

**The effect of manipulating training demands and consequences on experiences of pressure in elite netball**

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### **Abstract**

Testing the efficacy of a pressure training framework (Stoker, Lindsay, Butt, Bawden, & Maynard, 2016), the present study investigated whether manipulating training demands and consequences altered experiences of pressure. Elite Netballers ( $M_{\text{age}} = 26.14$  years) performed 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 was 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.

*Key words: pressure training, stress, anxiety, stressor, coping, choking, demands, consequence, forfeit, reward, judgment*

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Baumeister (1984) defined performance pressure as “any factor or combination of factors that increases the importance of performing well on a particular occasion” (p. 610). In high-stakes sporting situations, the desire to perform as well as possible is thought to create performance pressure (Beilock & Carr, 2001). Indeed, in light of both real-world (Dandy, Brewer, & Tottman, 2001) and laboratory evidence (Beilock, 2008; Beilock & Gray, 2007) it has been argued that the pressure to attain performance success often causes people to perform below their actual abilities (DeCaro, Thomas, Albert, & Beilock, 2011).

The process of performing more poorly than expected, given one’s skill level, under performance pressure is called *choking* (Beilock & Gray, 2007). The two primary explanations for choking under pressure are distraction and skill-focus theories (DeCaro et al., 2011). 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. 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 proceduralized processes that normally run outside of conscious awareness (Hill, Hanton, Fleming, & Matthews, 2009).

Since pressure can cause individuals to choke, there is a necessity to develop methods that allow athletes to improve their ability to cope with pressure (Hill et al., 2009). One such method is pressure training. Pressure training (PT) strategically exposes athletes to stressors in a training environment and allows them to enhance their ability to cope and perform under

pressure (Bell, Hardy, & Beattie, 2013; Driskell, Sclafani, & Driskell, 2014; Oudejans & Pijpers, 2009). Previous literature has identified PT to be a popular method, adopted by practitioners (Beaumont, Maynard, & Butt, 2015) and coaches (Bell et al., 2013), as a method for enhancing performance under pressure in elite sport. For example, Oudejans and Pijpers (2009) examined the impact of PT on expert basketball players. Basketball players were exposed to two pre-tests; one with and one without pressure. A five week training protocol then followed where several stressors were used to train the experimental group under pressure. In a post-test it was found the control groups' performance still deteriorated under pressure. However, the experimental groups' performance no longer deteriorated, indicating an improvement in the participants' ability to perform under pressure.

Extending this line of research, Bell et al. (2013) conducted an experiment examining how PT developed mental toughness. In the experimental group, elite youth cricketers were exposed to a PT program during training that involved being exposed to a number of consequence stressors, including the physical forfeit of cleaning the changing room and missing the next training session. In addition, transformational leadership was used to facilitate the development of coping strategies. Specifically, a multidisciplinary team of coaches, ex-international cricketers, medical staff and psychologists delivered the intervention while articulating an inspirational vision of the future. This included expressing belief in the players, and role-modelling appropriate behaviors including taking responsibility for mistakes. Results showed that the experimental group made significant improvements in objective and subjective mental toughness scores, as compared to the control group, indicating an improvement in the elite participants' ability to perform under pressure. More recently, research has found similar results with novice performers (i.e., Lawrence et al., 2014). In this study, novice golfers learned a golf putting skill while exposed to stressors. The experimental groups were exposed to consequence stressors, involving alleged judgment,

rewards and forfeits, at different stages during practice, before later being tested on their skills under similar consequences. Results revealed a significant acquisition-to-transfer decrement in performance between acquisition and transfer for the control group only, indicating that performance only suffered for the control group who were trained without the presence of consequence stressors.

However, despite the developing interest and promising findings, research is scarce regarding how pressure is systematically created across training environments (Stoker et al., 2016). Specifically, while there are examples in the wider literature of specific stressors being used to create pressure (e.g., monetary reward or physical punishment), little is known about how one systematically identifies stressors and constructs PT environments (cf. Bell et al., 2013; Oudejans & Pijpers, 2010). This indicates that PT is currently being applied in elite sport in the absence of comprehensive theoretical frameworks. Addressing this lack of knowledge, Stoker et al. (2016) conducted a study that investigated how elite coaches created PT environments. 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 create challenging training exercises. For the consequences of training, coaches organized 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.

