be asked questions on why they failed to hit their score by fellow athletes and members of management. This test was agreed upon by the coach as an appropriate forfeit. The media conference will take about ten minutes.

Regarding psychological discomfort, participants will experience performing with the potential to win a reward (£200) and with a coach evaluating them. The level of discomfort this will cause will be minimal. This is because the reward is meaningful but not perceived as crucial, and the pressure of being evaluated by one of their coaches is also of minimal discomfort as they experience regularly.

16) Outcomes of Risk Assessment Provide details of the risk and explain how the control measures will be implemented to manage the risk.
There is minimal risk associated with this study. The physical discomfort athletes will experience will be minimal. The control measures put in place are the presence of an on-site sports physio, as well as the rest of the support team. All conditions will be discussed in length amongst the Disability Shooting staff. There will be some psychological pressure experienced, due to the intended goal of the study. However, this will be minimal as the set-up involved will increment a level of pressure that the athletes already currently manage in their programme.

17) Attachments	**Tick box**
17.1 Risk assessment (including CRB risk assessment)	✓
17.2 COSHH assessment	
17.3 Participant information sheet (this should be addressed directly to the participant (ie you will etc) and in a language they will understand)	✓
17.4 Informed consent form	✓
17.5 Pre-screening questionnaire	✓
17.6 Collaboration evidence/support correspondence from the organisation consenting to the research (this must be on letterhead paper and signed) See sections 9 & 10.	
17.7 CRB Disclosure certificate or where not available **CRB application form**	✓

17.8 Clinical Trails form (FIN 12)	

18. Signature Principal Investigator	Once this application is approved, I will undertake the research study as approved. If circumstances necessitate that changes are made to the approved protocol, I will discuss these with my Project Supervisor. If the supervisor advises that there should be a resubmission to the Sport and Exercise Research Ethics Review Group, I agree that no work will be carried out using the changed protocol until approval has been sought and formally received. _ Mike Stoker_ Date _ 18/5/14_ _ _ _ _ _ _ _ _ _ Principal Investigator signature Name _ _ _Mike Stoker _
19. Approval Project Supervisor to sign **either** box A <u>or</u> box B as applicable (refer to Appendix I and the flowchart in appendix VI of the ethics guidelines)	**Box A:** I confirm that the research proposed is based solely on 'minor' procedures, as outlined in Appendix 1 of the HWB Sport and Exercise Research Ethics Review Group 'Ethics Procedures for Research with Humans as Participants' document, and therefore does not need to be submitted to the HWB Sport and Exercise Research Ethics Review Group. In terms of ethics approval, I agree the 'minor' procedures proposed here and confirm that the Principal Investigator may proceed with the study as designed. _ Date _ _ _ _ _ _ _ _ _ Project Supervisor signature Name _
	Box B: I confirm that the research proposed is <u>not</u> based solely on 'minor' procedures, as outlined in Appendix 1 of the HWB Sport and Exercise Research Ethics Review Group 'Ethics Procedures for Research with Humans as Participants' document, and therefore <u>must</u> be submitted to the HWB Sport and Exercise Research Ethics Review Group for approval. I confirm that the appropriate preparatory work has been undertaken and that this document is in a fit state for submission to the HWB Sport and Exercise Research Ethics Review Group. _ Date _ _ _ _ _ _ _ _ _ _ Project Supervisor signature Name _
20. Signature Technician	I confirm that I have seen the full and approved application for ethics approval and technical support will be provided. _ Date _ _ _ _ _ _ _ _ _ _ Technician signature Name _

Sheffield Hallam University

APPLICATION FOR RESEARCH ETHICS APPROVAL FOR BIOMEDICAL SCIENCE, FOOD SCIENCE AND SPORT SCIENCE (SHUREC2B)

SECTION A

Important Note - If you have already written a research proposal (e.g. for a funder) that answers the methodology questions in this section please include a copy of the proposal and leave those questions blank. You **MUST** however complete **ALL** of Section B and C (risk assessment).

1. **Name of principal investigator:** Mike Stoker

   Faculty: Health and Wellbeing

   Email address: michael.stoker@eis2win.co.uk

2. **Title of research:** Exploring a Framework for Pressure Training in Elite Disability Shooting.

3. **Supervisor** (if applicable): Professor Ian Maynard

   Email address: Maynard, Ian W <I.W.Maynard@shu.ac.uk>

4. **Proposal Tracking number (applicable for externally funded research):**

5. **Other investigators (within or outside SHU)**

Title	Name	Post	Division	Organisation
Mr	Paul Hughes	Sport Psychologist with Disability British Shooting		*The English Institute of Sport.*

6. **Proposed duration of project**

   Start date: 25/6/15 **End Date:** 25/8/15

7. **Location of research if outside SHU:** Stoke Mandeville Shooting grounds.

8. **Main purpose of research:**

☒ Educational qualification
☐ Publicly funded research
☐ Staff research project
☐ Other (Please supply details)

9. Background to the study and scientific rationale (500 words approx.)

Evidence indicates that there is a necessity for elite athletes to be able to perform under pressure (Greenleaf, Gould, & Dieffenbach, 2001). One approach that has been shown to advance this ability, linked to the development of mental toughness and resilience, is pressure training (Bell, Hardy & Beattie, 2013; Fletcher & Sarkar, 2012; Gould, Dieffenbach, & Moffett, 2002; Mace & Carroll, 1985; 1986; Oudejans & Pijpers, 2009; 2010). Indeed, research has encouraged further exploration of this area (Sarkar, Fletcher, & Brown, in press).

In line with these calls, research has investigated how elite coaches created pressure training environments (Stoker, Lindsay, Butt, Bawden, and Maynard, submitted for publication). Findings from this research highlighted how elite coaches' manipulated training demands and consequences to create pressure. While this research contributed to the growth of knowledge on pressure training, relatively little is known about the application of demands and consequences on experiences of pressure (Stoker, Lindsay, Butt, Bawden, and Maynard, submitted for publication). Addressing this, the proposed research will explore the effect of demands and consequences of training on experiences of pressure in elite disability shooting.

10. Has the scientific / scholarly basis of this research been approved? (For example by Research Degrees Subcommittee or an external funding body)

☐ Yes
☐ No - to be submitted
☐ Currently undergoing an approval process
☒ Irrelevant (e.g. there is no relevant committee governing this work)

11. Main research questions

Exploring the effect of individual training demands and consequences on experiences of pressure.

12. Summary of methods including proposed data analyses (include outline of techniques to be used but do not include actual protocols).

A single subject design will be used and athletes will experience six conditions. At the start of each condition participants will have five minutes to calibrate their sights. At this point the participants will not know that nature of test the pressure test they are about to complete. The athletes' heart rate will be recorded during this phase of sight calibration. Athletes' heart rates from this calibration phase will be taken across all the six conditions. The average beats per minute will be calculated across all these six calibration phases, and this will act as a baseline. The participants will also complete an IAMS questionnaire at this point. This questionnaire asks athletes about their subjective experiences of anxiety. Athletes IAMS scores across the six conditions will be averaged, providing a baseline measure.

After the calibration exercise, the participants are told what their condition will involve. In all tests, participants are given ten minutes to shoot ten shots. This target is calculated based on their athlete average performance over the past three competitions. The athlete will experience different stressors in each condition. Each condition changes one variable relating

to the demands or consequences or training, thus providing information on the effect of this stressor. The order participants experience the conditions in will be randomised.

The six different conditions are based on the framework produced from study one, and further the exploration of study two. In condition one, the task is made more difficult by increasing the target the athlete is required to hit by 3%. In condition two, the athlete has to complete a cognitive fatiguing test (stroop test) immediately prior to shooting. In condition three, a fan heater will be positioned a safe distance away from the athlete for 12 minutes. The air coming out of the heater will be used as a distraction and contribute excess task irrelevant stimuli. In condition four, the athletes will have to do a forfeit if they don't hit their target. This forfeit involves partaking in a media conference where the athlete will be asked questions regarding their performance by the Disability Shooting wider staff team and management. In condition five the athletes get entered into the chance to win £200 if they hit their target. The winner of the £200 will be the athlete that surpassed their target by the biggest percentage. In condition six, the athletes have to perform their ten shots while the Performance Director is present. After the participants have completed the exercise, a social validation questionnaire will be completed. Following this, any rewards or forfeits will be administered.