This research and framework provided an initial insight into how elite coaches create PT environments; however, further research is needed to determine the effectiveness of the framework and the extent to which demands and consequences can be manipulated to create

pressure for elite athletes. Accordingly, the aim of the present study was to test the efficacy of this pressure training framework by investigating whether manipulating demands and consequences would alter pressure and performance. Based on previous research (e.g., Stoker et al., 2016), it was hypothesised that introducing challenging demands and meaningful consequences would increase experiences of pressure. In addition, it was hypothesized that introducing challenging demands and meaningful consequences would negatively impact performance. This prediction was based on previous research indicating that performance worsens under pressurized test conditions if participants have not received a training block under pressure (e.g., Lawrence et al., 2014; Oudejans & Pijpers, 2010), as was to be the case in the present study.

## **Method**

### **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, the sample was identified purposively (Patton, 2002) in relation to the aims of the investigation. 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. In addition, as heart-rate is sensitive to changes in physical activity (cf. Oudejans & Pijpers, 2010), in using this measure it was desired that the sport enabled the use of a closed-skill exercise. Finally, a venue that had isolated training facilities was also required. 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). For this same reason, it was also hypothesized that it may

be challenging to identify stressors that are meaningful enough to generate high levels of pressure.

Once the specific 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 Performance Director and Head Coach, players volunteered to take part. Informed consent was then obtained. The participants were aged between 19 and 32 years ( $M_{\text{age}} 26.14$ ;  $SD = 6.36$ ) 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.

### **Design**

Previous research generated a coaching framework which highlighted how elite coaches systematically created PT environments. Specifically, task, performer and environmental stressors were manipulated to shape challenging training demands, and forfeit, reward, and judgment stressors were organized to create performance-contingent consequences (Stoker et al., 2016). Seeking to examine the efficacy of this coaching framework, the present study investigated whether manipulating demands and consequences would alter experiences of pressure and performance. It was hypothesized that introducing challenging demands and meaningful consequences would alter experiences of pressure and negatively impact performance. To implement this examination, a randomized within subject design was used whereby participants performed a Netball drill across four conditions.

**Conditions.** There was a demands condition, a consequences condition, a demands plus consequences condition, and a control condition. Across the four conditions, participants performed the same Netball-specific drill. All of 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. 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.

The researchers collaborated closely with the participants, coaches, and wider support team when selecting the Netball exercise, stressors and conditions. 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 derived from these interviews was then discussed in meetings with the coaches and support staff, before the final stressors were agreed upon. These stressors were the closest to being as meaningful as the consequences found at competition (see Bell et al., 2013; Stoker et al., 2016).

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

**Netball Exercise.** The exercise consisted of throwing 12 one-arm shoulder passes at three targets on a wall. The throwing position was 4 meters away from the wall, and the targets were positioned 4 meters off the ground and were 1 meter apart. The targets had an outer target area of 12x12 inches, and at the center of each of these targets were a smaller 6x6 inch target. The 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, an experimenter recorded the accuracy of the shot on a purpose-built scorecard 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, 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.

**Stressors.** The framework generated by Stoker et al. (2016) was used to guide the defining and designing of stressors. In conditions where consequence stressors were introduced, this was achieved via manipulating judgment, forfeit, and reward (cf. Bell, et al., 2013; Driskell et al., 2014; Lawrence et al., 2014; Oudejans & Pijpers, 2009, 2010; Stoker et al., 2016). Judgment stressors consisted of requiring the athletes to perform the exercise in front of 2 or 3 of their peers, the Head Coach who was also the acting Performance Director, and a video camera. The observing teammates sat in a designated area and watched the athlete complete the exercise. Additionally, 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. Furthermore, the athletes were informed that the video camera would record 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 categorizes preferences into four factors and indicates to what extent an individual prefers and avoids each one. The theory has been used previously to understand the types of tasks athletes might favor or dislike (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 multiples of 17's, from 1013. In addition to receiving this forfeit, the holder of the lowest score also had to select one of the other participants in the condition to complete one of the four tasks (they could not choose the winner of the condition). Given that all of 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 to receive a forfeit. This reward was presented to the athlete who attained the highest score.

In conditions where the exercise demands were increased, this was achieved via manipulating task, performer, and environmental stressors (cf. Pinder, Davids, Renshaw, & Araújo, 2011; Stoker et al., 2016). Task stressors were manipulated by randomizing the shot sequence and requiring the athletes to release each shot within three seconds of receiving the ball. Additionally, 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 randomized, one of the experimenters called out a randomized 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. Additionally, 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 selected required the participants to perform 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 auditory distractions are a common feature of 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, Johnston, & Salas, 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 foot away from the performer and a beep was played 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; a crowd stressor could be interpreted as a judgment (consequence) stressor and music could differentially impact motivation.

As the experiment was conducted in an applied setting, as oppose to a laboratory, specific steps had to be taken to reduce confounding variables. The study was located in a Netball hall that was completely secluded and thus bereft of bystander observation. Excluding the conditions where consequences were manipulated, only the first and last authors were present during the conditions. Athletes were asked not to discuss their experiences with fellow participants until the study was complete. A script was followed for all conditions, so as to ensure the same narrative was delivered to each participant. All the conditions took place at times that were within the athletes' normal training hours. In the consequence conditions where athletes were grouped, the coaches chose the grouping so as to ensure an equal level of competency within each cohort.

**Measures.** To assess experiences under pressure, several measures were used. Pressure and anxiety were directly assessed via self-report and heart-rate was examined using a heart-rate monitor. These methods were adopted based on previous studies examining performance under pressure. For example, perceptions of pressure were assessed in a basketball exercise via a 7-point Likert-type scale where 1 indicated "no pressure" and 7 indicated "extreme pressure" (Kinrade, Jackson & Ashford, 2015). This scale has also been adopted outside of sport, by the same researchers, in cognitive and motor tasks (Kinrade, Jackson & Ashford, 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 and 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. Also, Malhotra,

Poolton, Wilson, Ngo and Masters (2012) assessed these measures in a pressurised surgical task.

Based on the literature highlighted previously, perceptions of pressure were examined by asking participants to rate how much pressure they felt they were under on a 7-point Likert-type scale (Kinrade et al., 2010; 2015). On this scale, 1 represented “no pressure” and 7 represented “extreme pressure”. Heart-rate data were monitored using a Nexus-4 encoder (MindMedia, Roermond-Herten, the Netherlands) and captured via Bluetooth to a laptop running Mind Medias 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 were 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) of each athlete were calculated using Biotrace+ functions. Participants’ average bpm was calculated from the start signal to when the last shot was thrown. For contextualisation, average resting heart-rate has been indicated as 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 using both short (Oudejans & Pijpers, 2009; 2010) and full version (Kinrade et al., 2015) questionnaires. While short and full version questionnaires have been the target of 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 (Thomas, Hanton, & Jones, 2002), which has been identified as a valid and reliable method for

assessing state cognitive and somatic anxiety, alongside the direction and intensity of self-confidence (Williams et al., 2010). This questionnaire composes three items 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 debilitating (-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”. Using these scorecards, the researchers measured performance score and performance accuracy. Performance score was calculated by adding up all the points, where one point was accrued every time a target was successfully hit. In conditions with easy demands, 1 point was attained every time the ball hit anywhere on the correct 12x12 target and no points were awarded for hitting the smaller 6x6 targets. In difficult demand conditions, 1 point was gained every time the ball hit anywhere on the correct 6x6 target and no points were awarded if the larger 12x12 area was hit. This total score was used during the completion of each condition as the measure of performance. Performance accuracy was calculated post-experiment for each condition using a scoring system whereby hitting the smaller 6x6 target area was worth 2 points and a the larger 12x12 target area was worth 1 point.

## **Procedure**

Prior to partaking in the conditions, a group session was conducted 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 was used throughout the completion of each condition. Upon arrival, the performing athlete was plugged up to the Nexus-4 encoder. The exercise was then explained to the participant before they completed the IAMS. The participant then 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 where consequences were manipulated, following an explanation of the exercise and consequences, the order of participation was randomized. 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 of the athletes had performed the exercise. 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.