Athletes' IAMS scores will be taken after they have had the condition explained to them and immediately prior to completing their ten shots under pressure. Their heart rate will be recorded as they complete their ten shots under pressure, and then their average beats per minute calculated. The athletes score will also be calculated

The baseline IAMS and average heart beats per minute scores will be compare with the relative scores from the pressure test. These means will be compared using repeated measures in SPSS. This will reveal which condition equated to any significant changes in heart rate, and IAMS scores. The social validation questionnaire will be used to provide additional qualitative information regarding the athletes' experiences.

SECTION B

1. **Describe the arrangements for recruiting, selecting/sampling potential participants.** This should clearly indicate if participants with a particular health condition or healthy volunteers are being used, the inclusion and exclusion criteria, the sample sizes with power calculations if appropriate. Include copies of any advertisements for volunteers or letters to individuals/organisations inviting participation.

   The research has been requested by the performance director. There will be six athletes participating in the study, as this is a single subject design. The performance director has indicated which of his athletes he wants to partake in the study.

2. **Indicate the activities participants will be involved in** (tick and provide details as appropriate):

   i Providing biological samples:

   ☐ Yes
   ☒ No

   (If the answer is YES provide full details of samples including numbers and power calculation as appropriate, who is undertaking the sampling, location, procedures for collection, preservation and storage to ensure compliance with Human Tissue Act www.hta.gov.uk)

ii Taking pharmacologically active substances or nutritional supplements:

☐ Yes
☒ No

(If the answer is YES give full details of the preparation, dose, treatment duration, a route of administrations and relevant safeguards you will put in place to prevent harm to participants)

iii Participating in diet or exercise programmes or activities:

☒ Yes
☐ No

(If the answer is YES give full details of the programmes, their content and duration and the relevant safeguards you will put in place to prevent harm to participants)

For the content of the programme, please see "summary of methods section above".

Each condition will last approximately 25 minutes.

Each participant will partake in six conditions.

Participants will partake in one conditin per day. The six conditions will be completed over the course of two months.

3. **What is the potential for participants to benefit from participation in the research?**

The information that is generated from the research will be presented back to the participants, staff members, and Performance Director. These results will provide an insight into how athletes are responding to different stressors. This information can be used to inform how pressure training sessions are specifically designed for the participants moving forward. Additionally, the results will provide information that can be used by the participant in collaboration with the Sport Psychologist to inform how specific coping skills should be developed. The lasting effect of these results is that the Performance Director will be able to effectively and efficiently create and deliver pressure training interventions to the participants over the coming months..

4. **Describe any possible negative consequences of participation in the research along with the ways in which these consequences will be limited.**

The participants are going to be exposed to a range of stressors in the study. These stressors are: 1) a difficult target score; 2) a stroop test; 3) distracting stimuli; 4) a forfeit invoicing a mock press conference; 5) a potential reward of £200; 6) being closely observed by their performance director as they perform.

1) The difficult score is calculated based on the participants' performance at their last three competitions. Using this calculation, 3% is added to the score they are required to hit, making it a difficult target. This percentage was derived based on the expertise of the head coach and Performance Director.

2) The stroop test will be administered immediately prior to shooting their ten shots. This will act to cognitively fatigue them. Any negative consequences of this test will be limited by

reminding the athletes prior to the test that, as with all the conditions, they can withdraw at any time.

3) A fan heater will be used to propel air that will act as a distraction for the participants. This will provide task irrelevant stimuli that will compete for their attention. The heater will be positioned a safe distance away and will be used to generate an air flow that forms a distraction. Physical checks of the athletes clothing and apparatus, as well as communicative checks will be administered every minute to ensure the safety of the participants. The set-up of this condition will be checked and approved by a physiotherapist and/or coach.

4) The participants will partake in a mock press conference if they do not hit their score in the "forfeit" condition. In this press conference the participants will be asked questions by the members of staff, coaches, and other athletes on why they failed to hit their score. This forfeit is designed to facilitate the athlete in reflecting on how they can improve going forward. Negative consequences will be limited by briefing the mock "press" (athletes and members of staff) regarding the nature of the conference (i.e., the conference is not about berating the athlete, but asking them questions that encourage reflection on how to improve).

5) There is a potential reward of £200. This will be given to the athlete that surpasses their required score by the Largest percentage. Negative consequences are designed via making the winner calculated based on each athletes' performance in relation to their own personal best. This ensures a level playing field.

6) The performance director will be present for the judgement condition. This replicates a stressor they encounter regularly in training. Negative consequences will be avoided by informing the participant that they can communicate any questions with the performance director prior to and after the test.

In addition to these processes, there will always be a physiotherapist, and/or doctor on sight as the testing takes place. Additionally, the performance director and multiple coaches will also always be on site. Furthermore, the stressors have been designed with the knowledge of the sport psychologist and physiotherapist who works for the sport, and by my supervisor. Moreover, all the stressors and conditions will be explained to all members of staff and coaches so as to seek their expertise on any further changes that are required.

5. **Describe the arrangements for obtaining participants' consent.** This should include copies of the information that they will receive & written consent forms where appropriate. If children or vulnerable people are to be participants in the study details of the arrangements for obtaining consent from those acting in *loco parentis* or as advocates should be provided.

Written consent will be obtained. This will be obtained at the training centre where the study will take place. Participants will receive information about the nature of the study, and then have the choice to participate and provide written consent. There is a possibility that under 18 year olds will be used (the coach has not yet decided). If this turns out to be the case, consent will be sought from the participants' parents who will be in attendance at the training facility.

6. **Describe how participants will be made aware of their right to withdraw from the research.** This should also include information about participants' right to withhold information and a reasonable time span for withdrawal should be specified.

The participants will be made aware of their right to withdraw at the beginning of the study. The study will begin with participants being read a brief about the nature of the study. Following this, they will be informed that they can choose not to partake, and can withdraw at any time.

7. **If your project requires that you work with vulnerable participants describe how you will implement safeguarding procedures during data collection.**

n/a

8. **If Disclosure and Barring Service checks are required, please supply details**

n/a

9. **Describe the arrangements for debriefing the participants.** This should include copies of the information that participants will receive where appropriate.

The participants will receive information regarding their performance immediately following the completion of each condition. The debrief will be read from a script (see information sheet). At this point they will not receive any information about their heart rate data, or any additional information, due to the within subject design. Participants will be informed at the start of the study that they will receive the full scope of the results at the end of the study. At the end of the study, participants will receive a full debrief as to the results and full nature of the study. This will include: 1) What all the conditions and stressors were, 2) what their score and heart rates were in each condition, and 3) where there was any significant differences on a group level between conditions. Athletes will not find out each other's scores and heart rates in each condition. These debriefs will take place in a session where the athlete the sport psychologist, and the main researcher is in attendance.

10. **Describe the arrangements for ensuring participant confidentiality.** This should include details of:
    - how data will be stored to ensure compliance with data protection legislation
    - how results will be presented
    - exceptional circumstances where confidentiality may not be preserved
    - how and when confidential data will be disposed of

Data will be stored at the English Institute of Sport, and following the BPS rules regarding the storage of confidential documents. Information stored on a computer will be password-encryption protected twice. Results will be presented in a manner where participants remain anonymous. Confidential data will be disposed of via the "confidential waste disposal" bins located at the English Institute of Sport site in Sheffield. These bins are disposed of in line with the BPS rules regarding the disposal of confidential items.

11. **Are there any conflicts of interest in you undertaking this research?** (E.g. are you undertaking research on work colleagues or in an organisation where you are a consultant?) Please supply details of how this will be addressed.

No.

12. **What are the expected outcomes, impacts and benefits of the research?**

It is expected that the outcome will reveal information regarding what individual stressors create pressure. Additionally, the results will explore and shed light on the framework developed from earlier studies conducted by the lead

researcher. This information will benefit elite sport and the scientific community via expanding knowledge regarding pressure training. Currently there is no theory detailing how to systematically create pressure, and the findings of this study will address this gap.