### **Data Analysis**

The independent variables were the demand and consequence stressors manipulated across the conditions. The dependent variables were heart rate, performance, and 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 used 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.

## 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 below.

### 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).

### 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. There was no main effect for self-reported cognitive anxiety direction, self-reported somatic anxiety direction or self-reported confidence direction.

### **Performance**

A significant main effect was found for the performance score ( $F(3, 42) = 13.23, P < .000; \eta^2 = .49$ ) and performance accuracy ( $F(3, 42) = 17.08, P < .000; \eta^2 = .55$ ). Pairwise comparisons showed that performance scores were significantly lower in the demands condition ( $m = 6.40$ ) and the demands plus consequences condition ( $m = 6.20$ ) than the consequences condition ( $m = 8.93$ ) and the control condition ( $m = 8.93$ ). Likewise, 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 ( $m = 10.07$ ).

### **Discussion**

The present study tested the efficacy of Stoker and colleagues' (2016) pressure framework. The study investigated 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, Eastman, & Carroll, 1985, 1986; Oudejans & Pijpers, 2009) were measured. It was hypothesized that introducing

challenging demands and meaningful consequences would increase experiences of pressure and negatively impact 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. Additionally, 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 consideration of Stoker and colleagues' (2016) coaching framework and the findings of the present study, there is mixed support for the effects of demand stressors and an indication that consequences may be more influential than demands in generating pressure.

In the present study, 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 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, Stress Inoculation Training 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). 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 to the proposal that demand stressors could also be important when PT due to an 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 suggests that performance was not impacted by the introduction of consequences and 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 debilitating 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 can be contrasted with previous research (i.e., Bell et al., 2013; Lawrence et al., 2014; Oudejans & Pijpers, 2009) where stressors exposure has positively impacted on performance. This contrast is likely explained by differences in study designs. Specifically, previous literature has sought to examine the effects of a stressor-exposure training phase on subsequent performance under test conditions. Oudejans and Pijpers (2009) used pre-tests, Lawrence and colleagues (2014) incorporated trials, and Bell et al. (2013) utilized training blocks, whereby participants were trained whilst exposed to stressors for a period of time prior to being tested under pressure. Indeed, in Bell and colleagues' (2013) study, the participants underwent 46 days of training before subsequent testing. The present study, in contrast, was designed to investigate the impact of a specific coaching PT framework and, in accordance with this aim, the participants were exposed to four test conditions only and no training phase. Thus, performances in the present study may not have been enhanced under pressure due to the absence of such a training phase. Further research is required to test the utility of the proposed framework (Stoker et al., 2016) and its ability to be used to enhance performance via pressure training over an extended period.

### **Applied Implications**

These present study findings provide an insight for those creating PT environments. Specifically, it appears that consequences, such as forfeit, reward, and judgment, may be a necessity for producing pressure and previous research supports this position (cf. Bell et al.,

2013). Examples of forfeits include physical or ego punishments, such as cleaning up the changing room or missing a training session (Bell et al., 2013). Rewards may take the form of monetary incentives (Oudejans & Pjipers, 2009) or selection (Stoker et al., 2016), and judgment may take the form of peer or coach evaluation (Driskell et al., 2014; Kinrade, et al., 2015). While this is not an exhaustive list, coaches and practitioners may wish to consider the types of consequences highlighted in current literature and how these can be explored in one's own sport.

In the present study, the researchers conducted interviews and held meetings with the athletes, coaches and support staff to refine which consequences would be used. This was critical for developing an understanding of individual differences and designing consequences that were meaningful. It is important to recognize, however, that the process of identifying and designing personalized stressors is time, money, and resource dependent. While it may be possible in certain sports to tailor stressors for specific athletes, this might often be difficult, especially with large teams. A solution to this problem could be to utilize “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 and previous literature has also suggested that certain stressors, such as selection (Stoker et al., 2016), can be used to this effect. Hence, coaches who want to avoid personalizing each consequence when PT, such as 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 other respond to low, coaches could accommodate these differences by accompanying blanket stressors with a split-training program that allows some athletes to train with high demands and others with low.