13. **Please give details of any plans for dissemination of the results of the research**
It is anticianted that the results will be presented at a conference and published in a journal. Additionally, the results will become part of a PhD Thesis on pressure training.

SECTION C

RISK ASSESSMENT FOR THE RESEARCHER

1. **Will the proposed data collection take place on campus?**

☐ Yes (Please answer questions 4, 6 and 7)
☒ No (Please complete all questions)

2. **Where will the data collection take place?**
(Tick as many as apply if data collection will take place in multiple venues)

	Location	Please specify
☐	Researcher's Residence	
☐	Participant's Residence	
☐	Education Establishment	
☒	Other e.g. business/voluntary organisation, public venue	Stoke Mandeville Stadium
☐	Outside UK	

3. **How will you travel to and from the data collection venue?**

☐ On foot ☐ By car ☒ Public Transport
☐ Other (Please specify)

Please outline how you will ensure your personal safety when travelling to and from the data collection venue
I will travel in social hours. I will travel by train, with ticket purchased in advance by the English Institute of Sport.

4. **How will you ensure your own personal safety whilst at the research venue?**
I will work in sociable hours. I will be accompanied by a colleague at all times (the sport psychologist working for Disability British Shooting.

5. **If you are carrying out research off-campus, you must ensure that each time you go out to collect data you ensure that someone you trust knows where you are going (without breaching the confidentiality of your participants), how you are getting there (preferably including your travel route), when you expect to get back, and what to do should you not return at the specified time.** (See Lone Working Guidelines). Please outline here the procedure you propose using to do this.
My English Institute of Sport supervisors are aware of my contact time with Disability British Shooting, with whom I am carrying out my third study. I will be getting there and by train and taxi.

6. **Are there any potential risks to your health and wellbeing associated with either (a) the venue where the research will take place and/or (b) the research topic itself?**

☒ None that I am aware of
☐ Yes (Please outline below)

7. **Does this research project require a health and safety risk analysis for the procedures to be used?**

☐ Yes
☒ No

(If YES the completed Health and Safety Project Safety Plan for Procedures should be attached)

Adherence to SHU policy and procedures

Personal statement	
I confirm that: • this research will conform to the principles outlined in the Sheffield Hallam University Research Ethics policy • this application is accurate to the best of my knowledge	
Principal Investigator	
Signature	
Date	25/6/14
Supervisor (if applicable)	
Signature	
Date	
Other signature	
Signature	
Date	

Please ensure the following are included with this form if applicable, tick box to indicate:

	Yes	No	N/A
Research proposal if prepared previously	☐	☐	☒
Any recruitment materials (e.g. posters, letters, etc.)	☐	☐	☒
Participant information sheet	☒	☐	☐
Participant consent form	☒	☐	☐
Details of measures to be used (e.g. questionnaires, etc.)	☒	☐	☐
Details of any support materials provided to participants	☐	☐	☒

Debriefing materials	☒	☐	☐
Health and Safety Project Safety Plan for Procedures	☐	☐	☒

Appendix 3.2: Ethics Reviewers Feedback

Sheffield Hallam University

RESEARCH ETHICS REVIEWER'S FEEDBACK FORM (SHUREC3)

Principal investigator: Michael Stoker **Reference number:** HWB-S&E-30

Other investigators: Paul Hughes

Title of project:

Exploring a Framework for Pressure Training in Elite Disapbility Shooting

In my judgement the application should be (tick one box):

☐ Approved

☒ Approved with attention to the items listed below (1). Please email the details of how the issues have been addressed to the FREC and provide confirmation from the supervisor that the issues have been addressed for student projects.

☐ Referred back to the applicant for a full resubmission to address all the conditions listed below (1)

☐ Not approved for the reasons listed below (2)

1. The following issues need to be addressed:

A9. Referencing "Study 1" and "Study 2" is only helpful if the reviewers are aware of Study 1 and Study 2. The rationale needs a little further development here. How does the proposed study follow on from the findings of previous research literature?

A11. The outcome measures being used are subjective anxiety and physiological arousal (heart rate). Does this reflect the "pressure" and "pressure training" described in the main research question here? Specifically, does the research design (and outcome measures used) allow the researcher to find out which demand/consequence is 'best' for pressure training? Or does it merely give an indication of which condition elicits most anxiety/arousal?