When PT, previous research identified that elite coaches did not always look to utilize consequences that replicated competition (Stoker et al., 2016). 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 that which athletes experience at competition. With this in mind, when designing the conditions of the present study, the researchers, support staff and coaches considered the consequences that the participants were exposed to at competition. These included highly meaningful ego stressors, such as performing on television with an audience in the hundreds of thousands, and reward stressors, such as performing for a world title. Following these deliberations it could be seen that the participants were accustomed to managing notable consequences and, on a number of occasions, this led to stressors that had been identified for potential 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 for the participants. This process could be important for applied practitioners and coaches to consider. Explicitly, it could be worth identifying 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 (Keinan & Friedland, 1996).

### **Future Research**

While the present study findings do not establish that training demands are redundant at generating pressure, there is an indication that consequences may be more influential than demands in generating pressure in elite sport. As research strives to develop and refine a comprehensive theoretical underpinning model for PT, these initial findings require additional confirmation and exploration to support any future potential application in elite sport. This 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 and performance. Such research could reveal new insights into the precise roles of training demands and consequences and also identify which stressors coaches should manipulate in order to maximize their time and resources. Additionally, in the present study, a closed-skill exercise was used. Thus, considering that the coaches in Stoker and colleagues' (2016) investigation often constructed the training demands to replicate competition when pressure training, insights could be gained by conducting research utilizing training demands that more closely emulate the demands of competition (i.e., where there are greater pressures on skills such as decision making).

It might also be beneficial for future research to investigate if the findings are consistent in less skilled participants. 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 environments.

It could also be valuable for future investigations to research the effects of utilizing demand stressors that replicate competition. Specifically, the demand stressors used in the present study comprised a closed-skill exercise (one-arm shoulder pass). In this way, the training demands did not replicate competition. While previous research has identified that coaches believe training consequences do not need to replicate competition (Stoker et al., 2016), there is literature highlighting the benefits of constructing representative training demands (Pinder, Davids, Renshaw, & Araújo, 2011). Under conditions that emulate competition, (i.e., where there are greater pressures on skills such as decision making), it could be possible that training demands may have a different impact on pressure.

Stoker and colleagues' (2016) reported that one 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). Therefore, it is possible that there may be an interactive relationship between consequences, demand stressors and pressure, and this potential interaction warrants further investigation.

At present there is no standardized approach for eliciting information from athletes regarding their disposition towards specific consequences and training demands. Currently, as was the case in this investigation, those conducting PT may have to rely on an unstandardised material to gather such information. Developing a purpose-built questionnaire could allow for a more standardized, safe and effective approach.

### **Limitations**

One limitation of the study is that there isn't a measure for assessing perceived performance pressure with empirical validity and reliability coefficients. However, previous empirical research has faced this same challenge and documented a number of methods and measures that can be used to effectively examine experiences in pressurized environments (Kinrade et al., 2015; Mace et al., 1985; 1986; Oudejans & Pjipers, 2009; 2010). For instance, previous literature has demonstrated that self-reported state anxiety is a reliable indicator of pressure to perform (Gucciardi et al., 2010; Mesagno & Mullane-Grant, 2010). Accordingly, the present investigation relied on previous empirical research to ensure that the methods and measures used were supported by evidence. Another limitation is that 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 behavior, facilitated via the use of a script, was constant across all the conditions. A third potential limitation is that the participants may have discussed each condition with one-another. To reduce this possibility, a clause was included in the consent

form that asked participants not to share their experiences, and this message was reinforced at the end of each condition. Additionally, the captain agreed to continually and proactively reinforce this clause. A fourth potential limitation is that the study was conducted with a specific sports team and specific athletes. Bearing in mind research detailing the importance of understanding individual differences when PT (Stoker et al., 2016), one should consider the implications of directly generalizing the results to other sports, teams or individuals.

### **Conclusion**

Previous literature addressed a lack of research investigating how pressurized training environments are systematically created (Stoker et al., 2016). This research led to the emergence of a framework which identified two key areas that coaches manipulated to create PT environments: the demands and consequences of training. Based on a need to assess the efficacy of the framework (Stoker et al., 2016), the present study explored the effects of manipulating demands and consequences of training on pressure and performance.