A12 In the second paragraph, there is reference to a "target calculated on average performance over the last three competitions". What is this target?

A12. Could the social validation questionnaire also be included as an appendix? What is the purpose of the questionnaire in this study, given that no interventoin is actually being carried out?

B2. What is the period between conditions? Also, the form states each condition will last 25 minutes, but the Participant Information Sheet states 15 minutes. Some clarification/consistency is needed.

B4. The Stroop test might cause additional anxiety/distress for participants with, for example, dyslexia or colour blindness. Has this been taken into account?

B4. At what stage are the forfeits/rewards administered? For example, not all participants will have completed the "reward" condition until the very end of the investigation.

B9. Given the single subject design of the investigation, is there a need to calculate group differences? Indeed, if the purpose is to explore the 'best' methods of administering presure training, is a single-subject design the best method for answering that question? Or, given the nature of stress, is it actually possible to find the "most effective" methods for generating pressure, with the aim of generalising to a wider population?

Appendices: The appendices (attached forms) need labelling as there's no indication of what the questionnaires are. The participant information sheet doesn't contain full details of the study, i.e., there is no mention that partiicpants will be required to wear a heart rate monitor and complete written questionnaires. These details should be included.

Finally, the form is littered with spelling and grammatical errors, which should really be addressed.

Reviewed by Pete Olusoga & Harvey Anderson

2. The application is not approved for the following reasons:

Appendix 3.3: Response to Ethics Reviewers Feedback

A9:

Evidence indicates that there is a necessity for elite athletes to be able to perform under pressure (Greenleaf, Gould, & Dieffenbach, 2001). One approach that has been shown to advance this ability, linked to the development of mental toughness and resilience, is pressure training (Bell, Hardy & Beattie, 2013; Fletcher & Sarkar, 2012; Gould, Dieffenbach, & Moffett, 2002; Mace & Carroll, 1985; 1986; Oudejans & Pijpers, 2009; 2010). Indeed, research has encouraged further exploration of this area (Sarkar, Fletcher, & Brown, in press).

In line with these calls, research has investigated how elite coaches created pressure training environments (Stoker, Lindsay, Butt, Bawden, and Maynard, submitted for publication). Findings from this research highlighted how elite coaches' manipulated training demands and consequences to create pressure. While this research contributed to the growth of knowledge on pressure training, relatively little is known about the application of demands and consequences on experiences of pressure (Stoker, Lindsay, Butt, Bawden, and Maynard, submitted for publication). Addressing this, the proposed research will explore the effect of demands and consequences of training on experiences of pressure in elite disability shooting.

A11:

The research aim has been adjusted to be: Exploring the effect of individual training demands and consequences on experiences of pressure in elite disability shooting.

There currently exists no biological marker for pressure, and thus no objective means to directly and exclusively monitor pressure. In addition to this, in sport psychology no questionnaire exists with reliability and validity coefficients which allows pressure to be subjectively evaluated. With this in mind, alternative methods have to be utilised to assess experiences of pressure and such practices are replicated in the proposed research. Previous research has indicated that heart rate can be used as a reliable alternative measure in sport (Oudejans and PijPers, 2009). While this measure has been used exclusively to assess experience of pressure (Oudejans and PijPers, 2009), in the present study somatic and cognitive anxiety was also assessed via the use of the Immediate Anxiety Measurement Scale (IAMS; Thomas, Hanton & Jones, 2002). As it is impossible to perform a direct subjective measure of pressure, the IAMS score will provide an insight into experiences of anxiety. Previous research supports the process of using anxiety to infer information about athletes' experiences of pressure (Oudejans and PijPers, 2009). In addition to the use of the IAMS, a social validation questionnaire will be utilised to provide information regarding the athletes' subjective perceptions of pressure. This feedback is supplementary and could add meaning to the interpretation of other measures.

As indicated above, there are currently no objective or subjective methods for exclusively monitoring experiences of pressure. However, the means proposed above are based on previous peer-reviewed research that has used such methods to assess pressure. Nonetheless, this is a limitation that must be recognised by any research investigating pressure.

A12:

The target calculation is calculated by taking the participants performance at the last three competitions. From this score, the average is calculated.

A12:

The social validation questionnaire could be included as an appendix. Given the difficulties of measuring pressure (as described previously), the purpose of the social validation questionnaire is to add further insight into the athletes' experiences of pressure.

B2:

There will be a day's gap between each condition. The participant information sheet was adapted to say "25" minutes.

B4:

The athletes will be screened on their current status for dyslexia and colour blindness. In addition to these questions, the physiotherapist and doctor will be consulted to see if there are any additional conditions that should be screened for.

The forfeit is administered at the end of the day, on the day of the pressure training. The reward is administered at the end of the experiment.

B9:

The research aim has been adjusted to be: Exploring the effect of individual training demands and consequences on experiences of pressure. With this in mind, a single-subject design is the best fit for the investigation. This is reinforced by the fact that there was only access to six participants.

The appendices have been labelled and the participant information sheet now contains details regarding the wearing of heart rate monitors and giving written consent. Also, the spelling mistakes in the form have been addressed.

Appendix 3.4: Ethics Approval

Faculty of Health and Wellbeing Research Ethics Committee **Ref No: HWB-S&E-30**
Sport and Exercise Research Ethics Review Group
Report Form

Principal Investigator: Mike Stoker

Title: Exploring a Framework for Pressure Training in Elite Disability Shooting.

Recommendation:

Approved	x
Approved with attention to the items listed	
Referred back to the applicant for a full resubmission to address all the conditions listed	
Not Approved for the reasons listed	

Reviewers: Peter Olusoga and Harvey Anderson

Signature : ..... Date: 13.07.15
Donna Woodhouse
Chair, Sport and Exercise Research Ethics Review Group

Note: *Approval applies until the anticipated date of completion unless there are changes to the procedures, in which case another application should be made.*

Name of Supervisor : Ian Maynard

Appendix 3.5: Participant Information Sheet

Sheffield Hallam University

Faculty of Health and Wellbeing Research Ethics Committee
Sport and Exercise Research Ethics Review Group

Participant Information Sheet

Project Title	Exploring a Framework for Pressure Training in Elite Sport.
Supervisor/Director of Studies	Professor Ian Maynard
Principal Investigator	Mike Stoker
Principal Investigator telephone/mobile number	07977725885

Purpose of Study and Brief Description of Procedures
(Not a legal explanation but a simple statement)

You have volunteered to take part as part of the pressure training programme that your performance director has asked for. Will you partake in this study?

In this study you will be tested six times, each test lasting about 25 minutes. These tests will take place over the next two months, at these camps. You will be required to complete a string of ten shots. These ten shots will take place in this room on this range.

Over the course of the pressure training, including today, you will be exposed to various pressurised scenarios of varying degrees. This will include difficult tasks, cognitive fatigue, environmental distractions, judgement, rewards, and forfeits. During these experiences you will be required to wear a heart rate monitor, and complete several questionnaires regarding your experiences of anxiety and pressure. Written consent will also be required.

Before you sign the consent form, I will explain the brief of the session. For the purpose of the training we can't tell you exactly what you will be experiencing today until after you have done your "sighters". What I can tell you is that after your sighters, when you are told the full details, you have the right to withdraw from the experiment. To reconfirm, you have the right to withdraw at any time. At the end of this pressure test you will be debriefed regarding your score. At the end of the six tests, when the study is over, you will be fully debriefed. Here you will have a number of sessions with myself and your sport psychologist where we will go into detail and look at your scores and heart rates in each of the tests.

I will be responsible for all the information when the study is over. My supervisory team will have access to it. It may be published in a journal and within a PhD thesis. No individuals will be named, but it will be known what sport participated in the study. No one will be able to connect you with what is recorded and reported.

Also, please don't talk with the other athletes about what happens in these training sessions. You are asked to follow this rule until the end of the pressure training which will be in a few weeks' time. If you understand and agree to this, will you please sign the consent form.