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. Thus, there is evidence that consequences may 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. It was also discovered that manipulating training demands impacted performance. In accordance with these findings, the present study highlights some support for the Stoker and colleagues (2016) coaching

framework. Specifically, although it appears that they may have distinct roles, both training demands and consequences appear effective components for creating PT environments.

### References

- Baumeister, R. F. (1984). Choking under pressure: Self-consciousness and paradoxical effects of incentives on skillful performance. *Journal of Personality and Social Psychology, 46*, 610–620.
- Beauchamp, M. R., Lothian, J. M., & Timson, S. E. (2008). Understanding self and others: A personality preference-based intervention with an elite co-acting sport team. *Sport and Exercise Psychology Review, 4*(1), 4.
- Beaumont, C., Maynard I. W., & Butt, J. (2015). Effective ways to develop and maintain robust sport-confidence: Strategies advocated by sport psychology consultants, *Journal of Applied Sport Psychology, 27*, 301-318.
- Beilock, S. L. (2008). Math performance in stressful situations. *Current Directions in Psychological Science, 17*, 339–343. doi:10.1111/j.1467- 8721.2008.00602.x.
- Beilock, S. L., & Carr, T. H. (2001). On the fragility of skilled performance: What governs choking under pressure? *Journal of Experimental Psychology: General, 130*, 701–725. doi:10.1037/0096-3445.130.4.701.
- Beilock, S. L., & Gray, R. (2007). Why do athletes “choke” under pressure? In G. Tenenbaum & R. C. Ecklund (Eds.). *Handbook of sport psychology* (pp. 425–444). Hoboken, NH: Wiley.

- Bell, J. J., Hardy, L., & Beattie, S. (2013). Enhancing mental toughness and performance under pressure in elite young cricketers: A 2-year longitudinal intervention. *Sport, Exercise, and Performance Psychology*, 2(4), 281-297.
- Benton, S., Schurink, C., van E., & Desson, S. (2005). Overview of the development, validity, and reliability of the English version 3.0 of the Insights Discovery Evaluator (IDE). Dundee: Insights Learning and Development.
- Chamberlain, S. T., & Hale, B. D. (2007). Competitive state anxiety and self-confidence: Intensity and direction as relative predictors of performance on a golf putting task. *Anxiety, Stress, and Coping*, 20(2), 197-207.
- Dandy, J., Brewer, N., & Tottman, R. (2001). Self-consciousness and performance decrements within a sporting context. *The Journal of Social Psychology*, 141, 150–152. doi:10.1080/00224540109600540.
- DeCaro, M. S., Thomas, R. D., Albert, N. B., & Beilock, S. L. (2011). Choking under pressure: multiple routes to skill failure. *Journal of Experimental Psychology: General*, 140(3), 390.
- Driskell, J. E., Johnston, J. H., & Salas, E. (2001). Does stress training generalize to novel settings? *Human Factors: The Journal of the Human Factors and Ergonomics Society*, 43(1), 99-110.
- Driskell, T., Sclafani, S., & Driskell, J., E. (2014). Reducing the effects of game day pressures through stress exposure training, *Journal of Sport Psychology in Action*, 5:1, 28-43.

- Gucciardi, D. F., Longbottom, J. L., Jackson, B., & Dimmock, J. A. (2010). Experienced golfers' perspectives on choking under pressure. *Journal of Sport & Exercise Psychology, 32*(1), 61.
- Hays, K., Thomas, O., Maynard, I., & Bawden, M. (2009). The role of confidence in world-class sport performance. *Journal of Sports Sciences, 27*(11), 1185-1199.
- Hill, D. M., Hanton, S., Fleming, S., & Matthews, N. (2009). A re-examination of choking in sport. *European Journal of Sport Science, 9*(4), 203-212.
- Karageorghis, C. I., & Terry, P. C. (1997). The psychophysical effects of music in sport and exercise: A review. *Journal of Sport Behavior, 20*(1), 54.
- Keinan, G., & Friedland, N. (1996). Training effective performance under stress: Queries, dilemmas, and possible solutions. *Stress and Human Performance, 257-277*.
- Kinrade, N. P., Jackson, R. C., & Ashford, K. J. (2010). Dispositional reinvestment and skill failure in cognitive and motor tasks. *Psychology of Sport and Exercise, 11*(4), 312-319.
- Kinrade, N. P., Jackson, R. C., & Ashford, K. J. (2015). Reinvestment, task complexity and decision making under pressure in basketball. *Psychology of Sport and Exercise, 20*, 11-19.
- Lawrence, G. P., Cassell, V. E., Beattie, S., Woodman, T., Khan, M. A., Hardy, L., & Gottwald, V. M. (2014). Practice with anxiety improves performance, but only when anxious: evidence for the specificity of practice hypothesis. *Psychological Research, 78*(5), 634-650.