If you have any questions, or concerns, or any adverse effects occur, please speak with any member of staff. The results of today will be given to you at the end of the full study, once we have collated and made sense all your results from the different tests

Debrief
Thank you for participating in this study. Your score today was… To reiterate, at the end of the six tests you will have all the information regarding your scores and heart rate, in each test, fully debriefed with you. If you have any questions at any time, please ask me or any member of staff.

If necessary continue overleaf

It has been made clear to me that, should I feel that these Regulations are being infringed or that my interests are otherwise being ignored, neglected or denied, I should inform Dr Donna Woodhouse, Chair of the Sport & Exercise Research Ethics Review Group (Tel: 0114 225 5670) who will undertake to investigate my complaint.

Appendix 3.6: Participant Consent Form

Sheffield Hallam University

SAMPLE PARTICIPANT CONSENT FORM

TITLE OF RESEARCH STUDY:

Please answer the following questions by ticking the response that applies

	YES	NO
1. I have read the Information Sheet for this study and have had details of the study explained to me.	☐	☐
2. My questions about the study have been answered to my satisfaction and I understand that I may ask further questions at any point.	☐	☐
3. I understand that I am free to withdraw from the study within the time limits outlined in the Information Sheet, without giving a reason for my withdrawal or to decline to answer any particular questions in the study without any consequences to my future treatment by the researcher.	☐	☐
4. I agree to provide information to the researchers under the conditions of confidentiality set out in the Information Sheet.	☐	☐
5. I wish to participate in the study under the conditions set out in the Information Sheet.	☐	☐
6. I consent to the information collected for the purposes of this research study, once anonymised (so that I cannot be identified), to be used for any other research purposes.	☐	☐

Participant's Signature: _____ **Date:** _____

Participant's Name (Printed): _____

Contact details: _____

_____

Researcher's Name (Printed): _____

Researcher's Signature: _____

Researcher's contact details:
(Name, address, contact number of investigator)

Please keep your copy of the consent form and the information sheet together.

Appendix 3.7: Researcher Script

Script

1) We're going to be talking you through the experiment by following a script so as to assure the same consistent messages are delivered to all athletes.

2) Before you sign this, I will explain the brief of the session. For the purpose of the training we can't tell you exactly what you will be experiencing today until after you have done your sighters. However, we can tell you that over the course of the pressure training, including today, you will be exposed to various pressurised scenarios of varying degrees. This will include difficult tasks, cognitive fatigue, environmental distractions, judgement, rewards, and forfeits. If at any point you wish to stop a pressure training session, or pull out of the whole thing, please make this known. Also, please don't talk with the other athletes about what happens in these training sessions. You are asked to follow this rule until the end of the pressure training which will be in a few weeks' time. If you understand and agree to this, will you please sign the consent form.

3) You may now begin your sighting – you have 5 minutes and you will hear a thirty seconds warning before your time is up.

4) Explain IAMS

5) Nexus-4 encoder and heart-rate

6) Plug up to heart-rate

7) Condition specific explanation

8) Questions?

9) Take IAMS

10) Record data and begin experiment.

Appendix 3.8: Perceived Pressure and IAMS

I experienced

No pressure 1 2 3 4 5 6 7 "Extreme pressure

I am cognitively anxious

(not at all) 1 2 3 4 5 6 7 (extremely)

Is this feeling

(Very debilitative) -3 -2 -1 0 +1 +2 +3 (Very facilitative)

I am somatically anxious

(not at all) 1 2 3 4 5 6 7 (extremely)

Is this feeling

(Very debilitative) -3 -2 -1 0 +1 +2 +3 (Very facilitative)

I am confident

(not at all) 1 2 3 4 5 6 7 (extremely)

Is this feeling

(Very debilitative) -3 -2 -1 0 +1 +2 +3 (Very facilitative)

Appendix 3.9: Coaches Judgment Card

Coaches Judgment Card

Athlete's ability to handle the pressure of the task

Not at all	1	2	3	4	5	6	7	8	9	10	Very well

Athlete's ability to focus on the task

Not at all	1	2	3	4	5	6	7	8	9	10	Very well

Athlete's motivation towards the task

Not at all	1	2	3	4	5	6	7	8	9	10	Very well