- Mace, R. D., & Carroll, D. (1985). The control of anxiety in sport: Stress inoculation training prior to abseiling. *International Journal of Sport Psychology*, 16, 165-175.
- Mace, R. D., Carroll, D., & Eastman, C. (1986). Effects of stress inoculation training on self-report, behavioural and psychophysiological reactions to abseiling. *Journal of Sports Sciences*, 4(3), 229-236.
- Malhotra, N., Poolton, J. M., Wilson, M. R., Ngo, K., & Masters, R. S. (2012). Conscious monitoring and control (reinvestment) in surgical performance under pressure. *Surgical Endoscopy*, 26(9), 2423-2429.
- Mellalieu, S., & Hanton, S. (Eds.). (2008). *Advances in applied sport psychology: A review*. Routledge.
- Mesagno, C., & Mullane-Grant, T. (2010). A comparison of different pre-performance routines as possible choking interventions. *Journal of Applied Sport Psychology*, 22(3), 343-360.
- Miles, W. R. (1930). Ocular dominance in human adults. *The Journal of General Psychology*, 3(3), 412-430.
- Mindmedia. *Manual. NeXus-10 user's guide*. Roermond-Herten: Mind Media B. V., 2004.
- Neil, R., Wilson, K., Mellalieu, S. D., Hanton, S., & Taylor, J. (2012). Competitive anxiety intensity and interpretation: A two-study investigation into their relationship with performance. *International Journal of Sport and Exercise Psychology*, 10(2), 96-111.
- Oudejans, R., & Pijpers, J. R. (2009). Training with anxiety has a positive effect on expert perceptual-motor performance under pressure. *The Quarterly Journal of Experimental Psychology*, 62, 1631-1647.

- Oudejans, R., & Pijpers, J. R. (2010). Training with mild anxiety may prevent choking under higher levels of anxiety. *Psychology of Sport and Exercise, 11*(1), 44-50.
- Patton, M.Q. (2002). *Qualitative research and evaluation methods* (3rd Ed.). Thousand Oaks, CA: Sage.
- Pinder, R. A., Davids, K. W., Renshaw, I., & Araújo, D. (2011). Representative learning design and functionality of research and practice in sport. *Journal of Sport and Exercise Psychology, 33*(1), 146-155.
- Servos, P., & Goodale, M. A. (1994). Binocular vision and the on-line control of human prehension. *Experimental Brain Research, 98*(1), 119-127.
- Spodick, D. H. (1993). Survey of selected cardiologists for an operational definition of normal sinus heart rate. *The American Journal of Cardiology, 72*(5), 487-488.
- Starkes, J. L., Edwards, P., Dissanayake, P., & Dunn, T. (1995). A new technology and field test of advance cue usage in volleyball. *Research Quarterly For Exercise and Sport, 66*(2), 162-167.
- 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.
- Thomas, O., Hanton, S., & Jones, G. (2002). An alternative approach to short-form self report assessment of competitive anxiety. *International Journal of Sport Psychology, 33*, 325–336.
- Weinberg, R., & Butt, J. (2011). Building mental toughness. In D. Gucciardi & S. Gordon, (Eds.). *Mental toughness in sport: Developments in theory and research* (pp. 212-229), Oxford, England, Routledge.

Williams, S. E., Cumming, J., & Balanos, G. M. (2010). The use of imagery to manipulate challenge and threat appraisal states in athletes. *Journal of Sport and Exercise Psychology*, 32, 339-358.